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Characteristic Clinical and Laboratory Features of the Course of Mycotic Lesions of the Visual Organ

Abstract

In the article, brief information on the characteristic clinical and laboratory features of the course of mycotic lesions of the visual organ. The population of Baku is characterized by a worldwide trend − an increase with a very strong positive correlation connection (γ=+0,88 ± 0,10) as the age of the examined frequency of infection of their eye organs is increased by pathogenic fungi−from 8,9 ± 2,5 % to 32,6 ± 4,0 % of cases (χ^2=51,88; p<0,001). For the first time detected patients with my were registered 91 people (67,4 ± 4,0 %), with repeated recurrent diseases − 44 people (32,6 ± 4,0 %). The algorithm for diagnosis of patients with eye mycosis should include the evaluation of lipid peroxidation and antioxidant protection systems to correctly assess compensatory capabilities of the body in order to choose the method of correcting metabolic disorders. It is recommended to include the most informative indicators characterizing the state of cellular immunity and phagocytic activity neutrophils.

Keywords: *mycotic infections, eye mycoses, polymerase chain reaction, diagnostics, etiological structure, fungal keratitis*

Introduction

Mycotic infections (MI) are still a pressing health problem. Even fifty years ago, ophthalmicosis were relatively rare (Niculae, 2024, p. 30). In the ophthalmological special literature, only isolated cases were described, when fungal etiology of the disease was established by cultural methods or simply the presence of the disease was assumed (Cintra, 2023, p. 74; Arboleda, 2024, p. 1065). Mycotic keratitis, commonly known as fungal keratitis, is about 1-44 % of all cases of microbial keratitis, depending on the geographical location (Phongkhun, 2023, p. 1738; Soleimani, 2023, p. 222). In general, it is more common in tropical and subtropical regions (Dong, 2023, p. 691). The delivery, which usually causes corneal infection, includes *Fusarium, Aspergillus, Curvularia, Bipolaris* and *Candida* (Cabrera-Aguas, 2022, p. 543; Breazzano, 2022, p. 73). Most of these species are saprophytes (Herwig-Carl, 2022, p. 867). Rare fungal pathogens include *Fonsecaea pedrosoi, Lasiodiplodia theobromae, Cylindrocarpon species, Scedosporium prolificans, Metarhizium anisopliae, Paecilomyces species* and *Pythium insidiosum*. Most currently available antifungal drugs have limitations such as low bioavailability and limited eye penetration, especially in cases of deep lesions Some of the changes in endemic fungal infections can be attributed to climate change, expansion of human habitat, ease of movement and population displacement (Chiou, 2022, p. 55). Risk groups for opportunistic fungal infections or common endemic fungal infections include patients who have received transplants, prescribed immuno-depressants and chemotherapy agents, HIV-infected patients, premature infants, the elderly, and patients who have undergone major surgery (Karaca, 2022, p. 91). Although the epidemiology of fungal diseases has changed a lot over the past few decades, Aspergillus, Candida, Cryptococcus

species, Pneumocystis jirovecii, endemic dimorphic fungi such as Histoplasma capsulatum and Mucormycetes remain the main fungal pathogens responsible for most cases of serious fungal disease (Fang, 2022, p. 307). Thus, early diagnosis and properly administered treatment at the initial stages of the disease, regular, maintenance of the therapy in the distance will significantly improve the quality of life of such patients.

Research

The obtained clinical-laboratory results allowed the patients of the main group to form the appropriate clinical groups: 1 group (n = 86) − patients, from the MI having different eye diseases for the study period. 2 group (n = 49) − patients with MI, for the duration of the study were without clinical manifestations of eye diseases. In the work were used instrumental, clinical-laboratory, biochemical, epidemiological, bacteriological and statics methods of research.

Mycological examination of patients included microscopic examination of pathological material and cultural study. To identify the species of the selected fungi, polymerase chain reaction (PCR) diagnostics were used. PCR analysis used in this study takes 4 hours to produce results much faster than 2 days to 2 weeks required by any method of fungal culture. While fungal smears can be analyzed with light microscopy in minutes, the effectiveness of this method is more variable, and the results are not final. The ability of PCR-based tests to detect or exclude the presence of fungi in less time will represent progress in the treatment of eye infections, and can also contribute to efforts to recognize and study fungal keratitis. Intracellular production in the peripheral blood of cytokines lymphocytes was carried out using whole blood with sodium heparin for anticoagulation.

The research has shown that the population of Baku is characterized by a global trend – high body of sight with pathogenic fungi: The incidence of men was 45,2 ± 4,3 %, women – 54,8 ± 4,3 % of cases. Another trend is characterized by an increase with a very strong positive correlation (γ =+0,88 ± 0,10) as the age of the examined frequency of the tested of their eye organ is increased by pathogenic fungi − from 8,9 ± 2,5 % to 32,6 ± 4,0 % of cases (χ^2=51,88; p<0.01).

Although the parameters of the frequency of testing of the eye organ in the 1st group of all parameters, according to the Van der Warden criterion, are significantly higher than in the 2nd group (X = 3,47; p<0,01), we attach great importance to the hygienic factor, along with immunological factors. Thus, the incidence of the body of vision with pathogenic fungi among men is higher than women - respectively 64,5 ± 3,1 % and 53,1 ± 2,9 % (χ^2 =10,44; p<0,01). It is true both for the surveyed 1st group – 79,1 ± 3,3 % to 63,5 ± 3,6 % (χ^2 = 9,67; p<0,01), and for the surveyed 2nd group – 40,2 ± 5,1 % and 35,8 ± 4,6 % (χ^2 =0,42; p>0,05). The distribution by sex and age may reflect an increased impact on the environment of fungi. The predominant proportion of patients with mycoses of the eyes is represented by the affected in the age group of 36-55 years and 19-35 years: Respectively 32,6 ± 4,0 % and 25,1 ± 3,7 %. For the first time detected patients of the disease were registered 91 people (67,4 ± 4,0 %), with repeated recurrent diseases − 44 people (32,6 ± 4,0 %). In the study of the symmetry of the process, depending on the age groups, it was established that the two-sided lesion, revealed in 87 patients (174 eyes, 66,4 ± 4,1 %), a one-sided lesion was detected in 48 patients (48 eyes, 35,6 ± 4,1 %). A total of 222 eyes were struck. In the study of infection with pathogenic fungi in different age groups, depending on the symmetry of the lesion, the greatest defeat in the unilateral process was noted in the age group of 36-55 years − 20 cases (41,7 ± 7,1 %). In the other age groups, the distribution of patients was approximately the same: From 10,4 ± 4,3 % in the age group of 5-7, to 14,6 ± 5,2 % in the age groups of 8-12 and 13-18 years, respectively.

The age group of 19-35 years – 18,7 ± 5,7 % − was slightly higher. In the bilateral process, the greatest lesion was noted in the age group of 19-35 years − 25 cases (28,7 ± 4,7 %). Approximately the same was the distribution of patients in the age group of 36-55, and 13-18 years: 25,4 ± 4,6 % and 24,1 ± 4,6 %, respectively.

The age group of 8-12 years – 13,8 ± 3,7 % was slightly less affected and the lowest age group was 5-7 years – 8,0 ± 2,9 %.

In the study of the characteristics of different groups of patients in degrees of severity of the disease, it was established that in the first group of patients studied (with a slight current) the

number of patients was 28 people (20,7 ± 3,5 %). In the second group with a moderate disease, the number of patients was 62 people (45,9 ± 4,3 %; t = 4,39; p<0,001). In the third study group (with heavy current), 45 patients (33,4 ± 4,1 %; t = 4,12; p<0,001) were admitted.

An analysis of the distribution of the groups of patients studied by severity of the disease among 91 patients first identified with eye mycoses showed that the number of patients with light current was 20 (21,9 ± 4,3 %; t = 5,78; p<0,001). In the group of patients studied with the course of an average disease, the number of patients was 43 people (47,3 ± 5,2 %; t = 3,54; p<0,001). In the third group of patients studied with heavy current, the number of patients was 28 people (30,8 ± 4,8 %; t = 4,73; p<0,001). In 44 patients with recurrent eye mycosis, the number of patients with mild current was determined to be 8 (18,2 ± 5,8 %). In the group of patients with an average course of disease, the number of patients was 19 people (43,2 ± 7,5 %). In the third study group of patients with heavy current, the number of patients was 17 (38,6 ± 7,4 %). The mild severity of the disease among the patients studied was as follows: For the first time detected cases of eye mycosis were 20 people (71,4 ± 8,5 %), recurrent forms 8 people (28,6 ± 8,5 %). The average severity of the disease among the patients studied was as follows: for the first time detected cases of mycosis of the eye were 43 people (69,4 ± 5,9 %), recurrent forms − 19 people (30,6 ± 5,9 %).

The strongest activity of pathogenic fungi is observed to such sub-biopsies as cornea and biopsies of eye tissues, since the frequency of strong intensity of their seeding is very high from 47.3 ± 5.8 % (χ^2=8,17; p<0,01) to 53,1 ± 7,2 % (χ^2=0,75; p>0,05). Almost the same indicators of their average intensity from 32,7 ± 6,8 % (χ^2=2,16; p >0.05) to 37,5 ± 7,8 % (χ^2=1,06; p>0,05). Very low indicators of low intensity of seed − from 14,3 ± 5,1 % (χ^2=4,60; p>0,05) to 17,6 ± 4,5 % (χ2=0,86; p>0,05). Analysis of background diseases in patients with fungal eye pathology showed that mainly diseases from the gastrointestinal tract (chronic gastritis, gastric ulcer) − in 32 (23,7 ± 3,6 %), in 39 (28,9 ± 3,9 %) patients in the history of lambliosis, in 45 (33,3 ± 4,1 %) varicose symptomatic complex. The results obtained are consistent with the results of ultrasound, hepato-biliary system.

Changes in 95,4 ± 3,8 % have been detected; undoubtedly, determine the relationship between somatic pathology and fungal diseases of the eyes.

