

CURRENT RESEARCH IN HEALTH SERVICES AND EVALUATIONS I

Editors

Assoc. Prof. Dr. Aysel Güven

Assoc. Prof. Dr. Mustafa Gülşen



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PREFACE

The effort to keep up with the rapid technological and environmental change brought about by our age creates a series of chronic and permanent health problems in health workers as psychological, physical, physiological and biochemical.

In order to lead a better quality, productive and peaceful life for people and to increase their quality of life to a high level, it is necessary to be aware of the negative factors and causes that may occur in metabolism, to identify the factors that cause the emergence of the causes, and to learn how to cope with them by examining multi-dimensional researches.

In this context, with this book, the studies of Başkent University Vocational School of Health Services on health are evaluated in a versatile way with current study resources and the ways and methods presented for health care workers and health care businesses to minimize the factors that affect or may affect health in working life. It will be useful.

We would like to thank all the faculty members of Başkent University Vocational School of Health Services who contributed to the preparation of the book.

We would like to express our gratitude to Founder of Başkent University Prof. Dr. Mehmet Haberal and Başkent University Rector İ. Haldun Müderrisoğlu who have created all possibilities to create this book. Regards

Assoc. Prof. dr. Aysel GUVEN
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CHAPTER I

MOTIVATION IN HEALTHCARE WORKERS

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1. Introduction

Health is considered as one of the sectors that has become the locomotive of the economies of countries where competition is at the highest level. In its simplest form, manpower is accepted as the most distinctive resource that provides superiority in the competition of public health institutions operating in a country with the public, private ones with the private and the public with the private. Maintaining and increasing the efficiency of manpower resources is seen as an area of business that businesses operating in every field should actually think about.

An organization is defined as a union of people who have come together to achieve a common goal. Organizations want their employees to be equipped with high motivation for this purpose. Motivation is the power that activates the person and businesses have duties to direct this power to the goal. Businesses that fulfill these duties, on the other hand, adapt to competitive conditions and gain competitive advantage with the returns obtained with the highest level of employee performance. The revenues obtained are not limited to the employer only. Employees with high motivation are also happy with the work they love. In this state, the desired organizational climate is created by mutually operating the win-win principle of the parties within the organization. Motivation is one of the important factors capable of highly influencing human behavior and performance. The level of motivation in the work of an individual or team can affect all aspects of organizational performance.

Human is a complex being that is difficult to understand. The fact that an entity with these characteristics can be motivated in a health institution, which is

a structure where the variety of services provided and the functional dependence between these services is high, makes the work of those who perform the management task even more difficult. Providing health services with extremely low error tolerance potential by employees with low motivation will prevent the production of services at the desired quality level. A motivated and qualified workforce is extremely important to increase the efficiency and quality of health services in order to contribute to the achievement of the goals of health services.

2. Definition and Importance of Motivation

Motivation is derived from the Latin word “movere”, which is the equivalent of the verb to move (1). Dictionary definitions define motivation as a way of activating it. Motivation represents the psychological process that causes the stimulation, direction and continuity of goal-directed voluntary actions (2). Motivation in the context of work is defined as “the degree to which an individual strives for organizational goals and ensures the sustainability of this willingness” (3).

Although the definitions differ in some points, there is consensus on some features underlying the definitions. First, motivation is a phenomenon that traditionally concerns the individual. Every individual is unique, and all motivational theories place some emphasis on demonstrating this uniqueness (for example, different people have different needs, demands, values, attitudes, empowerment histories, and goals). Second, motivation is defined as a concept that is purposefully controlled by the employee. Most behaviors that appear to be influenced by motivation (for example, the effort expended on work) are seen as the individual’s preferred actions. Third, motivation is multidimensional. The two most prominent dimensions of behavior are arousal (activators, energizers) and direction (choices). What are the situations that motivate people to do better? The second question is about choice, which gives the individual the power to act in desired behaviors. Now that the person has been warned, what causes them to go in a particular direction? These distinctions are the focus of most motivational studies. Fourth, the purpose of motivation theories is to predict behavior. Motivation is about action and being involved as an internal and external force in one’s choice of action. Motivation is neither the behavior itself nor the performance of the behavior. Behavior is the criterion chosen. In some cases, the chosen path reflects the performance well. However, psychological processes, actual behavior and performance are different concepts that need to

be considered separately. When they are not handled as different concepts, it can cause problems in analysis, interpretation and application (2).

Early studies of understanding what motivates people go back as far as the Greek philosophers and hedonism, where pleasure is sought and pain is avoided. At the end of the nineteenth century, the subject of motivation began to enter the field of psychology, starting from the world of philosophy. The use of hedonism, which is the basis of motivational work, has brought difficulties to the surface. As the hedonistic assumption has no empirical content and cannot be tested, behavioral scientists have begun to seek empirical models to explain motivation. Early models included the instinctive theories developed by James, Freud, and McDougall. Rather than seeing behavior as a product of reason, these theorists claimed that most behavior is instinctive. From the early 1920s, the expansion of the theory's limitations had to replace instinctive theories with models based on motivation or reinforcement. Under the guidance of psychologists such as Thorndike, Woodworth, and Hull, theorists introduced the concept of learning in motivational behavior and stated that present or future behavior decisions are largely influenced by the rewards associated with past behavior. On the basis of their theory, past actions that lead to positive results are repeated, while past actions that lead to negative consequences are reduced. Hull argued that motivation is largely determined by 'motive \times habit'. Skinner et al. argued that later on, individuals learn the conditional relationships between actions and consequences and guide future behavior. Empowerment models continue to evolve to understand work motivation, work performance, and the workplace in various performance management programs. While psychologists focus on instincts and drives, managers seem to focus more on pragmatic issues (4).

Maslow showed the needs of human beings gathered in five categories in a hierarchical level by placing them in a pyramid shape and stated that the need for respect and self-actualization can only be activated if the physiological needs for love/belonging, security and existence are met (5). Herzberg, along with his colleagues, argued that only motivators such as recognition, personal development and job characteristics can motivate employees, while factors such as salary, conditions, status and security do not, but reduce dissatisfaction (6).

From the mid-1960s, a new approach emerged that focused on the study of work motivation and describing its underlying processes. Process theories were in sharp contrast to previous content theories, which focused on identifying motivation-related factors in a relatively static environment. While process theorists approached motivation in business life with dynamism at the forefront,

they focused on the causal relationships between time and events in employee behavior. At the heart of process theory is a set of cognitive motivation theories that seek to understand the thinking processes of employees as a whole to determine how they will behave in their organizations (4).

Nohria et al. published a new theory of employee motivation in 2008 in which they presented synthesized findings from the social and biological sciences. Researchers suggest that there are four universal emotional needs that underlie human motivation, regardless of a person's culture, age, and gender. These, according to the authors, are the motivation to win, to engage, to understand and to defend, which are connected to the human brain and are products of evolutionary heritage (7).

Human life is a series of continuous activities. In addition to the endless variety of actions and expressions that affect the social and physical environment, there is also a hidden side of the mental activities of experiencing, perceiving, thinking, feeling and imagining. While these mental activities are not directly observable by others and have a direct impact on the environment, they are also a part of the flow of life. Motivational psychology is particularly concerned with activities that pursue a specific goal and form a meaningful unit of behavior. Motivational studies are also aimed at explaining why and how these behavioral units are made (8).

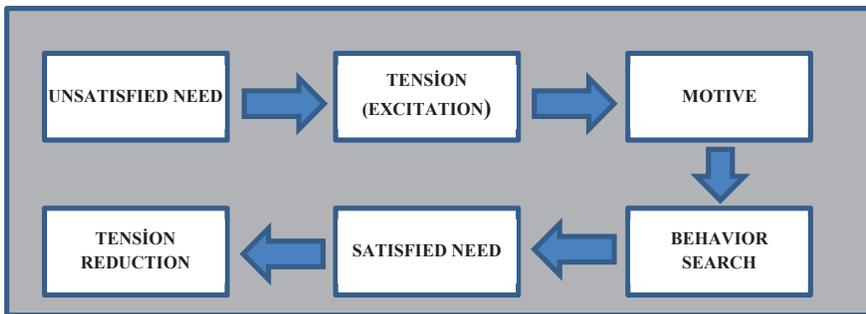


Figure 1. Basic Motivation Process (9)

Rahimic defined motivation as an individual's level of readiness to take action and includes all dimensions that affect, reinforce and regulate human behavior. In other words, it concerns an action of limited intensity and duration. On the other hand, motivation is influenced by many factors, especially the character of the person, the characteristics of the job and the organization itself. External factors (living standards, moral and value system, socio-economic development, etc.) can also affect employee motivation (10).

Motivation in working life is expressed as the individual's effort towards organizational goals and the desire to maintain this. Employees have different competitive needs driven by different motivators. Therefore, in order to maximize organizational performance, managers should consider what actually motivates employees (11).

While traditionally accepted motivational theories focus on the specific elements that motivate employees in pursuit of organizational performance, current research on employee motivation includes areas such as neuroscience, biology and psychology by keeping the discipline more in the foreground (11).

Many theories have been developed to explain the nature of motivation. These motivation theories are generally examined in two groups. Motivational theories in the first group are theories that investigate the reasons for human motivation and therefore its content. Content theories try to find situations, events and human needs that create motivation. The motivation theories in the second group are the process institutions that investigate the formation of motivation and its formation stages. Process theories try to recognize the nature of the motivational process that can be observed from the birth of the need to its satisfaction. These theories are not regarded as absolute truths. However, since the opposite has not been proven, these theories remain up-to-date. At this stage, it is important for managers to apply these theories. In other words, it is how to motivate employees (12).

Motivation in management science; It is the conditioning and willingness to meet one's own needs as a result of the individual's effort in order to achieve organizational goals (13).

The way to keep critical employees in the business is without their motivation. Organizational performance is maximized when organizational levers are used to drive and motivate employees. Large investments in employee retention efforts in organizations require careful consideration, analysis and contribution to motivation theories. Otherwise, it is inevitable for businesses to pay a heavy price for losing employees with scarce valuable knowledge and talent.

Although the developmental pace of theoretical developments in work motivation has slowed in recent years, the business world has visibly changed. Businesses often shrink and expand simultaneously, in different departments or at different levels of the hierarchy. The workforce is now defined by different needs and increasing diversity of demands. Information technologies have changed both the way of action and the position of business processes. New organizational

structures (such as e-commerce) are quickly becoming commonplace. Teams are redefining the concept of hierarchy alongside traditional power distributions. The use of situational workers is increasing. Managing employees who direct knowledge causes confusion for managers with experience in different sectors. Globalization and cross-border management challenges are now the norm rather than the exception (4).

Motivated employees focus their efforts to achieve set goals. Therefore, the task of managers is to guide employees and ensure that they offer the best they can. Motivated employees have fewer illness-related absences, are more productive, and less likely to act negatively towards customers and teammates. They also stay at their jobs longer, reducing staff turnover and employee recruitment and training costs.

Before starting the explanation of various motivation theories, the distinction between intrinsic and extrinsic motivation should be revealed. In its simplified form, intrinsic motivation comes from within: a sense of enjoyment about a task, satisfaction with a job well done and the desire to achieve are all included within the scope of intrinsic motivation. On the other hand, extrinsic motivation arises due to external factors such as reward. It is said that the fear of avoiding punishment or a bad outcome can be a great source of extrinsic motivation (14).

3. Motivation Theories

The views, which consider the human being as a being that constantly develops from physiological and psychological aspects, focus on the development of the person, his inner abilities and capacity, and the rational and emotional aspects that form the basis of certain attitudes, perceptions, feelings, desires and thoughts. Therefore, these views give importance to understanding the person and motivating the person by addressing these factors in the person.

Some of the motivation theories give weight to the external factors around the person rather than the internal factors. These theories are based on the assumption that people's behavior is influenced and controlled by external factors. The problem then becomes which external factors affect "how staff can be motivated". This problem is tried to be solved by interfering with the personnel or the environment in which they work. Therefore, the focus of these theories is on understanding and using the (external) factors in the person's environment and influencing one's behavior.

As a result, it is possible to collect motivation theories in two main groups. The first group are the theories that can be called Content Theories and give weight to internal factors, and the second group are the theories that can be named as Process Theories and give weight to external factors (15).

3.1. Content Theories

Within the scope of the theories included in this definition; It is tried to understand the factors that are in the person and that lead the person to behavior in certain directions. If the manager can understand the factors that direct the employee to a certain behavior, he or she can better manage the employee by focusing on these factors and ensure that he or she adapts to the goals of the organization (15).

Theories grouped under this heading are as follows:

- Maslow's Hierarchy of Needs
- Herzberg Two Factor Analysis
- Existence, Relationship and Growth by Alderfer "E.R.G." theory
- McClelland's Need to Achieve Theory

3.1.1. Maslow's Hierarchy of Needs

Maslow's Hierarchy of Needs is a pyramid-shaped model of human needs. With this model, which is applied in the business world as well as in psychology, it is tried to understand what motivates people. The pyramid has five steps, and unless the lower needs are met, one cannot move to the next level of need above. Maslow's theory explains that the lowest level need is the strongest motivator for human behavior, but once fulfilled, the next level need becomes the primary motivator.

Physiological needs are at the first level in the hierarchy. These are basic biological needs, such as oxygen, food and water, necessary for survival. If a person wants to be satisfied, he must first satisfy these needs. Unless these needs are met, they become dominant. For example, when it comes to food, the man who is extremely hungry has no other focus of attention other than food. The only thing that decorates your dreams is food. All he wants is something to eat (16). The next stage of the pyramid is security, which follows the satisfaction of physiological needs. Individuals strive to achieve stability, health, well-being, protection and balance. This need group needs key instruments such as money,

savings and insurance to protect their health and provide economic security (17). The third stage is the need for belonging and expresses feelings such as love, affection, giving and feeling belonging. This need becomes the main driving force only after physiological needs and safety are met. The third step generally means being a part of a family, community and society and establishing close and meaningful interpersonal relationships (18). After the first three steps of the hierarchy of needs are overcome, the need for respect comes to the fore. This need expresses both self-esteem and respect from others. If this need is met, the person feels confident and valuable. If it is not met, it perceives itself as weak and worthless. After the four steps, the need for self-actualization becomes the strongest motivation. This need was defined by Maslow as a need to realize what caused it to exist (19).



Figure 2. Hierarchy of Needs (5)

In order to meet higher-level needs, lower-level basic needs must be met first. Every person is actually talented and desires to climb the hierarchy to reach the level of self-actualization. However, climbing is often interrupted because lower-level needs cannot be met (20).

Table 1. Maslow's hierarchy of needs and examples (21)

Level	Needs
Physiological	Respiration, food, water, sex, sleep, balance, excretion
Safety	Body, employment, resources, morals, family, health, property security
The Need for Belonging and Love	Friendship, family, sexual intimacy
Esteem	Self-esteem, confidence, achievement, respect for others, respect from others
The Need for Self-actualization	Virtue, creativity, spontaneity, problem solving, lack of prejudice, acceptance of facts

While Maslow's original five-level Hierarchy of Needs model was sufficient to achieve most relevant goals, the seven- and eight-level "hierarchy of needs" models were later adapted by others based on Maslow's work.

Table 2. The Original and Extended Hierarchy of Needs (20)

	8. Superiority needs
	7. The need for self-actualization
	6. Aesthetic needs
5. The Need for Self-Actualization	5. Cognitive needs
4. Esteem needs	4. Esteem need
3. Belonging and Love needs	3. Belonging and Love needs
2. Safety needs	2. Safety needs
1. Physiological needs	1. Physiological needs

The most important critical point in Maslow's theory concerns the methodology of his work. Maslow formulated the characteristics of self-actualized individuals using a qualitative method called biographical analysis. He dealt with the biographies of 18 people he claimed to be self-actualized. With the data he obtained from these sources, he developed a generalized list for all of humanity. When evaluated from a scientific point of view, it is criticized that this approach has numerous problems. First of all, it can be said that biographical analysis as a method is highly subjective since it is completely based on the individual perspective of the researcher. Personal opinion is always open to bias, which reduces the validity of the data obtained. For this reason,

Maslow's definition of operational self-actualization has received criticism that it should not be accepted as scientific. In addition, Maslow's biographical analysis has focused on a biased sample, constrained by markedly well-educated self-actualizing white men (for example, Thomas Jefferson, Abraham Lincoln, Albert Einstein, William James, Aldous Huxley, Beethoven). Although Maslow also works with self-actualizing women such as Eleanor Roosevelt and Mother Teresa, it seems to constitute a small part of her sample. This makes it difficult to generalize the theory to women and lower social classes or different ethnicities. This caused Maslow's findings to be questioned in terms of demographics (20).

3.1.2. Herzberg Two Factor Analysis

In 1959, Herzberg, Mausner, and Snyderman developed the two-factor work motivation model and the motivation-hygiene theory influenced by Maslow's hierarchy of needs (22). It is seen that they carry out job satisfaction studies to decide which factors in the business environment cause satisfaction and which cause dissatisfaction. The basic hypothesis of Herzberg's theory was that some factors lead to positive attitudes towards work while others lead to negative attitudes. According to the research data, it was divided into two groups of factors that affect job satisfaction (22). These; classified as motivation and hygiene factors. Motivational factors are internal factors that will increase employee job satisfaction, while hygiene factors are external factors that will prevent employee dissatisfaction. Herzberg stated that the realization of all hygiene factors will not lead to job satisfaction in employees. They argued that motivation factors should be focused on in order to increase the performance or productivity of employees (23). Table 3 below shows the motivation and hygiene factors of Herzberg's two-factor theory (22).

Table 3. Factors in Herzberg's Theory (22)

Motivation Factors	Hygiene Factors
Development	Interpersonal relationship
The job itself	Fee
Probability of growth	Policies and management
Responsibility	Inspection
Discretion	Working conditions
Success	

Development factor; It is defined as the positive status or higher position of the person or employee in the workplace. A negative or neutral situation in the workplace is considered as a negative development.

When the job itself factor is evaluated, it is observed that job requirements and definitions have a positive or negative effect on employees. Whether the job is too easy or too difficult, interesting or boring can affect the satisfaction or dissatisfaction of the employees at the workplace.

The situation defined as the probability of growth; It relates to the real opportunities a person gets to experience personal growth and to be promoted in the workplace. In this way, professional development, gaining new skills, training on new techniques and gaining new professional knowledge is obtained.

The responsibility factor includes responsibility and authority related to the job. Responsibility is about enjoying the result of free decision making. Incompatibility between authority and responsibility leads to low motivation, which negatively affects job satisfaction.

Recognition occurs when employees produce high-quality work with praise or reward for achieving predetermined goals. On the contrary, situations can lead to criticism and accusations.

Success comes from completing a difficult task on time, solving a work-related problem, or achieving certain goals. Failure, on the other hand, occurs due to not making progress in the business or making the wrong decision in the business.

The motivation factors mentioned above are the variables that most strongly affect job satisfaction. Herzberg and other theorists argued that motivation factors should be improved in order to increase employee job satisfaction. Hygiene factors, on the other hand, reduce the job dissatisfaction of the employees in their absence. These relate to the scope of the job and include interpersonal relationships, salary, company policies and management, relationships with supervisors, and working conditions.

Interpersonal relations are concerned with the individual and working relationships between subordinates and superiors, subordinates and peers. These relationships include work-related interactions and social discussions in the work environment and during break times.

The wage factor includes movements such as an increase or decrease in one's wages at work. Institutions should clearly specify all procedures related to wages in their workplace policies.

Business policies and management factor; It includes adequate or inadequate definitions of management policies and principles that affect employees positively or negatively.

inspection factor; is associated with the authority or incompetence of the supervisory authority, its fairness or unfairness. At the same time, this factor includes the auditor's willingness to delegate responsibility or to provide teaching, fairness, and business knowledge. Access to a good supervisor or supervision is important to increase the employee's job satisfaction level. Poor leadership or management can reduce job satisfaction in the workplace.

Working conditions factors include whether the physical environment of the job is good or bad. Work conditions can include workload, work environment, ventilation, equipment, temperature and safety. A good working environment, unlike a bad one, makes employees happy and proud (22).

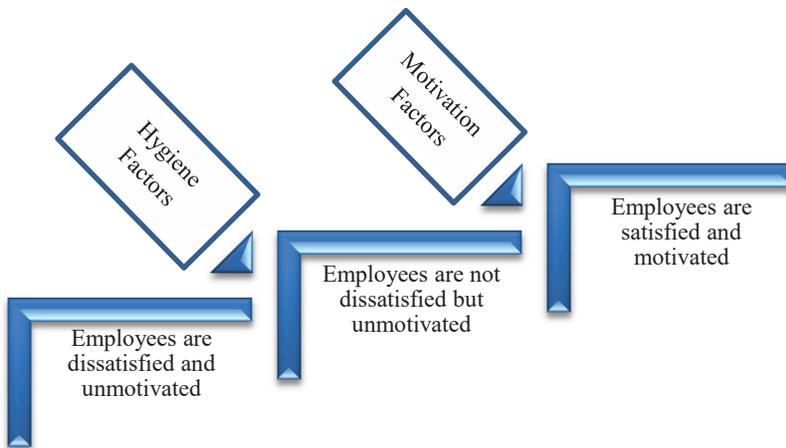


Figure 3. Herzberg two-factor theory of motivation:
Hygiene factors and Motivation factors (24)

The interesting aspect of Herzberg's theory is that the presence of the hygiene factor does not have a positive effect on job satisfaction, but its absence causes great loss of motivation. Hygiene factors are an external prerequisite that must be continually reinforced to achieve the basic level of job satisfaction. While hygiene factors only have an effect on dissatisfaction, providing motivational factors increases job satisfaction. While the absence of motivational factors does not reduce job satisfaction, their presence significantly increases the internal attitudes and motivation of employees.

The main criticism of Herzberg's theory; used a storytelling approach to present their findings and the interviews were not analytical enough. It has

been argued that he has inherent bias in his selection when setting specific criteria for hygiene or motivational factors. In addition, only white-collar employees were included in the study (24). These criticisms make it difficult to generalize the results of the study. Another dimension of criticism, especially in underdeveloped and underdeveloped economic and socio-cultural structures, hygiene factors can play a motivating role (25). In addition, motivational factors should not be handled in a common way for all individuals. Many factors such as individual differences, cultural environment, education, social roles and values shape what motivates the individual. It is considered Herzberg's biggest mistake to keep all individuals as one and evaluate only two factor groups (26).

3.1.3. Alderfer's Theory of Existence, Relationship and Growth "E.R.G"

Clayton Alderfer (27, 28) tried to eliminate the deficiencies of Maslow theory by arranging the hierarchy of needs with empirical research. With his theory, Alderfer argued that human needs are motivated by three basic groups of needs: "Existence", "Relationship" and "Development" needs. "E.R.G." The theory is evaluated as an extension of Maslow's hierarchy of needs by recategorizing Maslow's five motivational needs into three categories as Being, Relationship and Development.

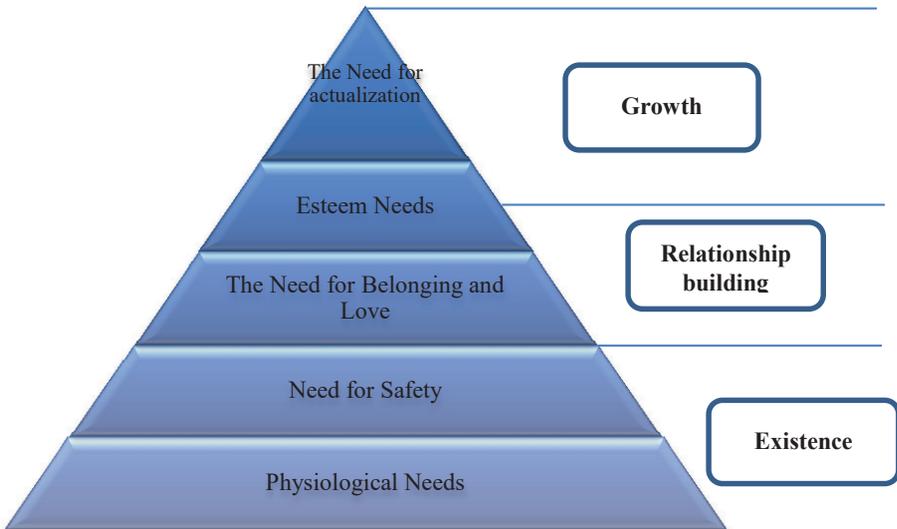


Figure 4. Maslow's Hierarchy of Needs and Alderfer's E.R.G Comparison of the theory (29)

Alderfer's theory differs from Maslow's theory in two ways. First, Alderfer proposes a triple hierarchy of needs instead of Maslow's five-line hierarchy of needs. Secondly, according to Maslov, the individual does not tend to meet the higher-level needs without meeting his lower-level needs, while in Alderfer, if the higher-level need cannot be met, the lower-level need is met, that is, tension causes the individual to withdraw (30).

Existence needs: What Maslow defines as "physiological needs" and "safety needs" were combined by Alderfer to provide existence needs (29). In this group, there are basic human needs related to survival, comfort and well-being.

The need for relationship building: This group focuses on how to interact and maintain relationships with others. The need includes open communication, satisfaction by sharing feelings and thoughts with others. It corresponds to the need for belonging and love in Maslow's theory and the need for respect from the other side.

Growth needs: These needs include the individual's self-esteem and self-actualization needs. The need for self-esteem refers to self-productive effects such as pursuing, seeking information, acquiring, controlling, building confidence, being independent, and feeling competent. Self-actualization refers to the achievement of goals and the development of an individual's personality. Their ability to realize their potential and support the growth of others is also included in this group (31).

E.R.G. model is variable, meaning an employee may feel different needs simultaneously. Someone struggling to meet the need for "Existence" may seek "Relation" in others.

When Alderfer's theory is considered in the context of job satisfaction, it should be considered that employees may have more than one need at the same time. For example, an employee who thinks that he has not had the opportunity to improve may turn to meeting his relationship needs if he is disappointed. If the work environment is not conducive to meeting these requirements, he may return to his existence needs and become interested in the wages he receives. When a manager who aims to satisfy the employee's job realizes a similar situation, he/she should help the employee to reach his/her development goal again by meeting his/her needs (32).

The main criticism of this theory is its lack of originality in its understanding. Alderfer's E.R.G. borrows the ideas of his theory largely from Maslow's theory that he founded and was criticized for. Like Maslow's theory, there are some

emotional and psychological bases that affect human needs that Alderfer's theory is not aware of (33).

3.1.4. McClelland's Need to Achieve Theory

McClelland's theory of needs is a motivational model that explains how the need for achievement, power, and togetherness influences human behavior and behavior within a managerial framework. Twenty years after Maslow's theory, David McClelland published his book *The Achieving Society*. In this book, McClelland highlighted the three types of motivation everyone has: the need for achievement, power, and togetherness. In fact, he argued that people have different characteristics according to the type of motivation that predominates. According to McClelland's theory of needs, these motivations are acquired. For this reason, this theory is sometimes called the "acquired needs theory" (34).

The needs underlined by McClelland (35);

The need for success; The individual's desire to do something better, to solve problems, or to specialize in complex tasks.

McClelland observed that successful people differentiate themselves from others by their desire to do something better. These high achievers do not like to succeed by chance; They take calculated risks that ensure success. Success-motivated people need projects that are challenging but not impossible to achieve. They continue to overcome difficult problems or situations. Successfully motivated people work effectively alone or with other successful people (36).

Power requirement; It is the desire to dominate other people, to control their behavior by influencing them, and to be responsible for them.

People with a high need for power strive to influence, persuade, and control others. They prefer to be in status-oriented positions and like to compete.

McClelland divides power into two categories:

- Personalized Power: For an individual's personal gain and
- Institutionalized Power: For the social benefit of others

Those with a high need for power work for the best when they take responsibility. Their enjoyment of competition makes it easier for them to work successfully on purpose-built projects or tasks. They are also very effective in negotiations or in situations where they need to persuade another person to an idea or goal (36).

The need for togetherness is the desire to establish and maintain good relations with other people.

People with a high need for togetherness want to establish harmonious relationships with others and be accepted. They tend to conform to group norms and are more docile than others. They display a strong trait of genuine concern for the feelings of others, a desire for approval from others, and a high level of mutual understanding. People who are motivated by commitment do best in a group setting. They also dislike uncertainty and risk (36).

Among motivation theories, Robbins and Judge stated that while McClelland's theory has good support, it unfortunately has less practical impact than others. Because McClelland argued that the three needs he emphasized are subconscious and stated that it is not easy to measure them. In addition, because this measurement process is time-consuming and costly, few enterprises have attempted to invest in measurement (37).

3.2. Process Theories

Process theories are concerned with what goals and how people are motivated. In theory, it is focused on the question of how a person who shows a certain behavior in the working environment can repeat this behavior or not (15).

The following theories will be discussed within the scope of process theories;

- Vroom's Prospect Theory
- Porter and Lawler's Prospect Theory
- Equity Theory
- Locke's Goal Setting Theory

3.2.1. Vroom's Prospect Theory

Vroom's Model; It is based on the belief that the degree of motivation is determined by the nature of the reward people expect to receive as a result of their job performance. What is expected from a person who is assumed to act rationally is to try to maximize the perceived value of the rewards he will receive. People are more motivated if they are convinced that as a result of a certain behavior they will get outcomes that match their preferences and expectations. The higher the chance of fulfilling their expectations, the higher their motivation level.

Vroom's Model has three factors (Figure 5). In order to exhibit performance motivated by three factors in the model formulation, high positive values should be obtained. Having zero variables makes the probability of motivated performance zero (38).

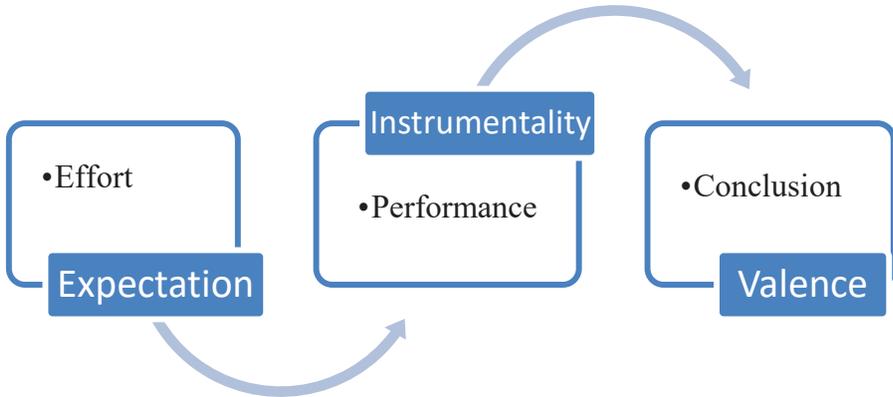


Figure 5. Three Variables of Vroom's Model (38)

Vroom's motivation; valens treats it as a product of expectation and instrumentality. These are represented in the equation below (38).

$$\text{Motivation} = \text{Valence} \times \text{Expectation} \times \text{Instrumentality}$$

Valens: Valence is the degree of desire a person has for behavioral purpose. Valens is subjective. It is about the emotions people have towards results or rewards. Employee performance is based on external factors such as money, promotions, paid leave and internal factors such as rewards and achievements. In this sense, management should discover the values of the employee and also investigate what is demotivating them.

Expectation: Expectation is the belief that if you work hard (if you have effort), you can achieve the goals (performance) set for you by your manager (39). Employees' expectations and trust levels differ from person to person, depending on what they do. Providing the support needed to complete the task is influenced by many variables, including the right resources, required skills and job expertise. Management must realize that such factors are present in the organization in the best possible way.

Instrumentality: Instrumentality refers to employees' perceptions of the probability of obtaining what they desire upon completion of assigned tasks, even if promised by management. It is the duty of the management to fulfill

the promises made in the organizations and to increase the awareness of the employees.

Vroom's expectancy theory; It has been criticized because it has not been tested experimentally, it is difficult to research and apply in practice, the valence measurement cannot be measured with scales, the model is theoretical rather than practical, and it cannot provide realistic assistance to the manager in solving problems.

3.2.2. Porter and Lawler's Prospect Theory

The theory developed by Porter and Lawler arose from the need to develop a conceptual framework in a study examining the relationship between business-related attitudes of private sector managers and their work-related behaviors and success at work. This theory is basically an expectation theory, but other attitudinal variables that are not in Vroom's theory are also included in the theory. The main feature of the theory is that it brings together a large number of variables that were discussed separately before and indicates the relationships between them (40).

The variables of this theory are briefly explained as follows (41):

Value of Reward: This variable indicates the individual attractiveness of various goals. If the individual sees the value of the reward at a high level, he may put more effort into obtaining that reward.

Probability to be rewarded with effort: This variable includes the person's expectation of whether their efforts will result in reward. This theory may differ from person to person. For example; The greater the value of the prize and the greater the probability of attaining it, the greater the effort will be.

Effort: It is the amount of physical and mental energy that a person expends to do a job. These show the amount of energy people will spend on their work. If the individual's value for the reward is high and depending on the possibility that his efforts will not be in vain, the energy he will spend while doing work will increase.

Abilities: Personal characteristics that affect one's success. A person's ability to do a job does not only depend on his willingness to do that job. At the same time, he must have the necessary skills to do the job. The efforts and abilities of each individual should be at a level to perform that job as it should be.

Job Knowledge: This variable includes the worker's subjective views on how they should do their job and how they should work in order to be successful.

If the person has full knowledge of the job, the effort to perform that job can provide high performance.

Performance: It is the product of the effort made by the employee at work. Individuals who can achieve their goals and accomplish the tasks assigned to them at a high level have high performance. Even if it is necessary to strive for performance, a good performance may not emerge as a result of every effort. When talent, business knowledge and effort are combined, the desired performance can be achieved.

Intrinsic Rewards: Rewards that one receives as a result of one's own behavior, such as doing a successful job.

Rewards: According to the Porter and Lawler model, performance should result in rewards. Every manager rewards their employees for their performance in certain ways. While some of these are given by individuals, some can be given by others from the outside. Awards are divided into two groups as internal and external;

1) Extrinsic Rewards: These are the rewards given by the company outside the employee, such as wage increase and promotion. Rewards such as wages, salaries, favorable working conditions, security, and vacations fall into this category.

2) Intrinsic Rewards: They are the rewards that a person receives as a result of his own behavior, such as doing a successful work. The sense of being successful, the sense of being able to take responsibility and the sense of being able to use their abilities fall into this group.

Principle of Equity: It is the amount of reward that the employee thinks he should receive in return for his effort. The expectations of each individual will be different according to their personality structure and environment. Individuals will evaluate whether the reward given to them complies with the principle of equality by evaluating the effort and performance of those around them according to their own effort and the resulting performance. An individual will be happy when he receives more rewards than he expects, or at least as much as he expects.

Satisfaction: It shows the relationship between the products obtained and the perceived fair rewards. If the rewards received are greater than the perceived fair reward, the person will be satisfied, whereas if the rewards obtained are less than the perceived rewards, they will be dissatisfied. Contrary to the idea that high level of satisfaction creates high level of performance, Porter and Lawler emphasize that high performance leads to high satisfaction.

As in Vroom's expectancy theory, the most important criticism made in Porter and Lawler's expectancy theory is; that these theories are very complex. This situation causes difficulties in testing. Another criticism is the suspicions that people make detailed logical arithmetic calculations without showing a certain behavior (15).

3.2.3. Equality Theory

The essence of equality theory is the principle of balance or equality. According to this theory of motivation, an individual's level of motivation is related to the perception of equality, impartiality, and fairness exercised by management. The higher the individual's perception of justice, the higher the motivation level. While assessing equality, the employee compares the effort he has made and the result he has achieved with another colleague who works in the same equal cadre. To make such a comparison, the "Output/Input" ratio is used.

His/her $\frac{Output}{Input}$	<	Companion's $\frac{Output}{Input}$	→	Low Reward (Inequality Tension)
His/her $\frac{Output}{Input}$	=	Companion's $\frac{Output}{Input}$	→	Perception of Equality
His/her $\frac{Output}{Input}$	>	Companion's $\frac{Output}{Input}$	→	High Reward (Inequality Tension)

Adams has four basic propositions about inequality (42).

1. Perceived inequality increases the tension level of the individual.
2. The level of tension is proportional to the size of the perception of inequality.
3. The tension created motivates the individual to reduce it.
4. The strength of motivation to reduce inequality is proportional to perceived inequality.

In order to eliminate inequality, a person can exhibit the following behaviors (15):

- Change in effort (increase or decrease pay, less efficient work)
- Changing the result (claiming higher fees or rewards)
- Changing the logical definitions of effort and results. thus reducing inequality.

- Leaving the job (Resignation, change request in the workplace, absenteeism)
- Forcing others to reduce their effort
- Changing the key factors on which the comparison is based

3.2.4. Locke's Goal Setting Theory

Goal setting is a powerful tool that can be used to motivate and challenge employees to achieve the strategic goals of the business. Well-defined goals are clear, and whether the goal has been achieved or not can be determined objectively. Poorly defined goals are not clear, and although it is thought that the goal has been achieved, it becomes extremely difficult to say what the achieved goal looks like. With the latter situation, it is inevitable to result in disappointment and lack of effectiveness (43).

According to this theory, goals set by individuals will also determine their degree of motivation. If a person sets goals that are more difficult to reach and higher, they will perform higher and be more motivated than someone who sets goals that are relatively easy to reach. The main idea of the theory is the degree of reachability of the purpose that people set for themselves (44).

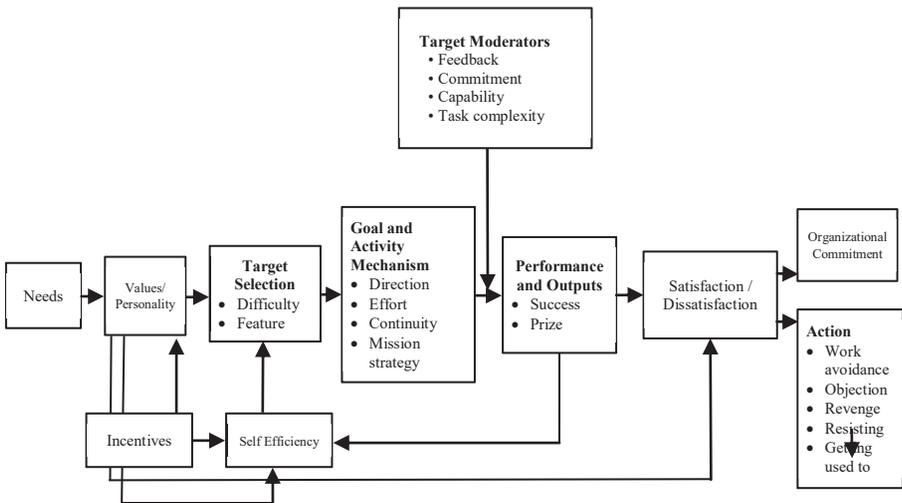


Figure 6. Locke's Motivation Process (45)

Locke's goal setting theory focused on five goal setting principles. Adhering to every principle in your goal setting and goal attainment process is essential for success. Principles (46):

a. Clarity: Clear goals should be set to save time, easy to understand and communicate with others. Clear and specific goals are easier to measure and get feedback on.

b. Challenge: Challenging goals motivate people to pursue goals. Purposes; be realistic, aligned with skills, abilities, time and resources.

c. Commitment to Purpose: Effort and persistence are very important in achieving challenging goals.

d. Feedback: Goals should be monitored frequently and performance should be measured while reaching these goals.

e. Task difficulty: If the objectives and related objectives are being tackled, it is necessary to ensure that they are truly specific, measurable, achievable, relevant and time-bound.

4. The Importance of Motivation in Healthcare Professionals

While it is said that unmanned autonomous systems exist today, this situation does not seem to be possible in the medium and long term for health systems. It is an extremely important resource for the human health sector. The World Health Organization estimates that by 2030, there will be a projected shortage of 18 million healthcare workers, predominantly in low- and lower-middle-income countries (47).

In addition to the technological facilities and equipment used by health institutions, the health care workers working in these institutions have a great impact on the provision of health services. In recent years, the importance given to human resources has increased. This is true in the health sector. The desire to work in the health sector is high at all times. Health-related higher education institutions have high motivation in the education process. This is explained by the possibility of more employment compared to other occupational groups (48). A sincere interest and morale are especially important in the provision of health services. Health workers have a great responsibility in ensuring this. The attitudes and behaviors of the health workforce greatly affect the perspective of people towards health institutions (49).

The healthcare system is a labor- and capital-intensive industry. However, it is the motivation of health workers, which manifests itself in behavior at work, that greatly influences the outputs of the health system. Low motivation of the

workforce can reduce the quality of service delivery and alienate employees from their profession. Quality in health services; efficiency, effectiveness, accessibility and vitality, as well as the performance of health professionals providing these services. For this reason, it is extremely important to place employee motivation and development in a central position in determining health policy (50).

Health workers are the backbone of health services. The quality of health services is directly proportional to the performance of health workers. Healthcare workers perform a very sacred duty in terms of both the sensitivity of their fields of activity and the intense and difficult working conditions. They are able to overcome many difficult conditions due to the pleasure they derive from the spiritual dimension of their duties. Of course, every profession has its own challenges. However, being a healthcare worker is perhaps one of the most difficult of these. After an intense and grueling training process, the profession is started. A healthcare worker can work in a well-equipped health unit, as well as in a place with very limited opportunities and where transportation is very difficult due to its geographical location (51). All employees working in the health sector; Due to the unpredictable, high-stress and emotional aspects that they encounter every day, they need motivational support in their proactive processes by focusing on individuals and their environment.

Motivation can be affected by both monetary and non-monetary incentives. While monetary incentives are important, increased salaries are not always sufficient to solve the problem of low motivation. Increasing the amount of money should not mean higher motivation. Low motivation has a negative impact on employee performance, health institutions and the health sector in general (52). Inadequate and outdated medical resources and supplies in clinics and hospitals can also contribute to healthcare workers' frustration and eventual attrition at work. Health professionals argue that a lack of adequate resources prevents them from doing their jobs (53).

Motivation is an outcome because it influences and results in the extent to which health workers' efforts to contribute to the achievement of organizational goals motivate and energize. Motivation also contributes to employee satisfaction and personal satisfaction. This is a process because it changes over time, depending on health professionals and external factors specific to their work environment, including organizational culture and climate (54).

In health institutions where the human factor is important, the slightest error that may occur is almost often not compensated. In order to prevent

such situations from occurring or to minimize mistakes, managers should give due importance to employee motivation and job satisfaction. If the necessary importance is given, it will be ensured that the human resources working in the health sector will provide the desired service to the patients waiting for service, so that the health institutions will also provide the necessary benefit from this situation (55).

Motivation is influenced by a complex set of social, occupational and economic factors. There are many reasons why healthcare professionals are motivated and continue their profession. In general, a healthcare worker will be motivated and express satisfaction with their work if they feel they are effective and performing well in their work. Factors that contribute to motivation and job satisfaction include strong career advancement, adequate pay, and adequate working and living conditions. The presence of a strong human resource mechanism within a healthcare system can help ensure that there are adequate levels of the right motivational factors to be used to satisfy healthcare professionals. Ensuring that healthcare workers feel safe in their jobs is important in their motivation, efficiency and decision to stay at work (56).

The task of motivating healthcare workers does not fall only on their first-degree supervisors. National policy makers and stakeholders also have a role to play in this regard. The development of national plans to attract, motivate and retain healthcare workers should be accomplished through evidence-based decision making (57).

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CHAPTER II

‘TOUCH’ MATTERS IN HEALTHCARE

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1. Introduction

Touching and being touched, which are an integral part of human life, are also the basis of health practices. Do not touch; It has been defined as a successful form of communication and interaction free of words that meets all the needs of the mind, body and spirit for all age groups. The act of touching another person provides stimulation of emotions, mutual communication, trust, relaxation, self-confidence, feeling of closeness and self-centeredness (1). This study has been prepared to draw attention to the latest research on touch. The research includes touch and sense of touch, the meaning and importance of touch in health services, types of touch, literature on touch in healthcare and attitudes towards touch.

In the late 1900s, some nursing research focused on three main aspects of touch: its use, effects, and patients’ experiences. Although the data obtained from these studies were variable, touch generally had a relaxing and calming effect on the other party (2). Massage with touch can be both therapeutic and relaxing in this form.

The physical contact of caregivers with their patients; It has been defined as a purposeful, non-pharmacological activity that contributes to a safe, relaxing, and accepted environment (3).

In a study, patients stated that there may be an increase in their level of pleasure with touch, and that their pain can be relieved, but at the same time, being touched can be frightening (4). Health care providers should be careful and respectful when touching patients.

At the end of the century, three main aspects of touch were discussed in nurses' research. These; use; impact and patient experience. Although the results obtained from these studies differ from each other, the common conclusion is that touch has a relaxing and calming effect. Massages involving touch are therefore considered both therapeutic and relaxing (2).

2. Touch and the Sense of Touch

Touch has been defined as various sensations elicited by mechanical, thermal, chemical or electrical stimuli directed at the skin. While Aristotle divided the relationship with the world into five senses, he doubted that touch should be defined as a single sense (5). It is more accurate to describe touch as the "sense of touch" as there is a wide variety of sensations caused by stimuli that interact with the skin. The mechanical and physiological properties of the skin and these receptor structures define and limit the skin's sensitivity to stimuli, as in other senses (6). Touch, which can also be defined as the direct physical contact between two bodies, expresses the conscious special emotion in which the contact of bodies is perceived in the mind in neuroscience. The sense of touch and motor components, which enable us to recognize hand-held objects and use them as tools, are anatomically connected in the brain and play a functionally important role in directing dexterous behaviors (7).

Our sense of touch gains meaning only through the skin. Pain, temperature, coldness, itching and many other touch information are transmitted to the central nervous system by the skin. Touch sensations are conveyed by different combinations of mechanical sensory end organs and low-threshold mechanical sensors that hurt them (8).

The sense of touch, which is acquired at birth and lost with death, plays a very important role in the flow of daily life, in relationships and in physical, social and mental development (9).

Touch is the first sense that starts to act in the developmental way of individuals. However, touch as a sense can be the main subject of disadvantaged situations due to its complexity in human interaction (10). However, people do not connect with words alone. There are many sensory mechanisms that play a vital role in interpersonal communication. People talk to others, hear others, and touch others (11). Touch can be an important bonding tool. Chamley and James (2013) state that it is "a two-way process involving emotions and sensations and indicates a caring or loving relationship"(12).

3. Types of Touch in the Field of Health Services

The literature includes different classifications of touch according to time. One of these classifications is divided into three as instrumental touch, expressive touch, and therapeutic touch. In some other studies, classifications such as systematic touch, empathetic touch, positive affect touch, and task-related touch are also seen. It is seen that instrumental touch, which is included in these classifications, is also expressed as task-oriented touch (13).

The categories of touch for physical comfort and touch for emotional restraint require constant interaction. Nurses can provide emotional support as well as physical comfort while taking blood or changing the patient's bed position (14). Another classification is touch; It is divided into three as instrumental, protective and expressive (15). Most touch is known as instrumental touch, and this type of touch occurs as a result of the procedures performed.

Protective touch is directed at a patient to prevent a healthcare provider from putting the patient in a dangerous situation. For example, a patient has to touch the patient to prevent him from pulling or hitting the cannula or nasogastric tube (16). Relaxing touch can be defined as contact that relieves distress. In situations where pain is at the forefront, the act of touching can provide physical and emotional relief for individuals (17).

Another type of touch is touch that conveys emotion and compassion. This type of touch, known as expressive touch, helps to improve the relationship between the patient and the healthcare provider. This touch lets the patient know that you are there and that you care (18). Expressive touch is also categorized as a cathartic intervention (19). Expressive touch helps a patient suppress feelings of tension and anxiety: for example, holding the hand of a suffering or dying patient and making them feel like they are there. Expressive touching is also defined as friendly intimate physical contact. With this act of touching, not only is a task accomplished, but it has been associated with improved condition, increased compliance, and great gains with treatment (20).

Therapeutic touch, on the other hand, is a complementary therapy in which specialists use their hands to facilitate relaxation, but this touch is not considered a real touch. Therapeutic touch, which is claimed to be based on the concept of energy field, improves the healing process of patients (21). The purpose of this type of touch is to soften or relieve the energy blockage in the patient's body, thus it is assumed to help the individual in reducing the level of anxiety and pain (22). The therapeutic touch is seen as crucial in certain areas of modern and traditional medicine.

Social touch plays an important role in development and adulthood. It has an important place in achieving physical and mental health. Touch is a fundamental element in establishing bonding under the influence of social interaction. An early, unique social touch has many beneficial neurophysiological and epigenetic effects (23, 24).

Social touch is divided into three types: (1) defined as simple, short-term touch applied to a restricted part of the body; (2) prolonged, including longer mutual contact, for example hugging or holding hands; and (3), in the example of dynamics, which includes systematically repeated movements directed at the skin for a certain period of time where caress can be given (25, 26)

When the physiological effects of social touching were examined, it was determined that daily hugging behavior that lasted for 14 days was significantly and inversely proportional to proinflammatory cytokines (27).

Dealing with critically ill patients can cause both positive and negative emotions among intensive care nurses, which can become difficult over time (28). In addition, the intensive care patient's need for a compassionate touch is at the center of the nurse-patient relationship. Compassionate touch is at the center of nurse attention in establishing mutual goals in the nurse-patient relationship and promoting well-being (29).

4. The Meaning and Importance of Touch in Health Services

Touch is a means of physical connection between people and has an important place in health services (30). Touching the patient in health services can also be evaluated as an expression of compassion and compassionate behavior. Touch also provides comfort and safety to patients. Touching is therefore allowed to establish a real connection between nurse and patient. (31).

With the physical touch of the nurses, success was achieved in the improvement of sleep, blood pressure, respiratory rate and pain in patients. In addition, physical touch of people who do not know the close family or the patient during the treatment process can be beneficial (32).

Touching is an important feature of the service provided in the environment where nurses provide direct care to patients. Acute care nurses need the action of touch to get the medically fragile or frail patient out of bed, to help him go to the toilet, and to get him up and moving. Nurses do not only touch patients to control vital signs, take blood samples and administer medication, they also come into physical contact many times during the day through social and daily

interactions. Generally, there is a series of touching actions such as putting a hand on the shoulder or touching the patient's hand in the construction of communication (33).

Palpation, an important aspect of physical examination, can provide healthcare professionals with a wealth of information to help guide the treatment plan. However, the effect of palpation and touch has a much deeper meaning than collecting information. It helps to create a bond between the healthcare provider and the patient. In this sense, touch has a powerful and non-negligible effect (34).

Touch is acted upon towards the emotional and physical gap between the doctor and the patient that needs to be filled. It is carried out in exchange for direct attention, affection and comfort. It has an important role in the healing process. While strengthening the patient's confidence and harmony, it supports the self-repair of the body with the "placebo effect" it will create. This requires a full collaborative relationship in doctor-patient communication. However, the use of touch is sometimes perceived as invasive or inappropriate by the patient and may cause misunderstanding and in this case, it may have a negative effect (35).

When you place your hand on someone else's hand, an interaction occurs between two individuals. For this reason, Craig (2016), states that touch can be very important for patients in the advanced stages of dementia, because physical contact may be the only way to communicate with those around them (36).

More research is needed to fully explore the mechanisms underlying the buffering effects of touch in humans, however, it has been suggested that social, emotional touch works as a potent interpersonal homeostatic regulator, particularly during early development (37). Some theories suggest that such social, homeostatic regulation primarily involves thermoregulatory actions (38, 39).

Someone who is deprived of nurturing touch early on is likely to experience significant ongoing physical and mental health problems. However, children with significant sensory gaps make significant improvements in their physical and mental health with appropriate nurturing touch (40). In a study conducted to determine the effect of touch on the health of babies, a total of 200 babies were selected and a random touch group and control group were formed. The babies of the control group were given routine care services. In addition to routine nursing care, standard touches were applied to the touch group. Index changes were observed and recorded in infants 30 days

after birth. As a result, in the touch group, the length, head circumference, weight gain, behavioral and neurological development determined by skin interometer and bilirubin values determined by skin interometer were found to be significantly better (8). Touch-based interventions can improve adverse clinical outcomes in patients with fibromyalgia, rheumatoid arthritis, and preterm infants (41,42).

Studies conducted to determine the effect of physical contact on health; It has proven the link with lower blood pressure, higher oxytocin levels and better sleep. Physical contact also prevents stress (43). With excessive physical contact and high emotional support, people can be protected from high blood pressure (44).

The therapeutic and healing properties of touch can serve to feel comfortable, not to worry, and to reduce pain (45). There has been research highlighting the potential benefits of touch in oncology (46) and palliative care (47).

5. Literature on Touch and Its Effects in Health Care

In one study, a group of nurses used touch as a tool to show compassion to patients. When patients were relieved by touching in this way, they also received compassion. The compassionate behavior included in the study included both incidental touching and deliberate but comforting touching. The patients also stated that the nurses knew when and in which situations they would touch them and they used touch appropriately. In the study, patients perceived compassion through the nurse's touch, and through touch, safety, authenticity, and connection emerged. Accordingly, they defined it as avoiding touching the patient, being cautious about touching, or considering touching as taboo, meaning stealing the moments of compassion from patients (31).

A qualitative descriptive approach was used in a study conducted to investigate nurses' perception of the use of touch in service delivery. In the study, nurses participated in focus groups and individual interviews. Research findings; focused on touch and massage, individualized boundaries and professional role conflict. In the variety of touch approaches, data showing the positive effects of touch on patient care have been encountered. The data obtained for practice in the study showed that while taking into account the preferences of the individual, educational programs should be developed that focus on how to integrate touch into practice as a relaxing action (48).

In another study carried out to investigate the positive effect on the physical and mental health of intensive care patients, impressive touch was considered as an important complementary treatment tool in nurses' workflows.

In another study using pretest-posttest with a control group, 76 patients who had myocardial infarction for the first time and were taken to the intensive care unit were examined how touch affects their state anxiety levels. Hemoglobin, blood pressure and pulse values of the subjects were recorded. Results showed that the patients' pre- and post-touch anxiety scores and blood pressure averages on the 1st and 2nd days were statistically significant between the groups. It has been stated that expressive touch is effective in reducing the anxiety of patients in the intensive care unit, increasing hemoglobin values, lowering blood pressure and pulse (49).

In the virtual reality experiment conducted to investigate whether behavioral inhibition system and gender differences contribute to the perception of emotional touch, the perception of touch was measured directly and indirectly. The results showed that the perception of touch is dependent on the emotional expression of virtual agents. Feelings of happiness, anger associated with the high arousal approach; Fearful expressions about avoidance increased personally reported touch intensity, while happiness decreased touch orientation. In addition, differences in inhibition of behavior and gender were observed among the participants. In males, inhibition sensitivity was associated with more effective emotional touch perception, especially high arousal, whereas in females inhibition did not affect touch perception. The results also show that individual differences in preferences for tactile communication determine how touch is perceived (50).

In a study investigating the expressive touch perceptions of doctors and patients in primary care consultations in Lebanon and its effect on patient satisfaction, audio-recorded semi-structured interviews were conducted with 12 doctors and 13 patients. In line with the findings, patient satisfaction and trust were associated with well-structured communication, and the benefit of empathy in establishing long-term relationships between patient and doctor was discovered. Although social and non-privacy touches are within the scope of ethics and belief, they were perceived positively by the patients. Male doctors have expressed open concern about the use of touch because of faith-related concerns, especially directed at female patients. In addition, it has been reported that touch directed by female physicians is accepted by patients of all genders, while touches from male colleagues are more disturbing. According to the

results of this study, religious concerns are common among Lebanese doctors and patients, but despite some limitations, the use of reassuring physical contact is the cornerstone of the patient-physician relationship, and verbal and non-verbal communication has potential therapeutic effects (51).

A cross-sectional study, which was conducted to determine the limitations of touch in the service delivery and general lives of nursing students, was conducted with nursing students in a state. The findings showed that 41.1% of the students had anxiety in their responses to touching patients, 15.4% were uncomfortable touching the opposite sex, and some participants had difficulty in touching due to lifestyle-related obstacles. It has been determined that students have difficulty in touching young men and women, psychiatry and forensic medicine patients. Caring for individuals with contagious diseases, providing perineal care, inserting catheters/care, caring for contaminated areas were the types of care that students had the most difficulty in touching. As a result, it has been seen that some religion, gender and other cultural codes of students create obstacles in touching, general life and professional environment (52). When the literature is examined, it is seen that the opportunities and obstacles in front of touching the patient in traditional societies have not been adequately researched. It shows that nurses in Turkey cannot adequately apply other types of touching to patients except for compulsory touching (53,52, 54).

In a touch study, in which eight databases were systematically searched, seven occupations in different fields were identified. In the study, the participants completed a metaethnographic synthesis of argument sequences. The study found that touch was cared for, exerted force, and required a safe space. As a result, it has been shown that different professions may express interest in different ways through touch, but all expect patients to initiate touch first. With various applications, the boundaries of safe areas between healthcare workers and patients are tried to be defined.

Therapeutic contact in nursing and midwifery students; A study was conducted to evaluate the effect on stress, daytime sleepiness, sleep quality, and perceived fatigue. In the study, students were randomly divided into three groups as therapeutic touch group, fake therapeutic touch group and control group. In this randomized, placebo-controlled study, the therapeutic touch group was subjected to therapeutic touch twice a week in designated sessions. Results showed that the therapeutic touch group had higher levels of stress, daytime sleepiness, decreased sleep quality levels, and increased sleep quality compared to the sham-therapeutic touch group and control groups. It has been shown that

touching is effective in reducing stress, fatigue and daytime sleepiness and increasing sleep quality (55).

A systematic review of recent qualitative studies of touch in healthcare found 41 studies on doctor-patient interactions, of which only four were examined. In these studies, it has been found that the doctor's touch helps to establish closeness with the patient and shows care and understanding to the patient. The study showed that practitioners generally found touching to be risky, especially with regard to cultural and gender boundaries (56).

6. Attitudes Towards Touch

People react differently when exposed to touch. The avoidance of touching structure gains meaning with the attitude of anyone towards touching and being touched (57). The act of avoiding touch reduces the degree of pleasure that can be obtained with any kind of touch (58). The tendency to avoid touching can become an ossified personality trait that develops throughout the person's life (9). Measuring and assessing this condition is important not only for a deeper understanding of the act of touch, but also for its implications for health practices. The act of touching in nurses can be instrumental in establishing a deep bond with patients, thus strengthening the nurse-patient relationship (59, 60,61). It is thought that avoidance of touching, which should be evaluated, will also help in psychotherapeutic settings (62,63).

Even though social touch is accepted by patients most of the time, why it fails in soothing in some cases is an overlooked area of research. For example, it is seen that hand-foot massage in elderly care reduces agitation and contributes to the state of being healthy, but sometimes causes the opposite reactions. These adverse reactions seem to be based on the perception of lack of experience or distrust towards the person applying the massage, and gender (64).

A touch of compassion from someone whose source is familiar, while reducing tension, increases emotional well-being, but when the same touch is of foreign origin, it can make the person uncomfortable. Current neurophysiological findings show that there is no different response to desired and unwanted touch, but we also perceive touch differently in context (50).

Age is another factor that has been proven to affect the pleasure of touch. Emotional touch may be more accepted at younger ages (65,66).

The pleasantness of a gentle caress is influenced by gender, type of touch, tactile familiarity, culture, and age. In addition, pleasantness, avoidance of touch,

and attitude towards interpersonal touch are also affected (67). In addition, there is evidence that socially performed touching has positive contributions to health protection and recovery (68). In addition to the neurophysiological basis, the pleasure that is the result of gentle caress affects the increase of pleasure by personal and contextual factors. For example, receiving a gentle touch instead of an unwanted touch can change the perception from negative to positive (69).

Gender affects attitudes towards touching; It is known that women approach touch more positively than men (70). It is seen that women accept the act of being touched by strangers without sexual purposes more than men (71), while men prefer to be touched by women more (72,73). However, there is a relationship between length of service and the comfort of using touch for emotional restraint. When this situation is evaluated in terms of female and male nurses, it is observed that there is a difference (74).

7. Conclusion

Touch studies in health services and social care are a voluntary action due to the nature of touch. For this reason, the studies are designed in such a way that the participants are not aware of their purpose and thus lead to ethical dilemmas. Due to these disadvantages, the samples in the studies are small or limited in number.

On the other hand, physical touch studies in nursing; focused on three main topics: the use of touch, the effects of touch, and touch experiences. Of these, use of touch has been most widely studied, but the results have not been fully consistent. So much so that some findings even differ sharply from each other. Although this prevents generalizations from the results obtained, it is known that physical touch has an important role in the field of health services. It can be said that as much as a patient needs help, health care providers will have to touch the patient at the same rate.

Although the effects of touch on the biophysical mechanisms of the individual are limited, it is also known that it has a calming effect. Undoubtedly, this effect creates variability between individuals in the experience of touch, gender, age and parts of the body touched. It can be said that while the physical touch of the nurses, who have the most contact with the patient, is generally perceived as positive, some negative experiences are also defined.

In this context, what is particularly important to know about touch is that expert touch is subtle and how it is viewed and transmitted individually or socially, and it should be understood and taken into account. Even where

the use of touch as a tool is imperative, precision is required. Physical touch is not necessarily a form of touch used by healthcare professionals, but it is necessary to better understand the effects and meaning of touch and learn how touch can be used in healthcare. Because a healthcare professional is in close contact with patients every day, and this contact is inevitable in some cases. Otherwise, it will not be possible to fulfill the duty of care towards patients in order to provide personal and clinical care. However, it should be kept in mind that touching is not always appropriate for the patient. Some individuals feel uncomfortable being touched and do not like being touched. The health worker should act in accordance with preferences, cultural structure and beliefs while obtaining consent from the patient. Therefore, how the touch is designed is extremely important for both the patient and the healthcare worker. Correctly directed touching can help develop a good therapeutic relationship, while wrong behavior can have negative consequences.

Health professionals systematically use four of their five senses in their practice, these are; sight, hearing, smell and touch. The sense of touch is arguably the most problematic and open to misinterpretation. Yet the appropriate use of touch in healthcare is central to effective and compassionate care.

Touching is a highly complex and ambivalent behavior in which sensitive and sometimes vulnerable patients do not have a chance to limit the self-directed and context-specific compulsive touching behaviors of healthcare professionals. Therefore, students, clinicians, and educators need to review and consider the role, utility, cultural significance, and potential threats of touch, as well as what is considered acceptable professional behavior to meet patients' needs.

Little has been discovered about touch, particularly in healthcare delivery. Much of the content is a shallow discussion that focuses on the relationship between male and female experts rather than the provider and the beneficiary. This critical approach will play an important role in shaping the growing social debate about touch.

Verbal and nonverbal communication is a natural component of doctor-patient interaction. Non-verbal communication such as gestures, expressions, eye contact and especially physical contact in health care provides many mental and physical benefits. Communication education efforts should emphasize the importance of religious and morally appropriate expressive touch in health care. This emphasis will serve to promote positive healthcare worker and patient perceptions of practice and to improve clinical communication and expression.

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CHAPTER III

SUPPORTING ROLE OF IMAGING METHODS AND BIOCHEMICAL FINDINGS IN THE DIAGNOSIS OF BREAST CANCER

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1. INTRODUCTION

With the development of cancer, important changes occur within the cell. In the initial stage, cancer manifests itself with epigenome, chromosome and DNA damage that regulates gene expression, which follows a long process. Genomically unstable cells appear to grow with inflammation. In the progressive stage, while the cells proliferate, they cause more damage to their genomes and turn into malignant tumors (8). If damage to DNA remains unrepaired, it can lead to gene mutations. These mutations can be harmful if they occur in genes that control the cell cycle, cell growth, or other critical processes (48). That is inherited by genes from parents, and the remaining 85-90% is shaped by the exposure of DNA in living cells to mutagens throughout life, progressive changes in cell DNA and errors in replication. Cancer is one of the most important diseases of our age, characterized by high mortality and catching millions of people every year around the world. Breast cancer, which is one of the most common cancer types, is one of the common cancer types that develops in the milk ducts or glands in the breast tissue and affects the female population and constitutes approximately 16% of all cancers (44 It is a well-known fact that the incidence of breast cancer in the world

regularly increases by 2% and deaths due to breast cancer are rapidly increasing. Breast cancer is the most common type of cancer among women worldwide and is a type of cancer that occurs in one of every eight women. Although age and genetic mutations are among the strongest risk factors for breast cancer, increased breast density, family history of disease and reproductive history also play a role among the additional known risk factors (34). Almutlaq et al., (2) age, age at first birth, early menarche, gender, nutritional factors, tobacco smoking, alcohol consumption, low-dose radiation, obesity, physical activity, breastfeeding, hormonal, hormone replacement therapy, steroid hormone receptors, mammographic density, benign reported breast disease and genetic factors as factors causing breast cancer. In addition, estrogen hormone plays an important role in the etiology. Many of the risk factors are directly or indirectly related to the effect of estrogen. The lifetime risk is 12.5% (1 in 8), 25–30% premenopausal, 70–75% postmenopausal. Although there have been great advances in the follow-up and treatment of breast cancer, the supporting role of all imaging methods and biochemical findings used in the diagnosis of breast cancer should be analyzed very well, since early detection and diagnosis of breast cancer will increase the chances of successful treatment and recovery of the patient (8,44,3457).

However, compression of the breast during imaging and the use of low-power ionizing X-ray are the most important disadvantages of X-ray mammography. These disadvantages have been an important factor in the development of methods such as magnetic resonance imaging (MRI) and ultrasound imaging (USG) and their use in breast cancer imaging. Due to the cost of these methods and the disadvantages such as low specificity for cancerous tissues, studies of the effectiveness of oxidative stress and antioxidant levels in the diagnosis, as well as biochemical elements and molecules, have gained importance. Early diagnosis significantly reduces deaths from breast cancer, which is the second most common cancer in the world after lung cancer. Effective treatment and follow-up of breast cancer requires early and accurate diagnosis. The main purpose of screening asymptomatic women for breast cancer is to detect cancer at an early stage and to reduce the mortality rate. Lukong has focused on the study, which includes more specific treatments, where more targets are characterized and highly innovative approaches are developed for the early diagnosis, treatment and prevention of this disease, which is a serious health problem all over the world (36). Porto-Mascarenhas et al., in their study to evaluate the capabilities of these biomarkers in line with

the idea that salivary biomarkers can help characterize breast cancer, found that salivary biomarkers identify advanced stages of breast cancer rather than early stages (46). Alharbi and Tchier carried out an optimized high-performance diagnostic system with a 97% success rate with a Hybrid study on an automatic computer diagnosis system that will help physicians for early diagnosis of breast cancer using fuzzy-based systems and evolutionary genetic algorithms (2). Breast cancer is usually diagnosed by symptoms that occur due to pain or a palpable mass during palpation. Different breast cancer diagnostic examinations such as mammography, MRI, biopsy, ultrasound and molecular imaging are frequently used diagnostic methods, as well as many biochemical parameters (9,16,4,3713).

In this study, the importance of the correlations of mammography, MRI, biopsy, ultrasonography, blood biochemistry, lipid peroxidation and antioxidant values, which are frequently used in the early diagnosis of breast cancer, in terms of early detection of breast cancer is supported by current data and literature, and reliable information is aimed to assist physicians in breast cancer treatments. It is expected to make a positive contribution to the “early diagnosis” parameter, which is the most effective factor affecting success.

2. METHODS USED IN BREAST CANCER

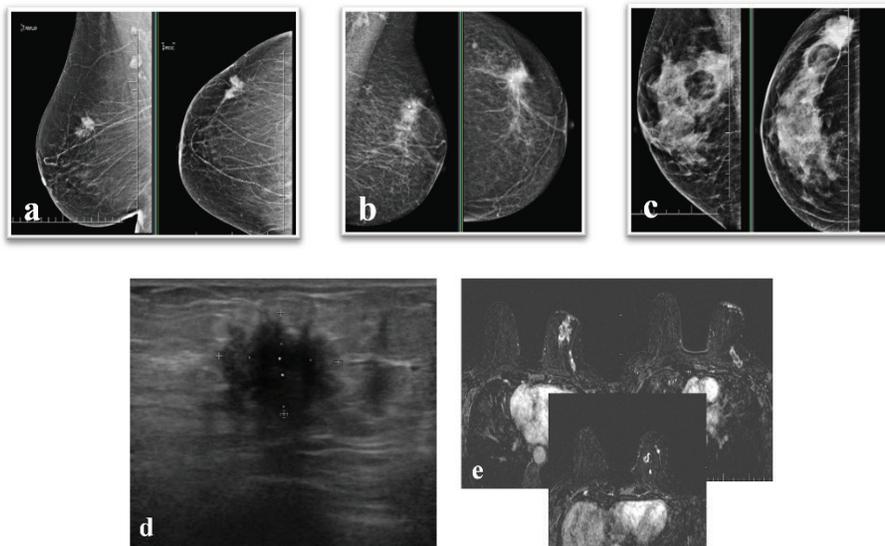
Breast cancer is a type of cancer that is relatively easier to view than other types of cancer. X-ray mammography is the most cost-effective primary method used today to monitor the detailed structure of the breast, which is most used in the early diagnosis of breast cancer. However, compression of the breast during imaging and the use of low-power ionizing X-ray are the most important disadvantages of X-ray mammography. X-rays are electromagnetic waves with an energy range of 0.125 ~ 125 keV (kilo electron volts), wavelengths in the range of 10 to 0.01 nm (30 to 30,000 PHz (Petahertz)) and can be harmful because they are included in the ionizing radiation class (62).

For high-risk patients, it has been determined that supporting mammography with other imaging methods gives successful results in the detection of mammographic occult cancers.

In a general mammography examination, 4 different images are taken from each breast, two CC (cranio-caudal) and two MLO (mediolateral oblique). However, interpretation of mammograms is based on education and experience, is often difficult, error-prone and subjective (49). Therefore, the symptoms in the early stages of cancer are diverse in appearance and it is difficult to diagnose

even for experienced radiologists (63,64). In addition, the total number of mammograms that specialists have to evaluate has reached quite high figures with public awareness (41). Each type of breast mass has different characteristics from neighboring tissues. Thus, breast masses can be distinguished from neighboring tissues. The textural and morphological features of the mass can be used for classification. The shape and edge features of the mass have important clues for the separation of breast masses. Studies have shown that for women over the age of 50 who have had a mammogram, the mortality rate can be reduced by 30% (56,19). In inflammatory carcinoma or locally advanced invasive breast carcinoma, malignant cell deposition in the dermal and intramammary lymphatics may occur as a reticular pattern, skin thickening, and diffuse asymmetric edema in MG (35). Diagnosis of breast cancer with mammography is difficult especially in young women in the presence of dense glandular breast tissue, scar tissue due to previous breast surgery, increased tissue density due to radiotherapy, breast implants, underlying fibrocystic disease, multifocal and multicentric lesions. Breast-specific gamma imaging (BSGI) is the imaging of a part of the body using sound waves(10). Today, BSGI has become a good method that can be used together with mammography. BSGI in the breast is to differentiate between cystic and solid lesions and to evaluate palpable lesions that cannot be visualized by mammography 10,30).

Figure: Breast tissue in patients with invasive ductal carcinoma



Right MLO and CC mammograms of a 69-year-old female patient with invasive ductal carcinoma (Grade: 1) show an irregularly shaped dense mass with a spicular border in the upper outer quadrant of fatty breast tissue (Type A) (Fig. a). 58 years old (Grade :2). Left MLO and CC mammograms of a female patient show an irregularly shaped dense mass with spicular border and pleomorphic calcifications in the upper outer quadrant within scattered fibroglandular tissue (Type B). Mammograms also show architectural deterioration and skin retraction accompanying the mass. 49 years old (Degree: 1). Right MLO and CC mammograms of a female patient show an irregularly shaped dense mass with a spicular border in the posterior part of the dense breast tissue (Type D) in the upper outer quadrant (Fig. c). Sonogram in a 62-year-old (Grade: 1) female patient shows an irregularly shaped heterogeneous hypoechoic solid mass with an indistinct-spicula edge and antiparallel orientation (Fig.d). A 41-year-old female (Grade: 3) patient sonogram shows an irregularly shaped hypoechoic solid mass with microlobular margin, echogenic calcifications, and antiparallel orientation. A 62-year-old female patient with invasive lobular carcinoma (Grade: 1). The sonogram shows an irregularly shaped hypoechoic mass with a spicular rim and a surrounding echogenic halo (Fig. e). A 47-year-old female patient (Grade 3) with mucinous adenocarcinoma shows an irregularly shaped heterogeneous contrasting mass with spicular-indistinct margins extending posteriorly from under the left breast areola on dynamic breast MRI subtracted images. MRI shows the multifocal nature of the mass, its spread and skin invasion very well (Fig. f).

Ultrasonography is also used to evaluate abnormal findings on clinical breast examination, palpable breast masses in women with dense breast tissue or breast implants, and peripheral lesions located outside the area of interest on mammography.

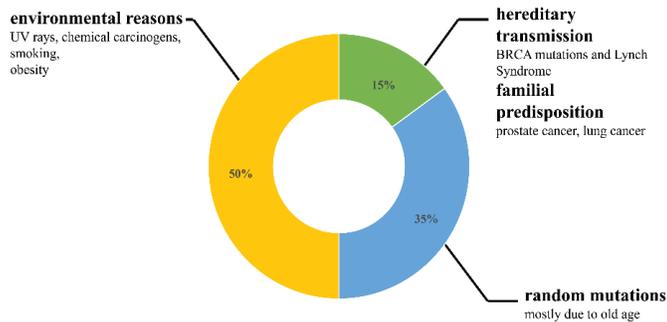
On the other hand, radio waves and strong magnets are used instead of x-rays in magnetic resonance imaging MRI. These waves are turned into a highly detailed image by means of a computer. Breast MRI; In the evaluation of breast implants, in the evaluation of mammographic and ultrasonographically uncertain lesions, in the screening of high-risk patients for breast cancer, in the detection and reconstruction of multifocal tumors in patients who will undergo breast-conserving surgery, in the evaluation of the response to neoadjuvant therapy before surgery in patients with locally advanced tumors, and in the local spread of biopsy-proven breast cancer. used for detection. In high-risk women, the sensitivity with MRI + Mammography is quite high and is between 93–100% (56,40,19,35,10,30).

3. BIOCHEMICAL ELEMENTS AND FREE OXYGEN RADICALS IN BREAST CANCER

Biochemical elements and molecular structures take part in many vital activities in balance in the body. Trace elements play an important role in many biological processes. They either activate or inhibit enzyme reactions by competing with other elements for binding sites of metalloproteins. Trace elements can have toxic and carcinogenic effects when present in excess. Metal ions participate in reactions that convert hydrogen peroxide and hydroxyl radical to superoxide (59).

Free radicals are atoms, groups of atoms and molecules that have unshared electrons in their outer orbitals; They have a very short lifespan and show an unstable structure. These particles want to reach a stable state by interacting with the molecules around them (7). Reactive oxygen species (ROS) are defined as molecules that involve and participate in the transfer of electrons from reactive oxygen. 3 main ROTs with physiological importance; superoxide anion (O_2^-), Hydroxyl radical (OH) and hydrogen peroxide (H_2O_2) (5).

When free oxygen radicals are overproduced, they can cause oxidative damage, resulting in mutation, lipid peroxidation, and carcinogenesis. Metal ions not only trigger oxidative damage to DNA in the nucleus, but also cause oxidative damage to cellular components of phospholipids, such as unsaturated fatty acids, which are extremely sensitive to oxidants. Thus, trace element levels show a close relationship with the oxidant/antioxidant structure in both physiological and pathological conditions. Kuo et al. have defined various trace elements (Fe, Cu, Zn) as biomarkers for the initial neoplastic process in breast cancer (33). A possible cause of oxidative stress is iron ion. Iron has a catalytic effect for free radical reactions in plasma (21,50). It has been shown that the complex formed by doxorubicin with the iron ion has a potential prooxidant effect. This complex can reduce glutathione or NADPH-dependent enzymes, as well as initiate a step of free radical formation reactions (61). High levels of oxidative stress are cytotoxic to the cell and induce proliferation, appopause or necrosis. Thus, it can stimulate the promotion of tumor growth. There is a link between increased ROS levels and the disturbing activities of enzymatic and non-enzymatic antioxidants in tumor cells.

Figure: Sources of Oxidative Stress

It is thought that trace element amounts in serum and tissue of breast cancer patients will be useful in diagnosis and prognostic processes. However, the role of trace elements in breast carcinogenesis is not fully known (55). In the studies conducted in Taiwan in 1999, Huang et al., in 2011 in China Feng et al. in his study, Fe levels in the control group were found to be statistically lower in the control group when compared with the breast cancer group. In studies conducted in China in 2011, Feng et al., in Taiwan in 1999 Huang et al. in his study, the Cu levels of the breast cancer group were found to be statistically higher in the patient group when compared with the control group(15,24,15).

Some elements; While entering the structure of antioxidants, it provides balanced activation of some enzymes to hormones (26,12). All tissues obtain their energy needs from glucose. Since anaerobic glycolysis is very rapid in rapidly growing cancer, excessive amounts of pyruvate are produced, resulting in excess lactate production. This creates a highly acidic environment in the tumor, such an environment that causes significant interference with certain types of cancer treatments (38).

Oxidative stress and inflammation are important factors that play a role in the development of cancer and in determining the prognosis of chemotherapy, and the oxidation of low-density lipoproteins (LDL), reactive oxygen stress (ROS) or cellular enzymes is considered an atherogenic modification in the first stage of atherogenesis (3,17). It is known that oxidative stress can damage the DNA molecule, alter signaling pathways, and lead to the progression of various cancers, including breast, lung, liver, colon, prostate, ovarian, and brain cancers (63, 60,51,14). ALT and AST are intracellular enzymes released into the blood as a result of hepatocyte damage. ALT and AST are intracellular enzymes released into the blood as a result of hepatocyte damage. The increase of this enzyme in the blood is an indicator of liver damage (14). It is claimed that under the

condition of oxidative stress, LDH enzyme activity in various tissues may increase due to liver tissue damage (31). Despite early diagnosis and treatment techniques, the mechanism of action of breast cancer is still not clear. Oxidative stress is thought to play a role in the pathogenesis of breast cancer, among the important causes of cellular damage in the etiology of cancer (15). The level of ROS and the oxidative defense system are in balance in healthy individuals. Disruption of this balance causes oxidative stress in the organism; The free radicals formed cause oxidative damage to lipids, proteins and DNA, which are the basic structural molecules of our body (39). Free radicals produced outside the cell must cross the cell membrane before interacting with cell components. Since the oxygen molecule has a high affinity for membrane lipids, the cell membrane is an important target for free radical reactions. Free oxygen radicals bind to unsaturated fatty acids in the membranes, causing lipid peroxidation. Lipid peroxidation is one of the most important results of oxidative stress and it is known that it contributes to the deterioration of cell structure and integrity and to the formation of many diseases such as cancer (28) In the studies conducted in Turkey in 2002, in Korea in 2003, in Taiwan in 2004 Huang et al., in Turkey in 2006 Şener et al., Pande et al. in India in 2011, reported that MDA levels in the healthy control group were significantly increased in the breast cancer group when compared to the breast cancer group(43,54,24).

The fact that the serum (plasma) MDA levels of breast cancer patients are higher than the control (27,25) and that oxidative stress in various cancer patients has an important role in the formation of cancer due to mutagenesis. brought to mind the idea that he can play (25,20). However, there is a study suggesting that the decrease in plasma MDA levels of breast cancer patients is due to the high antioxidants characteristic for the tumor (31,32).

During cancer development, especially in advanced stages, oxidative stress and inflammation increase with the weakening of the immune system in the organism.

4. ANTIOXIDANTS

As long as the total oxidative stress (TOS) formation rate and their inactivation rate with total antioxidant systems (TAS) are in balance, the organism is not affected by these compounds. Damage formation of free oxygen radicals originates from malondialdehyde (MDA), a product of lipid peroxidation, and biomolecules resulting in mutagenesis and carcinogenesis (23,21). Free oxygen radicals are mainly; They are removed by various enzymatic antioxidants such

as superoxide dismutase (SOD), glutathione peroxidase, catalase and non-enzymatic antioxidants such as glutathione (GSH), α -tocopherol and vitamin C (22,42). It is thought that the antioxidant defense system, which decreases for various reasons, causes an increase in ROS and an increase in the products of lipid peroxidation, as a result it plays a role in the pathogenesis of breast cancer (43). In studies conducted in Korea in 2003, Kim et al., in Turkey in 2006 Şener et al., in 2011 in China by Feng et al., in 2011 Pande et al., when the healthy total antioxidant levels of the breast cancer group were compared with the control group, they were found to be statistically lower in the breast cancer group. In study, when breast cancer patients were compared with healthy individuals in the control group, oxidant and antioxidant levels were found to be significantly higher and antioxidant levels were found to be significantly lower. (54,29,15). This change shows that oxidative stress is potentially associated with antioxidant/oxidant balance in the pathogenesis of breast cancer. Feng et al., found that the total oxidant level (TOS) levels in the breast cancer group were statistically higher in the breast cancer group when compared with the control group. In 2011, in China in his study, OSI levels in the control group were found to be statistically higher in the group with breast cancer when compared with the group with breast cancer. We observed an increase in OSI, TOS, MDA, Cu and Zn levels and a decrease in TAS levels in breast cancer patients compared to normal values. Considering that oxidative stress plays a role in the pathogenesis of more than 100 diseases, changes in TAS, TOS and OSI are not unique to breast cancer. Although MDA and Zn values returned to normal values after treatment, we observed a decrease in OSI and TOS values, but they did not return to normal values. We also observed an increase in Cu level compared to normal and pre-treatment values. When the groups were compared statistically, no significant difference was found in Fe values. In addition to all these, it shows that while many antioxidants active substances increase proliferation at low doses in cancer cells, they can be anticarcinogenic at high doses (58).

5. CONCLUSION AND DISCUSSION

Breast cancer, one of the most common types of cancer, is a deadly disease that affects women. Despite intensive studies on the fight against cancer with a focus on treatment for years, a definite result has not been reached yet. However, early diagnosis is the most important parameter that increases our chances of winning in the fight against breast cancer and all other cancers and diseases. In this context, mammography, MRI, biopsy, ultrasound and molecular imaging,

which are different breast cancer diagnostic examinations, are frequently used diagnostic methods, as well as many biochemical parameters that facilitate the diagnosis, after symptoms caused by pain or a palpable mass in the palpation of the breast for early diagnosis. Today, the relationship between trace elements and the oxidant/antioxidant system remains unclear. In our study, we compared TAS, TOS, OSI, lipid peroxidation and trace elements in breast cancer patients and healthy individuals in order to investigate whether there is any connection between oxidative stress and breast cancer. He thinks that some enzymatic and non-enzymatic enzymes may have different effects in breast tumors and the amount of TAS is not sufficient to determine oxidative damage. Since TOS measurements in serum may contain oxidant species that are not yet known, measuring TAS and TOS levels may provide more advantages than measuring antioxidant and oxidant enzymes. In particular, the ratio of TOS to TAS can be helpful in determining the net OSI.

He thinks that this study, which was carried out within the framework of the thought that it will be beneficial to clinical studies and field experts, can help breast cancer researches and oncologists through the study data. In this respect, he thinks that the study will contribute to the literature.

When the studies performed were compared with the study comparing the pre-treatment patient group with breast cancer and the post-treatment patient group, no significant difference was found between total oxidant capacity, oxidative stress index, copper and zinc high, malondialdehyde level low, total antioxidant capacity and iron levels. When the patient group was compared with the control group after the treatment, no difference was found between low total antioxidant capacity, total oxidant capacity, oxidative stress index, high copper, malondialdehyde zinc, iron (64). In breast screening methods, the comfort of the patients, the production of high-resolution images, the cost and the accuracy of malignant masses should be considered.