As the main trigger factors that provoke exacerbation or increase the intensity of the disease, most patients noted the psychogenic factor (99 patients, 73,3 ± 3,8 %) (the connection of the onset of another exacerbation with work stress, personal situations, overfatigue), as well as seasonality (82 patients, 60,7 ± 4,2 %) − deterioration in the autumn-winter season of the year. In addition, 72 (53,3 ± 4,3 %) patients noted as a starting factor contact with the allergen (household chemistry, washing powders, domestic dust, plant pollen), 55 (40,7 ± 4,2 %) patients noted errors in diet (use of honey, citrus, eggs, chocolate, coffee, fish). Allergic reactions to drugs in the history were noted in 76 (56,3 ± 4,3 %) people. Analysis of questionnaires allowed evaluating the existing practice of treating eye mycosis in outpatient conditions.

Analysis of questionnaires allowed evaluating the existing practice of treating eye mycosis in outpatient conditions. Previously, 83 (61,5 ± 4,2 %) patients received treatment from various fungal diseases, including 100 % topical antimicrobitics, and systemic − only 7 patients (5,2 %). The absence of treatment effect and recurrence of the disease is registered in 29 (34,9 ± 5,2 %) patients previously treated with drugs from the azole group, 26 (31,3 ± 5,1 %) − allilamines, 11 (13,5 ± 3,8 %) − naphthyphine and 17 (20,3 ± 4,5 %) − drugs of other groups.

Conclusion

The study of the spectrum of etiology of isolated pathogens in fungal pathologies indicated a small proportion of Coccidies immitis (7,4 ± 2,4 %), Actinomicetes (8,9 ± 2,6 %), Sporotrichum (11,1 ± 2,8 %), a share in cases where micromycetes (otherwise mold fungi) (37,8 ± 3,7 %) spp. Penicillum (13,4 ± 2,9 %), Aspergillus (24,4 ± 3,7 %) and Candida (34,8 ± 4,1 %). The release of independant pathogens in patients with mycosiases as etiological agents is determined by the degree of dominance of mold fungi (37,8 ± 3,7 %) and fungi of the Candida species (34,8 ± 4,1 %). Synergistic effect can be traced in various mold pathogenic fungi from species Aspergillus,

Penicillum, Sandidda (50,0 ± 2,9 %). The population of Baku is characterized by a worldwide trend − an increase with a very strong positive correlation connection (γ=+0,88±0,10) as the age of the examined frequency of infection of their eye organs is increased by pathogenic fungi − from 8,9 ± 2,5 % to 32,6 ± 4,0 % of cases (χ^2=51,88; p<0,001).

The algorithm for diagnosis of patients with eye mycosis should include the evaluation of lipid peroxidation and antioxidant protection systems to correctly assess compensatory capabilities of the body in order to choose the method of correcting metabolic disorders. It is recommended to include the most informative indicators characterizing the state of cellular immunity and phagocytic activity neutrophils.

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Epidemiology Characteristics of the Course of Intestinal Nematodoses in the Territory of Azerbaijan

Abstract

In the article, brief information on the epidemiology characteristics of the course of intestinal nematodoses in the territory of Azerbaijan, and the successes and experience gained in the study of these diseases in recent years were shared. On the basis of the epidemiological analysis, it was determined that the specific weight of the level of infestation among the examined persons in the territory of Azerbaijan varied between 7,7 % and 26,5 % The etiological structure of helminthosis was represented as follows: in the general structure of helminthosis, the incidence rate of ascariasis – 41,7 ± 2,9 %, enterobiosis – 36,9 ± 2,8 %, trichocephalosis – 2,9 %, hymenolepidosis – 4,7 %, with taeniidoses – 3,7 %, with other helminthoses – 10,1 %. Among the examined persons, the number of infected children was highest in girls aged 12-15 years (36,6 ± 4,6 %) and boys aged 8-11 years (28,6 ± 6,1 %; $p<0,001$). The highest proportion of infected adults was among men aged 16 to 30 (16,1 ± 4,9 %) and women aged 31-50 (13,4 ± 3,3 %; $p<0,001$). Screening examinations carried out in different regions of the republic showed a high level of infection of children with parasitic infections, which confirms the active transmission of the infection and the stability of foci.

Keywords: *helminthosis, epidemiology, prevention, diagnostics, infectious diseases, epidemiological aspects, epidemiological control*

Introduction

The World Health Organization expert assessment shows that diseases caused by helminths are the third most important infectious and parasitic diseases in the world, and diseases caused by plasmodials are the fourth (1,4 billion and 600 million cases, respectively) (WHO, 2012, p. 88). Helminthosis is a widespread group of diseases and to some extent determines the health status of the population (Khalafli, 2014, p. 154). Helminths have various pathological effects on the health of the population (primarily children). They cause acute allergy, which is accompanied by a weakening of the immune system, promotes the development of secondary infectious and non-infectious diseases (Buaro, 2019, p. 56; Ermakova, 2017, p. 43). Against the background of helminthiasis, children are 2-4 times more ill with acute intestinal and respiratory diseases (Taghiyeva, 2024, p. 128). It should also be noted that the course of parasitic diseases is sometimes accompanied by the chronicity of the infectious process and irreversible complications, which increases their role as a factor that potentially lowers the quality of life and general health of the population. It is known that intestinal helminths change their chemical composition in the cavity of the gastrointestinal tract, which can lead to a change in the composition of the normal intestinal microflora) (Supryaga, 2018, p. 12; Raimkulov, 2019, p. 50). Therefore, intestinal dysbacteriosis is often accompanied by worm infestations and aggravates the clinical picture of these conditions with functional disorders in the gastrointestinal tract (Ajtmurzayeva, 2019, p. 44; Aslanova, 2019, p. 19). Microecological disturbances, in turn, are sometimes involved as a mechanism for initiating and then maintaining pathological processes (Siviero, 2024, p. 460). In this regard, the relevance of the examination of intestinal microbiocenosis in persons infected with helminthosis is not in doubt) (Rokaitė, 2024, p. 916).

In recent years, reviews summarizing a large number of sources of literature on helminthology and microbiology either contain information about the possible effect of helminths on the intestinal

microflora, or there is no information at all about the effect of helminths on the microbial landscape of the intestine. In modern times, the final verification of ascariasis and enterobiosis is based on the detection of either helminth eggs or the parasites themselves in the cofiltrate of the patient (Saini, 2024, p. 288). However, the infestation can be detected by this method only when the helminths have reached the adult stage − when there are a sufficiently large number of female and male (or only female) individuals in the patient's body, or before the parasite dies naturally.

Research

Grading of the inspected areas according to the level of morbidity made it possible to distinguish more typical zones for the regions of the Republic and to distribute the settlements according to these zones, which was carried out for the purpose of analyzing the indicators of morbidity of the population with parasitic diseases. We used the cartographic method to assess the ecologically unsatisfactory situation in the territory of the republic. In accordance with the goals and tasks of the inspection, a program for the improvement of epidemiological and hygienic control by stages was developed in the context of the reconstruction of the State Sanitary Epidemiological Service of the Republic, which consists of 3 stages.

In the first stage, a complex sanitary-epidemiological characterization of environmental objects was given, indicators of changes in the sanitary-hygienic situation were found, and the ecological-hygienic effect of various factors (water, soil, food products) on the level of morbidity with parasitic diseases was scientifically substantiated. In the conditions of human anthropogenic activity, the assessment of the quality of environmental objects was carried out on the basis of sanitary-hygienic, microbiological, parasitological and other indicators found through complex examination and calculation methods.

In the II phase of the research, a comparative analysis of parasitic disease in the territory of Azerbaijan was carried out and a ranking by regions was carried out. The structure of registered infectious diseases consists of many nosological forms and is characterized by the specificity of the clinical course of the disease and the main indicators of the epidemic process. The analysis of the epidemiological situation for more priority parasitic diseases in the republic was performed during 2007-2017. The main laws of the epidemic process were revealed: the dynamics and level of the disease, its nature (hotness, outbreaks, periodicity), high risk groups, economic parameters of the importance of infections were determined. In order to assess the state of the disease, statistical reports of the dynamics of parasitic disease were analyzed based on the data of the state and internal statistical reports. Calculation of average annual intensive indicators of parasitic diseases, which are more important for the regions of the republic, was carried out.

On the basis of socio-epidemiological examinations carried out in the III phase of the research, a comprehensive action plan was developed for the prevention of intestinal nematodes in urban families, for lowering their general level of morbidity and increasing health indicators.On the basis of the epidemiological analysis, it was determined that the specific weight of the level of infestation among the examined persons in the territory of Azerbaijan varied between 7,7 % and 26,5 % The etiological structure of helminthosis was represented as follows: in the general structure of helminthosis, the incidence rate of ascariasis – 41,7 ± 2,9 %, enterobiosis – 36,9 ± 2,8 %, trichocephalosis – 2,9 %, hymenolepidosis – 4,7 %, with taeniidoses – 3,7 %, with other helminthoses – 10,1 %. Among the examined persons, the number of infected children was highest in girls aged 12-15 years (36,6 ± 4,6 %) and boys aged 8-11 years (28,6 ± 6,1 %; $p<0,001$). The highest proportion of infected adults was among men aged 16 to 30 (16,1 ± 4,9 %) and women aged 31-50 (13,4 ± 3,3 %; $p<0,001$).

The highest level of morbidity with helminthosis (26,5 %) was found in Baku city and Absheron peninsula. Yevlax-Ismailli zone (18,0 %), then Sheki-Zagatala zone (13,1 %), Ganja-Gazakh zone (12,4 %), Lankaran zone (11,7 %), Guba-Khachmaz zone are in second place (10,6 %) and other zones (7,7 %).

Parasitic diseases are closely related to the population's household and behavioral infrastructure, sanitary-hygienic and natural conditions, the level of organization, quality and efficiency of epidemiological control. The analysis carried out during the years 2007-2017 gave reason to say

that the level of infection of children (0-14 years old) during intestinal helminthiasis and primary infections reached 85 %. The high level of enterobiosis (71,2 %) is considered as an indicator of population, especially children's helminthosis.