It has strong potential to overcome some of the drawbacks of conventional X-ray mammography. Other methods are available, such as Magnetic Resonance Imaging and Ultrasound Imaging, that provide advanced and quality results for the detection of small tumors; but they are more expensive, invasive and insensitive. In fact, researchers are working on new detection techniques for early breast cancer detection that will overcome the limitations of current imaging modalities.

It is to show that tumors are much smaller in their early stages and that microwave imaging is a good candidate with high potential for detecting small

tumors. A number of promising strategies have emerged to exploit this potential, among them microwave tomography, microwave microscopy, microwave-induced thermal acoustic imaging, and ultrasound-guided microwave imaging. Each method has its weaknesses and strengths, but the amount of development and research continues to evolve as each possible approach is explored.

Although mammography and ultrasonography are the most commonly used imaging methods in breast cancer screening and diagnosis, benign and malignant lesions may appear similar in both methods, resulting in unnecessary large number of negative biopsies. It is important to select patients who can benefit from biopsy by using non-invasive methods and to reduce the number of biopsies with negative results. For this purpose, breast scintigraphy and positron emission tomography methods are applied using various radionuclides.

Although ultrasonography is a useful method in the evaluation of palpable breast masses together with MG, its use alone is not recommended as a screening modality.

In conclusion, it revealed that the sensitivity and specificity of breast scintigraphy performed with Tc-99m MIBI in the detection of breast cancer cases is quite high. When all three methods were evaluated together, it was determined that the sensitivity, specificity, NPV, PPV and accuracy rates increased even more. In the light of these findings, although it is not recommended to use MS as the basic screening method, such as MG and US, in the detection of palpable breast masses, it reveals the nature of the suspected lesion in terms of malignancy before biopsy, especially in women with suspicious mammograms and US and who are at high risk for breast cancer. can be recommended for use. Thus, unnecessary large number of negative biopsies that cause stress and anxiety in patients will be prevented.

From this point of view, antioxidant supplementation may be important to increase the body's resistance. However, considering that the supplement can also contribute to the reproduction of cancer cells, it is important to do it very carefully and consciously. For this reason, examining the effects of antioxidant substances on cancer cells and sharing them with the scientific world may contribute to the development of new approaches in cancer treatment.

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CHAPTER IV

CURRENT VIEWS ON GENE MUTATIONS

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1. Introduction

Mutations are permanent changes in DNA sequences. Mutations may occur when there is an error that cannot be corrected by DNA repair enzymes during DNA replication. Also it may occur due to the effect of physical and chemical agents on DNA. (16) Therefore, mutations can occur spontaneously. It can also occur artificially, with chemical substances called mutagens (nitrous acid, acridine, purine and pyrimidine analogues, etc.) and physical applications (UV-rays, x-rays, heat, etc.). (14, 40) Mutations may have no effect on the organism or may have beneficial/detrimental effects. (16)

Natural mutations occur as a result of errors in the function of enzymes such as DNA polymerase and recombination enzymes. The rate of occurrence of these mutations varies between 10^{-8} and 10^{-10} depending on the development conditions of the organism. In addition, this rate can be increased significantly by using mutagens. Genome mutations cause changes in the number of chromosomes, while chromosome mutations can change the order of genes in the chromosome. On the other hand, the most common point mutations in genes can cause base sequences in genes to change. (10, 21)

Although mutation is considered as a negative situation at first glance because it causes changes in genetic material, it is actually an important phenomenon that creates diversity among living things and enables organisms to develop and evolve. Mutation of a gene creates a new allele for that gene. If there is a second mutation which is a different mutation than the first of the same gene, a new allele will occur. Thus, the occurrence of multiple allelic conditions for the same character provides an increase in diversity. (44)

Mutation is a rare event. Whether it is effective in beneficial or harmful aspects, it causes changes in gene frequencies both in a small family and in society. (22)

Mutations form the basis of genetic studies. The phenotypic variation created by mutations allows geneticists to learn about the genes encoding the changed trait.

Mutations may or may not be within regions of a protein-coding gene or non-gene regions that affect how the gene is expressed. Therefore, mutations may or may not lead to an identifiable change in phenotype. The extent to which a mutation affects an organism's characteristics depends on where the mutation occurs and how much it changes the gene.

Mutations can occur in gamete cells or somatic cells. Mutations in gamete cells can be inherited. These mutations can cause genetic diseases and form the basis of genetic diversity and evolution. Mutations in somatic cells can cause alteration of cellular function, tumorigenesis or localized cell death. (25)

The term mutation is generally includes changes in chromosome structure, changes in chromosome number, changes in genes. In this section, gene mutations will be explained.

2. Gene Mutations

Gene mutations occur at the nucleotide level without changing the gene's location on the chromosome. In this type of mutation, one nucleotide base is replaced by another nucleotide base. Point mutations are examined in two ways, at the DNA level and at the protein level, according to their effects on codons. (39)

Gene mutations are the source of new alleles and genetic variation in populations. The negative aspects of these mutations are that they cause cell death, genetic diseases and cancer. (25)

Mutations are divided into spontaneous and induced mutations. Mutations that occur spontaneously in the natural environment and without the effect of a significant mutagenic factor are called spontaneous mutations. Most of the spontaneous mutations are thought to be caused by changes in the nucleotide sequences of genes during DNA replication. Spontaneous mutations may cause the proteins to lose their biological activity completely, or may not impair the protein's function. The incidence of spontaneous mutations is generally quite low and differs from organism to organism. While the spontaneous mutation rate

during replication is $1/10^8$ in *E.coli*, $1/10^6$ - $1/10^5$ in humans. (44) Spontaneous mutations include deamination, depurination and tautomerism.

Mutations that occur as a result of the effect of any external factor are called induced mutations. These mutations result from the effects of chemicals such as alkylating agents, nitrous acid, oxidative radicals, hydroxylamine, DNA intercalating agents and base analogs. Some other physical factors it induces mutations include DNA cross-linkers, ultraviolet light and ionizing radiation.

The scale of mutations can be large or small and change the function of some essential proteins. Mutations can be classified as insertions, deletions, duplications, frameshift mutations, nonsense mutations and missense mutations. Even minor mutations that occur can lead to a defective phenotype. (47)

2.1 Classification by Location of Mutation

2.1.1 Somatic Mutations

Mutations that occur in body cells are called somatic mutations. Somatic mutations are evolutionarily unimportant as they are not passed on to new generations and they are destroyed by the death of the mutant individual. However, the effects of somatic mutations on the organism may differ. Such mutations are rarely significant to the individual, as the recessive alleles that occur with somatic mutations are usually masked by the dominant alleles. Somatic mutations in which there is no masking, such as the formation of dominant alleles or the mutation on the X chromosome, have a greater effect on the individual. Somatic mutations that occur in the embryonic stage and in cells that have not yet begun to differentiate can cause some serious diseases, including cancer. The effect of mutations in adult cells can be masked by a large number of normal cells that have completed their differentiation and can perform their functions in a healthy way. (44)

Environmental factors such as exposure to ultraviolet radiation or certain chemicals often cause somatic mutations. Somatic mutations and environmental factors cause approximately 90% of cancers. Several types of cancer are also linked to germline mutations. (34)

Uncorrectable errors during DNA replication, exogenous or endogenous mutation exposures, enzymatic modifications of DNA, defective DNA repair or combinations of these can cause somatic mutations that cause cancer. (3)

For somatic mutations to have a significant effect on an organism's phenotype, they must first reach a minimum prevalence within a tissue. (29)

Somatic mutations can enable cells to develop resistance to the effects of the disease. Increasing disease-resistant cells within a tissue can restore some of the tissue function. The presence of mutations that restore tissue function has been demonstrated in chronic liver disease. (32)

Many mutations occur in somatic cells throughout life. Among these mutations, the so-called driver mutations ensure their survival or increase their replication. Some are selectively neutral and some cause senescence or death. Cancer is an end product of somatic evolution. (29)

As humans age, somatic mutations accumulate in healthy cells increase. Mutations occur in approximately 25% of skin cells exposed to strong mutagens such as ultraviolet light. In the study, the mutation rate in the normal esophageal epithelium from nine human donors of different ages was found to be lower than in the skin. However, there was a strong selection of positive clones carrying mutations in 14 cancer-related genes. More than half of the esophageal epithelium in middle-aged individuals is colonized by mutant clones. Mutations in the cancer driver gene NOTCH1 were more common in normal esophageal epithelium than in esophageal cancer. (28)

Smoking causes lung cancer, as there are more than 60 carcinogens in cigarette smoke that directly damage and mutate DNA. The study revealed that the frequency of driver mutations increases with age and affects 4-14% of cells in middle-aged people who have never smoked. In current smokers, at least 25% of cells were found to carry driver mutations and 0-6% of cells had two or even three driver mutations. It was concluded that smoking tobacco increases mutation load, cell-to-cell heterogeneity and driver mutations, and smoking cessation promotes bronchial epithelial regeneration. (46)

2.1.2 Gametic Mutations

Mutations that occur in reproductive cells are called gametic mutations. Gametic mutations are especially important from an evolutionary point of view, as they are passed on to new generations and take place in all cells of the next generation. Gametic mutations sometimes do not affect the quality of life of the individual carrying this mutation, and sometimes they can cause very serious disorders. (44)

The autosomal recessive mutation that occurs in gametic cells may go unnoticed for many generations. their phenotypic expression would occur by a chance mating which brings two copies in a homozygous condition. (35)

2.2 Classification by Phenotypic Effects

2.2.1 Loss-of-Function Mutation

Loss-of-function mutations lead to the loss and inactivation of a gene's critical function. (20) Any mutation, from a point mutation to the loss of an entire gene, can cause loss of function. These mutations are also called null or knockout. Dominant loss-of-function mutation can occur when a defective protein binds to a normal gene product in the same organism or inhibits its function. (25) In the heterozygous state, wild-type protein is still made and it is often sufficient for a wild-type phenotype. But in the homozygous state, the gene is completely dysfunctional. (20)

Two main mechanisms can cause gene loss: physical events leading to deletion of fragments of one or more genes and deleterious mutations that cause loss of function (LoF) in gene coding regions. (2)

2.2.2 Gain-of-Function Mutation

Gain-of-function mutations cause the gene product to acquire a new function. This situation may lead to a change in the amino acid sequence of the protein that carries out the new function or to abnormal expression of the gene due to a mutation in the gene's regulatory region. Most gain-of-function mutations are dominant. (25)

Mutations in the p53 gene, which is an important tumor suppressor, have been associated with many cancers. These mutations result in loss of the tumor suppressor function of wild-type p53. In addition, the mutp53 protein, the product of the mutated gene, acquires new oncogenic activities to support cancer progression. The accumulation of the mutp53 protein in cancer cells is usually very high. Considering the high probability of mutation frequency of the p53 gene and the gain-of-function activities of mutp53 in cancer, therapies targeting mutp53 gain importance in cancer treatments. (48)

2.2.3 Morphological Mutations

Morphological mutations affect the external appearance of organisms. Morphological mutants are easily distinguishable from wild-type individuals as they are phenotypically different. For example, tyrosinase is the main enzyme responsible for the synthesis of the pigment called melanin, which makes the skin, hair and eyes dark in mammals. As a result of the mutation in the gene

encoding the enzyme, the enzyme becomes inactive and melanin cannot be produced. As a result, albino people differ from normal individuals with very light skin, hair and eye color. Most of the genetic variations encountered in both animals and plants are morphological mutations. (44)

2.2.4. Biochemical Mutations

Biochemical mutations cause an organism to be unable to perform any biochemical or synthesis reaction. It is also called nutritional mutation. Examples of biochemical mutations are sickle cell anemia and hemophilia in humans. Although these mutations do not always affect a particular morphological trait in organisms, they can have an overall impact on an individual's overall health and quality of life. (25)

2.2.5 Lethal Mutations

If a mutation prevents a process that is absolutely necessary for the life of the organism, it is called lethal mutation. For example, an organism that cannot produce an active polymerase enzyme due to a mutation in the gene encoding a subunit of the RNA polymerase enzyme cannot survive because RNA synthesis will stop.

A lethal mutation is lethal even when it is recessive, as there are no wild-type alleles to mask the mutation in haploid organisms. For example, bacteria that cannot synthesize an amino acid cannot reproduce in the absence of that amino acid. Recessive lethal mutations can be tolerated in heterozygous individuals of diploid organisms, but lethal effect is seen in homozygous individuals where two defective genes come together. There are also dominant lethal mutations that are effective in heterozygotes. Huntington's disease can be given as an example, which causes neurological impairment in humans. (44)

2.2.6. Conditional Mutations

Mutations whose effect is seen only under certain conditions are called conditional mutations. Heat sensitive mutations fall into this group. At some tolerable temperatures, the mutant gene product functions normally, but loses its functional capability at restrictive temperatures. Therefore, when the organism is transferred from the tolerable temperature to the restrictive temperature, the effect of the mutation becomes evident. (25)

2.3 Classification by Molecular Alteration Type

2.3.1 Point Mutations

Point mutations are changes that occur in a single base pair or a small number of neighboring base pairs. They usually occur during DNA synthesis. It can also occur as a result of random errors during the repair of DNA damage caused by chemical mutagens or high-energy radiation. Either way, changes occur as a result of reactions catalyzed by the DNA polymerase enzyme. (17)

When a nucleotide is replaced by another nucleotide in DNA, a change will occur in the mRNA produced as a result of transcription. This will cause the polypeptide chain to be synthesized by the relevant gene to change. Thus, a different chain can be synthesized, chain synthesis may be interrupted, or no chain synthesis will take place. In such a case, this mutation can cause disease or show no phenotypic effect. (22)

Point mutations can occur as base substitutions or indel mutations. Base substitution can occur in two different ways, transition and transversion. In a transition mutation, one purine is replaced by another purine ($A \leftrightarrow G$), or a pyrimidine is replaced by another pyrimidine ($C \leftrightarrow T$). In a transversion mutations, a purine is replaced by a pyrimidine or a pyrimidine is replaced by a purine ($A \leftrightarrow C$, $A \leftrightarrow T$, $G \leftrightarrow C$, $G \leftrightarrow T$). Indel mutations are the insertion or deletion of a base pair. If the number of insertions or deletions is not divisible by three, these mutations cause frameshift. (19)

Transition occurs twice as often as transversion. During DNA synthesis of transitions, it is assumed that they cause much less interruption in spiral formation, so that these mutations are less likely to be perceived and corrected. (17)

If point mutations occur in coding regions, they can be categorized synonymous (silent) mutations, nonsense mutations, missense mutation according to their effect on protein sequences.

Point mutations in non-coding regions often cause little or no phenotypic change. The effects of these mutations are more difficult to predict. Point mutations in non-coding regions are called silent. (19)

When a nucleotide is replaced by another nucleotide in DNA, a change will occur in the mRNA produced as a result of transcription. This will cause the polypeptide chain to be synthesized by the relevant gene to change. Thus, a different chain can be synthesized, chain synthesis may be interrupted, or no

chain synthesis will take place. In such a case, this mutation can cause disease or show no phenotypic effect. (22)

2.3.1.1 Missense Mutations

The base change in the missense mutation causes the codon to encode a different amino acid. If the encoded amino acid is chemically similar to the original amino acid, it is called mutation conservative, otherwise it is called non-conservative. (19)

The best example of missense mutation is sickle cell anemia. In this disease, there is a defect in hemoglobin, an oxygen-carrying protein found in erythrocytes. Therefore, erythrocytes are sickle-shaped. The hemoglobin of normal individuals is designated as HbA, and the hemoglobin of sickle cell individuals is designated as HbS. Both types of hemoglobin consist of α and β chains. However, in the β chain, HbA has glutamic acid at the 6th position, while HbS has the valine amino acid at the same position. This single amino acid change causes HbS-bearing erythrocytes to take a sickle shape. The reason for the change in amino acids is the mutation in the gene encoding the β chain. (4, 26)

The p53 is an important tumor suppressor. Many different cancers can develop as a result of this gene being mutated. Mutations in this gene occur in more than 50% of all cancers in humans. Most of the mutations in the p53 gene in cancers are missense mutations and resulting in the production of mutant p53(mutp53) protein with a differentiation in only one amino acid. (48)

2.3.1.2 Nonsense Mutations

As a result of nonsense mutations, an amino acid codon changes to one of the STOP codons (UAA, UAG, or UGA). Occurrence of nonsense mutation, especially in the beginning or middle parts of a gene sequence, causes premature chain termination and inability to synthesize the protein completely. Incompletely synthesized protein does not function. (44)

Nonsense mutations have the effect of cutting the protein. Therefore, they cause the formation of a shorter protein than normal. If these mutations are close to the beginning of the gene, most of the protein may be missing. In this case, the cell has many truncated proteins to deal with. With the activation of cellular mechanisms, these proteins can be eliminated or the production of proteins can be stopped. (37)

Nonsense mutations have been shown to be present in approximately 11% of the identified gene regions that cause inherited human disease, and in approximately 20% of the disease-associated single base pair changes affecting gene coding regions. (31)

2.3.1.3 Silent Mutations

In silent mutations, the base change does not lead to amino acid changes. It is also called a synonymous mutation.

The 20 standard amino acids used in protein synthesis are encoded by 64 three-nucleotide codons on DNA. Therefore, an amino acid can be encoded by more than one different codon. A silent mutation occurs if the changed codon still codes for the starting amino acid as a result of a point mutation in a codon. Since there is no change in the amino acid as a result of the mutation, it does not make any difference in the protein produced. For example, the CUU codon encodes the amino acid leucine. If the nucleotide (U) in the third position of the nucleic acid sequence is replaced by another base (for example, A, C or G), the new codon formed (CUC, CUA, or CUG) will again encode the amino acid leucine. Since there is no change in the protein produced as a result of silent mutations, they are generally considered neutral in terms of evolution. (12)

2.3.2 Frameshift Mutations

Mutations that cause triplets to change as a result of insertion or deletion of nucleotides that are three or not a multiple of three in bases in DNA are called frame-shift mutations.

Frameshift mutation can cause stop codon emergence and premature chain termination at any point.

The protein, which is the product of the mutation occurred gene, differs from the original protein from the insertion or deletion site. If the insertion or deletion is close to the 5' end of the gene, the product of the mutant gene is inactive, if it is close to the 3' end, the product may be partially active. (4)

It has been determined that frameshift mutations play a role in some cases of Duchenne Muscular Dystrophy (DMD), hemophilia B and β thalassemia. (44)

Frameshifting in the reading frame at any stage during the transcription of genetic information in DNA to mRNAs can result in the formation of a protein sequence that is quite different from the initial one. These mutations can be

a powerful evolutionary mechanism for the production of large numbers of proteins with disparate sequences. It has been shown that several key features of many protein sequences resulting from frameshift mutations remain unchanged, such as their hydrophobicity profile. It has been suggested that these mutations could be used to create new protein sequences with similar physicochemical properties to wild-type proteins. (5)

3. Causes of Gene Mutations

3.1 DNA Replication Errors

Correct copying of genetic information during DNA replication is very important for ensuring genetic stability in living organisms. Errors that occur during DNA replication can be life-threatening in organisms. The 3' to 5' exonuclease activity of DNA polymerases plays an important role in the error-free DNA replication. (8) Eukaryotic genomes pass on to the next generation with less than one billionth errors in copied base pairs, thanks to DNA polymerases and the DNA repair system. (30)

Although DNA replication in cells is usually performed with precision, instantaneous replication errors can occur. One of the most important factors in the formation of these errors is the tautomerization event. Purine and pyrimidine bases in the structure of DNA have alternative chemical forms called tautomers. The closed formulas of the tautomeric forms of the bases are the same, only the bond configurations between the atoms are different. Keto-enol forms of thymine and guanine bases and amino-imino forms of adenine and cytosine bases are formed as a result of instantaneous proton shift (tautomeric shift) between carbon and nitrogen atoms (44). Adenine base normally base pair with thymine. However, as a result of a proton shift in the molecule, thymine changes from the keto form to the enol form. In this form, it becomes able to three hydrogen bonds. Thus, thymine in the enol form may mismatch with the guanine base instead of adenine, resulting in a G≡T base pair instead of the A=T base pair. Likewise, as a result of a proton shift in the molecule, cytosine transforms from amino form to imino form. In this form, it can two hydrogen bonds and pair with adenine. Thus, C=A pair is formed instead of G≡C base pair. Such changes are called transitional mutations. (38)

Genome changes occur due to replication errors. This genetic instability can cause many diseases, especially cancer. It generates resistance to therapeutic intervention. However these genome changes make the difference between

cancer and normal cells targeted by chemotherapeutic agents and immunotherapy therapeutics. (9)

3.2 Chemical Mutagens

3.2.1 Base Analogs

Base analogs are chemicals that are structurally similar to purines or pyrimidines and participate in DNA structure by replacing normal bases during replication. Base analogues are dangerous mutagens, endogenously produced by potent antimetabolites, oxidative stress, inflammation, and abnormal nucleotide biosynthesis. The main mutagenic modified purine bases are 8-oxoguanine and 2-hydroxyadenine. 8-oxoguanine in the form of deoxyribonucleoside triphosphate can be incorporated into DNA by replicative and specialized DNA polymerases. It can form base pairs with cytosine and adenine and therefore lead to transversion mutations. Base-analogues in the form of deoxyribonucleosidetriphosphate are the source of genetic changes. Base analogues are clinically important and they are also widely used as immunosuppressants, antiviral and anticancer agents. (43)

3.2.2 Alkylating Agents

Alkylating agents cause alkylation by adding carbon-containing alkyl groups to the amino and keto groups of nucleotides. Alkylation often causes tautomeric shifts in bases. Therefore, transition mutations occur due to incorrect base pairing.

Alkyl sulfonates, nitrosoureas and nitrogen mustards are alkylating agents. They prevent denaturation of DNA duplex by cross-linking DNA chains and cause DNA damage. Therefore, they are used as antibiotics and anticancer drugs. In addition, platinum and gold compounds are also used in the treatment of cancer. Because these compounds bind to DNA, causing conformational changes, and these changes affect DNA function. (8)

3.2.3 Intercalating Agents

They are molecules that get between the DNA bases, causing the helix to stretch and DNA polymerase to mistakenly add extra nucleotides. As a result, a frameshift mutation occurs.

Intercalating agents such as acridines, anthracyclines, ethidium bromide cause unwinding, elongation and stiffening of the DNA double helix.

They prevent enzymes such as DNA polymerase, RNA polymerase, and topoisomerases from binding to DNA. These agents can inhibit cell division by causing multiple mutations during DNA replication. Therefore, they have a lethal effect for actively proliferating cells. (8)

3.2.4 Other Agents

Some chemical agents convert the amino group in the adenine and cytosine bases to the keto group. It is called deamination. Nitrous acid (HNO_2) is a mutagen that causes deamination. It converts adenine base to guanine-like base called hypoxanthine and cytosine to uracil.

3.3 Physical Mutagens

3.3.1 UV Radiation

Although the wavelengths of ultraviolet (UV) rays are high, their energy levels are low. For this reason, the damage they cause to DNA is lighter than gamma and X-rays.

UV radiation can cause two adjacent pyrimidine bases on DNA to form pyrimidine dimers. Thymine dimers are the most frequently occurring pyrimidine dimers by UV effect. Pyrimidine dimers (T-T, T-C) block replication and transcription (7). If these dimers are not repaired by the cellular repair system, they can cause skin cancer (8).

UV-induced DNA damage plays an important role in the initial stage of skin cancer. When damaged cells are left unrepaired or not eliminated by apoptosis, DNA lesions lead to proto-oncogene activation or inactivation of tumor suppressor genes. They can cause skin cancer (6, 8) UV radiation from sunlight is an important risk factor in the formation of skin cancers such as melanoma, squamous cell carcinoma and basal cell carcinoma. (45)

The chemical nature and amount of DNA damage largely depend on the wavelength of the incident photons. UV radiation is classified according to wavelengths. UV-C radiation has a wavelength of 200-280 nm and is the most dangerous type of radiation. High doses of UV-C have been reported to cause programmed cell death. (11, 18) UV-B radiation has a wavelength of 280-320 nm. It is filtered through the stratospheric ozone layer. Therefore, very few of them can pass through the earth. UVB, leads to the formation of cyclobutane pyrimidine dimers (CPDs) and pyrimidine (6-4) pyrimidone photoproducts (64PPs). UV-B causes growth inhibition, DNA damage and changes in gene

expression. The harmful effect of UV-B may be due to its absorption by cellular DNA. UV-A radiation has a wavelength of 320-400 nm. It cannot be absorbed by the ozone layer and passes directly to the earth. UV-A rays are not absorbed by DNA, so they are the least effective at inducing DNA damage. UVA is less energetic but 20 times more intense than UV B. UVA causes single-strand breaks. It induces a wide variety of oxidatively produced lesions such as oxidized bases and the formation of cyclobutane pyrimidine dimers (CPDs). Among them, 8-oxo-7,8-dihydroguanine(8-oxoGua) is the most frequently produced by various mechanisms. (6, 33)

3.3.2 Gamma and X-Rays

Ionizing radiations such as X-rays and gamma rays cause the ring structures to open. It breaks the covalent backbone of nucleic acids, causing the bases to break apart. Although ionizing radiations are short wavelength rays, they cause ionization of molecules due to their high energy. They are more dangerous because they can go deep into the tissues.

Ionizing radiation can cause structural damage to the DNA molecule. It can alter or abolish the ability of the cell to transcribe the gene located in the region of DNA exposed to ionizing radiation. It can cause single strand breaks (SSBs) in DNA. Single strand breaks can be easily repaired using the opposite strand. If the repair is incorrect (mismatch), it may cause mutation. However, its most detrimental effect occurs when the breaks in the two strands are opposite each other or are separated by only a few base pairs. (27)

One of the most dangerous DNA lesions among the causes of ionizing radiation is double-strand break (DSB). A single DSB can cause apoptosis (36), directly inactivate key genes, or cause severe chromosomal abnormalities. (42)

Ionizing radiation causes the formation of free radicals. Free radicals are high-energy atoms or molecules that have one or more unpaired electrons in their outer orbital. They are reactive and short-lived. Disruption of the balance between free radicals and antioxidants in biological systems is defined as oxidative stress.

A human cell is exposed to oxidative attacks from hydroxyl radicals and other reactive species approximately 1.5×10^5 times a day. The hydroxyl radical can interact with all components of DNA, causing damage to the purine and pyrimidine bases and the structure of deoxyribose. (13) Reactive nitrogen species such as peroxy nitrates and nitrogen peroxide have also been shown to play a role in DNA damage. (24) Oxygen radicals can induce a series of

DNA base changes that lead to mutagenesis. There are specific and general base repair mechanisms that repair these base modifications. The increase in DNA repair enzymes following oxidative stress suggests that the efficiency of repair enzymes increases after exposure to reactive oxygen species. (15, 23)

Ionizing radiation is used for the treatment of cancer patients, especially in nuclear medicine and radiation oncology clinics, due to the damage it causes on DNA. (1, 41)

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CHAPTER V

INFECTION, CROSS-INFECTION AND PROTECTION FROM INFECTION

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INTRODUCTION

Many infectious pathogens seen in the community can live, develop and multiply on human or animal organisms without clinical signs. This condition is called infection (1). Infection: It occurs as a result of the chain of infection formed by the source of infection, the infectious agent, the host and the transmission route. If the infectious pathogen disrupts the structure and function of the tissue in the tissue or organ where it is located, due to its own antigens, waste, or residues; is an infectious disease. Interaction with patients during healthcare causes the spread of infectious pathogens. The development of infection is related to the immunity and resistance of the host. For this reason, attention should be paid to isolation and transmission routes should be blocked. These measures are based on preventing the pathogen from reaching the host.

The task of immunity: It is to prevent the pathogens reaching the host from living, multiplying, and deteriorating the functions of the tissues colonized by the pathogen. Immunity and controlled contact/isolation measures provide various benefits such as preventing the spread of infection, the formation of resistant strains, reducing hospitalization times, and reducing costs.

1. INFECTION

Many infectious agents observed in the living areas of the community can survive and multiply in the human or animal body without clinical signs. This condition is known as infection. (1)

Infectious disease: It is the event that a harmful, infectious agent destroys the structure and function of the tissue in the tissue or organ, due to its own antigens, residues, and wastes. (1) Adding the signs of inflammation to this current picture allows us to talk about an infectious disease that manifests itself with symptoms such as vomiting, fever, and weakness. Not all infected individuals are sick. However, all infected persons are a potential source of infection. (1,3) Only people who are infected and show no signs of disease are called carriers. People who are carriers for life are called chronic carriers. Incubation carriage is the condition that the disease is carried and transmitted during the incubation period. (2,3)

Factors that maintain the balance between microorganism and human:

1. Host resistance
2. Infection dose (minimum number of microorganisms required for the disease),
3. Toxicity of the agent (implantation and reproductive power)

These factors differ for each disease. (1)

Immunity: It is the name given to the activities that the organized living body aims to protect itself against foreign agents. Immunity at cellular and humoral dimensions prevents infectious agents from living or multiplying by physical or chemical reactions. *Cellular immunity*, that is, innate immunity, is observed in the early stages of the pathogen encounter. Macrophages, neutrophils, and T lymphocytes are involved. In the next stages: *The humoral response* comes into play, and it acts in the whole body, specific to the pathogen, through B lymphocytes.

Passive immunity refers to the process of providing IgG antibodies to protect against infection, providing immediate but short-term protection. Passive immunity is generally classified as either natural or acquired. Transfer of maternal tetanus antibody (mainly IgG) across the placenta provides innate passive immunity in newborns for several weeks/months until this antibody degrades and disappears. In contrast, acquired passive immunity is the process of obtaining serum from immune individuals, concentrating the immunoglobulin fraction, and then injecting it to protect a susceptible individual. (2,3)

Active immunity refers to the process of exposing the body to an antigen to generate an adaptable host response: the response takes weeks to develop but can

be long-term or even lifelong. Active immunity is generally classified as either natural or acquired. For example, a severe infection caused by the hepatitis A virus (HAV) and subsequent recovery leads to a natural active immune response that often leads to lifelong protection. Similarly, administration of two doses of hepatitis A vaccine elicits an acquired active immune response that leads to long-term (possibly lifetime) protection. (2,3)

a) The Chain Of Infection And Its Components

Infection: It occurs as a result of the chain of infection formed by the source of infection, the infectious agent, the host and the transmission route. The occurrence of infection is prevented by various measures to target the components of the chain. (11)

Host: The name given to the body to which the harmful pathogen will infect. In the disruption of the chain, if the host is targeted, the applications to be made are usually protective measures. (4,6)

Source of infection: Areas where the infectious agent resides, reproduces, and is dependent on for survival. It is a term used for living or non-living substances such as soil, water, people, animals, plants. The source of many diseases such as various viral and bacterial infections, sexually transmitted diseases and mumps is human. (4,16)

Infections can be divided into endogenous, exogenous, or mixed infections.

- Endogenous origin infections occur through microorganisms that have a mutualistic life between the host and the host's body flora, in cavities such as intestines, throat, etc. Weakening of the host's immunity can lead to opportunistic infection of the pathogen living in the host's own flora. This infection state is usually caused by a change in the immunity of the host or a change in the dominant species in the flora. (4,5,6)

- Infections of exogenous origin are observed due to pathogens that do not live with the host and are not present in the host. Exogenous infections occur due to cross-contamination or due to environmental transmission. Infections of exogenous origin are transmitted from food, parenteral route or airway as a result of direct contact or indirect contact. (4,6,7)

- Mixed infections are less common. In mixed infections, exogenous (external) infection occurs first. Endogenous infections occur with resistant strains formed in the host body due to incorrect drug use. (7,9,18)

Route of transmission: Any mechanism that causes a susceptible host to encounter an infectious agent.

b) Transmission Routes:

1. *Direct transmission*: It is the name given to the direct transmission of the infectious agent from the source to the host without the need for any vector. (1,3,11,16)

- a. Contact with infected body fluids such as blood, saliva, etc.
- b. Blood transfusion
- c. Sexual contact

2. *Indirect transmission*: The transmission of the infectious agent from the source to the healthy host by a vector. (11.16)

- a. Injuries with infected sharps
- b. Respiratory transmission
- c. Fecal-oral route
- d. Rodent and other living vectors

2. CROSS INFECTION

It is the transmission of the disease agent from infected people to healthy people due to the fact that health personnel do not take the necessary precautions. Indirect transmission is mediated by areas and tools that allow the common use of more than one patient, allowing the transfer of infectious agents between patients. Here, the transmission vector can be listed as health personnel, health center, common tools, and areas. During or after all health-related procedures, healthcare professionals should consider the risk of cross-infection and take the necessary precautions to prevent the chain of infection. (11,16,24)

Transition from patient to healthcare personnel: It is the situation in which the patient assumes the role of source of infection. The pathogen passes to healthcare personnel due to direct contact, droplet path, airway or instrument injuries. Everyone that healthcare personnel come in contact with is, at risk of infection. Contagion is largely prevented by standard precautions.

Transition from healthcare personnel to patient: Healthcare personnel assume the role of infection source. Contamination is nearly impossible if standard precautions are used. Contamination occurs through the respiratory tract or contact of the blood leaking as a result of injury to the personnel, with the injured tissues of the patient.

Passage from patient to patient: It is the passageway encountered due to the negativities experienced during the decontamination of the common areas or tools. Since blood and body fluids act as reservoirs for infections, attention

should be paid to the environments they come into contact with. Compliance with disinfection and sterilization rules, and health training on personal hygiene will ensure that the passageway is blocked.

Transition from hospital to society: the main factor is medical waste. Infection occurs when the pathogen is transmitted to the surrounding soil, drinking water, wastewater, animals or humans during the collection, storage, separation and destruction of infected gloves, masks, syringes, sponges, laundry, etc. Paying attention to the circulars and regulations regarding the management of medical wastes will prevent this transition.

Transition from society to patient: The reservoir is the water/cooling systems used during health services. The biofilm layer formed in the system and the infection of the water used cause infection. If there is no deterioration in the integrity of the tissues or if the immunity of the individuals is not weakened, it does not pose a risk.

Transition to family in Health Personnel: These are the cases where health workers are vectors in cross-infection. Health personnel, who are carriers of the pathogen in the working environment, can transmit the pathogen to their social environment and family members. (12,15,16,20,24)

3. PROTECTION FROM INFECTION:

The main purpose: To prevent the chain of infection from occurring is to block any of the chain links. The chain of infection; an infectious pathogen, consists of an essential transmission route for the pathogen to be transmitted to the host, and a host susceptible to infection. Among the measures to be taken against the formation of the chain are isolation, hygiene barrier, sterilization, and disinfection. The most easily intervened and deteriorated link of this chain is the transmission route. (6,7,17)

1.1. Insulation

Isolation is the work of isolating the patient from the environment during the contagious period. Isolation is not only applied to infected patients, but also separation of patients at risk of infection from the environment is considered isolation. The most effective way to limit and prevent the spread of the harmful infectious agent to the environment is to isolate the source of infection from the environment. With isolation, the spread of harmful infectious agents to the environment is prevented. (12,14,22)

Importance Of Isolation

Isolation has an important place in the control of healthcare-associated infection. Health care-associated infections, which are difficult to control and treat, can be reduced with necessary isolation measures, and the contagiousness of infections can be prevented. Healthcare-associated infections caused by inadequate precautions cause problems such as prolonged hospital stay, increase in total cost, and increase in morbidity and mortality. (7,14,22)

The main goal is to control infections associated with healthcare services with isolation measures. Standard precautions should be applied to all patients in the hospital, regardless of their diagnosis and infectious status. Because every patient is a potential source of infection. The second target is the measures applied for certain patient groups, targeting the transmission route, and used to prevent the transmission of harmful infectious agents to the environment. Healthcare-associated infections can be reduced or completely eliminated with due attention to isolation precautions. (21.22)

Standard Precautions

Protective measures taken against factors that can be transmitted from all body fluids except sweat are called standard precautions. All interactions with patients in the hospital should be made within these precautions, regardless of their diagnosis and infectious status. Standard precautions are basically; It is based on the assumption that all patients admitted to the hospital, regardless of the presence of infection, are a possible source of infection. Thus, personal isolation of each individual is insured and the necessary transmission routes for the transmission and spread of the infection are prevented. (21.22)

The purpose of developing and implementing standard measures; is to protect the host from pathogens ready to be transmitted by isolating the host in its interaction with the environment. These measures are: It should be applied, when contact with all body fluids (except sweat), intact skin, and mucous membrane areas. In this way, contact with areas that allow transmission is controlled and the host that is susceptible to infection remains isolated. (7,17,20)

Basic principles of standard precautions; hand washing and the use of gloves, masks, glasses, and aprons to ensure controlled isolation of the surfaces that the hand comes into contact with. The order of dressing of protective equipment; apron, mask, goggles (face protection), gloves. The order of removal is gloves, goggles (face protection), apron and mask. Paying attention to the rows

is important for controlling contact with contaminated equipment. In addition, proper use and disposal of sharps, collection, storage, and destruction of wastes with appropriate methods, transportation of patient samples, avoiding pollution of the environment with wastes, proper disinfection, cleaning, and sterilization of reused instrumentals, placing contaminated patients in a single room etc., are also can be included to standard precautions. These are among the foci that increase the risk of healthcare-associated infections. (6,20)

1.2. Hand Hygiene Techniques

Healthcare-associated infections are one of the most important health problems of modern medicine. Hand hygiene is the process of removing and cleaning the visible dirt and pathogens on the hand as much as possible. Hand hygiene is the single most effective, least expensive, and most important factor in preventing healthcare-associated infections. Health care-related infections occur in 5% to 15% of patients under treatment in the hospital, and approximately 30% of these infections can be prevented with infection control measures. (20)

Our hands are indispensable organs in our interactions with the environment. During interaction, there is an exchange of infectious pathogens between the surfaces we come into contact with and the hands. The transfer of these infectious pathogens from our hands to the environment and from the environment to our hands causes a temporary flora to form on the surfaces.

Temporary Flora: It occurs through infectious agents that come into contact with the external environment, are in the superficial layers of the skin, and are transferred by direct contact. Harmful infectious agents (*E. coli*, *P. aeruginosa* and other gram-negative bacilli) accepted in the temporary flora are easily removed with appropriate hand washing. These harmful pathogens, which are among the causes of healthcare-associated infections, are transmitted to healthcare workers through interactions with patients or the patient environment and spread through all subsequent contacts. The most important flora that is effective in healthcare-associated infections is the transient flora.

Persistent Flora: It includes pathogens (coagulase-negative staphylococci, diphtheroid) that have low pathogenicity, are located in the deep layers of the skin, and can rarely cause healthcare-associated infections unless the skin integrity is compromised. The skin of patients under treatment in hospitals is contaminated with microorganisms (*S. aureus*, Enterococci, *Acinetobacter* species) in the hospital environment, which are the causative agents of healthcare-associated infections. Persistent flora cannot be removed with a simple hand wash.

1.2.1. Social Hand Washing Technique

Social hand washing is the cleaning of hands after all the processes that have the risk of contamination with visible dirt and infectious pathogens that occur on the hands after interactions with the environment in daily life, by rubbing them with a liquid soap and water. With this process, the permanent flora is not affected, but the temporary flora can be eliminated. Before the meal, after the toilet, after contact with the soil, in contact with water sources that may be dirty, and the cleaning of the hands contaminated with blood or other body fluids, and the visible dirt on the hands are removed by social handwashing. (20)

In order for social hand washing to be effective and efficient, all accessories on the hands and wrists should be removed. Accessories create a habitat for pathogens. Hands are wetted in running water, lathered with liquid soap on wrists, palms, upper hand, between fingers, nail edges and undersides, and hand washing is done by rubbing for 20-30 seconds. Time is important for the effectiveness of the cleaning agent used. Also, if possible, after drying your hands with disposable paper towels, turn off the tap with that paper towel. Solid soaps: Due to the possibility of colonization with gram-negative bacteria, it should be made individually, or liquid soaps should be preferred. (17)

An increase in the workload of the personnel for various reasons causes the hand washing process to not be carried out properly and not to take sufficient care. It is completed in 5-10 seconds before the soap reaches everywhere and without showing sufficient antiseptic effectiveness. In addition, washing some areas can be neglected. It should be noted that only a properly practiced handwashing procedure is of paramount importance in preventing or reducing healthcare-associated infections. (13)

1.2.2. Hygienic Hand Washing Technique

Hygienic hand washing is the washing process performed with soaps or solutions containing antiseptic agents in order to completely remove the temporary flora formed on the hands after contact with contaminated surfaces. In the hygienic hand washing technique, besides the temporary flora, the permanent flora is partially affected. (7,10,14,17,20)

In the hygienic hand washing technique, first the faucet is opened with a paper towel and the hands are wetted in running water. Then 3-5 ml of antiseptic soap or solution is taken and rubbed for 20-30 seconds. The foam is spread over the entire surface of the hand, the inner and outer surfaces of the hands, between

the fingers, fingertips, between the thumbs, the middle of the palm and the wrists are rubbed, and friction is done. Foaming allows us to understand where the antiseptic agent reaches. Hands are rinsed, dried with a paper towel and the tap is turned off with the same towel. (10,13,17)

Points to consider:

- Nail tips
- Use of antiseptic soap or solution
- Hand washing time

1.2.3. Hand Antisepsis Technique

The main purpose of hand antisepsis is to remove harmful infectious pathogens from the skin surface in the shortest possible time, in the most effective and permanent way possible. (7) The main agents used for hand antisepsis are alcohol, iodine and iodophors, chlorine and chlorine compounds and ammonium compounds. These agents, which have antiseptic properties, are used to remove the temporary flora as quickly as possible.

In hand antisepsis, 3-5 ml of solution is handled, and hands are rubbed until dry. The nail tips, between the fingers and wrists, which should be considered in hygienic hand washing, should also be allowed to come into contact with the solution. Water prevents the contact of the aseptic agent with the skin and does not allow decontamination of the surface. Hands should not be washed before and after disinfection. Hand disinfection should not replace hand washing, hands should be washed when there is visible contamination. (10,11,13,14,20)

1.2.4. Surgical Hand Washing Technique

The aim of hand washing for surgical purposes is not to cause contamination in contact with sterile areas that do not contain infectious pathogens. In other words, in order not to play a vector role in pathogen transfer, it is to eliminate the temporary flora and to reduce the permanent flora to the lowest level possible and to ensure that this situation continues until the surgical intervention is completed. (13) There may be visible or invisible holes and tears in gloves used in invasive procedures and surgeries. Before any invasive or surgical intervention, surgical hand washing should be applied in case of contact with contaminated body fluids and secretions, or medical devices used for the patient. Hand washing time should be at least two to five minutes depending on the antiseptic substance. The antiseptic agents used should have a fast effect and their effectiveness should be permanent. (13)

For surgical hand washing, solutions prepared in foam forms or products such as povidone iodine are used. It is known that the jewelry used increases the infection by 2.6% during surgery. (14) For this reason, jewelry should be removed. After removing the jewelry, the tap is turned on and the hands are wetted up to the elbows and lathered with an antiseptic agent. In order to remove the temporary flora on the skin, brushing is done for at least 2 and at most 5 minutes, depending on the preferred agent. The purpose of using a brush is to ensure that the antiseptic agent reaches all inaccessible areas. Starting from the fingers with circular movements, rubbing is done up to the elbows. The arms are folded so that the hands are above the elbow level, the water is run down and rinsed. Dried hands with a sterile towel. Hands are held above the waist level and go to the surgical area, sterile gowns and gloves are worn. (11,17, 20)

1.3. Glove Use

Gloves are a barrier used to protect hands and control contact. (6). In health services; to prevent contamination of hands with microorganisms, to prevent the transmission of harmful agents from patient to healthcare professionals, from healthcare professionals to patients or from patients to patients through hands, and to ensure that healthcare professionals do not get infections through blood or skin. In short, it is used to isolate the hands and limit their contact. (17)

Since patients are a source of infection, gloves should be worn in procedures to be applied to the patient's body parts, gloves should be changed when passing from one patient to another, and hands should be washed after each procedure and patient change. The gloves used should be non-sterile disposable gloves and the gloves should not be washed. Sterile gloves, on the other hand, should be worn in procedures to be performed on sterile parts of the body, on open wounds and in situations where the sterility of the material needs to be maintained. (19,20,21,23)

Wearing gloves should not be a substitute for hand washing. Must not touch around with gloves. Also, wearing gloves does not provide complete protection against contamination of hands. Hands can become contaminated during wearing or removing gloves. For this reason, hands should be washed before putting on gloves and after removing them. (23)

1.4. Use Of Protective Equipment

There is a risk of cross-contamination by clothing during the interaction of healthcare personnel with the patient. It should be used in addition to hand washing and wearing gloves to prevent contamination, as well as to prevent

the formation and transmission of multi-resistant bacterial strains by blood and blood-containing fluids, bodily fluid secretions or urine splashes on the skin. (8.21)

Protective apron ; It is used to prevent the clothes of healthcare workers from getting dirty, infected with bacteria, and from carrying pathogenic microorganisms from the patient or the patient's environment to other patients and their environment.

Gowns worn are considered contaminated and should be removed and properly disposed of when leaving the isolated patient's room. After removing the apron, hands must be washed. Because hands can also be contaminated during removal. If possible, disposable gowns should be preferred in contact with the isolated patient. Aprons should not pass water and microorganisms and should be long enough to cover the leg. It should not damage to the work of the personnel. (7.20,21)

Mask and goggles; It is used in addition to gloves and gowns to protect the eyes, nose, oral mucosa and face against the possibility of contamination of harmful infectious pathogens by splashing blood, body fluids, secretions during interactions with the patient. It aims to protect the face. They must be resistant not only to infectious agents, but also to prevent physical injuries.

Surgical masks are effective in transmission through droplets and in preventing infections caused by infected particles larger than five microns in diameter. It takes its feature from the filters with different pore sizes it contains. Special N95 masks should be used in respiratory or airway isolation, since harmful infectious agents are in airborne liquid particles with a diameter of less than five microns. This mask can filter droplets up to 1 micron in diameter with 95% efficiency. The masks used should completely cover the mouth and nose. (7.20,21)

1.5. Precautions For The Way Of Transmission

These measures are; It is administered to patients infected with infectious agents that are highly contagious, epidemiologically important, specifically identified or suspected, in combination with standard precautions for transmission. Measures for the transmission route are examined under three main headings. (6,8,20,21)

- Contact precautions
- Droplet precautions
- Respiratory (airway) precautions

In cases where the risk of contagion is high, these isolation measures should be applied in combination with standard precautions. In particular, transmission of this infectious agent to neutropenic patients, newborns, patients over 65 years of age, or patients with weakened immunity for some reason should be prevented. In the case of infection, these patients may experience the disease more severely due to insufficient immunity and may have to face serious consequences. Health care workers who need contact, respiratory or droplet isolation should also be temporarily stopped from providing care to patients with weakened immunity due to such reasons. (7, 14, 21)

1.5.1 Contact Precautions

These are the measures applied in addition to the standard precautions against the agents that can be transmitted from the infected patient or the colonized area by direct or indirect contact. (5) Transmission by direct contact occurs as a result of direct physical contact between the host and the source of the pathogen. Infection by indirect contact, the host; It is the situation of ingesting an infectious agent from its source with needles and clothing, contaminated equipment, contaminated hands, that is, through a contaminated vector. (14) Gram (-) rods resistant to multidrugs in health institutions, Methicillin-resistant staphylococcus aureus (MRSA), Resistant microorganisms such as vancomycin-resistant enterococci (VRE) may be found in the patient environment. These harmful infectious pathogens can survive for weeks or even months on dry surfaces they come into contact with, contaminating the clothes and hands of healthcare personnel. For this reason, it is extremely important to protect the skin and clothing in contact isolation. Contact precautions for patients receiving treatment and care have an important place in preventing the spread of healthcare-associated infections. (17, 18, 20)

1.5.2 Droplet Precautions

It is applied in addition to the standard precautions to prevent the risk of the infected fluids in the airways leaving the host in droplets larger than five microns due to activities such as coughing and speaking, and reaching people close to one meter. (6) Since the droplets are large and heavy, they cannot stay suspended in the air and cannot reach long distances. Even if the infectious agent reaches the host, it must settle in the mucosa. Therefore, infected droplets pass to the mucosa of the sensitive host during speech, coughing, sneezing or during procedures such as bronchoscopy, intubation, aspiration. Ventilation of

the infected environment is ineffective in transmission through droplets. (14, 17, 18, 20)

1.5.3 Respiratory (Airway) Precautions

Precautions against respiratory transmission are in addition to the standard precautions for the control of agents that come out of an infected patient, are carried by particles smaller than five microns, and are transmitted. Since the droplet size is small, it hangs in the air or spreads by adhering to dust particles. Thus, the droplets are carried away from the source. Therefore, airway precautions should be applied and negative pressure rooms should be used to prevent airborne pathogenic microorganisms from infecting the sensitive host. (7, 8, 17, 19, 20, 21)

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CHAPTER VI

THE EFFECT OF PSYCHOLOGICAL VIOLENCE IN WORKPLACES (MOBBING) ON WORK EFFICIENCY AND OCCUPATIONAL ACCIDENTS

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1. Introduction

Facing various risk factors in the workplace and eliminating the negative consequences of workplace risk factors is a management responsibility and a reflection of the employer's understanding of duty. The purpose of intimidation (mobbing), which employees have been facing recently, is to reduce the efficiency of the employee and to remove him/her from the workplace over time. It is known that intimidation, which has become one of the most important problems of today, is a phenomenon that consists of many elements including management, managers at all levels, the work performed, the working group, the environment and the individual and is affected by each other. Employers try to fulfill risk management in line with the principle of commonality and common sense; within the scope of authority and responsibility approach, expertise and competence understanding, legal obligation, administrative and voluntary regulations and workplace OHS principles within the system integrity.

Contrary to what is accepted, violence in health is not only a problem in developing and transitional countries, but also a common problem in developed countries(1)

Psychosocial risks differ from other risk groups in terms of tangibility, measurability, traceability, control, audit and rating. The main findings of the "European Enterprise Survey on Emerging Risks Requiring Urgent Action (ESENER)", the first of which was completed in 2009, the second in 2014 and the third in 2019, and the reports of which were published shows that:

✓ Increasing importance of psychosocial risks such as stress, violence, harassment,

- ✓ Managers considered them among the most fundamental occupational health and safety risks,
- ✓ Management of psychosocial risks is a new and difficult area,
- ✓ Musculoskeletal disorders (MSDs) and psychosocial risks are of most concern to workplaces in Europe,
- ✓ Awareness of psychosocial risks is still not high enough (15)

Global approaches, economic and social phenomena, expectations, difficulties in working life and other current dynamics of our age have intensified the business environment. In addition to all these negativities, the pandemic process has caused serious pressure and anxiety on employees. Psychological intimidation (mobbing) in the workplace, which negatively affects work efficiency and gnaws success, has started to turn into a plague of the working environment today.

2. PSYCHOLOGICAL HARASSMENT AT THE WORKPLACE:

Psychological intimidation (Mobbing), which has attracted the attention of academic and business circles within the scope of occupational health and has been emphasized recently, is a series of social and psychological actions that are frequently seen in the working environment, but can be expressed as a difficult situation in terms of clarification and concretization phenomena(24).

Psychological harassment can be manifested in a wide variety of ways, such as words, attitudes, behaviors, words, actions, activities, or methods that reflect dignity, personality, reputation, physical or mental state. Studies on psychological intimidation, which has high losses and negative outcomes in the context of the individual and the workplace, started in the 1990s. Its effects can range from stress and depression to psychosomatic problems, psychosomatic problems, even chronic diseases and cardiovascular problems, depending on the psychological strength, ability to resist and willpower of the person.

Psychological harassment in the workplace is an approach and practice that creates a risk to health and safety, in which unreasonable and deliberate behaviors are repeatedly directed against a person or a group of employees with a vengeful mentality and a vicious and malicious nature, devoid of pity, evil deeds, vindictive attitudes and actions that damage honor and reputation.

Elements of mobbing:

- ✓ It should take place at the workplace and in the working environment. It can be applied by superiors to their subordinates as well as by subordinates

to their superiors. Professionally, it can also take place between equivalent authorities and counterparts who have the same status in terms of seniority, rank and position.

- ✓ It is systematic in its application and execution and is based on malicious and intentional activities and transactions.
- ✓ The ultimate goal should be to intimidate, push out of the system, pacify and dismiss.
- ✓ There must be damage to the personality, occupational status or health of the exposed person.
- ✓ Negative attitudes and behaviors towards the person may occur covertly or overtly.

Workplace harassment is unethical practice that may harm the employee's personality, honor and reputation, or harm his/her physical or mental health, destroy his/her willingness and effort to work, jeopardize his/her job or disrupt the work environment. It includes deliberate behaviors, negative and ugly words, purposeful and targeted actions, actions that are far from professional, conscientious and humanitarian characteristics and abusive attitudes, especially towards the selected target (22,24)

Intimidation includes verbal, sexual or racial violence, physical violence, discrimination, threats, social isolation and instability. The most obvious reaction of victims is to make excuses for not coming to work or walking away from work. The aim is primarily to get away and escape from that environment. Potential risk factors include managerial deficiencies and organizational problems, inadequate leadership and management, ambiguities in job descriptions and increased workload and tempo, irregular and variable working hours, shift work, work without goals, arbitrary practices and excessive working hours, time pressure, long working hours, and work intensification. In order to protect against psychological harassment, the managerial process and the vision of the will should be strategically planned and implemented in a way that will create a positive climate in the workplace, decisive and persistent practices and organized activities, and ensure continuity.

Psychological harassment (intimidation), which is an important psychosocial risk within the scope of occupational health, generally causes negative effects on people such as loss of mood, reticence, loss of desire to live, sleep disorders, insomnia, loss of appetite, forgetfulness, irritability, sudden anger, depression, distress, anxiety, inactivity, crying spells, withdrawal from things they previously loved, and changes in behavior and thinking such as not enjoying life.

In the first stage of the mobbing process, the effects seen in the victims are usually; gradual withdrawal, reticence, frequent and causeless crying, loss of appetite, sleep disorders, insomnia, irritability and difficulty in focusing. In the second stage, in addition to the symptoms of the first stage, symptoms such as stomach complaints, indigestion, high blood pressure, irritability, tense mood, depression, unwillingness to go to work, being late for work are added. In the third stage, the severity of depression increases and panic attacks and anxiety attacks occur. Self-harm, the desire to end one's life, suicide attempts, negligence, accidents and suicide attempts are mostly seen in the last stage of the mobbing process.

In the work environment, individual work can be carried out as well as team, group, team or team work. It is quite natural to have deviations from the principle of intellectual commonality in the work carried out. It is not always possible to think the same about everything or to interpret events from the same perspective. These situations are quite normal and are likely to be experienced in changing and developing processes. In the event that people's expectations are not met or contradictory situations arise, their anger and showing an attitude that will upset, hurt and injure the other person at a moment when they are restless and tense is an isolated incident and should not be considered very important. The feature that creates the intimidating and destructive phenomenon is that attitudes and behaviors aimed at disregarding, not addressing, satirizing, humiliating, covering and ignoring are a routine situation that is constantly experienced and applied in a systematic manner.

2. How Psychological Harassment Is Practiced

Psychological harassment is generally seen on the vertical or horizontal axis in accordance with the hierarchical structure, and it is not a correct approach to see it only on the vertical axis on the basis of command and loyalty and to think that it is a form of behavior that superiors and supervisors direct and apply to their subordinates. The perception that psychological harassment is generally perceived as violence and oppression by superiors and managers against subordinates under their command within the scope of the floor system within the framework of duty, authority and responsibility is not always valid. Although harassment is mostly experienced within the hierarchical order, harassment is occasionally seen among colleagues at the same level on the horizontal axis in terms of status. However, there are observations that those

at higher levels generally do not intervene or refuse to see or condone this behavior (15)

In contrast to weak and inadequate people with personality problems, underdeveloped self-confidence, incapable of expressing themselves, easy to be manipulated, losers, incapable of establishing superiority, the victims chosen as targets of harassment in the workplace are actually strong people with developed personality traits. The people who are chosen as targets are usually those who react to oppressive and authoritarian systems, refuse to be used, and have the capacity to resist authority despite oppression. In addition, these people are targeted and selected because of their well-developed personality, human values, constructive, positive, high comprehension, evaluation and synthesis abilities, knowledgeable, courageous, honesty, rebelliousness against unfair attitudes and behaviors, and intolerance of injustice (1,19,22)

The people who are selected and targeted are not slackers, undisciplined, or non-serious individuals in the work environment; on the contrary, there are highly committed, meticulous and qualified people who “pathologically come to work”. These perfectionist, quality and qualified employees want to fulfill the tasks assigned to them perfectly. These people, who work without thinking about working hours and do not pay attention to working hours, work devotedly until late hours, guided by the slogan “before the work is done, the work is not over”. They do not hesitate to come and work spontaneously, even on weekends if necessary, without receiving any instructions due to their duties and responsibilities. They make the sacrifice to come to work even when they are sick, regardless of their health problems. As a result of these degrading behaviors, the victim of psychological violence and harassment cannot use his/her knowledge, ability and capacity well. The work efficiency of the person who is distracted and unable to focus on work eventually decreases and this makes it easier to criticize the quality and results of their work. It may be easier to use this situation to dismiss the individual if the harasser, who is constantly following the person because of possible professional and task mistakes or deficiencies, creates conditions that will make it easier for the harasser to reach the target.

Psychological harassment and intimidation methods may vary according to the choice of the practitioner (harasser) and the targeted person. Determinations can be made by measuring the reaction of the victim with different methods and methods can be changed according to the situation with the effect-response processes..

3. Types Of Psychological Abusers

3.1. *Narcissistic Abusers*

The narcissistic personality, which is a structure created by a sense of superiority, the need to be admired and a lack of empathy, has an exaggerated sense of self-importance. Narcissists, who are defined as self-centered, highly arrogant, manipulative and demanding, often exaggerate their achievements and skills, seeing them as extraordinary. Although they are not the architect of an extraordinary success or even do not show a sufficient level of success, they expect other individuals around them to accept them as a superior individual and a valuable personality. People with narcissistic personality disorder;

- ✓ They act as if they are above criticism and sees themselves as far away and above criticism.

- ✓ They display approaches and behaviors that direct and guide people in line with their own ideas and thoughts that they want to see the result.

- ✓ A self-interested style and manner is considered to be among the usual behaviors of daily life and uses other individuals in the work environment for personal benefit and private gains.

- ✓ On the basis of establishing friendships, the criteria of authority, position, status, rank and power act as the most valid criteria for establishing relationships, and they want to establish intimacy with employees who have the same position and status as them. Even among individuals belonging to the same group, they want to stand out, stand in the forefront, and dominate their surroundings as if they are better and more effective than them. They exaggerate their own abilities and achievements and consider themselves superior to others, even in the environment they enter and establish intimacy with.

- ✓ It is important for them to be right and to be accepted. They approach with the logic of “I am right because I am strong”. They want to be approved by creating conditions in which they will be right all the time.

- ✓ It is in their nature to always be praised and to always be the best. They constantly seek praise from others and do not hesitate to exert all kinds of pressure for it.

- ✓ They consider other individuals in the work environment to be more unsuccessful, less talented, less beautiful and less intelligent than themselves.

- ✓ It assumes and accepts that the individuals around it are in a position to fulfill their own demands and wishes and to serve themselves.

✓ Although they see themselves as part of the group in the neighborhood where they work, they still think that they are different from the others in this group and deserve to be treated specially, and they try to express at every opportunity that they are the most important and superior person in that group..

✓ They are happy with the ego-satisfying approaches and support of those around them. Existence and sustainability through others is extremely important and necessary for them.

It is generally considered that the factors underlying this personality disorder date back to childhood and that the handicaps of love hunger and lack of appreciation experienced at that age, the opportunity to satisfy this hunger is tried to be seized, and attitudes and behaviors such as acceptance, prominence, love, appreciation, praise, etc. emerge for this reason. Although these individuals may appear to be self-confident on the outside, the concept of self-confidence is fragile and weak on the inside. They do not want this to be revealed and showing it is their biggest fear.

3.2. Irritable, Fierce, Yelling Abusers

They are typical of psychological harassers in every organization, and are proponents of coercion, force, violence and fear. They use intimidation as a weapon of control and try to instill fear in others. It is almost impossible to be in the same working environment, let alone live with such people. Due to their character and personality weaknesses, they cannot control their emotions and anger. They perceive every issue as serious, important and of vital importance, and for no apparent reason, they shout, call, curse and curse those around them. They can then go back to work as if nothing had happened. They create the perception that they are the real and sole authority and want everything to be done as they say. They often feel the need to remind others that they are the boss or supervisor. They cannot tolerate not being able to find the person they are looking for during working hours.

3.3. Hypocritical Abusers

They brag about the number of victims they have frustrated and devastated and never leave their targeted victims alone. They constitute the group of harassers who are sincere and underhanded. This type of harassers, who take great pleasure in psychological harassment, are always on the lookout for new victims and evils. They are always looking for new ways and methods to intimidate, stress and ruin

the other person. Due to their success-oriented approach, they cannot tolerate the superiority, professional success and promotions of others other than themselves. These types of abusers, who have a high level of awareness and act consciously, do everything they do knowingly and willingly. They are adept at passing off negativity and blaming it on others. They are in the habit of swearing to be credible and presenting the victims they have pacified and controlled as witnesses. They can easily blame all kinds of negativity and blame on someone else, and they are ready to take refuge in sacred values and swear that they are innocent.

3.4. Delusions of Grandeur or Delusions of Megalomania (Megalomaniac) Abusers

They place themselves at the center of the world and are self-conceited and self-righteous, seeing themselves as superior to others. The need for exaggerated and meaningless self-aggrandizement and pretense are the most important features of their personality. Insecurity is the most important building block and they are extremely insecure in themselves. Their attitudes and behaviors reflected in the form of jealousy, hatred and aggression towards others are based on serious insecurity problems. They constantly feel the need to impose their superiority and domination on the people they target. These types, who are environment hunters, constantly seek to set new rules according to the situations and conditions that arise. They expect everyone except themselves to comply with the patterns they construct and fabricate, and they force those who do not comply.

3.5. Critical Abusers;

As negativity is an indispensable fact and source of nourishment in their lives, they constantly take a negative approach to what is happening. Finding the wrong and looking for mistakes manifest as the routine of daily life. Complaining mechanism is their most important function and they constantly talk and complain about situations, events and experiences. They don't like the work of any other employee except themselves and they annoy the people around them with their complaints. Critical harassers are loved by their supervisors and managers; they encourage other employees to work continuously due to their directive and directive characteristics.

3.6. Disillusioned Abusers

This is the type of harasser who is at the center of private life problems and conflicts arising from disappointments, unfulfilled desires and expectations,

uncertainty, lack of family support, blockages in life processes, and insufficient opportunities. This type of harasser carries their state of mind into the work environment. They try to direct all the negativity towards them, as if the people at the workplace are the creators of the mood they are in. The dulling of positive emotions and their replacement with negative feelings, all the impossibilities and negativities or bad experiences and individual conflicts are seen as the solution center of the work environment. This method of harassment, which goes beyond the boundaries of reality and moves into the work environment and is directed at close colleagues, is almost like vomiting poison on others.

3.7. Traitorous and Mischievous Abusers

“Slander and humiliation”, which is incompatible with human dignity, is a despicable method they use. Far from humanitarian and conscientious virtue, these types are always in search of new evils. They are so reckless and limitless that they almost compete with themselves in planning evil and slandering. Through rumors, gossip and slander, they seek to dishonor, humiliate and injure their victims.

3.8. Incidental Abusers

They emerge as a result of a possible event, accident, or a negative situation towards the strategies and goals of the organization, or a situation that is contrary to the interests of the organization and the development of a conflict. Harassers, who appear randomly, act by gaining the characteristic of being the superior party. They implement all kinds of premeditated plans to finish off and completely ruin the person they are targeting. For the harasser who finds the opportunity they have been waiting for, it is the time and moment to take advantage of it and get results.

3.9. Abusers seizing the moment and the opportunity

They take advantage of situations and opportunities as they arise. They act with the logic of wait and attack when the time comes. These types of harassers are usually and seemingly bystanders who do not make themselves known and do not actively engage in activities. Whenever they have the opportunity, they direct whatever negative aspects they have previously identified and collected at the target person, so that they can use them when the time and place comes. Even if they are not actively involved in the conflict, they attack the target person

in a clear and obvious way. The harassers who are waiting for the moment and the opportunity, almost waiting in ambush, aim to take advantage of what is happening. They do not take any initiative to stop and prevent the actual psychological harassment they witness. In other words, their passive attitudes and behaviors, ignoring and unresponsiveness make them equivalent to the perpetrators of psychological harassment.

3.10. Sycophantic Abusers

They are individuals with weak personalities and lack of character who think and behave in a purely interest-oriented manner, who are easy to manipulate and manage under the auspices of superior and powerful people in terms of authority and position. They are people who want to curry favor by showing exaggerated respect and admiration, especially towards those from whom they expect to benefit, or from whom they expect to benefit, or from whom they benefit, or towards managers who are effective in terms of authority and status and who have a say in the organization. They like and adopt the attitude and approach of acting more like a king than the king. They are in a constant state of favoritism in order to gain the favor and appreciation of their superiors. They act as a kind of sycophant of their managers and superiors. Again, in order to appear hard-working in the eyes of their superiors, they apply cruel practices against their subordinates, shouting and yelling at times when it is not necessary, almost terrorizing them.

3.11. Bullying Abusers

Repression, violence and bullying are methods they never give up and use persistently. They act ruthlessly. The aim of this type of abusers, whose human and conscientious qualities are not developed, is to create a mass of people around them who blindly obey them. They do not see human beings as social beings. Therefore, they are always closed to the needs, wishes and demands of others. They do not attach any importance to the wishes and needs of their employees. Since they see themselves above everyone else, they do not hesitate to treat those around them as slaves.

3.12. Cowardly Abusers

The most important values of such abusers, who prefer to get along well with those who hold power in the work environment, are office,

position, status and success. Their priorities are to be in a good position, to be promoted, and to obtain new and more effective positions. Therefore, their colleagues with equal status are their primary targets. Success, competition and preference are their red zones, and they panic even when they think that someone else will be more successful than them and will rise more quickly. They have delusions of losing their place, of losing the field to a rival, of the rival assuming a more active role. They fear that the competitor will take away their duties or position. They choose to psychologically harass others to protect themselves.

3.13. Jealous Abusers;

Jealousy, which is the negative equivalent of questioning why someone else does not have the material or immaterial values and what this questioning makes the person feel, is a morbid emotional approach. Jealousy is an emotion that individuals feel intensely with the fear of being abandoned and disliked. Jealousy is a way of nourishment and an outlet for them. Such abusers never accept that another person is better than them. They start using psychological harassment as a weapon to destroy the successful person in the workplace.

3.14. Ambitious Abusers;

They act in an approach based on the logic that every means is permissible in order to achieve their goals. Even if their education, opportunities and abilities, individual capacities and performances are far below the targeted position, these individuals take every opportunity and risk everything in order to achieve their targeted position and rise. For them, every path to the goal is permissible. They will not refrain from resorting even to illegitimate means. There is nothing they cannot do for the sake of their interests. They will crush everything for the sake of their own interests. They are very ruthless.

4. Results For Victims Of Psychological Harassment

It is useful to consider the consequences of psychological harassment in the workplace within the scope of victims, businesses and society: It is obvious that mobbing has economic, social and physical consequences, primarily psychological (mental) consequences for the employees who have been subjected to mobbing and victimized.

4.1. When the mental and physical health consequences of psychological harassment on the individual are analyzed, it is generally

- ✓ Lack of enjoyment of life and boredom,
- ✓ Loss of self-confidence,
- ✓ Lack of self-esteem, social withdrawal,
- ✓ Do not blame oneself unnecessarily,
- ✓ Problems with focus, inability to concentrate, impaired concentration,
- ✓ Tension and anger, outbursts of anger,
- ✓ Panic attacks,
- ✓ Anxiety and depression,
- ✓ Irregular sleep, sleep problems,
- ✓ Pointless fears and unnecessary excitement,
- ✓ Blood pressure problems, high blood pressure, heart palpitations,
- ✓ Hand tremors and excessive sweating,
- ✓ Low back, head and back pain,
- ✓ Increase in harmful habits, smoking and alcohol use,
- ✓ Gastrointestinal disorders,
- ✓ Loneliness and a sense of abandonment,
- ✓ Loss of appetite, weight loss or overeating,
- ✓ Rashes and itching on the skin, etc.
- ✓ In more severe cases, there are adverse effects such as injuries and post-traumatic stress disorder.
- ✓ Within the scope of Economic Results:
 - ✓ Hospital expenses
 - ✓ Expenditures on medicines and treatment
 - ✓ Negative consequences such as job loss and loss of continuous and regular income as a result of not working.
- ✓ Within the scope of Social Results:
 - ✓ Loss of reputation and prestige, damage to social image
 - ✓ Serious problems in making friends and establishing a social circle
 - ✓ Instability in friendships
 - ✓ Abandonment of the people near and dear to him/her as a result of nervousness, irritability and depressive behaviors,
 - ✓ Loss of professional identity,
 - ✓ Being perceived as a failure and inadequate individual within the family and being questioned in terms of life.

4.2. Regarding the workplace consequences of psychological harassment;

- ✓ Discord, conflicts and disagreements among employees,
- ✓ Negative safety culture and negative organizational climate,
- ✓ Destructive approaches in the value system and the collapse of organizational culture values,
- ✓ Damage to the environment of trust, deterioration of the principle of reliability,
- ✓ Negative situations caused by a loveless environment and atrophy in employees' general feelings of respect and love,
- ✓ Restriction of creativity due to deterioration of the psychology of appropriate value creation and employee reluctance,
- ✓ Loss of excitement to create, produce and reveal and decrease in work efficiency of employees,
- ✓ Atrophy of the sense of togetherness, failure to establish team spirit and disruption of harmony within the team,
- ✓ Job disengagement and turnover as a result of the weakening of effectiveness, efficiency and creativity functionality,
- ✓ Increased absenteeism and sick leaves as a result of the thought of escaping from undesirable environments,
- ✓ Resignation of competent and qualified personnel who have reached the level of expertise gained through various trainings,
- ✓ Financial and moral expenses caused by separations and the additional costs of recruiting new employees due to increased turnover,
- ✓ Cost of training activities for departing and replacement personnel,
- ✓ Generalized underperformance of all employees, Reduced work productivity as well as work and product quality,
- ✓ Compensation to be paid to the separated personnel in accordance with the legislation,
- ✓ Unemployment compensation for those who lose their jobs and become unemployed and the additional burdens they create,
- ✓ Legal proceedings and/or court costs,
- ✓ Early retirement payments,
- ✓ Decreased commitment and enthusiasm to the workplace as a result of atrophy of the sense of belonging,
- ✓ Consequences such as decreased trust, respect and love for the workplace.

4.3. Within the scope of the family-related consequences of psychological harassment, it is generally

- ✓ Disruption of family integrity and relationships based on respect, love and mutual solidarity,
- ✓ Negative impact on parent-child relationships,
- ✓ Increasing number of children and youth in need of psychological support,
- ✓ Increase in domestic violence and oppressive and rude behavior,
- ✓ As a result of the pressure on the family, it is observed that there are consequences such as separations and divorces.

4.4. When the consequences of psychological harassment for society and the national economy are analyzed

- ✓ Increasing health expenditures covered by the state due to health problems and becoming a serious burden,
- ✓ Increases in insurance expenditures within the scope of insurance transactions organized,
- ✓ Each person leaving the job joins the Unemployment group and the number increases,
- ✓ Production and tax losses due to improper employment of those who are not employed in accordance with their individual characteristics, qualifications and abilities,
- ✓ Increasing number of people who want to benefit from social security opportunities,
- ✓ Increased demand for government-funded aid and support programs,
- ✓ Early retirement from active working life and higher retirement rates,
- ✓ Creating a society where unhealthy individuals who are disconnected from the production power and have lost their professional competence, psychologically exhausted, and lacking social well-being are idle,
- ✓ Formation of problematic families reflecting the deep and unresolved wounds left by the negative picture of the person,
- ✓ Increasing number of divorced and broken families as a result of the victim of psychological abuse becoming a rude and violent individual,
- ✓ Considering the fact that it has serious and important consequences, such as a work life with unhappy individuals and families and a work life where there is no working peace, it should be emphasized sensitively.

Eliminating psychosocial risks at the source, preventing workplace psychological harassment, raising sensitivity and taking serious measures that cause individual errors to intensify and ultimately lead to work productivity and occupational accidents are among the indispensable facts of a safe and healthy work environment.

5. Approaches To Mobbing, Task Performance And Problems Of Employees Exposed To Psychological Harassment In The Work Environment Within The Scope Of Psychosocial Risks

It is a fact that the pandemic has a negative impact on work productivity, and a special study was conducted to question the validity and accuracy of the hypotheses put forward in this regard and to examine their results. Hypotheses in this study are;

H-1. Considering the working conditions in the working environment within the scope of psychosocial risks, it is thought that the workload of employees exposed to mobbing increases considerably and due to the increased stress in direct proportion to this increased workload, the work efficiency of employees under stress is lower than others.

H-2. It is thought that the level of risk varying according to the nature of the work and the stress experienced by the employees due to mobbing will cause an increase in harmful habits (smoking, alcohol use, etc.).

H-3. It is thought that the employees generally conceal the mobbing they are exposed to in the work environment and the reason for the concealed mobbing exposure is mostly due to economic reasons and fear of losing their jobs.

H-4. It is thought that employees exposed to mobbing in the workplace; it is thought that the most common derivatives of mobbing by employers are excessive workload and finishing the work in unreasonable time.

5.1. Purpose and Type of Research: The aim of this study is to reveal the attitudes and task performance of employees who are mobbed in various ways in the work environment and the relationship between mobbing and work productivity.

5.2. Population and Sample of the Study: The population of the research is the mass of actively working women and men considering the working potential in Turkey, and 485 people who voluntarily participated in the research

and fully responded to the questions constituted the sample to finalize and verify the above hypotheses.

5.3. Data Collection Tools and data analysis: A questionnaire system was used as a data collection tool. With the “Questionnaire Information Form”, a questionnaire consisting of 36 questions based on Likert scale was applied to 485 employees working in various enterprises in order to determine the approaches to mobbing, task performance and problems of employees exposed to mobbing in the working environment.

In the questionnaire study, the first part was composed of socio-demographic questions (6), the second part was composed of areal questions (10) to determine the psychosocial risks in the working environment, and the third part was composed of questions (20) to prove hypotheses (questions with more than one option (3).

During the data collection process, the form created through Google Forms was sent electronically to the participants in order to be filled out by various professional groups working in various enterprises in February-March 2021. Within the data set obtained, 485 findings suitable for statistical analysis were considered. The data were analyzed with the Jamovi package program. Percentage, descriptive statistics, histogram, pairwise and multiple comparisons were used in the analysis..

5.4. Findings obtained from the study

50.7% of the employees are female (246), 49.3% are male (239), the average age of male employees is 38 and the average age of female employees is 37. Marital status of the employees; 60.7% are married, 26.7% are single and 12.6% are divorced. Educational status of the employees; 43.5% have bachelor’s degree, 21.7% associate’s degree, 1.7% doctorate, 2.5% master’s degree and 30.6% other. Of the employees; 67.4% are in the private sector, 28.5% in the public sector and 4.1% in other sectors.

78.6% of the employees stated that there are psychosocial risks in their work environment and 86.5% stated that mobbing is practiced in their work environment. In addition, 62.1% (297) of the employees stated that they were aware of psychosocial risks and mobbing.

As a result of mobbing, 88.1% of the employees stated that their work efficiency was lower than other employees within the working period with long working hours as a result of exposure to mobbing and that this low efficiency was higher in the private sector.

Table-1. Job efficiency and mobbing exposure approach status chart

Sector	Decreased work efficiency			Exposure to mobbing			Total
	Yes	No	No Idea	Yes	No	No Idea	
Private sector	321	33	24	233	21	124	378
Public sector	81	9	2	72	9	11	92
Other sector	12	1	2	9	2	4	15
Total	414	43	28	314	32	139	485

Within the scope of psychosocial risks, 85.3% (412) of the employees stated that they observed an increase in their harmful habits (smoking, alcohol, etc.) due to the stress experienced due to mobbing.

Table-2. Status chart of the relationship between harmful habits of those exposed to mobbing

EXPOSURE TO MOBBING		
HARMFUL HABITS	YES	NO
YES	371	39
NO	45	24

85.5% (414) of the employees stated that they or their close colleagues were subjected to mobbing in the workplace, 56.2% (266) of these employees preferred to conceal the mobbing, 79% of those who concealed the mobbing were afraid of being fired and not being able to find a job, and 23.4% stated that there were economic reasons.

Table-3. Table of the reasons for concealment of those subjected to mobbing

FEAR OF LOSING THE JOB			
EXPOSURE TO MOBBING	HIDING MOBBING	YES	NO
YES	NO	24	38
	YES	14	242
NO	NO	30	4
		1	4

56.2% of the employees stated that they were exposed to mobbing in the work environment and preferred to conceal it. The reasons for preferring to conceal are given in the table below.

Table-4. Schedule of reasons for concealing mobbing

REASONS FOR HIDING MOBING		
	AMOUNT	RATE
DISMISSAL AND UNEMPLOYMENT	229	%65,2
ECONOMIC REASONS	68	%19,3
SOCIAL REASONS AND ENVIRONMENTAL PRESSURE	17	%4.8
FEAR OF BEING PUSHED INTO LONELINESS	17	%4.8
INAPPROPRIATE EPITHETS AND NEIGHBORHOOD PRESSURE	14	%3.9
LACK OF ACCEPTANCE AND FAMILY PRESSURE	7	%1.9
TOTAL	351	%100

The employees who were exposed to mobbing in the work environment stated that 49.7% of them were exposed to mobbing derivatives such as overloading the work, demanding the completion of the work in unreasonable time, 34.6% were accused of not making enough effort, and 10.9% were accused of inexperience and humiliated because of their age.

Table-5. Mobbing derivatives encounter status chart

Mobbing Application Methods	Number of Employees Exposed to Mobbing	Rate
Overloading work, demanding work to be completed in unreasonable time	224	%53.2
Accusing you of not making enough effort	149	%35.3
Accusing and insulting for inexperience because of age	48	%11.5
TOTAL	421	%100

Table-6.Types of mobbing and encounter rates chart

TYPES OF MOBBING		
Making heavy accusations about performance	21	%15.3
Assigning simple or few tasks	19	%13.8
Forcing to be alone, leaving alone	19	%13.8
Threatening to dismiss	18	%13.1
Failure to notify meetings where presence is required	15	%10.9
Blocking communication, creating a physical work environment that isolates	12	%8.7
Behavior that implies a willingness to work together	11	%8.0
Not responding to phone calls or emails	9	%6.5
Using expressions that imply a mental health disorder	9	%6.5
Using or threatening to use physical violence	4	%2.9
TOTAL	137	%100

62.1% (297) of the employees stated that they were aware of psychosocial risks and mobbing.

5.5. As a Conclusion of the Study

As a result of the study; 88.1% of the employees who were subjected to mobbing within the scope of psychosocial risks; as a result of mobbing exposure, their work efficiency was lower than other employees within the working period with long working hours and this low efficiency was higher in the private sector,

With the stress experienced due to mobbing, 85.3% of the employees have an increase in harmful habits (smoking, alcohol, etc.), and the harmful habits they try to hold on to in order to relax or calm down seriously affect their lives,

85.5% of the employees reported that they or their close coworkers were subjected to mobbing in the workplace,

The majority of employees prefer to conceal mobbing and the primary reasons for concealing mobbing are fear of being fired, fear of not finding a job and economic reasons,

The most common mobbing derivatives of mobbing are overloading employees with excessive work, demanding work to be completed in unreasonable time, accusing them of not making enough effort, accusing them of inexperience due to their age and humiliating them.

It was also observed and determined that 62.1% of the employees were aware of psychosocial risks and mobbing.

6. Measures to be taken against psychological harassment

Measures to be taken against psychological harassment should be planned and implemented on an individual and institutional basis.

6.1. Individual Ways of Coping

The likelihood of encountering various hazards and risks in work environments is high. Qualities such as risk perception, personality traits, level of awareness, educational status, ability to struggle and intervene, resistance, protection and defense ability vary from person to person. When an individual encounters an unwanted situation (danger or risk), he/she makes an effort to get out of the situation harmlessly. The way each individual perceives and comprehends events, reacts and struggles is different from each other. The person who is subjected to psychological harassment and is severely abused uses his/her personal characteristics to get out of this situation, which he/she does not want to be in. Individuals who are subjected to psychological harassment should think about what they need to do to get out of this situation and take action without waiting, instead of shutting down and accepting the situation they are in. Instead of seeing themselves as weak, helpless and small, they should strengthen their fighting spirit. In the face of psychological harassment, the individual should reveal his/her strengths and determination to fight and strengthen his/her belief that he/she will succeed. They should take their behavior under control and do what they do with confidence and belief in themselves. They should take measures to strengthen their weaknesses and develop mechanisms based on proving their existence without giving up. In particular, they should not play into the hands of the person who attempts psychological harassment, should do their job diligently and carefully without criticism, and should increase their work efficiency. They should closely follow the duties, authorities and responsibilities and fulfill their job responsibilities while working. Success at work will increase the sense of being accepted and valued, restore self-esteem and increase the sense of struggle. In addition, the person should protect and continuously improve his/her mental health in this process and increase his/her resistance against all kinds of negative approaches and behaviors aimed at intimidation by reminding himself/herself of his/her values. Victims who are in the grip and target of psychological harassment and who are exposed to these behaviors should not be deprived of social support. In particular, they should receive constant support from their close environment, friends and family,

whom they consider important in terms of morale and motivation. They should prepare a reasonable and logical struggle plan and be consistent in following this plan. Instead of isolating and isolating themselves from other people, they should spend more time with the people around them who are good for them.

Ways to cope with psychological harassment from an individual perspective;

- ✓ First of all, to warn the person who attempts and practices psychological harassment appropriately and to prevent these behaviors from continuing.

- ✓ Reporting the harasser to higher units with written documents in a proper manner.

- ✓ Getting help according to the severity of the behavior.

- ✓ Research on how to take legal measures against psychological harassment.

- ✓ Seeking help from trusted colleagues who can be sincere in their help and support and who will not leave you alone.

- ✓ If the degree of mobbing is constantly increasing and the person is unable to cope with it, they should leave their job.

Corporate Ways of Coping

Psychological harassment in the workplace seriously affects the employer and other employees as well as the victim. The work motivation and productivity of people who are subjected to psychological harassment decreases significantly. The decrease in productivity negatively affects the employer. In addition, other employees also feel under psychological pressure and worry that such behaviors may happen to them one day.

Organizational management can take the following measures against psychological harassment.

A directive should be prepared that includes the procedures and rules to be followed, including the measures to be taken against psychological harassment and intimidation within the organization. In this directive, it should be clearly stated how employees should behave.

Everyone in the work environment should be treated equally.

Everything about the business must be systematized and documented.

The organization's employee policies and the rules expected and not expected from employees should be documented in a clear and valid way for all employees.

The rules set by the organization must have a legal basis.

Training should be provided for employees to strengthen their bond with the organization and to serve the organization's goals.

Training should be provided so that employees are compatible with each other and sensitive to psychological harassment.

When forming work teams, teams that are compatible and will fight against psychological harassment should be formed.

Tasks to be assigned to employees should be given in accordance with their professional competencies and areas of expertise.

Communication factor should be improved within the organization.

The right to democratic participation should be respected and employees should have a say in decisions taken about the organization.

It is important to establish problem screening and problem solving centers within the organization. These centers, which will contribute to solving problems before they become gangrenous, can make a significant contribution to the development of a sense of belonging and the formation of team spirit.