For the purpose of early diagnosis of intestinal nematodes, the 2 most promising methods are proposed in modern times, which are used for the purpose of individual examination of patients or persons suspected of any other infestation within immunodiagnostic studies, as well as mass examination of the population of endemic regions: PCR (polymerase chain reaction) and EIA (enzyme immunoassay). Both reactions have high sensitivity and specificity, can be used on a large scale, PCR differs from many other diagnostic methods in its high efficiency. The PCR method was highly effective in all clinical forms of invasion (from 92,3 ± 3,4 % to 95,6 ± 2,6 %). The EIA method was also highly effective – 82,6 ± 5,0 % - 89,5 ± 4,2 %, respectively.

Helminthoses were divided according to severity as follows: mild degree – 42,3 ± 3,8 %, moderate degree – 37,5 ± 3,7 %, severe degree – 20,2 ± 3,1 %. The following symptoms and syndromes were noted in the patients we observed: the complex of symptoms of dysfunction of the gastrointestinal tract (constipation, hard stools, loss of appetite, nausea, abdominal pain) – 83,3 ± 3,4 %, weakness (80,0 ± 5,9 %), dry cough (24,4 ± 6,4 %), headache (15,5 ± 5,5 %), skin rashes – 46,6 ± 7,4 %, decrease in hemoglobin index – 31,0 ± 6,8 %, broken nails – 26,7 ± 6,6 %, subfebrile temperature (13,3 ± 5,2 %), thinning hair and shedding – 8,89 ± 4,1 %.

The high level of cytokines in the blood serum of patients with intestinal nematodes confirms the presence of a chronic inflammatory process that occurs mainly in the gastrointestinal tract, so cytokines are considered markers of any inflammatory process. Their high amount can cause a number of clinical symptoms typical for the intestinal stage of the disease: intoxication syndrome (weakness, headache, subfebrile temperature); allergic syndrome (itching of the skin, rashes on the skin); syndrome of damage to the gastrointestinal tract (dysfunction of the gastrointestinal tract, abdominal pain). The data obtained on the amount of interleukin − IL-1, IL-6 and tumor necrosis factor − TNF-a indicate the participation of cytokines in the body's defense reactions in the intestinal stage of helminthiasis, as well as in the increase in the severity of the pathological inflammatory reaction in organs.

Under the influence of deworming, the number of patients with grade III-IV dysbacteriosis decreases, the number of patients with poorly noticeable grade I-II dysbacteriosis, and the number of patients without dysbacteriosis increases. The dynamic determination of the severity of dysbacteriosis gives reason to consider a new diagnostic criterion of the effectiveness of the treatment of helminthiasis.

Conclusion

Screening examinations carried out in different regions of the republic showed a high level of infection of children with parasitic infections, which confirms the active transmission of the infection and the stability of foci. The measures taken to get rid of parasites and increase the level of sanitary culture have been effective. In order to successfully solve the problem of reducing the level of infestation of the population, it is important to carry out mass deworming several times throughout the republic and to conduct sanitary and hygienic training of the population.

Exploratory epidemiological control, by using the 2nd generation epidemiological control data, new information was obtained about the factors affecting the development of the epidemic process during intestinal parasitosis, which made it possible to assess the impact of the behavioral factor on the level of morbidity and the development of the epidemic process. The data obtained during the epidemiological examinations made it possible to formulate the main directions of the epidemiological control of current helminthoses, to collect primary information, and to statistically process them during operative and retrospective analysis.

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Medical Foundations of Emergencies and Life Safety

Abstract

Recent years, the issue of ensuring human safety has become acute. This is because in recent times, when science and technology have developed rapidly, the number of accidents and natural disasters in industry, transport and other areas has increased significantly. One of the main tasks of the medical foundations of emergency situations and the safety of life is to ensure safety by searching for new directions for ensuring the safety of people in various conditions of life. In modern times, people suffer most from the dangers created by themselves, and not from the one-time losses of scientific research.

Medical events in emergency situations are such a situation that, as a result of the emergence of a source, the normal living and working conditions of people in a certain area are disrupted, there is a threat of the spread of infectious diseases, and there is a threat of the destruction of agricultural animals and plants. Infectious diseases have accompanied man since the moment he separated from the animal world and formed as a species. As society was formed and the social lifestyle of man developed, many infections became widespread.

Infectious diseases spread continuously among people. Their increase leads to economic losses and disruption of the epidemic situation in the country. It is known that microorganisms have the ability to reproduce very quickly, they have a high ability to change, adapt, and are resistant to external pressures. The widespread spread of infectious diseases at all times has resulted in the death of millions of people, and has also been the main reason for the shortening of human life. Infectious diseases are a large group of human diseases caused by pathogenic viruses, bacteria, and protozoa. There are a high level of technogenic hazards in the Republic of Azerbaijan, which are considered the main sources of various types of emergencies.

Keywords: *medicine, emergencies, health, human, safety, life*

Introduction

Our daily lives, every person, regardless of their profession and level of knowledge, should be able to provide first aid. When emergencies occur, saving people often depends on timely, purposeful first aid.

Emergency is a situation — that has arisen in a certain area as a result of military operations, accidents, natural or other disasters that may cause or have caused human casualties, damage to human health or the environment, significant material losses, and disruption of people's living conditions.

Some cases, the lack of necessary information leads to life-threatening complications for the victims. It is important to know that timely and correctly provided first aid slows down the development of the disease and prevents future complications. After providing first aid to the victim, he should be taken to the nearest medical facility.

First aid is a non-drug application performed at the scene of an accident or life-threatening situation, without seeking medical assistance, with the available forces and means, in order to save life or prevent further deterioration of the situation until medical help is provided. At the same time, first aid is provided on the battlefield, at the site of injury, and by the injured person himself, his companions, as well as by medical personnel. Saving the lives of injured people, alleviating their suffering, and restoring their ability to work depend on the speed and accuracy of the first aid provided to them. Unlike medical care, first aid can be provided by any person. For certain

categories of persons, providing first aid is considered a duty in accordance with relevant laws and regulations. If a witness to the incident does not know what to do at the scene or is unable to provide the victim (patient) with necessary assistance, he must call for help and then call the emergency medical service.

Research

During natural disasters, people experience changes in emotions, thoughts and behavior, loss of appetite, anxiety, wakefulness, suspicion, depression (depression), irritability, crying, feeling of powerlessness, headaches, sleeplessness, distrust of those who help, refusal to accept help, etc. In order to prevent such situations from occurring, it is important for people to be educated and prepared in advance for various emergency situations.

Person who falls into a disaster zone must control himself, be restrained and competent, and set an example for those around him with his personal activities so that there is no panic and panic. The first aid provided to a person who has suffered any injury (crushing, fracture, burn, etc.) or suddenly becomes ill is of great importance in saving his life and restoring his health. In cases of accidents and sudden illness that can occur at any time and place, there may not be a medical worker nearby, and in this case, other people are obliged to provide first aid to the injured. Loss of consciousness and incompetence can further aggravate the condition of the injured. In some cases (for example, shock, fainting, severe bleeding, etc.), if first aid is not provided within a few minutes, the injured person may lose his life. In this case, even the called "ambulance" service may not be able to save him. In such cases, it is the first medical aid provided that can save not only the health of the injured person, but also his life.

The urgent measures that must be taken first can be divided into three main groups:

First, the immediate elimination of the effects of external damaging factors on the victim (electric current, low or high temperature, compression under severe pressure, etc.) and their removal from unfavorable conditions (removal from water, burning or gas-filled places) (Taylor et al., 2024, pp. 23-94).

Second, depending on the type and nature of the trauma received, the provision of immediate medical assistance (stopping bleeding, artificial respiration, closed heart massage, dressing wounds, etc.).

Third, the delivery of the victim to the nearest medical facility as soon as possible. In this case, it is necessary to act very carefully or call an ambulance to the scene.

When providing first aid, it is necessary to carefully examine the scene, assess the conditions and ensure that the person providing assistance is not exposed to harmful effects (electric current, avalanche, etc.). The victim should be carefully removed from the unfavorable conditions in which he fell, so that he does not receive additional trauma and does not aggravate his condition. He should be laid down in a quiet place, his waist belt and collar should be loosened, he should be covered and medical help should be called. Thus, during accidents or natural disasters that occur in our daily lives, people face life-threatening situations. Timely and correctly provided first aid can save many lives.

Medical measures provided to people during emergencies are carried out as follows:

1. Medical measures for the protection of the population — include work to prevent or mitigate injuries to people, provide timely assistance to victims and treat them, and ensure epidemiological safety in regions where emergencies have occurred.

For this purpose:

• plan the activities of all available health authorities and means, regardless of their field subordination;

• open a sufficient number of medical institutions in the event of an emergency;

• use medical preventive measures in a timely manner;

• monitor food and water supplies;

• timely create qualified medical teams and prepare them for action;

• create reserves of medical protective equipment, medical and special equipment and technical resources;

• train medical workers and teach medical and sanitary knowledge to the entire population.

2. Protection against biological agents consists of timely detection of the threat or fact of infection, the type and scale of infection, as well as determination of administrative-economic, regime-restrictive and special medical measures.

For protection against biological agents:

• timely use of collective and individual protective equipment;

• establishment of quarantine and observation regimes;

• neutralization of the source of infection;

• carrying out urgent and special (specific) prophylaxis;

• it is necessary to achieve compliance with the anti-epidemic regime by national economy facilities, medical institutions and the population.

3. Monitoring and control of the environment, food products, water is carried out in the following ways:

• by creating in advance a nationwide and field monitoring and laboratory control network and maintaining it in constant readiness by involving sanitary-epidemiological stations, veterinary, agrochemical and facility laboratories, institutions of the State Hydrometeorological Committee, radiation and chemical observation posts;

• collecting, analyzing and disseminating information on the state of the environment, as well as on the contamination of food products and food raw materials, fodder, water with radioactive, chemical and bacteriological (biological) substances.

4. The ability to use protective methods and means, to provide first aid to the injured, to actively participate in rescue and other urgent work is taught to employees in enterprises. Administrations and organizations, as well as in residential areas, in accordance with the nature of the real danger that may arise. At this time, all conditions are created for the population to receive necessary advice and recommendations. The rules of action and behavior in the event of possible emergencies in places are brought to the attention of the entire population in advance through the mass media or by distributing special memory booklets.

Priority goals of medical care:

1. Eliminate life-threatening situations.
2. Ensure the continuation of vital functions.
3. Prevent the deterioration of the condition of the sick or injured person.
4. Facilitate rapprochement.

First aid is the most important stage of assistance provided to the victim.

It is clear that during an incident, no medical transport with medical personnel will be able to appear at the scene at that moment and provide medical assistance. At the first moment of an accident, first aid is provided to the victim at the scene by the victim himself, the surviving participant in the incident, a random witness to the incident, and then rescuers, firefighters and emergency medical workers arriving at the scene (Scopus Program Coverage Guidelines, 2024, pp. 5-9).

Therefore, teaching the basics of first aid to broad segments of the population should be the main goal, and they should be trained in accordance with the educational standards and training protocols adopted in our country. The provision of first aid should be unified for all state structures. First aid should meet modern requirements, comply with standards, be constantly developed, and be based on relevant legal documents.

First aid depending on the type of injury. First aid measures vary depending on the type of injury. The main types of injuries in emergency situations are: traumas (injuries), thermal burns, radiation injuries, acute chemical poisoning, psycho-emotional disorders, epidemics, combined injuries (mechanical-thermal, radiation-thermal, radiation-mechanical, etc.), accidents (drowning, sunstroke, stacking, snakebites, household poisoning). They can be conditionally divided into two profiles: surgical and therapeutic.

The following traumas belong to the surgical profile: mechanical injuries, prolonged compression syndrome, bone fractures, external bleeding, burns, etc. The most common injuries

with a therapeutic profile include radiation injuries, acute poisoning, psycho-emotional disorders and mass infectious diseases, as well as exacerbations of chronic diseases.

First Aid for Tension Pneumothorax

Tension pneumothorax requires immediate intervention. If appropriate assistance is not provided, the victim's condition may worsen. Because the damaged lung cannot perform its function and breathing becomes even more difficult. Focus on the respiratory problem:

− in such cases, immediately activate the emergency medical service;

− give oxygen via mask to all victims;

− take measures to reduce the likelihood of shock;

− lay the victim on the injured side so that adequate breathing can be achieved on the healthy side.

All victims with pneumothorax should be urgently taken to the hospital.

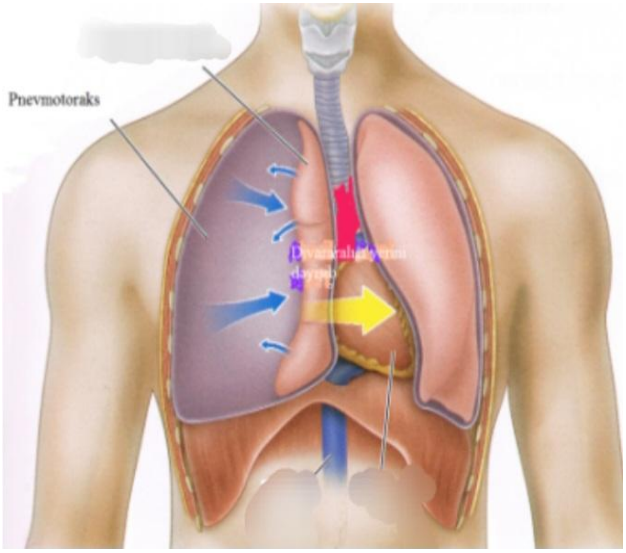

Figure 1. Tension pneumothorax

Rib Fractures

Ribs are broken as a result of a traumatic force. Simple rib fractures are the most common result of severe chest trauma. Rib fractures are important in terms of damage to organs located deeper than them (the occurrence of pneumothorax), or to the spleen and liver (in the case of fractures of the 9th, 10th and 11th ribs). Tenderness, crepitus (crackling sound), hemorrhage and local muscle tension occur in the area of the fracture. Left-sided rib fractures are accompanied by spleen damage in 20 % of cases, right-sided rib fractures in 10 % of cases with liver damage (Falagas et al., 2007, pp. 338-342).

Medical Care

− Pain control! Pain persists for a long time (1–2 weeks).

− Ensuring deep breathing. After the appointment of painkillers, the broken ribs should be fixed and the victim should cough at least 2–4 times during the day.

− Belts, tapes, and circular bandages that limit chest excursion are contraindicated.

Chest Flotation

Chest flotation (blowing, shaking, swaying) occurs when 3 or more ribs are broken in 2 or more areas, the lung is crushed. As a result, a freely moving shaking area is formed in the chest, ventilation is impaired. Flotation can result in serious complications and death.

Symptoms of Chest Flotation

− Multiple rib fractures can be detected during palpation (manual examination) of the chest.

− During careful observation, the presence of an area moving in the opposite direction with each respiratory act on the chest wall can be detected.

− Hypoxia (decrease in oxygen in the body) occurs.

First aid for Chest Flotation

The following measures should be taken during chest flotation:

− call an ambulance;
− lay the victim on the injured side or place a small bag filled with sand on that area;
− secure the injured area with wide adhesive tape;
− administer oxygen as soon as possible if possible;
− limit fluid intake;
− keep the airway open;
− use an aspirator (a device for suctioning) if necessary;
− transport the victim to the hospital.

Medical Care for a Collarbone Fracture

Blunt trauma to the collarbone causes a fracture or a rupture of the ligament between the collarbone and the acromial process. The victim holds the forearm (the part between the elbow and the thumb) and the elbow with the good hand and presses it against the body. When examining the victim, determine whether there is any deformation, open injury, pain and swelling in the area. Collarbone fracture is diagnosed by palpating the area and noting crepitus (crackling sound) in the fractured area, abnormal mobility, and limited movement in the shoulder girdle.

Broken bones should not be moved anymore, as blood vessels may be damaged and bleeding may occur. To determine the fracture, a doctor should perform an X-ray examination. As a result of the rupture of the ligaments connecting the collarbone to the shoulder blades, the collarbone rises up and forward, and when it sinks to the side, it falls and rises like a grand piano (piano, accordion) key (“key” symptom). When the collarbone is sprained at the point where it joins the sternum, it clearly bulges under the skin. Separation of the sternum-collarbone joint can also be treated by simply hanging the arm from the neck. The simplest method is to keep the elbow still and place the fingers of the injured limb on the healthy shoulder, providing comfort.

Figure 2. Fracture of the collarbone

Fractures of the collarbone can usually be treated with a figure-8 bandage or arm sling. In children and the elderly, the injured limb is usually suspended from the neck at a right angle using a petal bandage, with the head tilted to the injured side.

Figure 3. Medical care for a collarbone fracture

Such a bandage reduces muscle tension in the upper limb, reduces movement of the bone fragments (parts) of the broken collarbone and pain. If there are no bandages at hand, bend the victim's arms at the elbows and pull them back. Place a piece of wood under the elbows in the shoulder area so that the victim can support it with his elbows. In this case, take the victim with a broken collarbone to the hospital. During the recovery period and for a month after the bandages are removed, the victim should not lift weights and should lie on a hard bed. Surgical treatment is indicated only for open fractures or skin injuries (Colledge, Moya-Anegón & Bote, 2010, pp. 215-221).

First Aid for Chest Pain

Chest pain is the most common condition. In most cases, chest pain is of cardiac origin. Disturbing pressing (putting a load on the chest), burning (stinging), squeezing (piercing) pain behind the sternum (chest) and in the heart area are characteristic symptoms of angina pectoris and myocardial infarction.

Often, the pain is transmitted to the left arm, the left half of the neck, back, jaw, shoulder. The characteristic gesture associated with pain is the patient pressing his palm on his chest. The pain can range from ordinary anxiety, discomfort to an unbearable feeling of crushing the chest. Even a mild heart attack in a patient is accompanied by a feeling of fear of death.

If the pain lasts from 5 to 15–20 minutes, decreases and gradually passes after stopping physical (psychoemotional) stress or taking nitroglycerin, this is angina pectoris. Pain lasting less than a minute is not typical of angina pectoris. Pain lasting more than thirty minutes indicates myocardial infarction.

Patients with non-traumatic chest pain are the most frequently referred for medical help. The most dangerous type of chest pain is cardiac arrest (Garfield & Sher, 1963, pp. 195-201).

Approach to Chest Pain

The goal is to provide timely and adequate (fully appropriate) first aid to those with chest pain (especially in the heart area — behind the sternum), regardless of the patient's condition. It is not important for the rescuer to determine the origin of the pain. The main thing is to assess the patient's condition.

At the scene of the incident, the victim should first be examined externally.

If resuscitation measures are not necessary, the patient's vital signs (pulse, respiration, blood pressure, skin, pupil) are assessed. Any abnormal values should be rechecked and if they persist, measurements should be taken. If these values are within the normal range, an appropriate external examination should be continued and the patient's medical history should be taken. In cases where vital signs are unstable or severe illness is noted, the assessment should be expedited and completed (Sever, Vanholder, & Lameire, 2006, pp. 1052-1063).

Providing Medical Care During Bleeding

Immobilization should be performed at the scene and as soon as possible. If immobilization is not possible, keep the victim in the position in which you found him.

1. Stop the bleeding.

If a tourniquet is applied, do not cover it with a soft bandage or splint. The immobilization should not be disturbed when the tourniquet is opened.

2. Prevent the spread of infection.

− Treat all wounds and bandage them. Do not apply the splint directly to an open wound. Apply a bandage to the wounds before applying the splint. To do this, cut the clothing and expose the wounds under the clothing (open fractures, etc.). Immobilize only after the wound has been treated and a clean bandage has been applied.

3. Relieve the victim's pain before applying the splint.

4. Immobilize.

Transport splints are applied over clothing and shoes or on the naked body.

− when the splint is placed on the naked body, place a soft pad on top of it that matches the shape of the injured part.

− when immobilizing, place a soft object in the areas that come into contact with the bone and fill the gaps with pillows, towels, cotton.