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CHAPTER VII

THE EFFECTS OF PSYCHOSOCIAL RISKS ON WORK EFFICIENCY AND OCCUPATIONAL ACCIDENTS

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1. Introduction

Facing various risk factors in workplaces and eliminating the negative consequences of workplace risk factors is a management responsibility and a reflection of the employer's understanding of duty. Employers try to fulfill risk management in line with the principle of commonality and common sense; within the scope of the principle of duty, authority and responsibility, the approach of task identity, understanding of expertise and competence, legal obligation, administrative and voluntary regulations and workplace occupational health and safety policies and policies. Psychosocial risks have different characteristics from other risk groups in terms of criteria such as concreteness, measurability, traceability, control, audit and rating. Global approaches, economic and social facts, expectations, difficulties in working life and other current dynamics of our age have intensified the work environment. With this intensification, the psychosocial risks in the working environment confront employees with serious negativities. In addition to all these negativities, the pandemic process has caused significant pressure and anxiety on employees. Mobbing (*psychological harassment in the workplace*), which negatively affects work efficiency and gnaws success, has started to turn into the plague of the working environment today (34-36).

In general terms, health is a state in which an individual feels well physically, mentally and socially, and it is a state in which these dimensions, which interact with each other, are not individually but collectively in a state of

well-being. The World Health Organization (WHO) defines health as follows: “Health is a state of complete physical, mental and social well-being, not merely the absence of disease or disability.” This definition, which was made in a way to prevent different views and approaches between societies, has gained clarity by entering the basic laws of the World Health Organization within the scope of legal processes and practices. Thus, with the definition of health, which has been agreed upon, different approaches and definitions have been prevented, and it has ensured a view in the same direction.

Illness, which differs from individual to individual, is a multidimensional, changing and multifaceted (*physical, physiological, psychological, psychosocial, psychosexual, biological, social, environmental, familial*) phenomenon. While any negativity arising from a person’s physical structure can lead to the deterioration of physical functions, it also negatively affects the mental state of that person, while various problems of psychological origin and mental conflicts and tensions can lead to serious problems in physical structure and functions over time. In short, these are factors that trigger and affect each other in terms of life. In particular, the mental and social aspects included in the definition of health are very comprehensive and have deep content. The multidimensionality and multi-causality of these phenomena are serious triggers and regulators of personal life. Physical, physiological, bodily, mental and social phenomena are dynamics that encompass, envelop, guide and direct human beings as a social being.

Stressful life is defined as the incompatibility between the personal, social and environmental needs that the individual will need more than the usual conditions of daily life in adverse and difficult conditions that are likely to arise and the ability to react and resist a negative situation. The process of incompatibility negatively affects the health of the person by preparing the ground for physical dysfunction over time and almost triggering it. The stress factor, which includes psychological factors as well as personal, social and environmental factors, creates psychosocial risks as a result of prolonged duration, struggle and resistance weakness.

At every stage of our lives, we are faced with many psychosocial risk factors due to the conditions we are in or the processes we go through. If we do not know the psychosocial risk factors that negatively affect our quality of life and individual performance and do not take the necessary precautions, our health may be negatively affected and follow a very bad course.

Occupational health and safety, which is accepted as one of the multiple disciplines and aims to create a healthy and safe working environment, enables

the conduct of multifaceted and comprehensive systematic studies to protect employees from the hazards and risks that exist in the workplace. In addition to various risks such as physical, chemical, biological, ergonomic, chemical, biological and ergonomic risks, which have a relatively high level of awareness and ability to detect and take precautions in the working environment, it has been revealed in various studies that the recognition and awareness of psychosocial risks, which should have a higher priority to take precautions in terms of the negative effects and consequences they leave on people, are at a lower level.

All scientific studies on the causes and consequences of occupational accidents clearly show that human beings are the risk factor with the highest potential for accidents. Scientific studies on all accident formation models and accident causation approaches show that the majority of accidents are caused by dangerous movements and unsafe behaviors. Psychosocial risk factors, which leave serious effects on the mental structure and social well-being of employees, should be effectively combated with this disease, which disrupts working life, destroys inner peace, is the enemy of success and productivity, and is seen as the plague of our age. All institutions and organizations should take the necessary measures against this problem, which must be dealt with seriously and sensitively (27).

Psychosocial risk factors are a set of phenomena that shake and damage the person psychologically. Psychosocial risks, which cause problems such as deterioration in lifestyle, anger and anger control problems, social inadequacy and isolation, also cause various psychosocial problems such as loss of self-confidence, anxiety and worry, nervousness, sadness, tension, feeling helpless, constant crying crises, hopelessness, introversion, depressive appearance, fear of being alone and anxiety about turning to drug use. For this reason, the identification and process management of psychological and social problems in businesses is very important.

2. Psychosocial Risks Arising from Work Environment and Work

Psychosocial risks constitute the risk group that the field of occupational health and safety has frequently emphasized in recent years. The detection of physical, chemical, biological, ergonomic and biological risks known to exist in enterprises and the ability to take precautions are based on relatively more concrete data. Psychosocial risks, on the other hand, are partially known and less emphasized by the society and business circles compared to other risk groups due to their more abstract and relative content outside the concrete, measurable and easy-to-detect risk group.

Especially when the current conditions and processes are analyzed, serious work problems are experienced in working life. Negative factors such as increasing workload, supervisory and time-continuous pressures, long and tiring working hours, intense work tempo, aimless work with unclear reasons, incomplete work, shift work, psychological harassment in the workplace (mobbing), arbitrary approaches, personal special practices and double standards and inconsistency of direction cause many negative effects on their interlocutors, especially stress. These negative effects arising from the work environment, which cause the feelings of integration, ownership and protection to be eroded, also lead to undesirable consequences such as weakening of commitment to the organization, loss of sense of belonging, increased absenteeism, demoralization, loss of enthusiasm and reluctance, which reduce work efficiency.

The Occupational Health and Safety Law No. 6631, which has led to a radical change in the reality of the approach, has adopted proactive approaches instead of reactive approaches and has made it obligatory to carry out risk assessments in enterprises in order to take the necessary measures in place and in a timely manner for possible negativities. In the existing legislation, written documents and various guides on risk assessment, the explanations on the identification, grading and scoring of psychosocial risks are not satisfactory, limited and quite insufficient.

Today, although issues related to physical, chemical, biological and ergonomic risk factors arising from the working environment in enterprises are generally defined, awareness of psychosocial risks is not sufficient and satisfactory at both management and employee levels. Since it is not known exactly how and according to which criteria psychosocial risks should be assessed, adequate solutions cannot be developed to protect psychosocial health in workplaces. As a result of this, psychological disorders were added to the “International Labor Organization List of Occupational Diseases” in the latest renewal and regulation studies. However, considering the difficulty in diagnosing occupational diseases, it is obvious that it may be very difficult to consider and conclude a psychological disorder caused by various problems and conflicts arising from the working environment as an occupational disease (34).

A number of studies have been conducted to demonstrate the link between chronic diseases and psychosocial factors and various scientific studies are still being conducted in this context. In particular, many serious and important scientific studies have been carried out on the effect on coronary heart disease (CHD), taking into account its oppressive and triggering feature. In scientific

studies, it has been found that psychosocial factors in the work environment are associated with different diseases, especially coronary heart diseases, musculoskeletal diseases and mental health. There are determinations that there is a causal link between the processes experienced due to social and psychosocial factors and the findings and results of these processes and the disease. There are also views that the causality parameter that causes the formation of this link may be on the intermediate pathways and pathways of the mechanisms formed by various biological and behavioral factors.

According to the first view, which is based on weak and inadequate personalities who have not developed the ability to resist, struggle and show resistance, who are quickly demoralized and prone to giving up, who are prone to slipping and quitting; psychosocial factors emerge with helplessness syndrome in such personalities. The disease picture, which starts with helplessness, progresses towards introversion over time and can turn into all kinds of harmful habits, especially alcohol and tobacco use. It is observed that non-smokers start smoking, smokers increase their cigarette use, try to remedy deprivation and unhappiness with nutrition, and try to change their eating habits in this context. It is observed that they especially turn to sleep-inducing substances and seek refuge in alcohol. It is observed that the desire and craving for alcohol and its derivatives intensified, increasing their use and taking refuge in elements that threaten their health. This situation can seriously damage and affect the health of the person, creating a serious ground for and causing Coronary Heart Diseases (24-34).

According to a different view, psychosocial factors create a triggering and influential situation targeting physiological factors. It is known that psychosocial factors, which have a direct effect on the neuroendocrine and immune systems, also have a direct effect on physiological mechanisms. Increasing workload and tempo in today's working life, irregular and variable working hours, shift work, untargeted work, arbitrary practices and excessive working hours, time pressure, supervisor pressure, uninitiated work, monotony, waste of effort and labor, vicious conflicts, poor communication, inadequate coordination and tensions arising from relationships, unsupportive approaches of managers and decreased job security have negative effects on the health of employees and reduce work efficiency.

In addition, according to various statistics on occupational accidents, Turkey unfortunately ranks first in the European and world rankings. Our country, which does not have a good record especially in terms of fatal occupational accidents and accident frequency rate, ranks first in the European classification

and third from last in the world ranking. Especially in the cause-and-effect analysis of occupational accidents, we can state that there are important factors that we consider to be within the scope of psychosocial risks. If we list some of these factors;

- ✓ The effects of globalization and the implementation of neoliberal approaches and policies to reduce job security,
- ✓ Flexibility and inconsistency in working patterns,
- ✓ Unplanned, irregular and uncontrolled working conditions and the hardening and aggravation of working conditions,
- ✓ Privatizations without seeking qualified benefit and appropriate value,
- ✓ Lack of integrated and participatory approach, lack of organization and unionization,
- ✓ Increased and widespread subcontracting,
- ✓ Inadequate and ineffective social security systems,
- ✓ Unregistered illegal labor without social security,
- ✓ Exploitation of children and child labor,
- ✓ Lack of will and commitment of employers and managers to protection policies and lack of implementation,
- ✓ Lack of infrastructure of enterprises in taking technical and technological measures,
- ✓ Negative functioning of cost-effectiveness approach,
- ✓ Inadequate training and information,
- ✓ Weakness in workplace inspection and control systems, failure to establish effective inspection models,
- ✓ We can state that factors such as inadequacy of administrative-criminal sanctions are prioritized and important.

The issue of psychosocial risks has been brought to the agenda more frequently in recent years by researchers, primarily by relevant institutions and organizations in Turkey, as in the whole world. Psychosocial risks, which are considered in a newer and riskier category compared to other risks in terms of their effects, consequences and characteristics, are defined as risks that are not yet well known in the field of occupational health and safety. The newness of these risks leads to the fact that the process of identifying, defining, categorizing, evaluating and rating these risks, as well as the process of improvement and taking measures is not fully known. This situation, which has not yet been fully

clarified, is not unique to Turkey, and awareness has not yet reached a sufficient level in countries that have already started to work on this issue. Although various academic studies have been carried out on this subject, these studies have not yet reached a satisfactory level in scientific circles (12-18).

Within the scope of the determinants of mental health and social well-being, having a high level of economic power and being self-sufficient is seen as an important result to be evaluated. Values that nourish a person such as perseverance, determination, resilience, knowledge, controlled courage, confidence, strength and the spirit of competence are directly related to work as important factors in terms of revealing the strengths of the person. Various studies on the connection and relationship between work and unemployment and social well-being and mental health indicate that it is an important factor in the formation and understanding of the social parameters of health, especially in the adult period. In this period, in terms of employee health, finding a job, job placement, job continuity, the qualities and characteristics of the job and the harmony between the job and the person have direct and strong effects on health. The effects are not only limited to the tools necessary to maintain daily life, but also include the psychosocial aspect of unfavorable situations and conditions. Because being pushed out of the active working environment, being deprived of working, not being able to work when the conditions are suitable for working, losing one's job or being exposed to negative attitudes and behaviors during work, not being compatible with the work done, role ambiguity, role conflict, role inadequacy, and long-term association with direct and easy / complex mechanisms such as role ambiguity, role conflict, role inadequacy can lead to the formation of a stress factor over time and can be a deteriorating factor for mental health by influencing the person.

It is accepted as a fact that psychological factors, which have triggering properties, can eventually lead to some bodily/physical negativities and disorders, as well as various physical disorders that occur, negatively affect the psychology of patients. Physical and psychosocial factors in the work environment have been shown to play an important role in the development of musculoskeletal disorders in the neck, back, waist and shoulders. Various recent scientific studies confirm this. In industrially developed and industrialized countries, various back and lumbar disorders that develop due to negative factors arising from the working environment are among the serious, important and expensive health problems of employees (women, men and all age groups). Low back disorders, which are the most common work-related musculoskeletal disorders, persist for

a long time and cause various negative effects on the quality of life of patients. In most enterprises, it is seen that low back trauma is the second reason for not going to work or leaving work after infectious upper respiratory tract diseases. It is known that approximately 200 out of 1000 employees in enterprises where transportation and lifting work is intensive and in sectors where heavy work is performed have low back and back disorders. Back problems, which have a negative impact on work discipline and work efficiency, cause the biggest loss of labor force after upper respiratory tract inflammation.

Factors that cause low back discomfort are generally; not knowing the risk factors related to the load to be lifted or carried, being untrained in handling and lifting, inappropriate heavy lifting without knowing lifting techniques, standing for a long time, job dissatisfaction, repetitive and sudden movements, monotonous work, routine work, psychosocial factors such as exposure to full body vibration (vibration - long-distance driving), smoking, weakness in supervision and control, lack of supervisor and social support and inadequate colleague support, heavy workload responsibility, working under pressure, working without rest breaks and inadequate work organization, which cause serious stress to the person.

Studies have found that the effect of psychosocial risk factors in the workplace on the occurrence and development of work-related musculoskeletal diseases is higher than physical risk factors. A study that concluded that physical working conditions and psychosocial risk factors are effective in the emergence of musculoskeletal diseases was conducted in New Zealand and findings supporting this thesis were found in the study. In addition to physical and personal risk factors, psychosocial risk factors have a significant effect on the occurrence of low back pain and low back trauma, and there are studies showing that this effect differs according to gender. It has been emphasized that, with the exception of chemical and biological risk factors, especially ergonomic, physical and psychosocial risk factors often interact and are related to other factors in the workplace.

When we look at the psychosocial risks for healthcare workers, we can list factors such as long-term isolated work, sleepless working hours, round-the-clock shifts, shifts, inadequate and fast nutrition, lack of rest, being constantly in the same environment, working with time pressure and expectation percentage due to the nature of professional conditions. In addition, the sensitivity and intensity of the working conditions of operating rooms, which require serious, careful, disciplined, clean and organized work directly related to human life,

and the fact that it is a high-stress and isolated environment increase the risk of exposure to stressors for employees working in this unit. This exposure ultimately negatively affects the mental health of employees. The stress experienced can cause hypertension, migraine, coronary artery diseases, as well as behavioral and psychological problems. These problems reduce productivity in the workplace and cause psychosocial problems such as substance abuse (smoking, alcohol, drugs), obsessive behavior, anxiety and depression.

3. Psychosocial Risks

The International Labour Organization (ILO) has evaluated and defined psychosocial hazards on the basis of the interaction between work organization, working environment, administrative and managerial structure, environmental conditions in terms of interest and sphere of influence, job satisfaction, professional competence and expertise of employees and their needs.

3.1. Psychosocial Risks and Hazards

Under the support and auspices of the World Health Organization (WHO), a program to prevent psychosocial risks was initiated under the coordination of the University of Nottingham in the UK, together with occupational health and safety institutions in major European countries in order to identify and define what work-related psychosocial hazards and risks are (Leka and Cox, 2008, Prima-EFWork-RelatedPsychosocial Hazards, P:2) The scope of psychosocial hazards, which were divided into ten categories and content arrangements were made, was revisited and improved.

3.1.1. Within the scope of the work content

- ✓ Diversity (not much diversity at work)
- ✓ Fragmentation (doing a small piece of work that is very fragmented)
- ✓ Incompatibility (Not assigning the job according to the employee's ability)
- ✓ Uncertainty (high levels of uncertainty)

3.1.2. Within the scope of workload and work tempo

- ✓ Necessary/unnecessary work (overwork or idleness)
- ✓ Compliance/non-compliance (Compliance with machine cycle speeds)
- ✓ Oppressive approach (time pressure, pressure of deadlines)

3.1.3. *Within the scope of work programs*

- ✓ Shift work
- ✓ Night work
- ✓ Rigid work (inflexible work schedule)
- ✓ Unplanned work (overtime program that becomes clear at the last minute)
- ✓ Feeling of solitude and absence (working alone for long hours)

3.1.4. *Within the scope of control*

- ✓ Lack of democratic participation rights (low employee participation in decisions)
- ✓ Lack of control (employees have little control over occupational health programs)

3.1.5. *Within the scope of environment and equipment*

- ✓ Inadequate and outdated equipment (lack of adequate equipment)
- ✓ Negative and unsafe environment (negative physical environment such as inadequate space, lighting and noise)

3.1.6. *Within the scope of corporate culture*

- ✓ Communication weakness (inadequate communication)
- ✓ Problem of perception of support (lack of support in solving problems)
- ✓ Infertility of individual fulfillment and development (lack of support for personal development)
- ✓ Strategy and goal ambiguity/complexity (company goals are not known or shared by employees)

3.1.7. *Within the scope of interpersonal relations*

- ✓ Social isolation (social or physical isolation)
- ✓ Status approaches and relationship ambiguity (relationships with employees or managers)
- ✓ Individual or group conflicts (interpersonal conflicts)
- ✓ Social support approach
- ✓ Lack of social support

3.1.8. Within the scope of duties in enterprises

- ✓ Role ambiguity
- ✓ Role conflicts
- ✓ Responsibilities regarding people

3.1.9. Within the scope of career development

- ✓ Lack of promotion opportunities (no or uncertain promotions)
- ✓ Status and title confusion
- ✓ Economic inefficiency (low wages)
- ✓ Imbalance in wage policy
- ✓ Trust problem (job insecurity)
- ✓ Problem of prestige and value (low social value of work)

3.1.10. Within the scope of work and non-work life interaction

- ✓ Conflicting environment (contradictory demands of work and home life)
- ✓ Lack of family support (reduced support at home)
- ✓ Couple career issues

In a joint analysis by the European Agency for Occupational Safety and Health at Work (EU-OSHA), 13 EU member states, and experts from the United States and ILO, ten major new hazards were identified in five main groups (41). The hazard areas and the most important hazards identified within the scope of emerging and increasing psychosocial hazards have been revisited and improved.

Hazard Areas	The most significant hazards
1. Employment volatility (new generation employment contracts and lack of job security)	<ul style="list-style-type: none"> ✓ Precarious employment contracts in the context of a changing labor market ✓ Vulnerability of workers in the context of globalization ✓ Next generation labor contracts ✓ A sense of lack of job security ✓ Lean production and outsourcing
2. Lack of active and effective labor force (aging labor force)	<ul style="list-style-type: none"> ✓ Decreased ability to work actively and effectively ✓ Diversity and diversity in working methods ✓ Aging workforce
3. Work intensity and diversity (work intensification)	<ul style="list-style-type: none"> ✓ Increased workload and pace, ✓ Irregular and variable working hours, ✓ Shift work, ✓ Working without goals, ✓ Arbitrary practices and excessive working hours, ✓ Time-oriented oppressive approaches, ✓ Length of working hours, ✓ Intensive and high-paced work
4. Emotionality and psychological dimension (heavy emotional burden of work)	<ul style="list-style-type: none"> ✓ Psychological approaches ✓ Emotional approaches
5. Life complexity and disorganization (work and non-work life imbalance)	<ul style="list-style-type: none"> ✓ Life imbalance ✓ Lack of support

Experts consider the volatility of the labor market and the unreliable employment contracts that arise as a natural consequence of this volatility to be the most important danger of the current period. In fact, all of these factors are very important dangers, but the difference between them may differ due to the sociological and psychological situation and individual expectations.

Psychosocial hazards negatively affect employees' physical health and social well-being directly or indirectly. Depending on the power of influence, one or more different psychosocial hazards may come together and cause job stress. Psychosocial hazards can lead to job stress and job stress can lead to physical, physiological and psychological diseases. Physiologically, work

stress can lead to coronary heart disease, as well as physical illnesses such as musculoskeletal problems. Work stress can be caused by physical hazards (e.g. inadequate ventilation, noise, vibration, thermal comfort, etc.) as well as psychosocial hazards.

To summarize the interaction of psychosocial hazards and risks for a clearer understanding of the subject;

✓ Lack of job security, which is extremely important in terms of life, creates anxiety, insecurity, nervousness and tension. This leads to stress and intimidation (mobbing). Lack of job security (danger) can lead to stress (risk) on employees, and the existence of (risk) phenomenon can have negative consequences that can cause the life of the employee.

✓ Long working hours (hazard), leading to an imbalance between work and non-work life (risk), which can lead to stress, depression and musculoskeletal disorders (consequence).

✓ Long working hours (hazard) can lead to life imbalance (risk), as the employee cannot spare time for his/her private life and loved ones. For individuals with a heightened sense of duty and responsibility, irregular, unbalanced and unplanned work and life outside work can create stress (second risk). For some individuals who are highly sensitive in terms of assigned roles and expectations, failure to fulfill their duties in a complete and timely manner may lead to depression over time (psychological distress). Another individual, if he/she does not know how to cope with and protect himself/herself against increased stress, may experience musculoskeletal problems in addition to psychological disorders (physical disorders).

4. Psychosocial Risks in the Workplace

4.1. Violence and intimidation

Some of the problems experienced in businesses, increasing work obligations, life difficulties, dangers and risks arising from the working environment cause us to be burdened with stress. In addition to stress, the increasing incidents of violence, various types of harassment and bullying attitudes and behaviors due to the aggravation of living conditions have become very disturbing and remarkable and have entered the agenda of many businesses. Psychosocial risks include all forms of violence, especially intimidating psychological harassment (mobbing).

Violence in the workplace is defined as **“the behavior of one or more employees or customers against another employee or employees, which has negative physical or psychological consequences for those who are exposed to it”**. Violence can be physical or psychological in terms of its application and reflection approach. While physical violence in workplaces is generally seen as assault, psychological violence is seen as threats, blackmail, sexual, racial or verbal harassment, abuse, exploitation and intimidation. Even if it is classified as physical or psychological in terms of classification, it can also be stated that one includes the other and sometimes they are seen together without making a clear distinction.

It is not possible to find and collect very reliable data on workplace violence. Realistic results cannot be obtained in data collection due to reasons such as the management policies and policies of enterprises, concerns about prestige and reputation, negative approaches to morale and motivation, the principle of closedness and closure, economic concerns of employees, and fears of dismissal. The limited data that can be obtained from institutionally based occupational accident statistics have to be limited. Occupational accidents resulting in death or injury at work correspond to approximately 1% of all occupational accidents in the last ten years (SSI, 2012). Data on types of violence such as intimidation, psychological harassment, physical harassment, verbal and racial harassment are very limited, except for violent incidents such as killing and serious injury, which are seized by Public Prosecutor’s Offices and whose reporting is too important to be neglected and legally obligatory.

Violence is one of the factors that negatively affect health and safety approaches in the work environment. The violence potential of occupational groups arising from work and work environment is variable. In particular, health workers encounter violence in their work environment more frequently than those working in other fields. Patients or their relatives, whose sensitivity increases due to psychological factors such as fear of losing a relative, pain, suffering or anxiety, may be nervous, irritable and have high irritability coefficients. The situation they are in increases the tendency and orientation towards violence. Contrary to what is accepted, violence in health is not only a problem in developing and transitional countries, but also a common problem in developed countries(17).

Few times have humanity felt as helpless and in need of the support and compassion of healthcare professionals as during the pandemic. In this process, mankind has witnessed many historical moments that health care providers are working hard. Health workers working under inadequate conditions faced burnout syndrome. Despite this, in addition to the appreciation they received

from the great majority, they were also exposed to a substantial number of violence (17).

Exposure to violence in healthcare delivery is an important safety and public health problem that can have serious consequences for all healthcare professionals(16)

A study was conducted in the USA and the results were shared with the public, indicating that the risk of violence against healthcare personnel is 16 times higher than those working in other service sectors. It is stated that nurses, who have more contact with patients in terms of occupational proximity and intensity, are three times more likely to be exposed to violence than other healthcare workers. In a study conducted in our country on violence against health workers, it is seen that health workers who are in more contact with patients and their relatives due to their duty status, frequency of shifts, night work, overtime work, etc. have a higher rate of being subjected to violence. Especially in this context, it was found that 67.6% of general practitioners, 58.4% of nurses, 36.7% of faculty members and 32.7% of other health personnel were subjected to violence.

Again, when we look at the effects of violence in the workplace, we see that it leads to loss of confidence, reluctance, anxiety, fear, outbursts of anger, feelings of inadequacy, powerlessness, guilt, sleep deprivation and sleep disorders. In addition, physical injury, decreased quality of care and maintenance, demoralization, decreased enthusiasm and satisfaction at work, intensified desire to quit or intention to quit, quitting, increased stress levels, increased absenteeism, increased errors at work. Prevention of violence is an employer/manager responsibility and it is important to raise awareness at all levels to prevent violence in the workplace. At the same time, it requires a serious cooperation between employees, managers and leaders, as well as the management's persistence and determination on this issue.

Psychological harassment and intimidation methods may vary according to the choice of the practitioner (harasser) and the targeted person. Determinations can be made by measuring the reaction of the victim with different methods and methods can be changed according to the situation with the effect-response processes.

4.1.1. Refusing direct communication

With the desire to create the syndrome of absence and nothingness, the aim of the aggressor, who exhibits exclusionary attitudes without communicating in

any way, is to ensure that the targeted person turns towards him/herself and that the target blames himself/herself after a while. The purpose behind this attitude is to spread the notion that the person's character and human characteristics are aggressive and accusatory and to ensure general acceptance

4.1.2. Exclusion

As a type of passive and negative approach, is usually reflected in the body language of the attacker or in non-verbal communication. Aggressive approaches are made in the form of unnecessary aggressive attitudes, unnecessary or meaningless sighs, head turns, shrugs, finger wagging, unwarranted laughter, contemptuous glances or words that are not expressed explicitly, but are tried to be expressed indirectly, shocking, destabilizing and malicious, and indirect insinuations that damage honor and reputation and humiliate honor and reputation.

4.1.3. Discrediting

Based on suspicion and ambivalence, the attacker's aim is to create insidious suspicions in the minds of other employees through a policy of distancing and isolation and to distance the targeted person from his/her colleagues. It is to be able to use misunderstandings as they wish with insinuations, discourses, lies or a false narrative.

4.1.4. Leaving alone

With the aim of isolation and distancing, the aggressor wants to put the targeted person in a state of relationship deprivation. In particular, if an aggressor wants to psychologically weaken an employee and put him/her into a mental depression, he/she prefers to isolate him/her first by removing and disconnecting him/her from his/her environment in order to prevent him/her from showing resistance, taking self-protection and creating opportunities for defense. A person who is weakened and isolated, cut off from relationships, has little or no resistance. It is much more difficult for a person who feels that everyone is against him/her to intervene, struggle and rebel, even if justified.

4.1.5. Giving unnecessary work and burdening with unnecessary work

Is one of the approaches to wear down the targeted person by assigning humiliating drudgery or unnecessary and irresponsible tasks. In particular, by

assigning work that is incompatible with one's status and qualifications, it reveals the purpose of establishing authority over or humiliating the person. Sometimes the workload is given far beyond the capacity of the person, aiming to wear him/her down. Time pressure is one of the most important psychosocial factors used here. It can be in the form of assigning a task to the target that is impossible to be accomplished and finalized in the allotted time, or by making plans that will force him/her to work continuously, including weekends, or by assigning tasks outside his/her area of expertise that are impossible to accomplish and fulfill..

4.1.6. Pushing to make mistakes

Another method that aggressors often use to ostracize is to force a person to make a mistake. Through skillful and clever planning, they may deliberately make tasks and requests that will cause the victim to make mistakes in order to criticize, embarrass or humiliate him/her.

4.2. Stress

The term 'psychosocial' is used to define the word 'stress', which is widely used in writing and publications, in a broader perspective. In contrast to stress, which is very difficult to measure in daily life, psychosocial factors are easier to measure based on institutional models. Psychosocial events such as continuous stress or burnout/depression of social and environmental origin give some physiological stimuli. In particular, they may cause a stimulatory response in the hypothalamic-pituitary-adrenal (HPA) axis and may cause changes in the levels of catecholamines.

The shocking consequences and the effects of losses that leave deep scars can last for a long time in people who experience them. Loss of an irreplaceable family member (such as mother, father, sibling), especially in childhood and adolescence, and life events such as loss of a spouse, child or divorce in adulthood are among the most important psychosocial factors that cause depression.

Work-related stress, which is recognized as one of the main health problems of the employee, is one of the priority agendas and problems of European businesses. In addition to stress, violence, bullying and harassment are seen as the main problems of a large number of businesses. With the recent development of working conditions to the detriment of employees, working has almost become an obligation instead of an enriching endeavor that enriches life, supports individual development, improves the individual and contributes to production processes. Even feeling obliged and experiencing this

feeling is a source of stress in itself and negatively affects the psychological health of employees by disrupting their mental balance. Since the mental problems experienced by individuals negatively affect cognitive functions such as perception, comprehension, evaluation and decision-making as well as psychological and physical health, accidents increase in work environments under psychosocial risk (25-28).

Psychosocial factors in working life vary according to the individual and the environment and should be questioned well in terms of the process. In particular, information on the relationship between the general health and psychosocial status of the individual is very important. In order to reach this information, it is necessary to examine and evaluate the contact, level and frequency of a person's contact with all the people around him/her with whom he/she has relationships and meetings over time. It is important how the individual who is exposed to stress factors at work experiences, interprets and evaluates these factors. In addition to the genetic structure and hereditary factors, how the individual perceives and programs social, cultural and environmental factors at an early age is important in terms of his/her ability to respond and resist. It is also necessary to examine and monitor the outcomes that lead to pathological changes in the person and the other components and feedback pathways that interact with the diseases that cause them. It is an undeniable fact that each of the impact-based modifying factors that lead to changes in the person in these processes plays an important role in the relationship between health and psychosocial factors.

Studies have shown that psychosocial factors and stress-causing factors can be differentiated, revealed and concluded by direct physical or chemical measurements, which is different from biomedical occupational health research. There is a need for the existence of a model whose symptoms and results arising from stressful work, where the link between work and stress will be clearly revealed and especially distinguished. There is a need for the formation of institutional models that will help analyze the natural structure of the working environment and work life and generalize them for various professions and whose reliability cannot be disputed. In order to make these models unquestionably usable, methods using social and behavioral sciences with proven validity and consistency should be used. It is a theoretical and methodological challenge to identify with concrete data those who are exposed to the stress-inducing components of the oppressive, intense, monotonous, repetitive and prolonged pace of working life. In addition, issues such as what these measurement methods and theories will be limited to, which ones will interact, and the importance of

resilience and coping skills are issues of debate that have not yet been clarified. It is important that work stress measurement methods are methodologically feasible, reliable in terms of their results, up-to-date and sensitive to change, realistic, valid and accepted. The currently used job stress (workload-control-support) model and reward-effort imbalance model have relatively fulfilled this need, especially in developed countries. Examination of the results obtained from these two models, which have been used and tested in various studies, strengthens the hypothesis that high-stress work experience is associated with the risk of coronary heart disease and other diseases (36).

In a study conducted in Turkey based on a large and broad sample for the measurement of work stress, it was revealed that work-related stress is grouped under five main problems.

- a) Patterns, norms and practices put forward from a managerial perspective
- b) Nature of work and daily workload
- c) Mistrust and disconnection in relationships
- d) Career deprivation and developmental disengagement
- e) Working conditions and workplace risk factors

Instead of the work that should be done in order to color one's life, to add meaning to one's professional development, to produce, to renew, to specialize and to be useful, compulsory and reluctant work, which causes the blunting of existing emotions with the recent development of working conditions to the detriment of employees, is ultimately a stressor and negatively affects the mental structure and health of the person.

4.2.1. Job satisfaction

The triggering and driving force of morale and motivation is undoubtedly job satisfaction. One of the activities that add value and meaning to one's life is one's work and work life. An unsatisfied, soulless, colorless and unexciting work life is the source of various problems and brings unexpected problems. Job satisfaction is related to expectations, and the areas and scope of expectations vary according to the person and the job. Job satisfaction is a positive emotional result based on the pleasure of achieving the expectations and results designed by the employees and the happiness it creates in the person. Job satisfaction, which is important for every job and professional activity performed, also brings psychological and social outcomes. Job satisfaction, which affects not only the

physical and mental state of employees, but also their physiological and spiritual state, is a multifaceted and comprehensive issue that needs to be evaluated. A person who experiences serious dissatisfaction in the work environment far from job satisfaction will exhibit negative attitudes and behaviors, tend towards negative emotions, and deteriorate physical, mental and social health. Job dissatisfaction, which is likely to lead to burnout syndrome, will initially show situations that lead to dissatisfaction and burnout, such as cooling off and distancing from work, not coming to work, frequently leaving work by making excuses, taking frequent leave, changing jobs.

4.2.2. Mental health status

Mental health is defined by the World Health Organization as a state of well-being in which individuals are aware of their will, perseverance, effort, ability and strength, their ability to cope with the difficulties of life and the crises and tensions that are likely to arise, their ability to work in a productive, success-oriented and sustainable manner, and their ability to provide value and benefit to their society.

It is known that worsening living conditions, the negative outlook in individual and social human relations, the digitalized world and the increasing number of self-oriented individuals are the sources of the spread of mental illnesses all over the world. Depression, one of the mental illnesses, is one of the most common public health problems among the adult working population in the world, especially in the USA. Considering the prevalence of depression and the increase in psychologically based diseases and cases, especially in western countries that are strong in technical and technological fields, have high industrialization capabilities and developed industrialization opportunities, a serious and significant increase is expected in cases of depression, which damages and degrades interpersonal relationships, makes individuals lonely, almost single, alienates them from their family, close environment and the society they live in.

According to the World Health Organization's 2020 global burden of disease assessment, depression, which ranks fourth today, is expected to rise to second place in the coming period, regardless of age category and gender status. In terms of workplace efficiency and productivity, it is observed that employees with mental health problems generally have low contribution and support, blocking or slowing down decision support processes. It is also known that they frequently make timing mistakes, enter into a spiral of indecision

and experience decision-making difficulties and dilemmas, avoid stable and sustainable relationships, maintain their relationships with the individuals around them, are weak and inadequate in work control processes, tend towards undisciplined behaviors, have difficulty in planning and execution of work, make mistakes more frequently and have work accidents.

5. Psychosocial Factors and Work Accidents

When the issue is examined in terms of possible causes of occupational accidents and factors contributing to accidents, it can be said that there is a link between stress arising from the working environment and psychosocial factors that cause this stress and accidents. In particular, it is seen that some issues related to the content and status of the work, its organization, importance, follow-up and evaluation by the management, criticality and hazard level are important within the scope of accident-causing factors. Psychosocial factors, which can be defined as the direct causes of occupational accidents, also cause work stress in employees and increase the risk of occupational accidents indirectly, although not directly.

Symptoms related to stress, which causes some personal illnesses and negative causes, can be categorized into four groups: physical, emotional, mental and social. These symptoms are the most commonly observed symptoms and it is normal to see different and different symptoms that are not mentioned here.

5.1. Physical and physiological symptoms

the adverse conditions of the working environment, weakness of management and will, unsafe conditions, social and economic inadequacies can be listed as important factors that threaten employee health. Physical and physiological symptoms generally have negative effects on the circulatory and respiratory system, digestion and excretion, nervous and endocrine system, musculoskeletal system.

Effects on the circulatory and respiratory system in summary; high blood pressure, increased blood pressure, heart attack, excessive sweating, accelerated heartbeat and respiration, decreased pressure in the brain fluid,

Effects on the nervous and endocrine system in summary; headache, tension, anger, resentment, sleep disturbance, impaired concentration, fear, slowed mental activity, clenching or grinding of teeth, jaw contraction, rash, colitis,

Effects on digestion and excretion; constipation, diarrhea and indigestion, heartburn, heartburn and gas, ulcers, loss of appetite or changes in appetite, chronic fatigue or low energy,

Effects on the musculoskeletal system; symptoms such as muscle aches, back and lower back pain, sudden reflexes, muscle tension, stress, circulatory disorders.

5.2. Emotional Symptoms

Emotional symptoms vary according to the person, and the severity and the way they manifest themselves also vary. Depending on the situation, the environment and the cause, it can sometimes manifest itself as a very violent reaction and sometimes as a deep silence that causes anxiety. Symptoms such as anxiety and worry, crying spells of varying shape and dosage, tension, irritability, nervousness, constant and rapid mood swings, depression, lack of self-confidence and loss of self-confidence, insecurity and feelings of fear, excessive vulnerability or hypersensitivity, weakness in anger control, outbursts of anger, fighting and aggression or hostility, burnout and emotional deprivation, demoralization and reluctance.

5.3. Mental Symptoms

Mental breakdown or fatigue are problems in focusing. There are symptoms such as indecision, difficulty and timidity in making decisions, focusing problems, confused mind and weakness in perception reflexes, frequent forgetfulness, memory fatigue and weakness, imaginative approaches and excessive dreaminess, unnecessary preoccupation, stagnation, loss of humor and sense of humor, tendency to make mistakes and persistence in mistakes, obsession, fixation in ideas or thoughts, making mistakes more often, weakening in reasoning and comprehension.

5.4. Social Symptoms

Serious problems arise in organizing and maintaining social relationships. Symptoms such as loss of trust and distrust towards people, frequent use of the blame reflex and constantly blaming others, lack of time, lack of interest in appointments and not going to appointments, disorganization, the desire to change places too often or cancel meetings or interviews too soon, trying to find fault in people and verbally offending them, adopting an overly defensive attitude, being sullen with many people at once, not talking.

All of these symptoms listed above can ultimately lead to distraction, difficulty concentrating and focusing, which can pave the way for occupational accidents and occupational diseases. It can fuel an increase in work accidents. It can also directly affect work efficiency by affecting performance.

6. Factors Affecting Psychosocial Risk Factors

In general terms, there are many factors that affect psychosocial risk factors. If we look at examples of factors affecting some psychosocial risk factors;

6.1. Age and gender

Age and gender create differences in exposure to and coping with stress. In the light of sociological and psychological factors such as the role and social status of women, social perspective and traditional approaches, expectations, habits and education level, the perception of duties and responsibilities towards women is formed. In addition to the stress burdens caused by the problems and troubles arising from the working environment of the working woman, the work she carries out as a mother and housework inevitably causes serious stress burdens. It is observed that the factors that cause stress for employees intensify at older ages. Individuals with high levels of sensitivity and vulnerability become more stressed as they get older due to being affected by events and feeling more responsible. Inexperience, lack of education and inexperience are important factors in the work environment, and young individuals with insufficient knowledge and experience may experience stress. It is observed that the risk of negative stress may increase in middle age due to irregular and poor lifestyle. Bad habits (bad and unbalanced diet, smoking and alcohol habits, substance abuse, irregular settlement and nomadic life, etc.), which are acquired at a young age, especially in the twenties, and which are increased over time according to the course of living conditions, may turn into cumulative traumas in later years and may have serious effects. An irregular and chaotic lifestyle combined with stress can lead to symptoms that do not appear until middle age. When work stress is added to bad habits acquired at a young age, it leads to early loss of health.

Women, who are more vulnerable, emotional and sensitive than men in terms of the reactive processes of vital cycles, are more exposed to the effects of stressors. The role assigned to women in societies with a poor level of social development, the place and role of women in working life, sexist approaches to

discrimination between men and women, the oppressive and formal circulation of cultural values, various expectations arising from marriage, delusions created by the phenomenon of value and acceptance cause stress in women. In the face of natural factors such as job continuity and development processes and in situations that require supervision, control, follow-up, additional work, duplication of effort and punishment, women are more affected by stress factors than men.

6.2. Education status

The level of knowledge, consciousness and awareness affects the perspective and approach to events. Education, which is the most important parameter of social development level and modernity, is the key to success. It plays a key role for social and individual life. There is a relationship between the level and quality of education and individual and social achievements. The higher the level of education and personal development, the higher the individual's ability to adapt to situations and conditions, to comprehend, perceive, evaluate, analyze and draw conclusions. This increases self-confidence and individual dignity. It gives the ability to think differently and deeply, to analyze and synthesize. Low and inadequate level of education is seen as a risk factor for panic, tension, anxiety, fear, anxiety and somatoform disorders and may affect the prevalence of mental disorders (20-24).

6.3. Marital status

Marriage, in which the emotional intimacy that begins with the desire of adult individuals to want, love, be loved, like and be admired is shaped by traditional rituals and legal processes, is an important and serious social phenomenon in which mutual will is manifested on the basis of love, respect, sharing, happiness and peace. Men and women have different perspectives and approaches to marriage, which is regarded as the cornerstone of happiness. For example, the fact that only 11% of single women suffer from mental health problems, compared to 20% of single men, has led to an interpretation that marriage is not as effective in women's happiness as it is in men's, and that marriage is more important in men's happiness. Some factors such as lack of communication, infidelity, deception and inadequate social support pave the way for relationship problems in marriage, and marriages that fall short of expectations and turn into a problematic relationship spiral pave the way for

depression and various mental illnesses, and it is claimed that marriage may pose a risk for depression for these reasons. Various studies have shown that problematic marriages are more risky in terms of the triggering and development of mental problems, that they facilitate the entry into depression as one of the important factors that disrupt and affect the mental structure, and that it may be easier for divorced people or people who have not been divorced but live separately to become depressed.