− when applying a splint to the upper limb, place a cotton pad or pillow under the armpit. When applying the splint to the chest, place the pillow in the palm of your hand, turn it towards the chest, and hang it from the neck using the petal.

− in case of ankle and foot injuries, use soft tools such as a pillow or a folded blanket for immobilization) (Falagas et al., 2008, pp. 338-342).

5. Having shaped (adapted) the splint to a healthy limb or yourself, apply it to the injured person.

6. Give the limbs a physiological position:

− for the upper limb: the shoulder should be brought to the body and folded at an angle of 90^0;

− for the lower extremities: the thigh should be raised in the $5–7^0$ pelvic-hip joint with the calf flexed at the knee joint;

− for the spine and pelvis, the body and the surrounding area should be immobilized on a hard surface (stretcher, board);

− if the victim has a pelvic fracture, the victim should be stretched out on a hard surface and a pillow should be placed under the knee.

− in the case of neck and head injuries, a cervical collar should be applied and the entire body should be immobilized on the board.

7. It is advisable for the victim or another rescuer to help apply the splint, since the injured limb should be held by the hand above and below the injury site. The victim can hold the injured upper limb on his chest with the help of a healthy hand to provide a comfortable position. If the victim changes position, hold the splinted limb with his hand (Muxina, Evdokimov, & Sannikov, 2017, pp. 100-112).

8. In fractures of the sagittal and fibular bones, two adjacent joints (those above and below the injured area) should be immobilized, and in fractures of the humerus and femur, three joints should be immobilized. To immobilize the arm bent at the elbow, place a small piece of wood diagonally as shown in the figure. The splint should extend a few centimeters beyond the elbow and wrist.

Figure 4. Providing medical care during bleeding

9. Do not move the joint when it is broken and immobilize it in its present position.

10. Wrap the splint tightly around the entire circumference with a multi-layer bandage, gauze bandage or other bandage material. Do not tighten the bandage too much to prevent blood circulation and pain. Tie the knots in a healthy area.

11. Monitor blood circulation in the surrounding area. If the victim complains of increased pain, numbness in the limb, and if blood circulation is impaired, the applied splint (bandage) should be opened and re-closed or slightly loosened.

12. Raise the injured limb as high as possible from the body surface and hold it.

13. After filling the areas of the bone protruding from the skin or the embedded object with gauze or other bandage materials, wrap it. Do not put direct pressure on the bone protrusions. Do not touch the open wound or protruding bones with your hands.

Figure 5. Types of medical care during bleeding

14. Protect the victim from cold and heat. In cold weather, wrap the injured area with a blanket.

15. Pay attention to breathing and changes in the victim's level of consciousness.

16. Do not allow food or water to be taken.

17. Seek medical attention.

An improperly applied bandage can compress tissues and cause edema (swelling), bedsores, gangrene (tissue decay), and other complications. After immobilization, help the victim to take a comfortable position, apply a cold compress to the injured area, protect it from heat or cold, and calm it down.

Medical Assistance During Bleeding

Any damage to a blood vessel results in bleeding. If the bleeding occurs in an artery – arterial, if in a vein – venous, if in capillaries – capillary, if in internal parenchymal organs – parenchymatous bleeding.

− Arterial bleeding occurs under pressure and very quickly. Since the blood is under great pressure in the artery, it flows from the wound site like a fountain (pulsation, emphasis) and makes it difficult to form a clot. This type of bleeding is very dangerous because it is difficult to stop. Losing 1–1.5 liters of blood in a short period of time can lead to the death of the victim (Azizov, Efendiyev, & Magsudov, 2004, pp. 45-56).

Arterial blood is rich in oxygen, so it is scarlet in color.

− It is easier to stop bleeding from a vein than from an artery. Veins are often damaged because they are close to the surface of the skin. Blood in a vein is under lower pressure than blood in an artery and flows from the wound site continuously, slowly, and often in drops. Only when the veins of the body are damaged deep in the body, for example, in the trunk or calves, does severe bleeding occur, which is difficult to stop. Such bleeding can be stopped by applying a pressure bandage to the wound.

Figure 6. Arterial bleeding

Venous blood is rich in carbon dioxide, so it is dark red or maroon in color.

− Capillary bleeding is the most common and widespread type of bleeding. Since the lumen of the veins is small and the blood flows at low pressure, this bleeding is often weak. Bleeding manifests itself in the form of numerous small drops of blood that slowly collect on the bleeding surface. During capillary bleeding, the blood clots easily (within 1–3 minutes). Such blood differs from arterial blood in its light color.

− Parenchymal bleeding is observed when parenchymal organs are damaged (brain, lungs, liver, pancreas, spleen, kidneys, endocrine glands of internal secretion). These organs are rich in blood vessels and capillaries. In a parenchymal organ, damaged vessels do not accumulate and are not compressed by tissue. At this time, blood flows from the entire wound surface. Therefore, the bleeding becomes strong, life-threatening. Such bleeding is prolonged and profuse. It is very difficult to stop such bleeding with conventional methods. Blood usually accumulates in cavities and accumulates there (internal bleeding).

− Mixed bleeding is called bleeding that occurs as a result of damage to arteries, veins and parenchymal organs at the same time.

Figure 7. Venous bleeding

Basic Rules of Medical Care

Thermal burns − occur as a result of the action of high temperatures on the skin and mucous membranes, the source of which is flame, hot substances and liquids, flammable substances. Thermal burns are serious injuries that in some cases lead to disability or even death. Burns are common in industry as well as in everyday life. The severity of the burn depends on the size of the burned area and the depth of tissue damage. There are 5 degrees of skin damage during burns (Valiyev, Shadlinski, & Mammadova, 2001, pp. 23-45):

I degree − redness and swelling of the skin at the site of injury;

II degree − the formation of small blisters filled with a light yellow liquid;

III A degree − the formation of large, tense blisters. The walls of the blisters are usually torn, the bottom of the wound is pink and moist. Pain sensation is preserved or weakened at the bottom of the blister. In more delayed periods, a light yellow, and in some cases brown and gray, scab may form;

III B degree − the formation of ulcers with bloody contents, usually with a disintegrated wall, a dry bottom, whitish, sometimes marble-like, with individual spots of discoloration. Pain sensation is weakened or absent, the pus (if present) is dark or brown in color.

IV degree − the presence of a characteristic black or dark brown pus, with thrombosed veins visible underneath, damage to the tissues located under the wound (muscle, tendon, etc.).

Figure 8. First-degree burn

In the first days of a burn, it is difficult to give an idea of the true depth of the injury. This can only be done after the skin has broken off. When providing first aid, the degree of injury is approximately determined, and in this case it is better to assume its severe form. The area of the burn is calculated according to the palm or 9 % rule in relation to the total area of the human body.

Figure 9. Second-degree burn

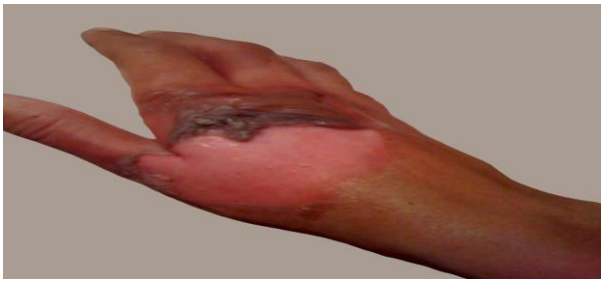

Figure 10. Third (a) degree burn

Figure 11. Third (b) degree burn

Figure 12. Fourth degree burn

Table 1

Burns of the skin and subcutaneous tissue layers by degree of damage

Degree	Layers damaged	Appearance	Skin	Healing time
I degree	Epidermis	Redness	Dry	5-10 day
II degree	The entire epithelial covering	Redness and leeches	Moist	2–3 week
IIIa degree	The superficial layers of the epidermis and dermis	Yellow or red skin, leeches	Very dry	3–8 week
IIIb degree	All layers of the skin	White, brown skin	Skinny	There is no complete recovery
IV degree	The skin and subcutaneous tissues	Charred tissues	Dry	It doesn't heal

According to the 9 % rule, in elderly people, each of the individual parts of the trunk and extremities (head and neck, chest, abdomen, calves and feet, thighs, back, waist and buttocks) accounts for 9 % of the total body surface area, only the external genitalia and perineum are equal to 1 %. When determining the area of the burn using the palm rule, in elderly people the area of a palm is considered to be 1 % of the entire body area. In practice, both of these methods are used. If the burn area is small, the palm rule is applied, and if it is large, the 9 % rule is applied. Knowing the depth of the burn area and the injury, it is possible to determine its severity.

Minor burns − less than 5 % of the body surface is damaged.

Moderate burns − less than 20 % of the body surface is damaged, and deep burns − no more than 10 %. Severe burns − from 20 % to 60 % of the body surface is damaged, and up to half of them are deep burns.

Very severe burns − more than 60 % of the body surface is damaged, and deep burns more than half. Minor burns can be treated on an outpatient basis in elderly people (Ojagov, 2000, pp. 87-94).

In children, an individual approach is required depending on the localization of the damage. Treatment of other forms of burns should be carried out in specialized hospitals.

Burn shock − the most severe complication of burn disease, a rapidly developing complication caused by damage to a large area of the skin and other tissues, leading to impaired blood circulation. The prognosis for burn shock depends on early diagnosis and the timely initiation of effective treatment.

In practice, burn shock develops when 15-20 % of the body surface is damaged and the depth of the burn exceeds 10 %. The risk of burn shock is much higher in cases of respiratory tract burns. If the victim was in a closed place during the fire, a respiratory tract burn should be suspected. At the

same time, burns to the nose, lips, tongue, and hair are also indicative of a respiratory tract burn. If the victim has both skin and respiratory tract burns, then damage to half the area of the skin is enough to cause burn shock. An aseptic dressing or, if available, a special anti-burn dressing is applied to the damaged area. It is possible to apply a moisture-drying dressing impregnated with antibiotics or antiseptics. In case of minor burns, after appropriate anesthesia, the burn wound area is wiped with 0.25 or 0.5 % ammonia solution, warm soapy water or antiseptic solution, then treated with alcohol or iodine solution.

After that, it is wiped with a swab soaked in antiseptic solution (furacillin 1:5000, chloracillin, rivanol), then with 0.25 % novocaine solution and carefully cleaned of extraneous layers, foreign bodies, and remnants of the upper layer of skin on the wound. Intact leeches are not removed. Very tense leeches are cut off at the base.

First aid should be provided to a person whose clothes have caught fire without delay. The fire cannot be extinguished with your hands or any other object. Pour water over the victim, and if there is no water, cover him with any covering (blanket, carpet etc.). It is necessary to carefully remove the burnt clothing from the victim's body (cut it off if necessary).

At this time, it is necessary to try not to harm the burned body. It is not recommended to completely undress the victim, especially in the cold season. It is necessary to cut off the parts of the clothing stuck to the burn. It is forbidden to pierce the wounds, apply oil, various ointments to the burn, sprinkle powdered medicines, or touch it with your hands.

Medical Assistance During a Sunburn

Sunstroke – occurs as a result of prolonged exposure to the sun’s rays. Sunstroke most often occurs when the head is exposed to the sun for a long time. In such cases, the sun’s rays increase blood flow to the brain and disrupt blood circulation in the brain. At this time, the victim experiences symptoms such as weakness, nausea, dizziness, severe headaches, ringing in the ears, shortness of breath, rapid pulse, chills, nausea and vomiting, and a temperature of 40^0C or more. In severe cases, convulsions and loss of consciousness may also occur.

Some cases, these symptoms occur immediately, and in some cases, several hours after exposure to the sun, upon returning home. As soon as the first signs of sunstroke are noted, the victim should be taken to the shade or a cool room, removed from tight clothing, and laid in a semi-sitting position (the head should be higher than the body!). Give the victim cold water, wipe his face and chest with cold water. Apply ice to the head, sides of the neck, armpits and groin (where large veins pass) or, if this is not possible, a compress with cold water. At this time, you can also put mustard paper on the hands and feet. Another method is to undress the victim and wrap him in a cloth soaked in cold water, and apply ice to his head. When the victim's temperature returns to normal, wrap him in a dry cloth or towel.

Emergency medicine is a field of medical care applied in emergency situations that save people and protect their health. This field includes the provision of medical care in cases of accidents and injuries, natural disasters, epidemics and other emergencies (Mammadov, 2012, pp. 34-67).

The basis of medicine in emergency situations is to save lives, reduce diseases and accelerate the recovery process. Several important components related to this field can be noted:

1) Emergency Medical Care (EMC): Providing emergency medical care in emergency situations and to transport the injured to the hospital as soon as possible.

2) Resuscitation and intensive care: Primary patients with life-threatening diseases (cardiac arrest, trauma, asphyxiation, etc.) and intensive medical services are provided. The goal here is to restore their functions and protect them from disease.

3) Emergency Situations and Measures: Natural disasters, accidents and other measures. These tools include the provision of medical equipment, the preparation of mobile hospitals, first aid and treatment methods for events, and the management of drug supplies for various complications.

4) Psychological Assistance: The psychological state of people in emergencies is also very important. People who have been injured or have suffered a disaster may have emotional needs. In this case, support is provided by psychologists and psychiatrists.

5) Medical Area Assistance and Evacuation: Medical assistance in natural disasters, war or major accidents allows for the immediate evacuation and assistance of people from hazardous areas.

Emergency medicine also focuses on the provision of medical services in accordance with the conditions and the proper use of resources. For the successful implementation of emergency medicine, the training of medical personnel, effective teamwork and the use of modern equipment are essential.

Emergency situations and medical foundations of life safety − a set of medical approaches and projects applied in emergency situations to protect people's health and save their lives. Emergency situations include situations such as accidents, natural disasters, epidemics, wars, etc., and in this case there is a need to protect people's health under threat of life. By preventing life activities, it ensures that people live a socially and environmentally harmful life. Emergency medical care in emergency situations provides first aid to save the health of the patient or injured person. This includes activities such as stopping bleeding, resuscitation in case of cardiac arrest, solving breathing problems, and in case of trauma, etc. initial danger.

Conducting Triage for Medical Care

The scene, the leader-rescuer, according to the START protocol, first of all separates the lightly injured−those who are free to move (walking) from other victims. They should be involved in providing first aid to themselves, each other and other (unable to walk) victims. Assistance is provided with the means at hand.

Triage and first aid should be carried out before the arrival of medical personnel or rescuers. Initial triage at the scene should be carried out quickly and cannot be replaced by any measures other than resuscitation measures. In such cases, these measures are carried out simultaneously with triage.

Considering that conducting medical triage is a difficult and responsible task, the leader of the rescuers selects those who are able to walk freely and those who are familiar with medical triage and first aid, and together with them continues medical triage based on the START protocol. Other able-bodied people gather together and provide self-help or mutual assistance (bandaging, splinting, etc.) to those with minor injuries (minor wounds, bruises, sprains). Those who are able to walk are marked with a green tag.

Leader of the rescuers regulates the sequence of medical triage and first aid at the scene, distributing tasks between team members and those who come to help.

As additional help arrives, the triage continues, becomes more specific and deeper. The members of the team consisting of able-bodied people are divided into groups of medical triage and first aiders under a single team and are given short training. It is very important to provide assistance as a team. One rescuer should act as the lead rescuer, while the others should follow his instructions. He should give orders in a clear, controlled voice. Shouting or using a loud voice can disrupt team interaction. Only one person should speak at a time.

The rescuer conducting the medical triage should assess the breathing, blood circulation and consciousness of the agile, unable to walk victims and divide them into three groups and mark them.

Marking should first start with victims who are not breathing (signs of life). After that, their blood circulation and consciousness should be assessed. It is not advisable to waste too much time on one victim:

- ✓ assistance should be provided without delay, first of all − red tag;
- ✓ assistance can be provided urgently and secondarily − yellow tag;
- ✓ deceased and dying − black tag.

Start with the most dangerous injury. If there are many injured victims at the scene, first of all, medical care should be provided to the victim who is seriously injured but has a higher chance of survival. If the victim has several injuries, it is necessary to start with the injury that is most life-threatening.

When medical triage of victims with different types of injuries, a primary view helps to determine the sequence of assistance. For example, a victim with an airway obstruction requires

more attention than a stable victim with a traumatic amputation (Seyfullayeva, Alekberova, & Mammadova, 2006, pp. 43-89).

Conclusion

1. Scientifically substantiated, developed and experimentally tested system of regulatory provision of first aid and medical-organizational measures in emergency situations, training first aid participants in the rules for its provision and equipping them with means for its provision, made it possible to ensure the timeliness and effectiveness of first aid and reduce the mortality rate of victims who died before the arrival of emergency medical assistance by 15-20 %, reduce the time and costs of treating victims in hospitals.
2. An optimal scheme for organizing medical care for victims with combined burn injuries during the elimination of the consequences of an emergency situation accompanied by explosions or fires has been developed. When implementing it, all victims, after first aid, should be transported as soon as possible by air to medical institutions where they can be provided with fully specialized medical care–regional burn centers or burn departments of multidisciplinary hospitals.
3. Protecting the health of the population consists of a set of political, economic, legal, scientific, medical, sanitary-hygienic measures aimed at protecting the physical and mental health of every person, increasing their active longevity, and providing them with medical care.
4. Emergency and urgent medical assistance to citizens in cases requiring emergency medical intervention (accidents, traumas, poisonings and other diseases) is provided by emergency medical institutions, regardless of their form of ownership, as well as by persons obliged to provide first aid in accordance with the procedure established by law.

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Directions for Improving Fire Safety in Healthcare Facilities

Abstract

This research work, an assessment of the level of fire safety and an analysis of the fire safety situation in medical institutions were carried out. Documents on fire safety issues, a scheme of fire extinguishing equipment, draft orders for the appointment of persons responsible for fire safety and primary fire extinguishing equipment were developed. The management of the institution is responsible for ensuring fire safety in healthcare facilities. Violations of standard construction norms and rules, technological design norms established in the institutions should not be allowed, and detected violations should be eliminated immediately. Each employee of the institution must know the fire safety rules, strictly observe these rules and the fire prevention regime in the relevant area, and in the event of a fire, take all measures that depend on it to save people and extinguish the fire.

We would like to remind you once again of a number of rules for ensuring fire safety in healthcare facilities:

1) The territory and buildings of the institution must always be kept clean, extra items should not be stored in attics, stairwells, evacuation routes, passages and corridors should not be blocked by beds, cabinets and objects that may impede the movement of people, flammable and combustible liquids should not be stored in basements, warehouses, attics, garages, stairwells, corridors, wards and rooms;

2) The roads, passages, and entrances to the buildings, facilities, and water sources of the institution must be maintained in good condition and must not be blocked by obstructions;

3) Tthe distance between beds in the wards must not be less than 0.8 meters, and the width of the main central passage must not be less than 1.2 meters;

4) Seriously ill patients and children must be placed on the first floor.

Keywords: *fire safety, healthcare facilities, inpatient, fire safety system level, analysis, evaluation*

Introduction

Fire safety in healthcare facilities is of great importance. Because these facilities have a large number of visitors, and at the same time, most patients are unable to save themselves in the event of an emergency. Some clinics are considered highly dangerous places in case of fire, given the presence of inpatient departments and separate wards for newly arrived, often inadequate or sleepy people.

Thousands of people always apply to hospitals, most of whom are treated inpatient, that is, staying in the hospital day and night. If a fire occurs in a healthcare facility, the failure of the hospital can not only cause damage to people and property inside the building, but also cause major problems for the city and its population. When a fire occurs in a healthcare facility, that healthcare

facility cannot accept patients, and then responsibility for their lives is transferred to other facilities (Khannap, 2024, pp. 2-3).

Turn, queues form in these institutions and many people cannot receive full assistance. In this regard, state fire control authorities pay increased attention to healthcare facilities, as well as when carrying out administrative and legal activities. This problem requires special attention, as a number of large fires in healthcare facilities around the world have claimed hundreds of lives.