6.4. Working life

The most important and inseparable fact of life is to have a job and to be able to sustain one's life. As important as work is for people, the workplace, the working environment, the audience they deal with and their perceptions about their work are equally important. Work and the work environment, which have very high determinant effects, bring important consequences in human life. In return for the work done and the labor given, there is definitely the purpose of earning money and sustaining life. However, sometimes people do not only look at their work with the logic of providing material gain. Professional satisfaction and the psychology of production are among the factors that motivate people. Being accepted in the work environment, being taken into consideration, being in a team, the pleasure of doing that job, moral satisfaction, pride, sense of success, the feeling of adding value and contributing to the national income and the society in which they live through their work. Individuals who do not work, who do not produce, who do not enjoy their work even if they work, who are dissatisfied and dissatisfied, on the contrary, lead to the emergence of a spiritual climate in which stress and reluctance surround the person, and a result in which discontent fuels and deepens this situation. Considering the findings and findings related to working life, it was determined that mental complaints such as anxiety and phobia were higher in housewives than in women with an active working life.

6.5. Socio-economic level

Socio-economic level is a definition that tries to reveal the social status with economic parameters and expresses the effect and results of economic gains on individual welfare level in the social development index. All phenomena in which both social development level and economic gains are evaluated together are considered as socio-economic. It can be said that there is a direct link

between the economic status of the individual and his/her social life, and that this interaction-based situation directly affects his/her life. Various studies have revealed that there is a relationship between people's earnings and their mental health. Unemployment, which is a socio-economic concept, does not only affect the individual and society economically. When a person does not have a regular income, it also leads to a decrease in social standards. In particular, it is stated that low income and low earnings increase mental disorders such as major depression, generalized anxiety-anxiety disorder and panic disorder in individuals, and income inequality is seen as the most important reason for the increase in the frequency of neurotic disorders in employees.

6.6. Rate of life change

Factors that cause stress are phenomena that vary according to the individual. It is inevitable that serious and important events that vary according to time, environment, situation and conditions will cause stress. However, these events or situations do not only consist of what we call vital events. The acceptance status of individual expectations and important facts may also vary. What is very important for some individuals may be considered unimportant for others. Issues that may lead to positive or negative life changes and that are emphasized and considered seriously from an individual perspective are considered as important stress factors. Many changes such as losing a job, death of a parent, death of a spouse, loss of a child, serious and important illnesses, divorce, birth of a new baby or loss of a baby at birth, imprisonment, quitting a job, not being promoted, excessive debt, retirement have a significant stress burden. Changes in a person's life affect the person and increase the level of stress. The effects of these changes leave different effects on individuals.

6.7. Migration

Migration triggered by wars, sectarian conflicts, religious identity searches, problems arising from ethnic problems and separatist ideologies, famine, poverty, hunger, as well as the pandemic process, is one of the most striking and important phenomena of recent years with the number of displaced refugees, the speed of change and transformation. Migrants, who are forced to leave their homelands for various reasons and settle in different countries and regions, and who bring with them serious and important problems of status, identity, culture, belonging, acceptance and integration in the regions where they settle, are one

of the most important problems of today. These people, who are also subjected to various injustices and irregularities due to their status in the lands where they are located or where they have to settle, sometimes succumb to the injustices they have suffered due to the environment and situation they are in, or they fuel permanent problems and events over time with the effect of the psychology of hatred and greed.

Migration is one of the factors that contribute to the emergence and prevalence of various psychological illnesses and depression. Migration, which is based on war or political, ethnic, religious, sectarian, economic, etc. reasons, is the forced removal of people from their own country and lands and the culture they are accustomed to. It has been shown that the type, intensity and severity of the symptoms of mental complaints exhibited by individuals who come with migration and live in a different place differ in terms of their cultural characteristics and their situation arising from living in a foreign country.

Due to the changing physical, cultural, economic and social environment, this process, which is very difficult in terms of recognition, introduction, acceptance, adoption, adaptation and integration, has serious difficulties and problems. Migrants, in particular, have difficulties in expressing themselves in their environment and face different and difficult to understand problems caused by social dialogue and cultural incompatibility. Due to the inadequacy of psychosocial support systems that can compensate for or mitigate these problems, the size and severity of the problems are gradually increasing. Problems may increase depending on the situation and conditions in relation to the acceptance potential and the effectiveness of internalization mechanisms in the country of immigration. External factors such as the acceptance of foreigners in the country of immigration, differences in cultural values, reactionary approaches brought about by the challenging life, the occurrence of incidents caused by the difference in social reflexes and the state of harmony between cultural identities can affect the increase of these problems. As a matter of fact, when problems cannot be solved and new problems come to the agenda, psychosocial adaptation of individuals deteriorates over time and some crisis reactions are triggered accordingly.

Due to their challenging life experiences and unresolved conflicts, migrants have a number of mental and social problems. These may include decreased work efficiency, behavioral problems, substance abuse and criminal behavior, as well as neurotic, psychotic and psychosomatic problems in the mental dimension.

6.8. Fertility Characteristics

The cycle of menstruation, or menstrual cycle, is a regular natural change in the female reproductive system (especially the uterus and ovaries) that makes pregnancy possible, and is a series of events aimed at preparing the woman's body for pregnancy. In particular, fertility, pregnancy, reproduction, or vice versa, have an impact on women's emotional state. In this context, the menstrual cycle, pregnancy, post-pregnancy period, wanting a child, not having a child, menopause periods lead to fluctuations in emotional states as periods of sensitivity, vulnerability and fragility, and this situation leads to serious abuse and negative effects on mental health.

Various adverse events such as childbirth, fertility, pregnancy, infertility and similar traumas can lead to various risks. In particular, women with infertility problems, which can be defined as a condition in which pregnancy never occurs or pregnancy no longer occurs even if pregnancy has already occurred, women who become mothers at a young age, and women going through menopause constitute a high risk group for depression. Depression, which occurs due to expectations, life changes and the results that arise, is also influenced by depressive episodes that have shaken and enveloped the person in the past. "**Empty Nest Syndrome**", when children leave home, women may show depressive symptoms thinking that they have lost their purpose and identity. Especially in our society, sexual inadequacy, loneliness and a sense of isolation and exclusion lie at the root of menopausal anxiety and tension.

7. Protection from Psychosocial Risks

Creating a healthy and safe working environment in working life is the duty and professional obligation of all managers, especially employers. It is important that the negative effects of mobbing, which is an important psychosocial risk in occupational health, are well known especially by managers in terms of work efficiency and taking precautions against occupational accidents. Measures and corrective actions to be taken to eliminate and repair the negative consequences of psychosocial risks that are not foreseen and prevented in a timely manner on the workplace and employees are both a serious burden and a major blow to business gain processes. People-oriented approach and high morale are key factors in creating a safe workplace.

Taking precautions against psychosocial risks that pave the way for the loss of gains, disrupt balance and harmony, create insecurity, destroy the system

✓ To create an environment where possible infectious diseases and their effects can be discussed and addressed in an open, honest and effective manner and to exhibit the same attitude and approach in all possible negativities (work accidents, occupational diseases),

✓ Inform employees about the results of risk assessments conducted to identify any potential work-related exposure and train employees on OHS measures and procedures, including the appropriate use of personal protective equipment,

✓ Informing employees more frequently about their rights and responsibilities in this process,

✓ To inform employees about how workplace procedures will continue in the event that an employee's transmission efficiency is high and positive and to clarify the procedures in this regard,

✓ Informing employees about the government's leave, assistance, policies and where to contact if they have any questions to deal with all kinds of diseases and adversities, especially communicable and dangerous diseases,

✓ Ensure that the language and materials used for information are inclusive of all workers (including refugee/migrant workers) and ensure unity of language and understanding,

✓ Managers and team leaders who are leaders and are looked up to as role models are important for employees. For this reason, organizing trainings so that they can create a safe working environment that supports healthy behaviors, especially to create team spirit,

✓ Organize trainings for managers, team leaders and employees to facilitate the recognition and monitoring of symptoms of depression and PTSD (such as social withdrawal, performance impairment, absenteeism and presenteeism),

✓ Organize trainings for managers and team leaders on how to detect violence and harassment in the workplace and, where possible, how to identify signs that employees are victims of domestic violence,

✓ Organizing trainings on relaxation and self-help techniques,

✓ Informing employees about the psychological support services they can benefit from during this process and actively using psychological support units,

✓ Organizing information seminars on ergonomic, physical and psychosocial risks for home-based workers,

✓ Training managers on best practices to adapt to changing working conditions so that they can better advise and support their teams,

✓ Respecting the privacy of employees, acting in accordance with the “need-to-know principle” and the “Confidentiality of Privacy” rule regarding information about employees’ health, personal problems or family matters,

✓ To make / have made organizations to direct employees to social activities, sports activities and educational activities where they can relax and devote themselves to their work with love,

✓ It is important to organize and conduct informational activities to teach and enable the implementation of methods that enable the employee to be self-sufficient and cope with stress.

7.2. Precautions that Employees Can Take Against Psychosocial Risks

It is also very important for employees to educate and train themselves to cope with psychosocial risks and the negativities that may occur in this context..

7.2.1. Receiving trainings on resisting and coping with stress

Many events in our lives can cause stress. There are factors that can cause serious stress, such as losing a close relative, suffering from a serious disease, struggling with a chronic illness, changing jobs compulsorily, as well as some events that are almost routine and that we experience on a daily basis. For example, traffic problems, being stuck in traffic, problems arising from lack of proper communication and personal conflicts, or problems arising from technical failures in the workplace can often be a cause of stress.

The better we manage the stress in our lives, the better we know how to cope with stress and the better we apply it, the more comfortable and better we can feel. Managing stress, which has a negative effect on the immune system, can make the immune system stronger and more resilient. Recognizing and managing stress, which affects all vital activities, especially the decision-making mechanism, requires strong willpower and administrative ability. We should be aware of the fact that the ways of coping with stress, which is one of the important measures of quality of life, and the fact that everyone knows the methods of struggle provide undeniably important benefits. Knowing stress, approaching it in a knowledgeable and conscious manner, and being able to evaluate the phenomena that cause stress well is only a matter of knowing oneself very well. Training on ways of coping with stress and managing stress should be given to people working at all levels, especially to managerial staff in enterprises (37,38)

7.2.2. Performing Physical Movements and Relaxation Exercises

Regular and planned exercise provides serious and important benefits in terms of healthy life as an enhancer, complement and supportive element of physical activities. Regardless of age category, sportive activities performed by individuals of all age groups are important in coping with and combating stress. In this context, sustainable long and determined walks, swimming, cycling, jogging, running, tennis, aerobics, etc., the pace and speed of which are determined by the individual, are beneficial as they help the person to relax and relax. Exercise is an active biochemical event that activates and strengthens the immune system. At the end of the sporting activity, because all limbs and systems are working, including the supporting and holding musculature and the immune system, immune cells become stronger and more alert in response to periodic exposure to stress. Regular exercise plays an important role in reducing stress. For example, for a person who is overwhelmed and stressed by the busy work environment, taking a walk or engaging in a sporting activity after work can help him/her to relax and get away from the stress that is affecting him/her at that moment. Physical activity, which has positive effects on physical health, undoubtedly also has positive effects on psychological and social health. Doing physical movements and relaxation exercises not only makes the individual feel good and happy, but also helps to develop the ability to think positively and cope with stress. Considering the total benefits of physical activities that increase social cohesion and acceptance, physical activities performed at an adequate level lead to the formation of societies with healthier individuals and make the society healthier (7-11).

7.2.3. Vigorous physical activity

Vigorous physical activities that differ according to age and physical condition are important for keeping the immune system strong and effective. Paced exercises performed according to one's ability and endurance are beneficial for strengthening and repairing the cell structure. For example, brisk sports activities such as jogging, fast and brisk walking, swimming, horseback riding and cycling can be done in accordance with the wishes and tastes of the person. Planning 2-3 sessions of activities with periods of at least forty-five minutes per week will benefit the strengthening of the body and muscle system.

7.2.4. Mental well-being

“Psychological neuroimmunology”, a new science that examines the interaction between the nervous and immune systems and mental life, states that

emotions and mood changes should be seen as important phenomena that affect the daily life of the person. Suppressing excessive emotions and intense sadness experienced negatively in daily life should be seen as suppressing the functions of the immune system, seriously damaging and weakening the person, preparing the ground for possible diseases and embracing them. Positive approaches, optimistic thoughts and positive emotions strengthen the defense system.

7.2.5. Brain exercise

Amnesia, which is likely to be experienced according to age, hereditary status, stress and individual characteristics, varies according to the person. There may be physical, physiological and psychological reasons that cause amnesia, which is also seen at a very early age. It is useful to take some precautions against amnesia due to the presence of many reasons, from nutritional characteristics to work-related stress. Just as regular and brisk exercise keeps your heart and blood circulation healthy, frequent and regular brain training can help keep the mind fit and young.

7.2.6. Breathing Exercise

One of the most important aspects that make it easier to cope with stress is correct and controlled breathing exercises. If the correct inhalation and exhalation techniques are known and practiced, the oxygen taken into the body through breathing will spread and transfer to the cells more effectively. Rhythmic and regular breathing is important as it has a positive effect on the nervous system. Breathing in this direction helps to calm the nervous system and reduce stress and slow down the effects of stress. Proper breathing creates a basis for relaxation and relaxation. This prevents the person from contracting and helps to reduce tension. It is important to know the correct breathing and exhalation techniques for the body to relax and feel good and to internalize this in daily life in order to help relieve the tensions caused by stress.

7.2.7. Calming and Relaxation

Relaxation is one of the individual factors that can help an overly tense and contracted person to relax and normalize their physical activity. Calming and relaxation is one of the ways to cope with stress, which causes various changes in the body physiologically and physiologically (*high blood pressure, muscle contraction, sugar increase, slowing or acceleration of respiration, dilated pupils, excessive sweating, etc.*). These symptoms may decrease in individuals

who calm down and relax. It is also important to know and correctly apply relaxation techniques. By using relaxation and calming methods, the effects of stress can be partially eliminated. When an individual is faced with a stressful or stressful situation, he/she should at least take correct and appropriate deep breaths and try to relax and calm down. Thus, by trying to relax oneself, one can get rid of the negative situation to a great extent. Thanks to these techniques, which are extremely easy to apply, it also helps to reduce mental intensity and relaxation in stress-laden individuals. With the relaxing and soothing effect of the relaxation and calming method, the stress factor in the person can be greatly reduced.

7.2.8. Strengthening the nerves

Calm people usually have a strong nervous system. The most important sources of energy in daily life are proteins and fats. The amino acid glutamine, which is the most important constituent of protein-containing foods, and lecithin, which is in the structure of fats, are the dynamo of mental activity and functionality and substances that increase performance. Each vitamin has its own benefits, but the brain needs B vitamins more for energy metabolism. B vitamins, whose natural source is yeast products, are important for brain functioning and performance, with vitamin B1 being particularly needed and important.

7.2.9. Listening to music

Music is the food of the soul and a positive triggering dynamo. Music has the ability to support the development of cognitive performance; at the same time, it has been proven by a number of scientific studies that it contributes positively to the processing speed in the brain, reduces stress, affects the autonomic nervous system and strengthens memory. Music is an arbitrary activity and preference is individual. Although people's music preferences vary, it has been determined that especially calm music is good for stress. It can be said that music listened to regularly with closed eyes has a strengthening effect on the harmony of health.

7.2.10. Making the right use of time

Among the stressors, time pressure is the most important and most effective source of stress, and it is a source of stress that can be debilitating and traumatizing. Competing with time or feeling under time pressure causes stress

to emerge. Time pressure, the effect of which varies according to personality traits, is a time-triggering factor in terms of revealing stress and being burdened with stress, especially in individuals with Type A personality traits. Failure to accomplish certain tasks in the given time, incompatibility between the desired workload and the time to be spent, not making the right time planning and not being able to manage time correctly are among the reasons that reveal stress (1-4).

7.2.11. Participation in Social, Cultural and Sportive Activities

Making the boring and monotonous environment of life more beautiful and enjoyable is one of the biggest trump cards in the hands of the individual. Taking advantage of sportive and cultural opportunities in the environment in line with individual tastes, participating in joint social, sportive and cultural activities with a group of friends and friends who are happy to be together, meeting people, acquiring an environment, coming together and interacting with different people are decisive steps towards socialization. It is seen that individuals with developed social personality traits have a healthier mental and physical structure due to their high self-confidence, ease in the process of adaptation and participation, and features that are sought and accepted by the environment. The individual's enthusiasm and desire to develop himself/herself in many ways (cultural, artistic, music, theater, theater, cinema, travel, sports, etc.) and the activities he/she will do in this context and the social activities he/she will participate in will enable him/her to fight and cope with the negative effects of stress. The fact that they will reach a healthy body structure through various sports activities, and a wealth of knowledge, consciousness and awareness through cultural and artistic activities, and that this will become a habit over time will lead to the formation of a strong physical, mental structure and social well-being.

7.2.12. Keeping spirituality strong

Spirituality is a way of keeping one's moral values strong and can be applied even in the most difficult moments. In the face of events and situations that are sometimes considered unsolvable, the strength of faith and spirituality, spiritual wealth, belief in God and prayers made with the most heartfelt feelings, which are believed to protect from all kinds of evil and the evil of malicious people, are like a harbor where people find refuge, comfort and peace in their spiritual world.

The mystical and spiritual richness that the individual is required to experience religiously, such as the power of belief and faith, the sublimity of religion and spirituality, and the devotion to God, brings people indescribable inner peace and comfort. Worship, which is the most important phenomenon of spiritual fulfillment, is the culmination of the spiritual interaction between the servant and the creator, and staying one-on-one during worship brings the person to spiritual pleasure as desired. Especially the old age period, which is defined as the last stop of the vital cycle, is a sensitive period in which the thoughts that the end of life is approaching, that the mortal world will be transformed and transformed into the eternal world are made meaningful. According to the researches, religion is an element of balance against the psychological problems and difficulties that elderly individuals face; praying and worshipping cause people to move away from negative thoughts and ideas due to their beliefs, and the strong bond between the creator and the strong bond between them causes a sense of peace. Thanks to religion, by being connected to a supreme creator, human beings are provided with a constant trust and inner peace that they cannot find in this world they live in. Elderly individuals move away from the feeling of emptiness and loneliness and realize the importance of their own existence. As a source of positive energy, the dynamo of inner peace and the driving force of spirituality, prayer is an important factor against the important spiritual problems of our age such as anxiety, stress, meaninglessness, emptiness and loneliness. Prayer, especially as an important part of worship, positively affects mental health and most importantly, the repetition of verses causes concentration and relaxation, as in the contemplative method.

7.2.13. Nutrition

7.2.13.1. Strengthening the immune system

The immune system, which helps protect our body against inflammation, infection and contamination, is made up of a number of organs (*thymus, bone marrow, lymph glands, lymph ducts, lymph fluid, tonsils, liver, spleen, large intestines and appendix*) that have neural connections with the brain and are important because they are directly related to the immune system and the mind. Stress is the trigger of all kinds of ailments and one of the leading negative phenomena that directly affect the immune system. A strong and resilient defense system prevents all disease-causing agents from penetrating the body, preventing contamination, inflammation or inflammation.

In reducing stress, it is important to recognize oneself and to stay away from stressful environments. Undoubtedly, nutrition has a great importance and role against stress. The principles of balanced and proper nutrition are one of the important criteria of personal health. Avoiding foods that may cause harmful consequences on the body and metabolism and avoiding harmful habits are important as the basic health inputs of nutrition. Regular and timely nutrition and not missing meals, and avoiding harmful and habit-forming foods and beverages that stand out with their stimulant properties rather than their nutritional properties should be strictly avoided. It should not be forgotten that nutrition is a powerful and effective factor that can be used against stressors. There is an opposite relationship between nutrition and stress, and while quality and strong nutrition is effective in combating stress, unbalanced, weak, inadequate and poor nutrition may be insufficient to cope with stress. Foods and drinks containing caffeine and its derivatives cause anxiety as they disrupt the heart and respiratory rhythm. Excessive fatty and salty foods may cause stress because they cause irritation of the vascular wall and arteriosclerosis and increase blood pressure. High-calorie and fatty foods can cause obesity through weight gain, while excessive weight can cause a number of physical and physiological disorders, while at the same time causing the individual some psychological problems. Obesity, which leads to a decrease in self-esteem over time, is the result of poor and unbalanced nutrition, and a healthy and balanced diet for mental and physical health is one of the conditions for a long life. Preferring foods with high vitamin value and taking them regularly, avoiding hormonal and GMO foods, consuming fruits and vegetables in accordance with seasonal conditions, avoiding excessive fatty, salty foods and caffeine drinks, and using them in moderation when necessary make the person strong in coping with stress (29-34).

7.2.13.2. Intestinal flora

Intestinal flora, which can also be defined as microbiota and has dozens of characteristics that affect general health, is important for the immune system. It plays a key and essential role in regulating the functions of the immune system. Eating habits and foods consumed daily are the most important factors affecting our immune system. The formation of undesirable bacteria that threaten health, predispose to diseases and weaken defense mechanisms, lack of beneficial bacteria or an increase in the number of fungi (e.g. *Candida albicans*) weakens the body's resistance power and defense mechanisms and increases its susceptibility to diseases by reducing the immune system's fighting and resistance reflex.

7.2.13.3. Anti-stress substances from nature

Nature, to which we owe so much in terms of life, is the greatest laboratory that continues to contribute and support human life with the millions of plants and flowers it contains. Various plants and herbs that are selectively used in all kinds of medicines are important for healing. In particular; ginseng, St. John's wort, valerian, kava kava, sword grass, lavender, magnesium, vitamin C, vitamin E and selenium, etc. It has been revealed by various observations and studies that substances such as substances strengthen the immune system against stress, repair and activate the defense mechanism and protect against possible diseases and negativities.

7.2.13.4. Healthy diet

It is important not to consume GMO vegetables and fruits, which are contrary to ethical and humanitarian values, which cause serious health problems for those who use them, which are never approved and which threaten human health in many ways. It is especially suitable for health to prefer seasonal foodstuffs. Utilizing foods that are beneficial to the body and support the immune system makes our body healthier and stronger. The basis of good nutrition is the identification and preference of quality and qualified foodstuffs and being a conscious consumer.

7.2.13.5. Preparation by preserving its value

Every foodstuff has a consumption period and a lifespan. Regardless of the food source, the principles of processing, consumption and consumption are important. Even nutrients with very high quality, properties and qualities may lose their real nutritional value due to improper preparation, packaging, storage, cooling, freezing, freezing, before and after consumption. Therefore, it is especially important to maintain the nutritional value and level of additives.

7.2.13.6. Ecological nutrition

Today, a wide variety of agricultural pesticides and genetic modification studies are carried out in order to increase the amount of crops, to earn more, to get crops at short intervals, and to obtain more and larger crops. Ecological nutrition is a natural and healthy diet that advocates the consumption of foods produced with a system that uses local seeds, not genetically modified seeds without chemicals, pesticides and artificial fertilizers. Foods obtained through

ecological agriculture and from animals raised in natural environments are preferred for human health and strengthen the immune system due to their vitamin value, quality, nutritional efficiency, taste and smell. Such foods load our bodies with less harmful substances and do not leave chemical toxic residues in our bodies.

7.2.14. Situation Oriented Methods

Time is the most precious capital given to a person. Using it well requires talent. Proper time planning is needed to use time well. Using time well increases productivity. Social relations and social activities create a strong bond with the environment. Self-confidence increases. The opportunity to benefit from social support increases. Communication is the most effective way to solve problems and be understood. It is important to develop communication skills. One should update oneself according to situations and circumstances, such as acquiring assertive behavior habits and using them at the right time, developing problem solving skills.

7.2.15. Biological Feedback

The human body is a set of integrated parts and organs open to the action-reaction mechanism. It transmits possible negativities to the relevant person depending on the situation and conditions. There may be symptoms that we can detect and evaluate with some external techniques and methods. However, we do not have the opportunity to recognize some of them physiologically. We need technical devices and apparatus for this. Biological feedback is one of the effective methods used to combat stress. We can recognize the number and speed of your heartbeat when we put our hand on our jugular vein or chest. It is very simple to notice a problem in your breathing, a problem in your stomach. But we cannot see, taste, feel, hear or smell our brain waves, muscle cells or blood pressure. The biofeedback method is a relatively easy-to-use advanced technique that allows the rhythmic and systematic phenomena and events in the body to be monitored by means of an electronic apparatus. This device simply observes the physiological events in your body and converts the detections into signals. These signals are displayed on the monitor, sometimes as a light, sometimes as a sound, sometimes as wavy graph lines. Even a thermometer measuring body temperature can function as a simple biofeedback device. Whatever type of device is used, the aim is to enable you to see or hear your bodily reactions through some signal.

7.2.16. Humorous approach and Laughing

A humorous approach and laughter are positive factors that are good for the soul. It helps the person to relax and reach spiritual serenity. Humor, which helps to reduce stress and helps the person to get out of this situation, alleviates the negative emotional burden and reduces the level of stress by ensuring that stressful situations are perceived more positively instead of a threat. Humor makes a person feel happy. A person who manages to laugh is a person who can look at life positively and moderately and manage to control his/her stress.

7.2.17. Quality Sleep

Sleep is the most important need and is an extremely important process in which everything in our lives is put in order and our body is repaired and treated. Sleep is extremely important for a healthy life. It has been proven that sleep disorder accelerates cell aging, weakens the immune system and predisposes to all kinds of diseases..

A strong and resilient body is the indispensable dynamo of daily life in order to keep up with the increasingly difficult and heavy pace of work. For this reason, one of the activities we need most to rest and recharge is sleep. Tense and stressful times are the times when a good and quality sleep is most needed. It is a well-known fact that stress causes serious problems such as insomnia, sleep disorders and sleep deprivation, which need to be addressed. For this reason, it is necessary to avoid being in stressful environments, especially in the evening hours, to do things that you enjoy doing, and to relax the body. A quality sleep increases energy and allows you to start the day energized. Sleep, which increases endurance and helps strengthen the immune system, creates the opportunity to fight more effectively against all kinds of difficulties that may arise during the day. As the benefits of sleep, which is serious and important for human health;

- ✓ Excretion of sediments and strengthening of the mind,
- ✓ Cleansing of accumulated toxins and regeneration of cells,
- ✓ Repairing cell damage that occurs during the day,
- ✓ Stabilization of cortisone caused by stress and rising cortisone,
- ✓ Repairing all kinds of damage in the body,
- ✓ Secretion of serotonin, known as the happiness hormone,
- ✓ Strengthening the immune system,

- ✓ Increased energy levels and increased stamina,
- ✓ It provides rest, cleansing and regeneration of all limbs.

Resting both the body and the mind can only be achieved with a quality and sound sleep. Difficulty falling asleep or staying asleep, i.e. insomnia, is an important health problem seen in one out of every three people in the society. Individuals with insomnia are irritable and tense, and their ability to resist weakens and they may immediately exhibit negative behaviors in the face of difficulties.

7.2.18. Aromatic fragrances

This practice, which has appeared in various civilizations in ancient times, aims to relax the soul and body. The origin of all medicines is nature, and relaxation and calmness are achieved by using oils and scents obtained from certain herbs and plants found in nature. Aromatherapy seeks to unleash the healing power of the body by using herbal essential oils for the physical, emotional and spiritual health of the person. This natural healing method provides physical and emotional well-being through massage, mists, compresses and scenting of the space. This method, which was used especially in ancient Egyptian and Greek civilizations, is applied in the form of massage with scents, special perfumes and oils that relax the soul and body. The idea that aromatherapy is important in the fight against stress is becoming more and more accepted every day.

7.2.19. Regular Health Checkup

It is necessary and important to have regular health checks in order to take precautions in advance and to see a possible negative situation early. Regular health check-ups are important for the physical, physiological and psychological health of the individual. In particular, these periodic checks help the individual to take timely precautions by warning them in advance against possible problems that may arise. It is important that this practice, which helps the morale values of the individual to feel good, is carried out without interruption.

7.2.20. Regular Vacation Habit

It is important for individuals who are constantly working and burdened with the responsibilities of the work environment to get away from the working environment from time to time and rest their body, brain and soul. Fullness

of mind and constant work pressure can lead to low work efficiency and an intensified reflex to make mistakes. It is necessary to take a vacation and rest in order to regenerate and re-energize and return to the work environment with a new morale and enthusiasm. Taking vacations from time to time at short intervals, going on periodic vacations, helps our body to rest and relax at times when stress is at its peak. The intensity and wear and tear of the working environment, the characteristics of the work, the working position, the risk and danger position should be taken into consideration and the vacation time and break pattern should be adjusted. Resting or getting away from the environment helps to reduce stress by relaxing employees. Thus, individuals who move away from the stressful environment can provide mental and physical relaxation.

7.2.21. Writing therapy and other similar hobbies

People are affected by some events throughout their lives. Although the traces and effects of events on people are variable, some events are shocking and permanent. For example, the mood of an adult who lost his/her family in an earthquake, or the mood of a mother who lost her baby, or the mood of an individual who lost his/her spouse at a young age can leave deep traces on the person. Based on the events that leave a traumatic effect on the person, writing therapy for that person is applied as one of the relaxation methods. According to a study conducted in the United States, it has been observed that people who write and write about important events that shook them or talk about their excitement transform their stress into positive energy.

9. Conclusions and Evaluations on Psychosocial Risks

The most important factor in terms of work efficiency is to protect employee health. The basis of modern occupational health and safety is to adopt the perception and understanding of human-oriented and “**prevention is more humane and economical than payment**”. By protecting employee health, businesses also protect production safety and operational safety. Healthy and safe workplaces are very important for ensuring efficient work and high quality work life.

Increasing industrialization, globalization, the increase in borderless cases with high probability of contagion, the increase in disasters and emergencies, especially the existence of frequent major disasters caused by nature, necessitates more comprehensive, more qualified and effective studies on occupational

health and safety. The ability of enterprises to eliminate the negativities that will occur in production processes depends on the protection and prevention policies they develop in terms of occupational health and safety.

Today, the aim of occupational health and safety studies, which are formed as a common field of study of many disciplines such as engineering, medicine and social sciences, is to ensure systematic working integrity in which the risks arising from the execution of the work are eliminated, conditions that may harm health are eliminated, and working conditions are improved.

Ensuring occupational health and safety is an important responsibility towards employees, their colleagues and their families. It is also an important investment for the economy and an obligation under the law.

It is undeniable that businesses where psychosocial risks are minimized will be in a better position in terms of productivity and profitability than their peers and will be in a better position to grow and develop.

In terms of the economic dimension of OHS, the leader (employer), system dynamics and management policies, production and income sources, sales and marketing processes, finance and financial discipline, human resources and personnel, and security, all of which are in continuous interaction with each other, it is the human being who will get results. The key to success is being a team and believing (34).

Businesses where psychosocial risks are eliminated or relatively low are businesses focused on winning and growth.

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CHAPTER VIII

THE EFFECTS OF MIGRATION AND POVERTY ON PUBLIC HEALTH

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1. Introduction

The number of international migrants has nearly tripled in the last 50 years. There are approximately 281 million international migrants in 2020. It is about 3.6% of the global population (1). Migration is defined as ‘people crossing an international border or relocating within the borders of another country, regardless of time, form and reason’ (2). The history of migrations is one of the situations that affect humanity when the periods are examined. Peoples; It is seen that they migrated from their dormitories to places they did not know before due to wars, famine, inability to reach food, drought, the desire to acquire a new settlement, disasters, existing health problems, transportation to places with high employment rates, reaching higher education goals (3). Migration that occurs within the borders of the countries they live in (province, district center, sub-district and village) is defined as internal migration, while geographical displacement outside the borders of their own country is defined as external migration (4).

The naming of immigrants varies according to the reason for migration and their legal status. According to the immigration situation; immigrant, refugee,

asylum seeker names are used. According to the United Nations refugee concept, 'race, belief, nationality, membership in a particular social group, or political view that would be persecuted because of justified anxiety and because of that inhabited the settlement was abandoned due to concerns and, never to return or to return is defined as people who do not think. This concept also refers to people fleeing from a war situation. Looking at the basis of the concept, it is in an international legal framework that includes the 1951 Refugee Convention, the 1967 Protocol, and the 1969 Organization of African Unity Convention regulating specific chapters on refugee problems in Africa. In addition to the fact that individuals who migrate can apply individually to receive refugee status, if a large number of refugees migrate at the same time, they can also receive refugee status on their arrival. Refugees cannot be sent back to their countries of origin if they do not want to (5).

The concept of asylum seeker is defined as individuals who want to be accepted as a refugee in another country within the scope of local or international documents and are waiting for the result of their application regarding the refugee identity. If these individuals are not accepted to the country as a result of their application, they can be expelled from the country. A migrant, on the other hand, is a person who, apart from the reasons found in the definition of a refugee, often leaves his homeland willingly for material reasons and settles in another country with the knowledge and permission of the authorities of that country (4).

Considering the globalization process, the concept of migration is considered as a social crisis. Developing and changing situations cause countries to go beyond the borders and create new borders. The concept of migration is a dynamic process that humanity has experienced for many reasons. This process brings with it more than one stressful situation before, during and after migration (3). One of the most important sources of stress experienced by immigrant individuals is poverty. Poverty is considered not only to be unable to have a minimum standard of living, but also to be deprived of the necessary elements needed to reach a humanly acceptable level of life. When immigrants migrate from their own country to another country, they are exposed to another aspect of poverty (6).

Considering the basis of migration, economic (poverty, unemployment), social (difficulty in accessing welfare or education), environmental (biodiversity degradation, disasters), poor security conditions that can threaten people's lives (attack on human rights, oppression / persecution of minority groups, armed

attacks etc.) and the existence of migrant networks (7). Although many factors cause migration, it is seen that the concepts of migration and poverty affect each other.

In the world where the capitalist system prevails, the concepts of migration and poverty are two concepts that interact with each other. In the globalizing world, poverty causes migration and migration causes poverty. Immigrant individuals suffer from poverty and even deprivation, which is another type of poverty, in the countries they migrate to due to the poverty they have experienced in their own countries. Immigrants experience social injustice, violence, gender discrimination, etc. in their new settlements exposed to many injustices. The administrations of the receiving countries fulfill the legal regulations they have made in the face of poverty and deprivation that immigrants are exposed to, not because of social equality, but within the scope of their own security fears. It is seen that developed countries are extremely sensitive to protect the personal rights of their citizens, but they are insensitive to the social rights of immigrants. Immigrants, whose social rights are not protected, are exposed to different types of poverty in many countries of the world (6). Among the main factors that cause migration, sometimes people's desire to have a better life and sometimes the country they live in can be shown to become unlivable due to the external factors they are exposed to. Regardless of the reason and style, the fact that immigrants as well as individuals who migrate to their country are affected by this process should be seen as another important detail (8).

Immigrant individuals experience great stress in the face of the concept of migration. Immigrants experience loneliness, alienation, regret, stigma, exclusion, communication problems due to not understanding the language of the country they go to, as well as problems affecting their mental health in the society they have gone to (3). Immigrant individuals face many social and economic risks. Physical and mental health of immigrants; Loss of social status, loneliness, language barrier, cultural differences are under the threat of many stressors. For example, communicable diseases caused by poor living conditions and malnutrition are the most common problems faced by immigrants (9). As in every society, in immigrant societies, children, the elderly, women and disadvantaged groups with chronic diseases are more affected by immigration, and it is seen that the risk is higher in these individuals. Disadvantaged groups become more important due to their physical conditions and difficulties in accessing health services. Immigrants in the disadvantaged group experience difficulties such as poor environmental conditions, low socioeconomic income,

unregistered and uninsured work, difficulty in accessing food, not knowing the language and institutions to receive service, excessive stress, lack of support mechanisms, prejudices, cultural shock. It also causes mental problems such as exclusion and stigmatization (3).

The immigrant group that shows the fastest increase among the immigrants in the world is those who migrate for economic reasons. Apart from economic reasons, many people suffer from war, political problems, natural disasters, famine, etc. forced migration. Forced migration individuals are exposed to more risks. The effects of migration on the health of individuals are considered as short-term and long-term health problems, as well as as health problems that occur in the region of immigration (10).

To understand the effects of migration on the health of individuals; First of all, it should be understood how the mental health of an immigrant individual is affected. Delara explains the pattern of immigrants' spiritual well-being according to the frustration model. Accordingly, there are predictable stages of immigrants' spiritual adaptation. In the first place, with the enthusiasm of "arrival", the mental health of immigrants is equal to or better than that of the host population. In the second stage, the mental health of the immigrants deteriorates due to the disappointments of the past and the "longing for home" and regresses to a level below the host population. This decline is explained by many factors such as socioeconomic status, financial and employment restrictions, resettlement and cultural adaptation difficulties, multiple responsibilities, discrimination, language differences and difficulty in getting timely service. The third stage is the adaptation stage, and at this stage, the mental health of immigrants approaches the health of individuals in the host country. As can be expected, the speed of adaptation depends on the service that that country offers to immigrants and the measures it takes for risk factors (11). Migration affects individuals from all age groups both physically and mentally.

2. The effects of migration and poverty on child health

Millions of children in different parts of the world are forced to live in conflict environments such as war and terrorism, they are dragged into inevitable migration and poverty, their life, childhood and right to grow up and develop healthy and to be an adult individual are usurped (12). Immigrant children and families find themselves in a new struggle as refugees in order to hold on to the society they migrated to. Immigrant children face many problems in every field such as social, cultural, psychological, physical and health. They have to cope

with many problems such as nutrition, shelter, infectious diseases, language problems, inability to access health services, child labor and child marriages (13).

Regardless of the reason for migration, the consequences of migration affect children deeply. Children constitute a vulnerable group both within their families and in the society they live in. Especially migrant children living in poverty; In addition to risky behaviors such as psychological problems, exclusion from the society they live in, self-alienation, tendency to crime and alcohol-substance use in order to reach financial resources, they may also be exposed to situations such as violence, neglect and abuse. The inability of children to continue their healthy growth and development causes their lifelong health to be adversely affected (14).

Childhood and adolescence are shown as the initial stages of at least half of the mental problems that a person has experienced throughout his/her life (15). It is seen that individuals who have been exposed to immigration during childhood or adolescence are more likely to encounter traumatic situations related to their mental health (16). In a study conducted in Canada with the participation of African parents and their children, it was found that the negativities that parents and children are exposed to affect their mental health (17). In another study conducted in the USA, it was concluded that since Somali immigrant children are exposed to many psychological pressures, especially racism, trauma, stress, perceived discrimination role and depression rates are high (18). Care practices are required to eliminate or reduce the social, psychological and physical health problems caused by the traumas experienced by children (13).

Children, who are seen among the disadvantaged groups in the migration process, live deprived of many human rights. Nutritional disorders are the basis of these human rights to life. In a study conducted with immigrant children in the United States, it was concluded that approximately half of the children in the 3-12 age group are overweight/obese (19). In a study conducted on Syrian migrant children who migrated to Turkey, it was found that children had to work to reach basic food because their parents did not have a regular income and the number of population in their families was high, but they had problems in meeting their basic needs due to the low wages they earned. It has been stated that they do not have adequate nutrition opportunities (10).

Immunization is very important in combating infectious diseases, which are among the most important causes of child mortality. The World Health Organization states that in line with the principle of health and quality of life,

which is in the 3rd rank of the Sustainable Development Goals, immunization activities constitute an important part of especially the reduction of newborn and child deaths. According to WHO, it is seen that immunization prevents more than 20 infectious diseases, but due to inequalities, 20 million individuals, including approximately infants, cannot reach immunization activities each year (20). One of the groups that cannot reach these immunization activities is migrant children. In a study conducted by Binici and Börekçi (2021) on the immunization of children migrating from Syria to Turkey (n=651), it was concluded that 52.1% of the children did not have their childhood vaccinations completed or were not known by their families (21). It has been stated that the immunization rates of Somali children are low in early childhood immunizations among immigrant children in the US state of Minnesota. It was stated that this low immunization rate was effective in the onset of the measles epidemic in the state of Minnesota (22). In another study on the measles vaccination of Somali children who immigrated to Norway, it was stated that the measles vaccination rate of Somali immigrant children was lower than that of Norwegian children (23).

Effective communication with the parents of the children in the disadvantaged group; It is necessary to provide education and counseling, nutrition, immunization, common childhood diseases and home accidents by making observations and interviews. Environmental hygiene, clean water, education on food hygiene and getting support from the necessary institutions, the role of defense, prevention of domestic violence, immunization are the responsibilities of the public health nurse regarding children in case of migration (24).

3. The effects of migration and poverty on women's health

Women's health affects not only their own health, but also the health of children, families and society. Therefore; Women's health is an important part of public health (25). Protecting and improving the health of migrant women will be important for the health of both her and her family and the migrant community.

Adolescent and women's health constitute one of the vulnerable groups in society. Migrant women face various difficulties before, during and after migration, and these difficulties negatively affect women's mental health. Women in the pre-migration and migration periods; sexual harassment, abuse and rape. Women who have to leave their hometown and family behind during the settling

stage remain unfamiliar with the language and culture of the migrated country, and also have difficulties in providing shelter, food and hygiene conditions. With migration, women move away from their own culture's clothing styles and lifestyles, and their chances of accessing education decrease. With migration, women are one step closer to all kinds of violence. These adverse conditions cause deterioration in the mental health of women (26). Having to leave her hometown and family behind during the settling stage, the woman remains unfamiliar with the language and culture of the migrated country, and also has difficulties in providing shelter, food and hygiene conditions. Important problems related to postpartum depression in immigrant women; It is the inability to identify postpartum depression due to personal (cultural beliefs), social (lack of social support, language problem) and inaccessibility to health services (economic status, difficulty in transportation, time limitation) (27).

In a cross-sectional study conducted in Venezuela to determine the sexual and reproductive health education needs of adolescents and young adult women aged 10-24, most of the participants lived on the street, about half of them had given birth before, and more than one-fourth did not receive prenatal care. It was determined that he did not know (28). Based on the results of the study; In addition to family planning and prenatal and postnatal education, it can be said that the social rights of immigrant adolescents and young adults should be regulated first.