Research

The purpose of the research work was to improve fire safety in healthcare facilities. The work will also include the development of documents and requirements for healthcare facilities, an analysis of the fire safety situation in healthcare facilities, and ways to improve fire safety (Marberry, Guenther, & Berry, 2022, pp. 3-8).

Chart

Major fires at health facilities around the world in 2010-2018

History	Location	Hospital	Death toll	Additional information
02.03.2018	Baku city, Khatai District	National Narcotics Center	26 men	Because of the inability of firefighters to enter the object, problems arose, and strong winds worsened the situation.
26.01.2018	Republic of Korea	Hospital in the name of King Sedjan	46 men	The number of people affected is 146. It has taken up to 2 hours to extinguish the fire
17.10.2016	Opissa State of India	Hospital	24 men	Number of victims 100
10.08.2016	From the garden, Iraq	Hospital maternity unit in Yarmuk's name	13 men	All those who died were newborns.
24.12.2015	Jizan, Saudi Arabia	Intensive therapy unit	25 men	107 people were injured. Many of them are poisoned by the fumes, some of them were dead when they jumped out of the window.
13.12.2015	Voronezh, Russia	Psychiatric-neurological dispensary	23 men	Number of victims 23 and one FHN partner
27.04.2014	Kosixinski, Altay region	Private rehabilitation center	8 men	The number of people affected is 6. The fire covered an area of 200 square feet
11.10.2013	Fukuoka, Japan	Orthopedic hospital	10 men	The number of people affected is 8. The fire had been put out in 1.5 hours.
26.04.2013	Moscow province, Russia	Psychological-neurological hospital	38 men	Only three people have been rescued.
23.10.2012	Taynan, Tayvan	Geriatric Hospital	12 men	The number of people affected is 70. Patient who tried to commit suicide caused building fire

9.12.2011	Calcutta, Hindictan	AMRI hospital	90 men	About 160 people were in the fire and smoke zone
13.06.2011	Springs, South Africa	Psychological-neurological hospital	12 men	Number of victims 27
16.08.2010	Bucharest, Romania	Julest birthplace	13 men	All of the dead were children and newborns, as well as 2 pregnant women.

Analysis of regulatory documents and requirements in medical institutions

General provisions

Due to the high flow of people and the fact that people stay inside the building day and night, healthcare facilities require additional control. In order to determine the correct measures to ensure the fire safety of the facility, it is necessary to determine the constructive fire hazard class, the functional hazard class and the category of the medical facility in terms of fire and explosion hazard. The constructive fire hazard class is established in the regulatory documents "Code of Rules for Ensuring Fire Safety Systems, Fire Resistance of Protected Facilities" (Cheung, 2018, pp. 1-2).

The functional hazard class is determined based on the individual characteristics of the structure and its operation. In addition, the possible reaction of people, their number (including personnel), readiness for a quick response to an emergency situation and the availability of beds should be taken into account. Healthcare facilities operating as dispensaries belong to the first hazard class, which also includes residential buildings that are permanently in operation. Such buildings must include the possibility of independent evacuation of people, as well as the ability to equip them with fire barriers. Bedrooms allocated for sick people should be located separately from other designated areas of the building. Fire safety systems are characterized by the level of fire safety of employees and visitors of a medical institution, as well as material values, taking into account all stages of the life cycle of buildings.

These systems must perform one or more of the following tasks:

− exclusion of fire;
− ensuring fire safety of visitors and employees;
− ensuring fire safety of material reserves.

Medical institutions must have fire safety systems aimed at preventing the occurrence of hazardous factors affecting visitors and employees and their repeated manifestations at the required level (Zamani, Joy, & Abbey, 2023, pp. 3-6).

The required level of ensuring human safety in facilities where the systems are used must be at least 0.9999 of the prevention of exposure to hazardous factors per visitor or employee per year. The permissible level of danger should not exceed 10(-6) of exposure to hazardous factors exceeding the maximum permissible values per person per year.

Hazardous factors that can harm people include:

− heat flux;
− sparks;
− flame;
− high temperature;
− increased concentration of oxidizing agents;
− reduced visibility in smoke conditions.

During a fire, various debris and debris, radioactive and toxic substances, high voltage transfer to conductive parts, explosive factors and the effect of fire extinguishing agents on people also lead to the emergence of dangerous situations.

To ensure the protection of medical workers, visitors and property, it is necessary to provide one or more ways to improve the fire safety system:

− prevention of the spread of fire beyond the source;
− improvement of the design of escape routes;

− improvement of fire detection equipment, as well as warning and evacuation control;
− use of personal protective equipment for individual and collective protection;
− use of highly fire-resistant structures during construction;
− use of highly fire-resistant substances and materials during work;
− use of emergency drainage devices for flammable liquids;
− organization of fire departments;
− use of primary fire extinguishing means in conjunction with automated means.

All buildings of medical institutions should have their own evacuation route planning solutions or collective protection should be applied. For the safe evacuation of people from medical institutions, the following must be provided:

− emergency evacuation
− exits that meet all State standards, dimensions and rules;
− unhindered movement along the entire perimeter of emergency exits;
− informing and managing people.

The fire detection, warning and evacuation management system should ensure automatic detection of fire in buildings in a time frame necessary for the activation of warning systems for the safe evacuation of medical personnel and visitors (Belyakov, 2018).

The fire protection system of the building ensures the protection of personnel and visitors in a safe area during evacuation and when exposed to dangerous fire factors.

The system provides one or more protection methods:

− the use of certain solutions to prevent smoke in case of fire;
− the use of special anti-smoke ventilation.

In all buildings of medical institutions, the main building structures should be used, which belong to the fire hazard classes corresponding to the fire resistance limits and the required degree of fire resistance of the buildings. The class and fire resistance of building structures are ensured by:

− constructive solutions;
− appropriate building materials;
− fire protection devices.

Limiting the spread of fire should be achieved by:

− fire barriers;
− fire protection sections and compartments;
− emergency shutdown structures of facilities;
− using means to prevent the spread of liquids in case of fire;
− fire extinguishing devices;
− fire extinguishing devices.

The presence of primary fire extinguishing means is mandatory for all buildings of a medical institution. The nomenclature, quantity and location of these means are determined in accordance with regulatory documents and state standards.

Provision of automatic fire extinguishing systems is carried out in cases where it is impossible to extinguish a fire using primary means, as well as in cases where the working personnel is not on duty in the building all day. Automatic fire extinguishing systems should ensure (Mikhailov, 2012, p. 144):

− extinguishing a fire before the occurrence of critical dangerous factors;
− extinguishing a fire before the fire resistance limit of the structure is reached;
− extinguishing a fire before maximum damage is caused to the property of the enterprise.

Buildings of healthcare institutions must have a fire-fighting water supply.

For example:

− natural and artificial reservoirs;
− internal water supply;
− external water supply.

Of particular importance for healthcare institutions is the functioning of evacuation routes and exits leading to a safe zone for people. During their construction, it is necessary to take into account

the requirements of regulatory documents on fire safety, comply with all design decisions and pay special attention to lighting, dimensions, quantity and space-planning solutions, and the installation of fire safety signs on evacuation routes before the facility is put into operation (Taylor, Fielding, Reilly, & Kwasnica, 2024, pp. 2-5).

An equally important factor is the elimination of a possible fire by preventing the formation of a flammable environment or the formation of ignition sources in flammable liquids. To ensure that a flammable environment does not form, it is necessary to use one or more methods:

− use of non-combustible materials;
− limit the mass and volume of flammable substances;
− place flammable substances in a safe place;
− exclude the presence of a flammable environment near ignition sources;
− control of the content of the oxidizing agent in a safe concentration environment;
− control of the ambient temperature;
− control of the ambient pressure;
− automation of medical processes in the field of technologies for working with flammable substances;
− placement of fire-hazardous equipment in an isolated zone.
− In order to properly exclude a source of ignition from a flammable environment, one or more rules must be followed:
− determine the class of fire and explosion hazardous areas and use electrical equipment strictly corresponding to this class;
− use of quick-acting means of disconnecting the power supply source;
− use of medical equipment that minimizes or completely eliminates static electricity;
− buildings and equipment must be lightning-proof;
− control of the temperature of materials and substances located near flammable environments;
− limit the energy of the spark charge for devices used near flammable environments;
− reduce the likelihood of spontaneous combustion of circulating substances.

When implementing fire safety measures, the necessary operations are carried out, including:

− penetration into places where fire hazardous factors spread;
− creation of conditions that will prevent the development of fires and various disasters;
− use of additional means of communication available at the facility, if necessary;
− prohibition or restriction of people's access to fire or other disaster zones;
− protection of places where fire extinguishing or other emergency measures are currently being carried out;
− evacuation of people from the fire scene.

Fire extinguishing is carried out by a fire brigade. The head of the fire brigade manages the entire process in accordance with the principle of unity of command of the personnel of the fire department participating in extinguishing the fire. He is responsible for achieving goals and objectives, ensuring the safe implementation of the event for his team. The duties also include determining the boundaries of the fire extinguishing area, the procedure and features of these actions, and in addition (Anderson & Ezekoye, 2018, pp. 715-747):

− making decisions on the evacuation of people;
− making other decisions limiting the rights of officials and citizens in the specified area.

All instructions given by the fire chief during fire extinguishing are mandatory for all officials and citizens. No one has the right to interfere with the actions of the fire chief or cancel his orders.

Duties of fire safety officers

Training of all personnel in fire safety measures at the facility is carried out and supervised by the management of the relevant facilities on the basis of special programs. The organization of this training is carried out by the official responsible for ensuring fire safety in this medical facility. The head of the medical facility must install signs with the numbers of fire departments, evacuation schemes and fire safety signs in visible places. In addition, during all working hours, the head is obliged to monitor the activities of medical personnel and visitors on the premises to ensure compliance with fire safety rules. Each employee must clearly know the fire safety rules established

at the facility and follow them. In no case should he allow actions that may lead to a violation of these rules. Also, personnel must undergo briefings and fire-technical minimums, depending on their positions and activities. The management of the fire safety system of a medical facility is the responsibility of the head or director of the medical facility. He must also perform his duties within the framework of the assigned powers. The head of the medical facility may delegate the necessary powers to officials responsible for ensuring fire safety at the relevant facilities.