In the meta-analysis study on the increase in the number of immigrant women of childbearing age across Europe; Results for the needs of migrant women in 14 countries; shows that migrant women face negative pregnancy outcomes. According to the results of the study; It has been reported that maternity care models should be inclusive of the whole society in order to prevent health inequalities. It has been reported that interdisciplinary and inter-institutional cooperation and quality and trauma-oriented maternity care should be provided. It was stated that transcultural health services should be provided for immigrant women and their socioeconomic and psychosocial needs should be met (29). A focus group study was conducted with 33 participants to determine the experiences of migrant women during pregnancy and childbirth in Switzerland. As a result of the study, their experiences in emergency aid and delivery services during birth were stated as positive. The negative experiences of migrant women are; language barrier, lack of social support and health literacy (30).

According to the International Labor Organization (ILO); migrant women are mostly employed informally in the countries they migrate to. They provide

basic health services to young and old people, people with disabilities or health problems. Working conditions are more severe than those of domestic workers and they are mostly devoid of social security. It is stated that migrant women working in care services should be empowered and gender equality should be ensured (31).

4. The effects of migration and poverty on the health of the disabled

About 1.3 billion people, 16% of the world's population, are disabled. Disability results in lack of access to education, inability to find a job, and exposure to deprivation in future life. Disability is both a development and human rights issue and a public health issue. Persons with disabilities experience more restrictions on other people in the society in daily life due to health inequalities, have worse heart health and die earlier due to health inequalities. Disabled individuals who refuse education/cannot reach education face the problem of finding a job, in this case, it deepens their poverty and it becomes more difficult to break the disability-poverty vicious circle (32).

It is stated that the number of disabled immigrants worldwide in 2020 is approximately 12 million people. It is emphasized that the current disability situation may worsen, especially in the case of forced displacement (33). It has been emphasized that it is important to empower people who are vulnerable, such as the disabled, immigrants and refugees, within the scope of the United Nations 2030 Sustainable Development Goals. Emphasis is placed on empowering people with disabilities and safe migration in Goal 10 on reducing inequalities (34).

Health rights in countries are usually limited to their own citizens. Barriers to health services stem from racism and prejudices towards the disabled. Especially, illegal immigrants with disabilities cannot use health services; this situation increases its disadvantages even more (35). A workshop was held in five European countries to discuss the differences in the support that immigrant families with disabled children receive in terms of health, education and social services to the process of raising their children. It has been determined that there are differences in education, health and social service support for disabled children in terms of countries, and that both immigrant families with disabled children and professionals who care for them have problems due to this situation (36).

Being a disabled immigrant worsens the problem. In a study examining the relationship between refugees living in Australia and mental health, disability

and social inclusion, it was found that refugees with secure visas had higher levels of post-traumatic stress disorder, symptoms of depression, thoughts of suicide and death compared to refugees with insecure visas. The difference between groups was that refugees with insecure visa status received support from significantly more groups in the Australian community. However; It has been determined that refugees in insecure visa status with low group membership have more depression symptoms and suicidal intention (37). It can be said that the support of the society regarding the disabled and the access to health services should be especially supported, and the disabled will feel better when there is social support.

5. The effects of migration and poverty on the health of the elderly

In 2019, the maximum number of immigrants under temporary protection status in official records was more than 3.5 million. According to the United Nations, more than 6% of immigrants are over the age of 65. Elderly immigrants are often more deprived than the elderly population of the country they reside in. The well-being, well-being and mental health of older immigrants are worse than those of the majority population in their home country. Gender differences stand out in terms of healthy aging. Especially in older men, the loss of social identity in their working life and friendship circles occurs earlier. Immigration brings with it social isolation. This situation; affect health behaviors, health status and use of health facilities. The language barrier of older immigrants limits their access to health services. It is observed that the use of health promotion programs, primary health care and rehabilitation services by immigrants is lower than the population of the country they migrated to. Language is an influential factor in this regard both in the world and in our country, and access to health services or interpreters in their mother tongue is important. Especially in old age, there is more dependency on language. Lack of adherence to drug therapy among older immigrants is also seen as a cause for concern. This situation also limits the purchase of prescribed drugs due to language barrier, socio-economic inadequacy, and low health literacy. Due to the migration of the elderly and social inadequacies, malnutrition and related health problems may occur, and they may be exposed to protein-energy malnutrition (38).

As mentioned above, there are many influences on the migrant elderly. In the literature review, various studies on immigrant elderly people were found. In order to determine the factors affecting the state of benefiting from health services and benefiting from health services among elderly immigrants

in China, the data of 13,043 people were reached by examining the immigrant data. Behavior model was used to determine the use of health services. It has been determined that about half of the elderly immigrants consult a doctor when they get sick; age, marital status, reason for migration, type of health insurance, household income and chronic disease status were determined to affect the use of health services by elderly immigrants (39). In a cross-sectional study conducted with 112 participants in order to compare the oral health, barriers to accessing dental care, and oral hygiene behaviors of immigrant and non-immigrant elderly people in Germany, it was found that elderly immigrants need more treatment. It has been suggested that dental health promotion programs should be made for elderly immigrants (40).

6. The effects of migration and poverty on men's health

There is no man in the world who has a longer life expectancy than a woman. Men's health is problematic around the world and has often been overlooked, both nationally and internationally. Men have a high rate of death from preventable causes. Men are generally deficient in all age groups in terms of using health services. Improving men's health is also important for poor health conditions and the economic structure of families (41). There are many research examples in the literature review on immigrant men. In a study on the unhealthy alcohol use and help seeking rates of Latino male immigrants, it was determined that the unhealthy alcohol use rates of the men participating in the research were high. Again, in the same study, it was concluded that the rate of seeking help of immigrant men is low and they prefer to cope with this situation individually (42). In a systematic review of the HIV risk among gay and bisexual immigrant men in North America and Europe, it was stated that immigrant men have a high risk of having unprotected sex and HIV transmission (43).

As a result of migration, male immigrants, who are one of the disadvantaged groups in the country where they settled, have to work to maintain their lives and earn income. Immigrant men have problems in finding suitable jobs. They generally work in jobs that local workers do not want to do due to health and safety problems, where there are occupational accidents, which are dangerous and have a monotonous structure. These jobs include the food industry, working in agricultural fields, cleaning and construction work (44).

Migrant male workers living away from their families face stress and loneliness as well as face discrimination, which causes social isolation and health problems such as alcohol, substance use, sexually transmitted diseases

and suicide attempts (45). Migrant workers who work informally in Turkey and do the same job as the citizens of the Republic of Turkey receive half of the wages of the work they do. Migrant workers often work in unskilled jobs. Official employment rates are quite low in Turkey (46).

7. Conclusion

In the meta-analysis study carried out with the studies carried out in European countries (Austria, Cyprus, France, Germany, Greece, Italy, Malta, Spain and Sweden) in order to determine the access of immigrants to health services, their access to health services and their use of health services were determined. As a result of the meta-analysis, it was determined that immigrants mostly use emergency services and use basic health services at a low level. It has been determined that the fields of psychiatry and oral and dental health are used at a low level (47). In order to protect and improve the health of immigrants, it should be ensured that they primarily use mental health and preventive health services. In order to ensure the oral and dental health of immigrants, first of all, the habit of brushing their teeth should be gained. All immigrants should have access to health services.

In order to protect and improve the health of migrant women, education on family planning should be provided. Birth control methods and contraceptive materials should be provided. Support should be provided to immigrant families in raising children after birth. Immigrant families should be supported in immunization. It should be ensured that immigrant families live in safe environments, have a healthy diet and be vaccinated. It should be ensured that immigrant families learn the language of the society they migrate to. It should be ensured that immigrant families find employment and exist in society.

The health of immigrant children must be protected and promoted. Immigrant children should be provided with safe conditions, adequate and balanced nutrition, and their education should be supported.

It should be ensured that immigrant elderly people live in safe conditions and receive care support. Disease and drug follow-up of the elderly with chronic diseases should be done.

It should be ensured that elderly immigrants live in safe conditions and receive care support. The elderly with chronic diseases should be followed up on disease and medication. Appropriate nutrition should be provided for the disease. It should be taken into account that older immigrants may be prone to depression.

Families of immigrant children with disabilities should be supported in accessing health services and education. Immigrants with disabilities should be provided with access to health services. Adult immigrants with disabilities should be provided with access to healthcare and their presence in society.

The primary role for male immigrants is vaccination, wound care and health assessment. The level of information about protecting and improving the mental health of migratory men and defining and answering the existing problems and problems should be increased (48).

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CHAPTER IX

PHYSICAL ACTIVITY AND EXERCISE DURING THE AGING PROCESS

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1. Definition of Aging

There are many terms used today that refer to aging and old age. People experience losses and deterioration during the aging process which refers to the changes and the developmental continuation in the late period of life. This is also a result of cultural, environmental, and economic factors. In other words, old age is a natural and inevitable period, such as childhood, youth, and adulthood. It follows development and maturation in the life span, has complex aspects where the interaction between genetic constriction and the environment is observed at the maximum level, physiological and psychological changes occur, and is seen in all living things. With aging, perception, memory, and creativity abilities, in general, begin to decay. It is hard to define the onset of elderly physiologically and psychologically (1). In the aging process, self-renewal of organs slows down and wears out in the organs of the individual. This causes an increase in people's susceptibility to other chronic diseases and a decrease in their general capacity. With the decrease in capacity, the person begins to avoid moving and gradually leads to a sedentary life. A person who spends most of the day immobile is at risk of falling and injury, together with

losses in the musculoskeletal system (2). All of these have an unfavorable effect on the health and quality of life in elderly. Functional and quality living is as important as long-term life (3). It is very important for individuals to live a quality life as well as a long life. Increasing the quality of life and maintaining functional independence in individuals have become more significant with the prolongation of life expectancy (4).

1.1. Classification of Aging

Aging is defined through different dimensions such as chronological, biological, physiological, psychological, sociocultural, economic, and social.

1.1.1. Chronological Aging

It is expressed in years that people live after their birth.

1.1.2. Biological Aging

It manifests as a loss of function in the tissues and organs that make up the human structure. It is the decline in an individual's physiological and psychological functions as well as their organs' function as a result of factors like heredity, lifestyle, job, eating habits, and diseases.

1.1.3. Psychological Aging

The problems brought about by chronological aging are difficulties in memory functions and deterioration in behavioral adaptability. During the psychological aging process, older adults often feel that they are not ready for old age, that they are inadequate, that they are a burden to others, and they worry that they are no longer useful.

1.1.4. Sociological Aging

Sociological Aging varies from society to society. The determining factors that are important in sociological aging are the values in society, the roles and behaviors that society expects from the elderly, and the status of the elderly in society. Factors such as retirement, widowhood, individual characteristics, social relations, and material, moral, physical, and social losses play a decisive role in sociological aging. Social Aging is the state of aging attributed to the individual by society when the individual begins to fail to fulfill their roles in society because of the effects of physical aging. Cultural characteristics play a decisive role in social aging (5).

According to the World Health Organization (WHO), 65 years and older are considered chronologically old. According to this definition, 65-74 years old are classified as youngest-old, 75-84 years old as middle-old, and 85 years and over as the oldest-old.

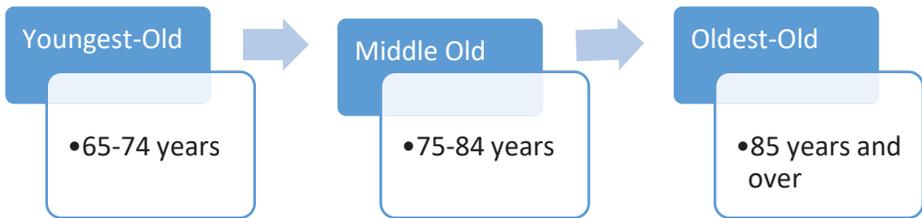


Figure1: World Health Organization Classification of Elderly

2. Physiological Changes During the Aging Process

Since aging is a process that starts with birth and affects many systems in the human body, it brings along some physiological changes with the advancement of age. These changes may vary depending on the lifestyle of the elderly, the presence of chronic diseases, the drugs they use, and their environmental characteristics.

These changes due to aging affect people's participation in daily life, work life, dependency, and communication with their environment (6).

2.1. Changes in Sense Organs

2.1.1. Vision: As people get older, they experience vision loss and changes in their eye health. The most common issues with aging are a decrease in vision quality and a decrease in tears.

2.1.2. Hearing: As people get older, their hearing systems undergo structural and functional changes. Hearing loss and difficulty hearing are two of the most common issues.

2.1.3. Smell: The sense of smell and taste diminishes. The nose's shape changes. Dryness in the mouth occurs as a result of decreased saliva secretion.

2.1.4. Skin: As people get older, their skin's structural integrity and other bodily processes like cell renewal, barrier function, wound healing, and temperature regulation decline.

2.2. Changes in the Nervous System

Different neurological changes can be seen as the brain's capacity to transmit signals and communicate decreases with age. Many other neurodegenerative conditions, such as loss of brain function, dementia (typically Alzheimer's disease), Parkinson's disease, or stroke, can be experienced as people age. Alzheimer's disease is the most common type of dementia seen in the elderly. This disease destroys nerve cells and causes tissue loss throughout the brain, affecting nearly every function. Damage occurs in brain areas associated with thinking, planning, and remembering.

People's reactions, mental functions, and reflexes deteriorate as they age. Balance issues, gait disorders, and cognitive dysfunctions are also common in the elderly (7).

2.3. Changes in the Cardiovascular System

The structure and function of the heart change as people age. Changes in the heart valve, vascular structure, and function are observed, in addition to a decrease in the amount of blood pumped. These changes result in oxygen deficiency, making people feel sluggish and tired.

2.4. Changes in the Respiratory System

The elasticity of the rib cage and lung tissues, as well as the strength of the respiratory muscles, all decrease with age. There is also a reduction in vital capacity and oxygen saturation, as well as a slowing of cilia movements. All of these changes reduce the elderly's respiratory function and capacity. Due to changes in the respiratory system, the prevalence of chronic obstructive pulmonary disease (COPD) and pneumonia increases (6,7,8).

2.5. Changes in the Endocrine System

As people age, their lean body mass decreases, their fat ratio rises, their need for energy increases, and their hormone secretion levels fall. With age, the prevalence of thyroid, diabetes, and metabolic diseases rises.

2.6. Changes in the Immune System

Aging causes a weakening of the immune system, and thus susceptibility to infections and chronic diseases. Biological factors such as genetics, unhealthy living habits, metabolic changes due to long-term physiological stress can lead

to disorders in the immune system with increasing age. Impairments in the immune system cause an increase in the susceptibility of elderly individuals to many chronic diseases such as cardiovascular diseases and diabetes (9).

2.7. Changes in the Digestive System

Digestive enzymes and metabolic activities slow down as people age. It causes functional digestive disorders such as dry mouth, indigestion, burning, and difficulty in swallowing (6; 8).

2.8. Changes in the Musculoskeletal System

The aging process causes a decrease in muscle mass and strength, which increases fracture risk and fragility, as well as a decrease in quality of life and functional independence. The loss of independence and physical activity causes other issues related to inactivity. Elderly people experience muscle wasting, decreases in muscle strength and volume, and the size of muscle fibers. The loss of bone minerals accelerates. Moreover, disorders of the connective tissue and cartilage tissue reduce the joint's range of motion. Functionality is reduced as muscle strength and balance control mechanisms deteriorate with age. These changes result in increased fatigue with less energy, posture and gait disorders, and an increased risk of falling (6,7,8).

3. Healthy Aging

The elderly population around the world is expected to exceed one billion by 2025 and reach nearly two billion by 2050 (10).

This increase in the elderly population is associated with an increase in life expectancy. Life expectancy is rising, but so is the prevalence of cardiovascular disease and chronic non-communicable diseases. Furthermore, changes in the physiological system such as decreased muscle mass, strength, and endurance, as well as balance and cognitive performance disorders, are observed with increasing age (3).

Nutritional habits, food preferences, lifestyle habits, and physical activity levels in childhood and adulthood are all important indicators of people's health in later life. Healthy aging is a concept that denotes the presence of a complete state of well-being that includes not only physical but also psychological and social aspects. Physical, psychological, and social activity at an advanced age without major diseases is defined as healthy aging. There are numerous key

components of healthy aging. These are the absence of disease and disability, high cognitive, mental, and physical function, active participation in vital activities, and good psychological adaptation to advanced age (11). In the “Successful Aging” model, the components of successful aging were determined as health, daily activities, physical and cognitive competence, social adaptation, active participation in social life, and control (12).

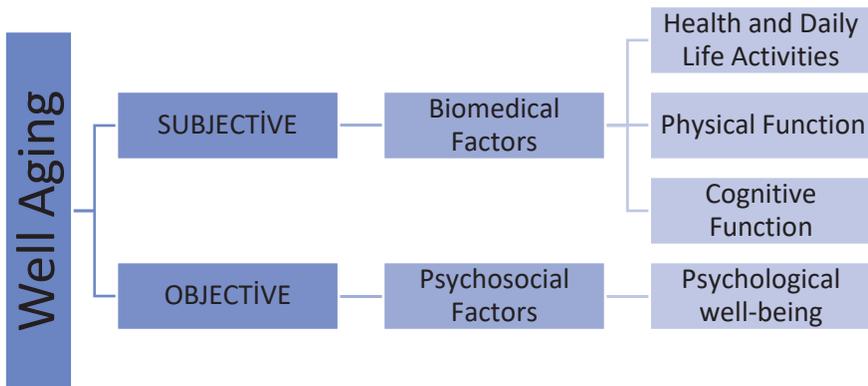


Figure 2: Successful Aging Model

Regular physical activity helps to prevent diseases, increase functionality, and improve quality of life. Regular physical activity in older adults is crucial for healthy aging (13).

Lifestyle plays a significant role in achieving the goal of healthy aging because it affects large segments of society and is one of the factors that can be changed. A well-balanced diet, non-smoking, the absence of alcohol use, regular sleeping habits, and being physically and socially active have all been shown to have a positive impact on health (14).

4. Physical Activity and Exercise in Elderly

4.1. Benefits of Physical Activity and Exercise

The World Health Organization (WHO) identifies low physical activity as the leading cause of mortality, emphasizing the importance of regular physical activity not only for the elderly but also for all age groups (15).

Physical activity is defined as all skeletal muscle movements that require energy expenditure, such as gardening, housework, dance, daily activities,

sports, and exercise. Exercise, on the other hand, is defined as regular, planned, structured, and repetitive physical activity (13).

It is widely accepted that physical activity is crucial for the prevention of cardiovascular diseases. In the American Heart Association (AHA) / American Society of Anesthesiologists (ASA), European Stroke Organization (ESO) and Turkish Cerebrovascular Diseases Society (TBDHD) guidelines; physical activity has been reported that it can reduce the risk of primary and secondary stroke (16). Based on the guideline comparisons of Firat et al., which is quite dense in scope; With physical activity in the AHA/ASA guideline; It is emphasized based on high quality data that cardiovascular risk factors can be reduced and blood pressure regulation, insulin resistance can be reduced, endothelial functions and lipid metabolism can be improved, and it can contribute to weight control (16,17).

Exercise benefits many different systems. Regular exercise improves muscle strength, endurance, and flexibility. It aids in the prevention of diseases such as cardiovascular diseases, hypertension, cancer, and diabetes. In addition to improving bone mineral density, blood lipids, the immune system, and the skeletal system, it is stated to improve mental well-being, lower the risk of dementia, improve sleep quality, and alleviate depression symptoms (13). In addition, improving physical activity tolerance and increasing endurance in individuals contribute to the protection of individuals against accidents, injuries and disabilities (18).

Physical activity attending lifestyle has benefits while as not attending may have many side effects; physical inactivity not only causes an increased susceptibility to weight gain, but also leads to deficiencies in skeletal regeneration and the immune system (19). Physical activity is very important and beneficial not only for the healing of the systems, but also for the protection.

4.2. Barriers to Physical Activity and Exercise in the Elderly

Regular exercise is known to be beneficial to health, however, there are numerous factors that prevent people from adopting and maintaining an exercise routine. Walking difficulties, pain, physical health issues, physical weakness, respiratory problems, and a lack of energy are cited as the most common reasons for not exercising.

Inappropriate physical environmental conditions, structural difficulties and inconveniences in the environment, insufficient level of knowledge about

exercise, limited time, lack of self-confidence, and fear of falling are stated as barriers for elderly people to exercise.

Table 1. Barriers to Exercise and Related Suggestions for the Elderly

BARRIERS TO EXERCISE	SUGGESTIONS
Lack of Self-Confidence	Exercises for the patient should be easy to begin with and then gradually increased.
Negative Beliefs About Exercise	The health benefits should be highlighted and made enjoyable.
Feeling Uncomfortable During Exercise	Exercise should be done in moderation and with the appropriate program.
Feeling of Inadequacy	A tailored exercise prescription should include motivation-boosting techniques.
Balance Problems	Appropriate exercises should be chosen for the individual, assistive devices should be provided if necessary, and supervised exercise should be performed.
Fear of Injury	Warm-up and cool-down exercises should be emphasized, simple exercises should be introduced, and balance and strengthening exercises should be included in the exercise program.
Fear of Falling	Balance exercises should be added to the exercise program if necessary, as should an assistive device, and appropriate shoes should be preferred.
Environmental Factors	Recommendations for exercise should be made in accordance with the environment in which they feel safe.
Economic Situation	Exercises that will not cause financial anxiety (such as walking) should be recommended.
Other Concomitant Diseases	Other diseases' effects should also be considered, and an appropriate exercise program should be provided.
Cognitive Disorders	Simple exercises that they can understand and do easily should be recommended.

4.3. Factors That Motivate Physical Activity and Exercise in the Elderly

People's levels of physical activity gradually decline as they age. Knowing the benefits of physical activity, such as it improves balance, walking ability, sleep quality, and overall health and reduces muscle pain, is said to be important in promoting exercise. It is critical in this context to form appropriate exercise

groups, select appropriate music, use the appropriate communication method and exercise type, and motivate people to exercise by increasing their self-confidence and knowledge level (20,21,22).

4.4. Pre-Exercise Evaluation

A detailed history of the person's diseases and medical problems should be taken, and an appropriate evaluation should be made. Before beginning the exercises, the individual's musculoskeletal system, mental and emotional state, pain, sensation, balance, functional status, and quality of life should all be assessed.

4.4.1. General Health Evaluation

The general health status of elderly people should be evaluated, including their family history, other accompanying diseases, medications, complaints, exercise habits, shortness of breath, cough, fatigue, sleep level, and pain. After assessing overall health, body systems should be physically examined to determine whether there is a functional disability.

4.4.2. Functional Evaluation

Functional status is an important indicator of the quality of life of the elderly. Functional status assessment evaluates the level of dependency of the elderly and their ability to continue their daily living activities. The Physical Activities of Daily Living Scale, Instrumental Activities of Daily Living Scale, and Barthel Index are the most frequently used assessment scales to measure functionality in the elderly.

4.4.3. Neurocognitive Evaluation

Memory status, orientation, attention, concentration, and speaking ability are evaluated in cognitive evaluation, depression, anxiety, changes in self-perception, and social withdrawal are evaluated in mood state. The Geriatric Depression Scale and the Mini-Mental State Evaluation Scale (MMSE) are the most frequently used assessment tools.

4.4.4. Physical Activity Status

The Physical Activity Rating Scale (PASE) for the Elderly was developed in 1993 to assess leisure, work, and home physical activity components; Turkish validity and reliability were done by Ayvat in 2017 (23,24).

Scoring of the PASE Questionnaire is based on participants' work-related activities, including walking, mild, moderate, and vigorous sports and recreational activities, muscle strength and endurance exercises, walking and standing, lawn and garden care, caring for another person, home repairs during the last week. Questions the intensity, frequency and duration of heavy and light housework activities. Among the activities, walking activity; mild, moderate and vigorous sports and recreational activities; activity levels are classified by evaluating the frequency of muscle strength and endurance exercises and the duration of these activities.

International Physical. Activity Questionnaire (IPAQ) was developed in 1998-99 by the International Consensus Group (25). It questions the remembered physical activity status of individuals in two alternatives, either in the last week or in a routine week, by telephone interview or self-administration. The Turkish validity and reliability of this questionnaire was performed by Sağlam et al. in 2010 (26).

As a result of physical activity calculations, the metabolic equivalent (MET) value, which is an indicator of energy expenditure, used by the body for one minute of activity is calculated.

1) Light intensity: (<3 METs) Characteristics of low-effort daily activities where breathing and heart rate are slightly above the resting value. It's like walking very slowly.

2) Medium intensity: (3–5.9 METs) Respiration and heart rate It describes activities that require moderate effort in which changes in speed occur. During these activities, the individual can speak, but cannot sing; like brisk walking.

3) Severe Intensity: (≥ 6 METs) Includes activities that require a lot of effort with marked changes in breathing and heart rate. The person cannot speak more than a few words without gasping during the activity. Jogging and dancing, heavy gardening, playing tennis, etc. (17).

Examples of Light Activity
Light housework (preparing food, dusting)
Walking at a slow pace
Examples of Moderate Activity
Brisk walking 5-6 km/h
Cycling 9-12 km/h
Slow jogging
Swimming
Tennis
Dancing
Heavy housework (vacuuming, hand washing the laundry, window cleaning)
Examples of Vigorous Activity
Walking with weights
Walking uphill
Running 7.5 km/h
Cycling 15 km/h
Climbing stairs
Running
Heavy gardening (hoeing, tilling, mowing, etc.)

Table 2. Examples of Activity

4.4.5. Evaluation of Aerobic Capacity

Cardiac risk factors, exercise-related symptoms, and physical limitations should be determined and, if necessary, an effort test should be performed (8). Maximal/submaximal oxygen consumption can be measured to evaluate aerobic capacity before exercise. In addition, the Borg scale for the measurement of perceived exercise intensity, 6 min. walking test and speaking test can be applied (8,27).

4.4.5.1. Exercise Tests

The cardiorespiratory exercise test is performed to determine the appropriate level of exercise as well as to identify deficiencies. Measuring

VO₂ max is the most precise and dependable method for determining condition and aerobic capacity. VO₂max is measured directly with oxygen consumption analyzers during submaximal or maximal exercise testing, which can be done with a bicycle, treadmill, or arm ergometer, or indirectly estimated from its close correlation with heart rate. In patients with chronic disease, the maximal exercise test with excessive load increase (e.g., Bruce protocol) may pose a risk. Submaximal exercise tests (Modified Bruce, Naughton, etc.) are preferred in this case because they cause less stress and have smaller workload increases while adequately stimulating the cardiorespiratory system. Instead of exercise tests to determine physical work capacity, indirect exercise intensity determination methods can be used that take into account Maximum Heart Rate percentage and resting heart rates, such as heart rate reserve, MET (Metabolic Equivalent of Task), and perceived intensity.

Maximum Heart Rate Percentage Method (%): To calculate your maximum heart rate, subtract your age from 220. To determine the “target heart rate range” to be maintained during exercise, multiply the resulting number by the upper and lower limits of the desired intensity percentage.

Karvonen’s Heart Rate Reserve (HRR) Method: Subtracting the resting heart rate from the maximum heart rate yields the reserve heart rate. The discovered value is multiplied by the desired functional capacity percentage. The desired target heart rate range in the exercise is found by adding the resting heart rate to the obtained values. Furthermore, the intensity of exercise can be determined by the person’s level of strain.

Level of Perceived Difficulty: The Borg Scale of Perceived Exertion (RPE) is a useful tool for assessing a person’s exercise tolerance. It can be used to track a person’s progress toward the maximal effort, particularly during exercise testing.

Speaking Test: It is an auxiliary method for determining exercise intensity. Moderate intensity is defined as the ability to speak but not sing during the exercise (28,29).

4.5. Exercise Prescription

Before developing an exercise plan, people should be educated on the benefits of physical activity. After that, goals should be established, and an individual exercise program should be developed considering their health status and functional capacity level. It is important to create a multi-component

program of various exercises for the elderly. Exercises can be incorporated into daily life or used as a program (22). The type, duration, intensity, and frequency of each exercise should be specified in the exercise prescription, and exercises should be started at low intensity and pace, and gradually increased. The elderly should engage in moderate to intense multi-component physical activities three or more days per week (30).

4.6. Exercise Choice

Endurance exercises, strengthening exercises to increase muscle strength and functionality, and stretching exercises should all be included in an elderly exercise program to improve their cardiopulmonary condition. Considering that high-intensity exercises can have detrimental effects on the immune system, low- or moderate-intensity exercise is recommended for older people (31).

4.6.1. Endurance Exercises

Endurance exercises help to improve cardiopulmonary function. Exercises can be started with 40-50% of the target heart rate for 10 minutes and gradually increased to 30-60 minutes. While exercising, appropriate rest intervals should be provided, and the goal should be to increase the heart rate up to 60%, depending on the patient's tolerance. To get the maximum benefit, a total of 150-300 minutes a week for moderate-intensity activities and a total of 75-150 minutes for high-intensity exercises are recommended. Walking, water exercises, and spinning are the most commonly recommended types of exercise (32).

4.6.2. Strength Exercises

ACSM (The American College of Sports Medicine) recommends the elderly exercise moderately at least 2 times a week for the large muscle groups, with an average of 8-10 exercises to be performed 8-12 repetitions in each set. The exercises can be applied for an average of 20-30 minutes by using weights, balls, elastic bandages, and the person's body weight. Warming up and cooling down before exercise helps reduce the risk of injury.

4.6.3. Flexibility Exercises

ACSM recommends that flexibility exercises be performed before or after aerobic and resistance exercises, at moderate intensity and at least two days a week (32).

4.6.4. Balance Exercises

Balance exercises help to strengthen the lower extremities while decreasing the risk of falling. Balance exercises should be included for 10-15 minutes 2-3 times per week in exercise programs. Balance training can be done with balance boards, Wii fit programs, and balance balls. However, exercises should begin with easy positions and the person should be supported if necessary, to reduce the risk of falling (32,33).

4.7. Things to Consider While Exercising

Table 3. Things to consider while exercising

Warm up before exercise and cool down after it.
Start with low intensity and increase the intensity according to your tolerance.
Choose the shoes and clothes to be used during the exercise correctly.
Set the exercise time correctly according to the weather, and do not exercise in very hot or very cold weather.
Pay attention to water consumption, and prevent dehydration.
Do not exercise right before or after meals, if possible, exercise 1 hour after meals.
Control your breath while exercising, do not hold your breath.

4.8. Barriers to Current Suggestions

Although physical activity is recommended for most or all days of the week for older adults, only 31% of people aged 65 to 74 and 20% of people aged 75 and over regularly engage in moderate activity for 20 minutes or more three days a week.

Physical-cognitive disorders in elderly individuals may not allow exercise at recommended levels. Therefore, using innovative and holistic approaches that support physical and cognitive functions will help facilitate their participation in exercise.

It is essential to combine motor and cognitive exercise when choosing exercises. Tai Chi and dance moves combine physical activity, sensory-motor interaction, and cognitive functioning in a social setting. Dance has been shown in studies to improve cognitive functions such as reaction time, working memory, and flexible attention, as well as lower body muscular endurance, strength, and balance in older adults. Another study showed that dancing cause positive effects on brain volumes in elderly (34). Furthermore, Tai Chi performance has been shown to enhance physical function and cognition in older adults.

Exercise games are a new complementary technique that has emerged for elderly exercise and rehabilitation. Exergaming combines motor and cognitive exercises with physically demanding video games (Nintendo Wii Fit, Xbox Kinect, and Dance Dance Revolution)

The Human-Computer-Interaction and game design communities offer useful research and development examples for older adults that incorporate effective exercises and education into an engaging and motivating multimedia design. It is also possible to use technology to support elderly people's healthy aging and their participation in daily life (35).

4.9. Relationship Between Exercise and Diseases in Elderly

It has been found that aerobic exercises reduce the physiological decline in cardiovascular performance and increase physical functions in elderly individuals. Resistance exercises have also been shown to be effective in increasing muscle mass and strength, especially in elderly individuals. In addition to these studies, it has been suggested in recent years that light or moderate physical activities such as regular gardening and cycling reduce cardiovascular risk.

According to the American College of Sports Medicine (ACSM) hypertension recommendations; It is recommended to perform moderate-intensity aerobic endurance exercises, preferably for at least 30 minutes every day, and to be supported with resistance exercises.

Regularized physical activity also plays an important role in reducing the complications that develop with obesity and the death rate associated with these complications. In individuals, glycogen stores are depleted with physical activity, fat oxidation increases, fat oxidation and fat intake balance is maintained, plasma insulin level decreases, the amount of leptin produced in the adipose tissue decreases, and the amount of corticotrope-releasing hormone produced in the hypothalamus increases.

Exercises have positive effects on acute and chronic insulin sensitivity and increase in GLUT 4 called "muscle glucose transporter protein", glycogen synthesis activity, capillary, mitochondrial enzyme activity, increasing mitochondrial density in skeletal muscles, endothelial function and muscle fiber types. Aerobic, endurance, passive and resistance exercises are the exercises that can be recommended for type 2 diabetic patients.

Regular physical activity, on the other hand, increases the strength of the diaphragm, reduces dyspnea, provides greater ventilation of the lungs and sputum mobility. This effect is thought to be due to increased lung movement (increased minute ventilation) and changes in the autonomic system.

Although the underlying mechanism of exercise's protection against cancer has not been fully elucidated yet, it has been reported that its possible beneficial effects may be through reduction of obesity and adipokine concentrations, lowering of insulin, glucose and sex hormone levels, antioxidant effect, reduction of inflammation and stimulation of the immune system.

Physical activity increases bone mineral density by stimulating bone formation with the mechanical strain applied to the skeleton. The transmission of the load to the skeleton with physical activity occurs by the direct effect of the bone from the body weight-bearing activity or by pulling or stretching the attached muscle. For this reason, exercises for muscle strengthening also strengthen bone tissue.

Possible mechanisms suggested for physical activity to reduce the risk of demans; vascularization, increase in neurotrophin levels, facilitation of synaptogenesis and decrease in obesity and inflammatory marker levels.

Exercise causes an anti-inflammatory impact by decreasing visceral fat mass, and also exerts an anti-inflammatory effect by causing the release of anti-inflammatory cytokines such as interleukin-1 and interleukin-10 (36).

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CHAPTER X

LIVER DAMAGE DUE TO CHEMICAL POISONING AND ANTIOXIDANT DEFENSE SYSTEM

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1. Introduction

The liver is a basic organ that is confronted with very common diseases in the world such as cirrhosis and cancer, which develop due to viral, toxic, metabolic, pharmacological agents, obesity and diabetes. CCl₄ and ethyl alcohol, which are effective in the formation of liver damage and are also used in clinical experimental studies, are the leading ones. It is known that these free radicals cause oxidative stress by increasing lipid peroxidation, causing the balance between existing antioxidants and oxidants to deteriorate in favor of oxidants.

With the understanding of the relationship between free radicals and diseases, an increase in the interest of the society towards free radicals has been observed. During normal metabolism, our body produces unstable molecules. The most common of these are free radicals. Atoms or molecules with unpaired electrons in their outermost orbital are called free radicals. These molecules with missing electrons are short-lived, unstable, low molecular weight and very active molecules (16, 33). Free radicals can originate from oxygen and nitrogen. Among them, reactive oxygen species include superoxide, hydroxyl, peroxy, lipid peroxy and alkoxy radicals. Reactive nitrogen species are nitric oxide

and nitrogen dioxide. Free radicals are produced by endogenous and exogenous sources. The most important production site endogenously is mitochondria. Exogenous sources are UV rays and various chemicals (14, 19).

In this study, the toxic effects of CCl_4 and ethyl alcohol, which cause oxidative stress, on the liver and antioxidant defense systems were tried to be revealed with the current supported literature.

2. FREE RADICAL

Electrons in the structure of the atom move in opposite directions relative to each other in regions called orbitals, and each orbital can have a maximum of two electrons. This movement of electrons is called spin and because of this movement they have a magnetic field. An electron pair with opposite spins in the same orbital has no magnetic field. However, molecules with unshared electrons can create a magnetic field. When electrons are in pairs in their orbitals, that compound has a more stable and stable structure. Molecules with missing electrons interact with any molecule and either gain or lose an electron from that molecule. A free radical is compound that carries an unshared electron in one orbital (20). Since free radicals are of low energy, a radical in this state steals electrons from the nearest atom or molecule and abducts energy from the cells. Thus, they cause oxidation in living organisms (35). Oxidative stress; It is defined as the onset of a toxic effect as a result of insufficient cellular antioxidant level against reactive oxygen levels. This is due to either insufficient antioxidant defenses, excessive production of reactive oxygen species, or both. These are defined as reactive nitrogen derivatives (RNT) and reactive oxygen derivatives (ROT). There is increasing evidence that uncontrolled RNT and ROT production can damage cells (13, 12, 28). Molecular oxygen tends to form highly reactive oxygen species (ROS) as a result of its biradical nature. Low levels of ROS reversibly cleave thiol groups of proteins can oxidize. When oxygen is used for energy production, it causes the formation of both reactive oxygen species and reactive nitrogen species, and free radicals are constantly produced by the mitochondria during the body's normal use of oxygen. ROS include superoxide (O_2^-), hydroxyl (OH), peroxyl (ROO.), lipid peroxyl (LOO.), and alkoxy (RO.) radicals. RNS forms nitric oxide (NO) and nitrogen dioxide (NO_2). Reactive oxygen species and RNS can easily convert to other nonradical reactive species. Hydrogen peroxide (H_2O_2), ozone (O_3), singlet oxygen ($^1\text{O}_2$), hypochlorous acid (HOCl),

nitric acid (HNO_2), peroxyxynitrite (ONOO^-), dinitrogen trioxide (N_2O_3) and lipid peroxide (LOOH), often called oxidants they are not shown as free radicals. These oxidant species are produced by living things under pathological and physiological conditions and can easily cause free radical reactions in living organisms (16, 21).

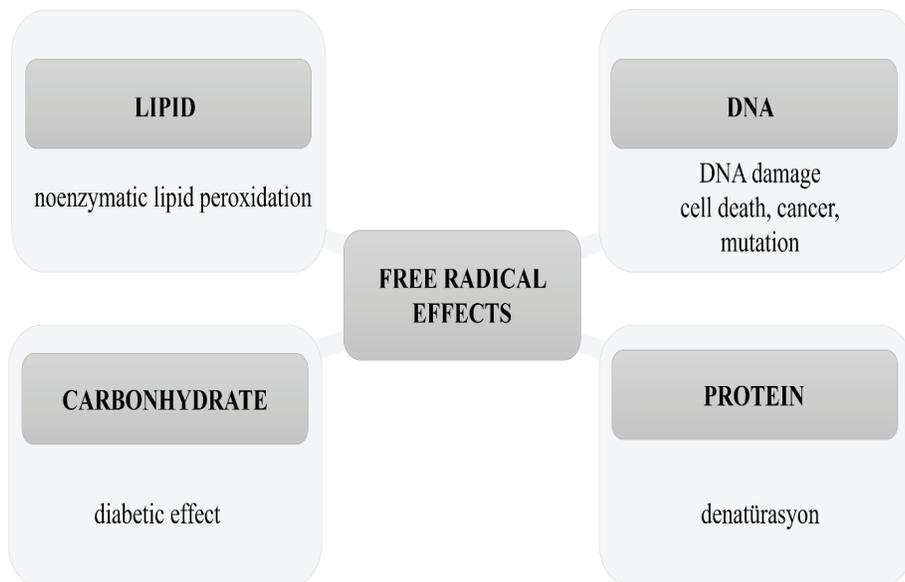


Figure: Free radical effects

3. Chemicals of Cause Tissue Damage

Electrons are detached from the elements on the surface of the cell membrane and free radicals are formed in the cells. These radicals create free radicals in every cell they touch, wherever they go. These, in turn, circulate rapidly throughout the body and damage the organs (26, 16). Many studies have proven that the toxicity mechanism of drugs, as well as some chemical compounds such as carbon tetrachloride and ethyl alcohol, can be attributed to oxidative stress in the liver.

Carbon tetrachloride (CCl_4): It is a toxic substance used in dry cleaning and is converted to trichloromethyl free radical ($\text{CCl}_3\cdot$) by cytochrome p450 in the liver. Trichloromethyl free radical interacts with molecular oxygen (O_2) to form peroxyxynitrite free radical ($\text{CCl}_3\text{O}_2\cdot$). This substance is absorbed through the respiratory, skin and gastrointestinal tract. Carbon tetrachloride and other liquid halogenated hydrocarbons have long been used as cleaners and degreasers

(detergents). They are also used in veterinary medicine in parasitic control against anthelmintics. Carbon tetra chloride (CCl_4) is a xenobiotic widely used in experimental liver injury and is metabolized by the mitochondrial monooxygenase (P450 2E1) system. During metabolism, firstly, the unstable initial metabolite trichloromethyl (CCl_3) free radical is formed, and then it rapidly transforms into trichloromethyl peroxide ($\text{Cl}_3 \text{COO}^-$) or chloroform form, which has lost hydrogen atoms, by forming covalent bonds with lipids and proteins (22,8). Then, structures such as conjugated diene, lipid hydroperoxide and malondialdehyde, which are formed secondary, are formed. Ethyl Alcohol ($\text{C}_2\text{H}_5\text{OH}$) Ethanol is a mixture of 95.57% alcohol and 4.43% water by weight. When alcohol is taken orally, absorption takes place both in the stomach and intestines. An insignificant part of alcohol is excreted unchanged from the lungs (2-3%) and kidneys (1-2%), while a significant part is metabolized in the body. Ethanol can also penetrate biological membranes, expanding them and increasing their fluidity. When the affected membranes are in an excitable state, this results in a modification of the action potential. Transport is impaired and neurotransmitter release is also affected. All of these suppress the cerebral function and, if they develop in sufficient weight, they can cause coma and death due to respiratory paralysis. In addition, NADH formed during the metabolism of ethanol competes with reducing equivalents from other substrates for the respiratory chain and prevents their oxidation. An increased NADH/NAD⁺ ratio may cause a left shift in the malate-oxalacetate balance, reducing the activity of the citric acid cycle. The net effect of inhibition of fatty acid oxidation is an increase in fatty acid esterification in triacylglycerol. This is shown to cause fatty liver. The accumulation of fat in the liver in alcoholism is called hyperlipidemia, and cirrhosis occurs with its progression. In some cases, as in induction with alcohol and acetone, cytochrome P450 is converted to an isoenzyme that produces excessive amounts of superoxide radicals ($\text{O}_2^{\cdot-}$). The toxin reduces antioxidant activity. For example, the metabolism of paracetamol by cytochrome P450 in the liver creates a product that reacts with glutathione, which has an important place in antioxidant activity, and ultimately reduces the amount of glutathione. Studies show that lipids in the membranes of intracellular organelles are extremely sensitive to free radical damage (12, 33, 18).

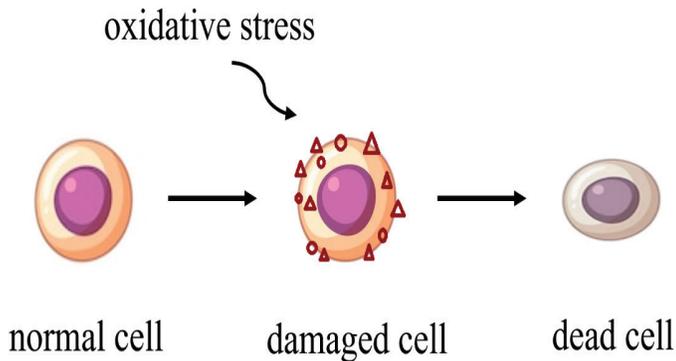


Figure: Effects of oxidative stress

When the living organism is exposed to high amounts of harmful components for a long time, lipid peroxidation, which is formed when free radicals react with lipids, can lead to highly harmful effects. High levels of ROS, on the other hand, attack the protein, lipid and DNA and damage the cell through protein oxidation, lipid peroxidation and DNA damage. Damaged DNA also causes mutations that will trigger the formation of cancer (30). At the same time, lipid peroxidation leads to the production of toxic by-products in large quantities, and these by-products act as second messengers and spread their effects in a region far from the area where they are produced. Therefore, damage from lipid peroxidation is extremely detrimental to the function of the cell (4). In particular, it has a significant effect on liver cells. It can damage the cell membrane by disrupting the fluidity and permeability of the liver cell membrane. Lipid peroxidation results in the removal of a hydrogen (H) atom from a methylene group (CH_2), resulting in the formation of an unpaired electron on the carbon atom ($\cdot\text{CH}$). The carbon radical thus formed is fixed to the conjugated diene by rearrangement of the molecules. The carbon radical fixed with the conjugated diene then reacts with the oxygen molecule to form the lipid peroxy radical ($\text{LOO}\cdot$). These radicals can react with other lipid molecules with further separation of hydrogen atoms. Thus, lipid hydroperoxides (LOOH) are formed and at the same time more lipid peroxides are produced (4,7,29).

4. Free Radicals And Liver Damage

The liver is one of the largest organs in the body, located in the abdominal cavity, below the diaphragm. Although it has many important functions, its

main tasks are; secretion, excretion, storage, phagocytosis, detoxification, conjugation, esterification, metabolism and hemopoiesis.

Liver damage is a condition that occurs as a result of a large amount of chemical substances entering the body by absorption. Toxic agents can destroy the membrane in a variety of ways, usually by direct contact with the membrane or by forming free radicals that cause peroxidation in membrane lipids. The absorption of chemicals into the body can be through the intestinal tract, lungs and skin.

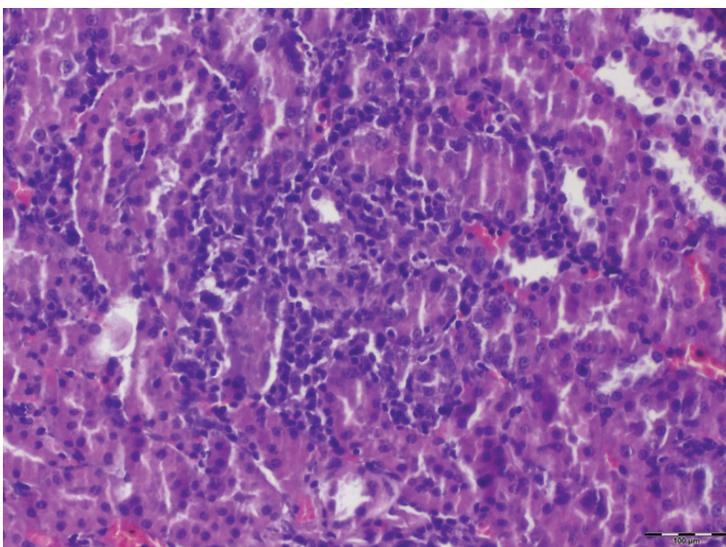
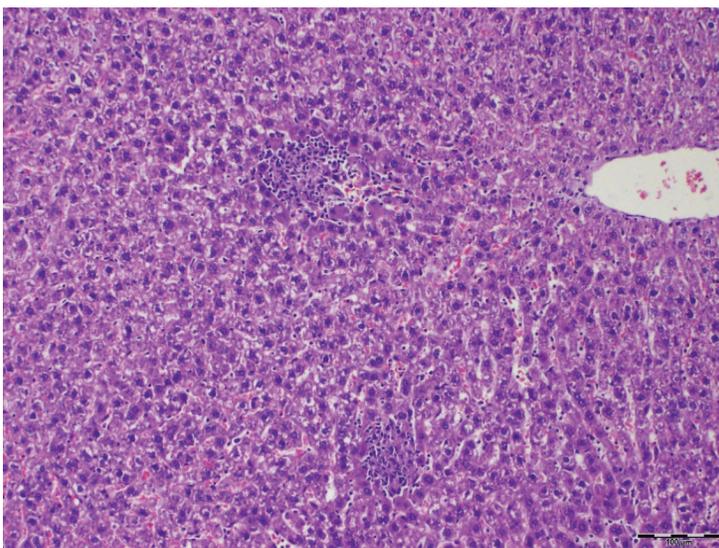


Figure: Liver cell damage

In addition, Kupffer cells stimulated by damage; They stimulate the production of proinflammatory cytokines, $\text{TNF-}\alpha$ and $\text{IL-1}\beta$. Therefore, inhibiting oxidative stress will have beneficial consequences (36) investigated the antioxidant activity of lycopene against the trichloromethyl peroxy radical ($\text{CCl}_3\text{O}_2\cdot$) formed in the presence of oxygen in the metabolism of CCl_4 , a xenobiotic that causes hepatotoxicity in humans and animals. In the study, it was observed that the color of lycopene was lightened where it was absorbed. This shows that lycopene reacts easily with $\text{CCl}_3\text{O}_2\cdot$ (8,12,32).

Alcoholic liver disease is a condition characterized by liver damage of varying severity due to long-term excessive alcohol consumption. Alcohol dehydrogenase (ADH), microsomal ethanol oxidizing system (MEOS) and catalase (CAT) that play a role in alcohol metabolism (37). ADH, a cytoplasmic enzyme, catalyzes the conversion of alcohol to acetaldehyde in liver hepatocytes and plays the most active role in the breakdown of alcohol (5). In this ADH-mediated oxidation, the redox potential of the cytosol is markedly increased by a marked increase in the NADH/NAD^+ ratio of the cytosol as NAD^+ is converted to its reduced form, NADH. The lactate/pyruvate ratio increases, causing lactic acidosis, which in turn causes hyperuricacidemia. Alcohol-induced ketosis and increased purine breakdown may also increase hyperuricemia. Another possible consequence of increased purine reduction is the production of ROS by xanthine oxidase (XO) (37,17,10) liver damage of varying severity due to long-term excessive alcohol consumption. Alcohol dehydrogenase (ADH), microsomal ethanol oxidizing system (MEOS) and catalase (CAT) that play a role in alcohol metabolism (37). ADH, a cytoplasmic enzyme, catalyzes the conversion of alcohol to acetaldehyde in liver hepatocytes and plays the most active role in the breakdown of alcohol (5). In this ADH-mediated oxidation, the redox potential of the cytosol is markedly increased by a marked increase in the NADH/NAD^+ ratio of the cytosol as NAD^+ is converted to its reduced form, NADH. The lactate/pyruvate ratio increases, causing lactic acidosis, which in turn causes hyperuricacidemia. Alcohol-induced ketosis and increased purine breakdown may also increase hyperuricemia. Another possible consequence of increased purine reduction is the production of ROS by xanthine oxidase (XO) (37,17).

An increased NADH/NAD^+ ratio causes increased lipogenesis and hypoglycemia. The activity of the citric acid cycle is reduced. Depending on the decrease in fatty acid oxidation, triglyceride synthesis increases. In this case, fatty liver occurs (25). While degeneration occurs in the liver for various reasons, regeneration also occurs. However, if the damage to the organ is continuous and repeated, connective tissue increase occurs at a higher rate than

cell renewal. Hepatic fibrosis is a progressive pathological condition involving numerous cellular and molecular processes. Viral hepatitis, alcohol use, drugs and metabolic diseases create chronic damage and cause liver fibrosis. If the damage cannot be answered with regeneration and repair, the normal structure of the liver is disrupted. Collagen and extracellular matrix proteins begin to accumulate in the disse space (the distance between endothelial cells and hepatocytes). This increase in connective tissue results in a disorder in the liver structure and is called cirrhosis (2). Because alcohol-induced oxidative stress is much more effective in the liver, because the liver is the main site of alcohol metabolism.

5. Antioxidants

Antioxidants is disrupted in favor of either one rather than the presence of radicals very sensitive equipment that the organism acquires from birth, it manages to keep free radical biochemical products, which are the natural result of physiological activity, in a line that can be defined as oxidant-antioxidant balance. The dangerous situation is that this balance between oxidants (1,12).

There are protective mechanisms in the organism against the harmful effects of free radicals. Some of these mechanisms prevent the formation of free radicals, and some prevent the harmful effects of formed free radicals. All of the substances that perform these functions are collectively called antioxidants (15). Antioxidants can be classified as intracellular and extracellular according to their cellular localization. According to their functions, they are examined in two categories as antioxidants that prevent radical formation (metal chelators, SOD, catalase, glutathione peroxidase) and prevent the effects of formed radicals in tissue (vitamin E, ubiquinone, retinoic acid, β -carotene, glutathione, urate).

Enzymatic Antioxidants	Nonenzymatic Antioxidants
Superoxide dismutase(SOD)	Melatonin.
Glutathione peroxidase (GSH-Px)	Ceruloplasmin.
Glutathione S-Transferases(GST)	Transferrin.
Catalase(CAT)	Myoglobini, Hemoglobin, Ferritin
Mitochondrial cytochrome oxidase system	Bilirubin
Hydroperoxidase	Glutathione
	Cysteine, Methionine
	Urate
	Albumin

Figure: Enzymatic and Nonenzymatic Antioxidants

Antioxidant defense; It affects in different ways such as prevention of radical metabolite production, scavenging of produced radicals, repair of cell damage, stopping of secondary radical producing chain reactions and increasing endogenous antioxidant capacity. The organism has to maintain cellular homeostasis against changing conditions. In this way, an antioxidant defense system is created against free radicals and lipid peroxidation, and cellular balance is tried to be maintained. Glutathione is a powerful antioxidant that acts to remove these products, which are harmful for metabolism, by reacting easily with the products formed due to free radical increase and lipid peroxidation (31). However, a severe oxidative stress state that develops due to the oxidation of GSH to GSSG and loss of adaptation mechanism may suppress the GSH level. Accordingly, CCl_4 applied increases the production of free radicals and it is thought that GSHs in the environment are used to neutralize these radicals. The increase in MDA, which is the product of lipid peroxidation, also supports this idea. SOD plays a major role in intracellular defense against oxygen radical damage in aerobic cells. The distribution of the SOD enzyme in living things should be examined together with catalase. Because the product formed at the end of the reaction catalyzed by SOD is one of the toxic types of oxygen and its accumulation is prevented by catalase. Superoxide radical also inhibits the enzyme catalase (27). GPx catalyzes the reduction of hydrogen peroxide and lipid peroxides. It is considered an enzyme that provides effective protection against lipid peroxidation. Glutathione peroxidase activity, which is one of the cellular defense elements, increased in the first stage in order to neutralize these harmful effects (24). Catalase, like glutathione peroxidase, plays a role in removing hydrogen peroxide from the environment. Catalase is involved in the breakdown of H_2O_2 at high concentrations, while glutathione peroxidase is involved in the breakdown of H_2O_2 at low concentrations (23).

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CHAPTER XI

METHODS USED IN EVALUATION OF SPERM DAMAGE

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1. Introduction

In vivo and in vitro studies have proven the importance of DNA damage in spermatozoa. Increasing the rate of DNA damaged sperm reduces the chances of conceiving naturally. There are studies claiming that spermatozoa taken from the ejaculate containing highly damaged sperm cause problems in IUI, IVF and ICSI. Researchers seeking answers to this issue focused on explaining the source of DNA fragmentation. Emerging data suggest that degradation may occur as a result of oxidative stress or the apoptotic pathway during the maturation process (1,3).

Sperm capable of healthy fertilization; It should have an intact plasma membrane, achromosomal structure, a functional mitochondria, and an intact genome (2,10)

Increased DNA damage in spermatozoa increases both natural pregnancy and early pregnancy loss after IVF or ICSI.

DNA damaged spermatozoon; It can be repaired, if it exceeds its repair capacity, it can continue to reproduce as damaged, spermatogenesis may pause at some level (maturation pause) or the cell dies. Many studies have been conducted on sperm DNA damage in male infertility. Sperm DNA damage is caused by pathological conditions, genetic factors, environmental factors or a combination of both genetic and environmental factors during the maturation process (1,3,6)

2. DNA Damage

Genetic events at the molecular level; based on the structure and properties of nucleic acids that act as genetic material. The two types of nucleic acids, DNA and RNA, basically share the same structural features. DNA is not only a macromolecule that carries genetic information, it is also responsible for transferring this information to protein synthesis. DNA is an easily damaged molecule and is constantly being damaged. DNA damage can occur as a result of spontaneous changes or environmental factors. Damage; Although repaired by DNA repair systems, DNA damage causes mutations or cell death if the damage is too extensive or if the repair systems are insufficient (3,6)

On the causes of DNA damage caused by spontaneous changes; Changes in the chemical structure of purine and pyrimidine bases as a result of base mismatch, ketoenol tautomerism and deamination during DNA synthesis, loss of hydrolytic bases due to thermal stability of purine and pyrimidine bases in the DNA structure, DNA damage caused by free radicals formed as a by-product of cell metabolism have an important place. and environmental damages are divided into two groups as physical and chemical damages. Ultraviolet and X-rays have an important place among the physical factors that disrupt DNA integrity and cause various DNA damages. Chemical agents that cause DNA damage include chemicals that can be metabolized to electrophilic reactants such as xenobiotics and alkylating agents, photoactivated psoralens, which are the largest group of environmental mutagens and carcinogens and are found in a variety of foods, antitumor drugs and tobacco (3)

The cell responds to DNA damage through various metabolic pathways. Severe DNA damage activates the cellular apoptotic pathway and leads to cell death. Failure to repair DNA damage during replication can lead to mutations and eventually genomic instability (10)

3. Spermatozoon DNA Damage

Sperm DNA is 6 times denser and 40 times smaller than somatic cell DNA. This dense structure and specific shape of DNA is provided by disulfide bonds between DNA and protamines. In addition to this protective form of sperm DNA, semen containing spermatozoa is high in antioxidants. It is also known that spermatozoa have endonuclease activity that can repair DNA damage. In addition, insufficient or defective DNA repair of damaged spermatozoa can lead to the development of new genetic mutations. Although the cause of sperm DNA

damage cannot be fully explained, spermatozoon DNA damage can occur due to many reasons. DNA damaged sperm can eventually be repaired, or if it exceeds its repair capacity, it can reproduce as damaged and spermatogenesis may stop at some level (maturation pause) or die (3)

Inflammation, apoptosis, and oxidants prevent the condensation of chromatin in ROS spermatozoa. If sufficient condensation does not develop in the chromatin, sperm DNA becomes more prone to breakage. Superoxide anions and reactive oxygen species such as hydrogen peroxide are the most effective factors that damage spermatozoa DNA. Although the sperm get most of the energy required for metabolic activity from glycolysis, for their high aerobic activity they benefit from the ROS involved in the fertilization event. ROS is highly reactive; The presence of one or more unpaired electrons in their orbitals enables them to form covalent bonds with other molecules. In a study by Aitken et al. in humans, they reported an inverse relationship between ROS and sperm count, and between forward motility of spermatozoa and ROS levels. Again, ROS-induced DNA damage accelerates cell apoptosis and fertility is adversely affected due to decreased spermatozoa count.(3,6)

Programmed cell death, DNA fragmentation and apoptosis play an important role in the normal functioning of all body tissues. Apoptosis can occur naturally for the healthy functioning of organs or can be stimulated by factors such as hormonal factors, ROS, and environmental toxins. The same is true for spermatozoa, and most of the factors known to cause infertility induce apoptosis through certain mechanisms. Short and long-term storage of semen, which plays an important role in artificial insemination, can lead to DNA damage and thus to embryo malformations and infertility. Since sperm DNA damage can be an important factor in infertility, it is important to know the proportion of spermatozoa with DNA damage in order to evaluate the possibility of fertilization and to determine the risks to which the embryo may be exposed (1).

Factors Causing Sperm DNA Damage

Spermatozoon DNA damage: disruption of chromatin structure, oxidation of DNA bases, incompatibility and suppression of tubulin polymerization, chemical changes in bases, abnormalities in chromatin structure, DNA chain breaks, DNA-DNA and DNA-protein transitions, mutations in DNA, structural distortions are counted (3).

Internal Factors

- Protamine deficiency or mutation (Compact DNA structure breaks)
- Defects in DNA packaging
- Advanced male age; Narendra et al. (2003), spermatozoon DNA damage increases with age, and report that they have become difficult to eliminate these damaged cells.

- Spermatozolar 75% completes complex series of events happen during the process of apoptosis. Spontaneous apoptosis of germinal cells and studies of an enlarged prostate defektif aimed at the destruction that occurs in this process, the male germinal cells of 75% of the result it has been reported that the two are exposed to

- If it is escaping through the process of apoptosis (apoptosis abortif) DNA damage is likely to (3,2,7)

External Factors

- ROS; The cryopreservation of Stallion semen in the semen of reactive oxygen species and DNA damage in a study about the effect on hydrogen peroxide plays a role in the damage of that, however, did not have any impact superoxide dismutaz mentioned that. In addition, in this study, the antioxidant alpha-tocopherol(0.1 mm) have seen a decrease in DNA damage following cryopreservation using.

- Temperature

- Ionizing radiation; the effect of IR on DNA, there may be both direct and indirect ways. Direct effect of the radiation energy of the roots from direct interaction with DNA, while the indirect effect is due to the interaction of DNA molecules with the energy stimulated with irradiation. As a result, the base damage and chain fracture occurs (7).

- Gonadatoksik agents

- Smoking

- Varicocele

- Hormone deficiencies; in one study, testosterone, spermatogenesis during DNA breakage and DNA topoisomerase II is an enzyme that makes the task of connecting, which plays a role in the regulation of expression it has been shown that positive (7).

Production of sperm cells and spermatozoa DNA damage during the transport mechanisms;

I. In the process of apoptosis Spermatogenes

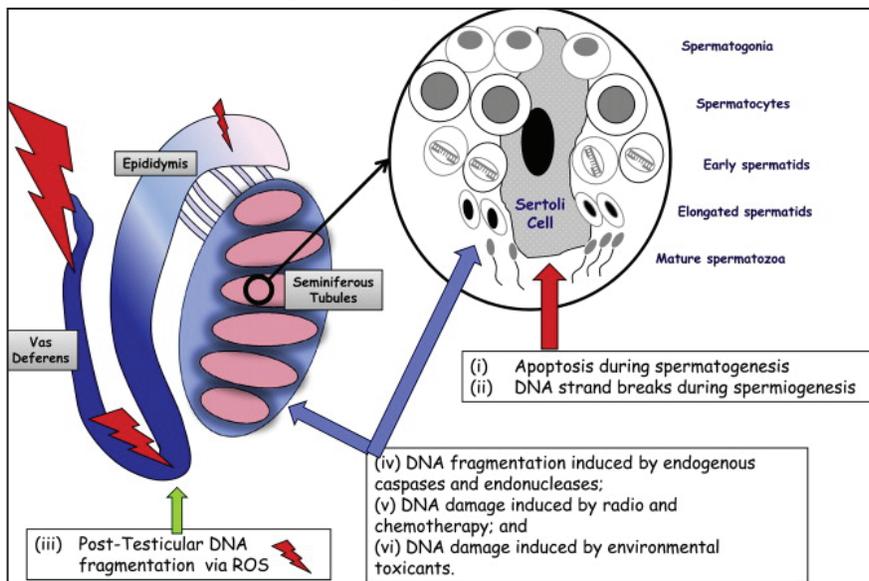
II. The process that occurs in DNA fragments Spermiyogenes

III. From the seminiferous tubules, sperm transport through DNA damage caused by oxygen radicals epididymis

IV. Radiation therapy, chemotherapy, DNA damage that occurs as a result of the toxic effects of environmental

V. DNA damage that occurs due to environmental factors

Figure 1. Sperm DNA damage



Reactive Oxygen Species (ROS)

A free radical is defined as an atom or molecule with one or more unpaired electrons. ROS are a class of free radicals with highly reactive oxygenated agents. Oxidation reactions occur by the transfer of single electrons to molecular oxygen by enzymes containing transition metals (eg Fe^{2+} and Cu^{+}) in the organism. As a result, NADH and NADPH lead to the formation of reactive oxygen intermediates from oxygen. These compounds are constantly formed as by-products of aerobic metabolism, reactions with drugs and environmental toxins. They are highly reactive and cause major chemical changes in DNA, proteins and unsaturated fats (3,11).

Physiological Role of Free Oxygen Radicals

ROS was previously thought to be toxic to human spermatozoa, but there is strong evidence that low levels of ROS are necessary for sperm's ability to fertilize. Studies have shown that low ROS values are essential for fertilization, acrosomal response, hyperactivation, movement, and capacitation (2).

Superoxide (O_2^-) and hydrogen peroxide (H_2O_2) are highly reactive oxygen metabolites that interact with neighboring molecules and initiate oxidative stress in cell organelles. Soaking spermatozoa in a small amount of hydrogen peroxide; It initiates sperm capacitation, hyperactivation, acrosomal response and oocyte fusion. Superoxide anion also increases capacitation and acrosomal response. In addition, SOR is involved in the interaction between spermatozoa and oocytes (2).

Sources of Free Oxygen Radicals

Free Oxygen Radicals; It shows a wide distribution including radical (hydroxyl ion, superoxide, NO, peroxy) and non-radical (ozone, singlet oxygen, lipid peroxide, hydrogen peroxide) molecules. Reactive nitrogen metabolites (nitrous oxide, peroxynitrite, nitroxyl ion) are free nitrogen metabolites and are considered a subclass of ROS. The harmful effects of NO on normal sperm have been shown to inhibit both motility and zona fusion. Each ejaculate is assumed to be contaminated with ROS (3).

Semen contains different cells such as spermatozoa, white blood cells and epithelium. Among these cells, the main sources of ROS are spermatozoa and leukocytes. Cytoplasmic droplets indicate an association between poor sperm quality and increased ROS. These structures, the result of abnormal spermiogenesis, represent the main source of ROS. The increased production of ROS and cytoplasmic residues is probably directly proportional to the cytosolic enzyme, glucose-6-phosphate dehydrogenase (3).

Source of ROS in Human Semen

The source of ROS in semen is leukocytes and spermatozoa(3,10)

Leukocyte

It is considered an indicator of ongoing infection in the male reproductive system. It occurs in 10-20% of all infertile men. The epididymis and prostate are the source of leukocytes in semen. Leukocytes can be found in the semen of

both normal and infertile men. Neutrophils with polymorphous nuclei constitute 60-70%. While fighting microorganisms, they release superoxide anions ($O_2^{\bullet-}$) into the environment. It reacts with ROS and ions or by dismutation to form other toxic substances such as hydrogen peroxide (H_2O_2), hydroxyl radical (OH^{\bullet}) or hypochlorite (10,11).

Leukocytes can produce 100 times more ROS than spermatozoa. Production of free oxygen radicals is significantly higher in leukocytospermic (semen leukocyte contamination) samples. DNA damage in leukocytospermic individuals can be noted significantly by comparing values between healthy donors and non-leukocyte. When the leukocyte life in the semen exceeds 3 million/ml, a significant decrease in fertilization is observed. It has been suggested that the adverse effects are mediated by leukocyte extrinsic factors such as ROS, proteases and cytokines (10,3)

Spermatozoon

Another source of ROS is the spermatozoa themselves. Human sperm are capable of producing a small proportion of endogenous ROS in a controlled manner (2,3). Essentially, it produces small amounts of superoxide anions and hydrogen peroxide, which are used in the signal transduction mechanism for spermatozoon capacitation. It has been shown that the fertilization ability of spermatozoa can be stimulated by capacitation, hyperactivation, acrosome reaction and oocyte fusion ability of spermatozoa incubated with low concentration of H_2O_2 . Early stage spermatocytes, round and elongated spermatids all produce equal amounts of ROS (10).

Immature spermatozoa in the epididymis produce more ROS than these. Sperm with impaired maturation cannot expel excess cytoplasm in the final stage of spermiogenesis. As a result, sperm produce more ROS than normal, giving signs of oxidative stress. In semen with high ROS levels, glucose-6-phosphate dehydrogenase activity is also increased. In semen samples with high cytoplasmic residue, this enzyme is elevatedolan (2,10).

Antioxidants

There are many defense mechanisms to prevent the formation of ROS and the damage they cause. These mechanisms are known as “antioxidant defense systems” or “antioxidants” for short. Antioxidant defense mechanisms are both intracellular (superoxide dismutase, catalase, glutathione, peroxidase,

ferritin) and extracellular (transferrin, lactoferrin, seroloptasmin, haemopexin, haptoglobin and albumin). Some free radicals are capable of getting rid of these antioxidants and causing damage (2,8).

Apoptosis

Cell migration, which is as important as cell division in the organism, is maintained by the control of cell number, tissue size, homeostasis, and regulation (or programming) of cell death. In multicellular organisms, elimination of developmentally unwanted cells occurs by cell death. Apoptosis and mitosis provide balance in the tissue. Cell proliferation in any tissue is determined by mitosis, and the number of cells in that tissue is determined by apoptosis. The plasma membrane is not ruptured by apoptosis. High levels of ATP are required for apoptosis. The amount of intracellular media of ATP drives the cell to die via apoptosis. This demonstrates the importance of mitochondria in the initial stage of apoptosis. During apoptosis, many substances such as cytochrome c are released from the mitochondria into the cytoplasm (8).

Spermatogenesis and Apoptosis

During normal spermatogenesis, along with cell development and differentiation, germ cell death is also seen, and this plays a very important role in spermatozoon formation. This reduces the potential sperm count by an estimated 75%. Testicular germ apoptosis occurs physiologically and continuously throughout life. Apoptosis has two important roles in the spermatogenesis process. The first is to limit the number of germ cell populations that can be supported by Sertoli cells, and the second is to selectively reduce the abnormal spermatozoon (8).

After studies revealed the presence of apoptosis in human spermatozoa, the presence of apoptosis in mature spermatozoa in the ejaculate was demonstrated by many researchers. These researchers believe that by activating endogenous endonucleases that cause DNA damage in body cells, they eliminate defective germ cells in the breeding pool. In 1999 Sakkas defined apoptosis as “abortive apoptosis” due to the lack of apoptotic elimination in ejaculated spermatozoon and suggested that these cells somehow escaped apoptosis. In one study, apoptosis was hypothesized to be the last step in the face of DNA damage to prevent the transfer of incorrect genetic information to the embryo and reduce DNA repair potential (8)

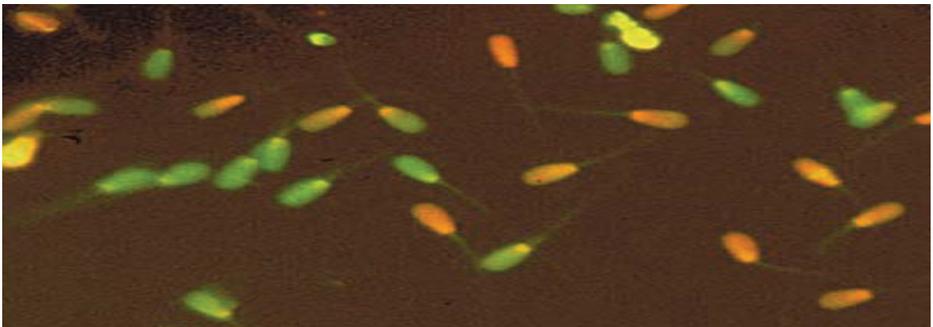
4. Methods For Determining Spermatozoon DNA Damage

Determination of Sperm Chromatin (Sperm Chromatin Structure Assay) (SCSA)

This test is based on the principle that DNA with abnormal chromatin structure is more prone to acid or heat denaturation. The SCSA test measures the susceptibility of sperm DNA to acid-induced denaturation using the color-changing property of acridine. The change of acridine orange from green to red after acid addition is determined by flow cytometry and the degree of DNA denaturation is determined. The parameter measured by the SCSA test is the DNA fragmentation index (DFI), which indicates DNA denaturation. In addition, it has been shown that the probability of pregnancy is zero at thresholds of ≥ 30 or >40 DFI in the SCSA test. In a recent meta-analysis, couples with a DFI of <30 and no known fertility problems are 7 times more likely to conceive/give birth with in vivo fertilization. Although there is general agreement that increased DFI rates are associated with lower pregnancy rates, high DFI % rates do not make pregnancy entirely impossible (4).

After DNA treatment with heat or acid, acridine orange is a metachromatic dye, and double-stranded DNA single-stranded DNAs give a red fluorescent color at ≥ 630 nm. Double-stranded DNA produces green fluorescent color at 515-530 nm, the rate is measured. (4,2). An increase in the ratio of double-stranded DNA to single-stranded DNA indicates more fragile and more denaturation of the chromatin structure (4,2).

Figure 2. Determination of Sperm Chromatin Structure

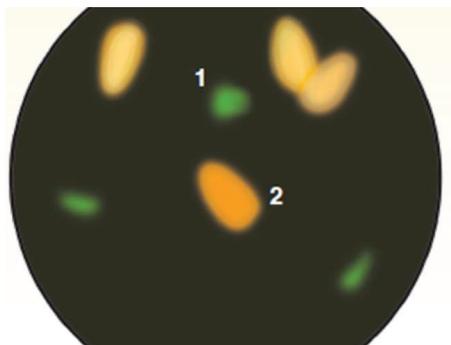


Acridine Orange Test (AOT)

Orange Akridine test is a diagnostic technique that is used in the detection of sperm with damaged DNA. Susceptibility to acid denaturation of nuclear DNA by the addition of the Spermatozoon is based on the measurement. AO

metachromatic dye, double-stranded or single-stranded DNA binds to when emissions are different (4,12).

However, the colors blurred, rapid discoloration and staining with the naked eye are heterogeneous inability to interpret the negative aspects of this test. single-stranded DNA fluorescence at 630 Nm red gives a double-stranded DNA fluorescence green at 515-530 Nm gives (4,12).

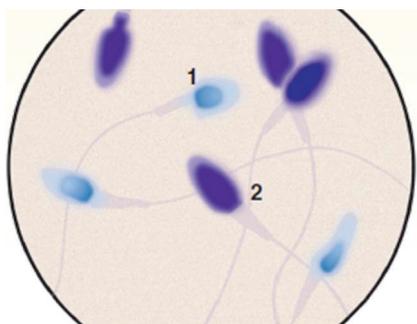


1. Sperm with normal DNA
2. Sperm with denatured DNA

Figure 3. Akridin Turuncu Testi

Toluidine Blue (TB) Test

TB is the basic stain used to assess sperm chromatin integrity. Phosphate residues of sperm DNA with poorly packed chromatin and/or damaged DNA are more prone to bind to base dyes such as TB. For this reason, normal sperm will remain colorless, while damaged sperm will be stained blue under the light microscope. The test is based on this principle (5).



1. Normal sperm
2. Damaged sperm

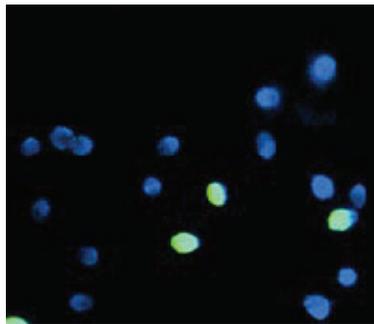
Figure 4. Toludine Blue Test

Aniline Blue Test

It is a dye used to distinguish between histones rich in lysine and protamines rich in arginine/cysteine. The lysine-rich histone-bearing nuclei of immature spermatozoa turn blue as a result. The arginine-cysteine-rich protamine core of mature spermatozoa will not be stained with aniline blue as it contains very low lysine (5,12).

TUNEL (TdT-mediated-dUTP nick end labeling) Test

This test is used to detect direct DNA breaks. Damaged sperm are known to be indicative of apoptosis. It is used to determine the sperm population in semen believed to be apoptotic. The TUNEL technique was first used by Gorczyca et al(1993). In this method, TdT enzyme, which catalyzes the reaction of the 3'-OH end of DNA breaks, is marked by binding and biotinylated by binding dUTP to this part (single and double DNA strand breaks). Biotinylated DNA combines with streptavidin to form a water-insoluble colored product (Agarwal and Said, 2003). In general, although the flow cytometric method is more sensitive and reliable, it is complex and expensive. Fluorescent TUNEL also correlates very well with control parameters (1,4,5).



blue sperm: TUNEL negative,
green sperm: TUNEL positive

Figure 5. TUNEL Test

In Situ Nick Translation Assay (NT) Test

NT detects only single-stranded DNA breaks. It has a similar mechanism to the TUNEL test, based on the association of dUTP (deoxyuridine triphosphate) with DNA breaks. NT method; It shows the anomalies that occur during the remodeling of nuclear DNA in spermatozoa (11).

Single Cell Gel Electrophoresis (COMET)

Single cell gel electrophoresis is another test that directly evaluates sperm DNA damage. Dedensed sperm are placed on an agarose gel and exposed to an electrophoretic gradient with an added fluorescent DNA-binding dye. They are then displayed. The low molecular weight, single- and double-stranded DNA fragments move during electrophoresis and form the typical comet image. High molecular weight, intact DNA segments do not move. Increased tail length and fluorescence intensity in sperm with excess DNA breaks are evaluated in imaging. ‘Comet Assay’ is a frequently preferred method for DNA damage measurement because it is simple, fast, sensitive, applicable for different cell types and DNA damage types, and most importantly, it does not require radioactive labeling (13).

Sperm placed on an agarose gel are visualized by exposure to an electrophoretic gradient with a fluorescent DNA-binding dye added. Damaged DNA moves, while intact DNA remains motionless (13).

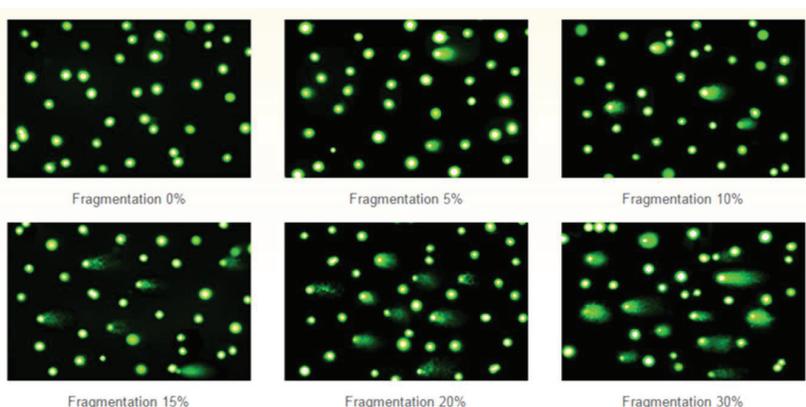


Figure 6. Single Cell Gel Electrophoresis

Sperm Chromatin Dispersion Test (Halosperm Test) (SCD)

SCD test principle; When spermatozoa are treated with acid solution prior to lysis solution, DNA dispersion halos (in fragmented DNA spermatozoa these halos are absent or minimal) occur after nuclear protein removal in spermatozoa with non-fragmented DNA. The presence of DNA breaks is promoted by halo expansion of the nucleoid. Its biggest advantage is its use without the need for fluorescent intensity. It is simple, short-lived and comparable to SCSA (sperm chromatin structure analysis). Sperm can be stained with Wright's dye for

viewing under a direct light microscope or with a fluorescent dye for viewing under a fluorescent microscope (4).

Sperm with normal DNA release their DNA to form large halos. Sperm that give very little or no halo are those that contain fragmented DNA.

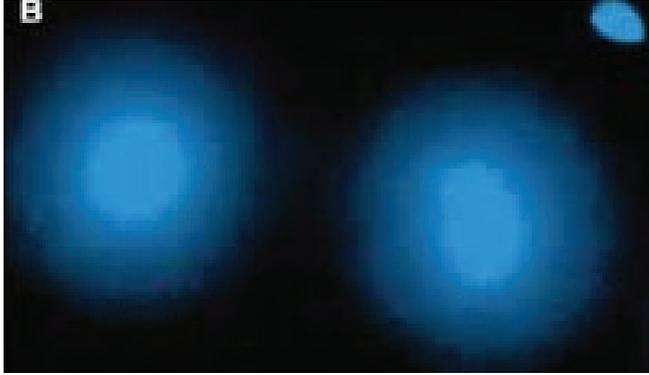


Figure 7. Sperm Chromatin Separation Test

High Performance Liquid Chromatography Method

It is a method based on measuring the level of 8-OHdG (8-hydroxydeoxy guanosine), a by-product of oxidative DNA damage in spermatozoa. This is the most widely studied biomarker of oxidative DNA damage. Among the various oxidative DNA adducts, 8-OHdG is preferred for its high specificity, mutagenic potential, and relative abundance in DNA in demonstrating oxidative DNA damage (7).

Chromomycin A3 (CMA3) Test

It is a guanine-cytosine specific dye that is used to indirectly visualize protamine-deficient DNA in poorly packed chromatin in spermatozoa. CMA3 and protamines bind to the same place in DNA. Therefore, high CMA3 fluorescence is a sign of low protamination of spermatozoa. The CMA3 method correlates strongly with other methods in the evaluation of sperm chromatin(12).

Fluorescent in situ Hybridization (FISH) (Detection of Sperm Aneuploidy)

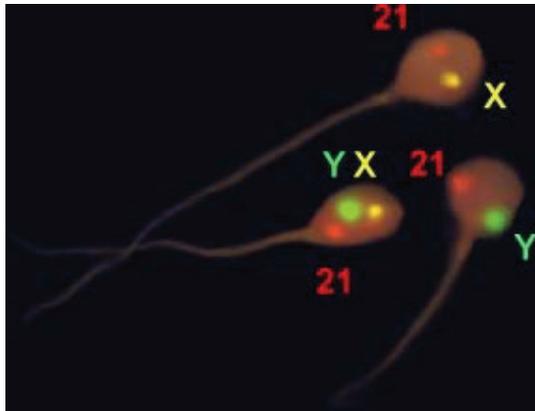
Sperm DNA damage in the genome outside of kromozom other abnormalities that can be seen in the number of changes. That should be the genome of Haploid sperm, abnormal cases

May have one or more extra or missing chromosomes of the Sperm (aneuploid),

Sets may have an extra chromosome (diploid).

In order to identify situations like this, the process of sperm fish (review with fluorescent dyes) is applied.

Fluorescence in situ hybridization to detect chromosomal abnormalities in multiple microdeletion that is used as a method. Cells with a matrix of agarose on a slide was buried in an alkaline solvent (denatured) decomposes in solution. the chain can be broken ssDNA DNA motifs. Neutralized and the protein is removed, and the ssDNA, or to the whole genome with DNA probes specific hibritlener fluorescent intensity are examined. Spermatozoon should reveal the structural properties of chromatin, although expensive, time-consuming and clinical is less than the value (14).



XY sex chromosome aneuploidy two and one healthy sperm

Figure 3.7. Determination Of Sperm Aneuploidy

Fluorescent Paints

Hoechst dye: with ultraviolet light blue/cyan emit fluorescent light in color, is used in live and fixed cells. Because the more lipophilic ethyl additional DAPI according to grubunden it is because it is easier to interact with the cell membrane. are mutagenic and kansorejenik

DAPI “4,6-diamid-2’-phenylindole”(kernel paints)

Dead Cells, Propidium iodide paint is paint. the permeability of the plasma membrane is measured to assess the integrity of the membrane that is used probtur. The damaged plasma membrane to the nucleus red paint

Orange ethidium bromide gives light when exposed to ultraviolet light. double-stranded nucleic acids used in the determination of FITC; FITC-PSA with the combination of intact/damaged acrosome, the distinction is made, and FITC-you're annex-V binding to phosphatidylserine on the cell surface of apoptotic cell becomes visible with the plot (15).

Results

As mentioned above, there are many tests available that measures the integrity of DNA. In this test, although the mechanisms that are used to measure sperm DNA integrity vary, are generally correlated with each other. The comet test SCSA, TUNEL, SCD, and TB test have shown statistically significant positive correlation. AOT tunnel testing of TB and with strong positive correlation is also shown. SCSA, TUNEL, and SCD test demonstrates that the levels of DNA fragmentation predicts similar. However, recently exhibited in the determination of sperm DNA fragmentation test and the AOT SCSA test has been shown to exhibit a significant correlation with high variation. Sperm concentration, motility and morphology of the comet, such as the standard semen parameters, DNA fragmentation as measured by the SCSA tunnel or shows a negative correlation with the level of tests. In addition, the degree of correlation between the tests although variable, all tests are abnormal semen parameters of patients with high DNA damage that reveals. These tests in the same patient is an important parameter in the evaluation of repeatability and the reliability of the test. Standard semen parameters in the same individual may vary over time. In spite of this, the tunnel and the measurement of sperm DNA damage SCSA test time-dependent stability demonstrates.

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