The management has the right to ensure safety in case of fire:

− organize fire departments in the established manner;

− make proposals to state bodies on improving fire safety;

− eliminate the causes of fires that have occurred in a medical institution;

− obtain complete information about the state of fire safety.

Duties of the management of a medical institution:

− compliance with fire safety requirements;

− develop and implement measures to ensure the fire safety of the institution;

− conduct briefings;

− control over personnel who need fire safety training;

− conclude a collective agreement;

− maintain the entire fire safety system in good condition;

− apply all possible forces and means in the event of a fire at the protected facility, as well as assist firefighters;

− ensure the access of firefighters to the territory during working hours when performing their official duties;

− issue documents on the state of fire safety at the facility at the request of officials;

− provide information about fires that have occurred at the facility;

− involve volunteer firefighters;

− ensuring fire safety measures at especially important facilities.

All managers and persons responsible for fire safety at the facility are liable for various violations in accordance with the current legislation and local regulations. Medical personnel are an integral part of the fire safety system at a medical facility. Employees have their own rights and obligations that must be strictly observed.

Rights of medical workers:

− protection of their health and property in the event of a fire;

− compensation for damage caused after a fire;

− assistance in determining the causes of a fire at the facility in the event of damage to their property or health;

− complete information on fire safety issues;

− assistance in ensuring fire safety at a medical facility.

Duties of medical workers:

− compliance with fire safety regulations at the workplace;

− immediate notification of the fire department upon detection of a fire;

− taking all possible measures to rescue people and patients, extinguish the fire and protect property until the fire brigade arrives;

− to assist the fire brigade in extinguishing a fire in the event of a fire;

− it is mandatory to comply with all rules and instructions of the state fire protection authorities.

In medical institutions with a large number of employees (50 or more), the establishment of a fire-technical commission is mandatory. Its purpose is to involve the enterprise's specialists in ensuring fire safety at the enterprise.

The fire-technical commission is established by order of the head of the enterprise. The activities of engineers in the commission are based on the organization of technological processes, the installation and conduct of work with electrical installations, water supply, communications, industrial automation, automatic fire protection systems and other automated devices and tools. If the enterprise does not have the opportunity to involve its own engineering and technical staff, it has the right to use the help of third-party organizations and hire engineers who will perform work

on a contractual basis. The chief safety engineer of the enterprise is the chairman of the fire-technical commission, who is appointed by the secretary of the labor protection service of the institution, the fire safety.

The duties of the fire-technical commission include:

− assisting the management of the enterprise in compliance with all fire safety laws and regulations;

− identifying and eliminating malfunctions in technical processes in production;

− developing measures to improve fire safety in the technical field.

The functions of the fire-technical commission include:

− identifying hazardous factors associated with the possibility of fire or explosion in workplaces;

− analyzing existing technical processes for the possibility of fire or explosion;

− notifying employees on behalf of the employer about identified equipment malfunctions or high-hazard factors of various devices;

− informing employees about ways to prevent fires in various buildings;

− assisting in identifying possible factors of fires that have occurred in the past;

− assisting in checking the compliance of all enterprise buildings, mechanisms and machines with fire safety requirements;

− assisting in developing improvements to improve fire safety and prevent fires at the enterprise;

− during the construction of enterprises, the participation of the fire-technical commission is taken into account in the commissioning of facilities;

− assistance in compiling a list of personnel to pass the fire-technical minimum;

− assistance in compiling a list of employees who need additional training due to increased danger;

− preparation of training programs;

− conducting initial briefings for new personnel;

− conducting initial briefings for other employees, including: students coming for internships, contractor employees performing various works at the enterprise;

− theoretical assistance to managers when reviewing instructions on fire safety measures;

− coordination of various draft documents;

− assistance in testing fire safety knowledge of enterprise employees.

Members of the fire technical commission have certain rights, namely:

− inspect the building at any time and familiarize themselves with fire safety documents;

− check and eliminate detected violations of the fire safety regime;

− prohibit their use if malfunctions are detected in equipment;

− request materials from department heads on the state of fire safety;

− issue an order to department heads to dismiss employees who have not received instructions and have not been trained on fire safety measures at the enterprise.

It is strictly prohibited in healthcare facilities:

− use of flammable liquids, flammable liquids and other hazardous substances in basement floors;

− use of unsuitable areas and buildings for the organization of production areas and workshops;

− placement of kiosks in elevator halls;

− deportation of exit doors provided for in the project;

− obstruction of people's evacuation routes;

− use of flammable and combustible liquids during cleaning;

− do not use lamps to heat frozen pipes;

− use of blind grilles on street windows.

The head of a healthcare facility must ensure compliance with fire safety regulations not only during the working day, but also during events involving a large number of people.

Analyzing the general provisions on fire safety of healthcare facilities, as well as the duties of managers and their subordinates, it can be concluded that such facilities are considered one of the most important and complex facilities for ensuring fire safety (Overholt & Ezekoye, 2015, pp. 335-367).

Analysis of technical documentation and fire safety of medical institutions

Normative regulation − In order to properly ensure fire safety at the facility, it is necessary to comply with fire safety requirements, that is, regulatory documents or special or technical conditions established by the authorized state body. The concept of normative regulation in fire safety refers to the adoption by state bodies of various normative legal acts that contribute to the regulation of public relations related to ensuring fire safety.

There are standards for determining general provisions and fire safety requirements for protected facilities at all stages of the life cycle. Fire safety legislation in the Republic of Azerbaijan is based on three main documents:

- Law “On Fire Safety” (Baku city, June 10, 1997 No. 313-IQ);
- “Technical regulations on fire safety requirements”;
- Fire safety rules in the Republic of Azerbaijan.

In addition to these documents, five more normative legal acts are known in the field of fire safety:

1. Code of Administrative Offenses of the Republic of Azerbaijan (approved by Law No. 96-VQ dated December 29, 2015). It describes all administrative liability of citizens for failure to comply with fire safety rules.

2. Criminal Code of the Republic of Azerbaijan (This Code was approved by the Law of the Republic of Azerbaijan No. 787-IQ dated December 30, 1999). This Code describes all criminal liability of citizens for failure to comply with fire safety rules.

3. Resolution of the Government of the Republic of Azerbaijan "On licensing of activities in the field of fire safety" (Resolution of the Cabinet of Ministers of the Republic of Azerbaijan No. 174 dated November 7, 2002).

This resolution establishes the procedure for licensing fire-fighting work carried out by legal entities and individual entrepreneurs.

4. Order of the Ministry of Civil Defense and Emergency Situations of the Republic of Azerbaijan "On approval of fire safety standards" "On design of fire alarm systems in buildings and structures".

5. Order of the Ministry of Civil Defense and Emergency Situations of the Republic of Azerbaijan "On approval of fire safety standards" List of buildings, structures, buildings and equipment that must be protected by automatic fire extinguishing installations and automatic fire alarm systems".

Evacuation routes and exits, emergency exits − The correct functioning of evacuation routes and exits plays an important role in ensuring the safety of a medical institution. For this, all norms and rules must be observed during the construction of the building. All calculations for them are carried out without taking into account the fire extinguishing equipment used.

The evacuation exit must lead people to a safe place, that is, outside the first floor of the building or to safe rooms on the floors above the first floor. When considering basements, evacuation routes must lead directly outside, except for cases established by State Law. All exits must be located in a staggered manner. Their number and width must be determined depending on the building and its possible evacuation when fully loaded, and the maximum permissible distance from the most remote place where people can stay to the emergency exit. If several rooms in a building have different functional hazards, they must be separated by fire barriers and provided with independent evacuation exits (Huang, Wang, & Liu, 2021, pp. 4-5).

The medical institution belongs to the functional hazard class F1.1, in connection with which the floors of buildings must have at least two evacuation routes on each floor, and if the number of people being evacuated is 15 people, then the width of the evacuation route must not be less than 1.2 meters.

Also, if the area exceeds 300 m2 or more than 15 people can enter at the same time, then there must be at least two emergency exits on the basement and first floors. In order to correctly place the stairs on each floor of the facility, the following expression should be used to determine the distance:

$L=1,5* \sqrt{P/n-1}$

P − perimeter of the room, n − number of evacuation exits.

The width of the evacuation exit should be such that it is possible to freely transport a person with a stretcher from the exit. The doors should open in the direction of exit from the building. They should also not be obstructed.

The corridors of evacuation routes with a length of more than 60 m are required to be separated by fire partitions (Tolo, Patelli, & Beer, 2017, pp. 2733-2756).

If the evacuation exits do not meet the requirements, they should be classified as emergency exits. Emergency exits are not taken into account in emergency situations. Emergency exits themselves are necessary to increase safety in case of fire. Emergency exits should lead people to a safe area, that is, to the exit:

− to an open balcony with a blank wall or a fire escape;
− to a room or compartment protected by minimizing the penetration of fire in case of fire;
− to a fire-resistant roof.

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− to an open balcony with a blank wall or a fire escape;
− to a room or compartment protected by minimizing the penetration of fire in case of fire;
− to a fire-resistant roof.

The lighting of evacuation routes should comply with the requirements for “natural and artificial lighting”. Photoluminescent elements are used for evacuation route signs. When placing them, it should be understood that people detect these signs with their peripheral vision.

The relationship between the size and frequency of installation of signs and indicators is established in accordance with State standards (Rohde, Corcoran, & Chhetri, 2010, pp. 58-69).

Primary fire extinguishing means − Primary fire extinguishing means are used only in the initial stages of a fire, since in the event of a full-fledged fire such extinguishing is dangerous to health and life. Primary fire extinguishing means include:

− fire extinguishers;
− fire hydrants;
− fire equipment;
− blankets that isolate the source of fire.

Fire extinguishers − One of the most important conditions for the operation of the facility is the availability of primary fire extinguishing agents. To determine the type and quantity of these agents, the following should be taken into account:

− physicochemical and fire hazardous properties of flammable and combustible substances;
− interaction with extinguishing agents;
− categories of buildings and structures.

The height of the place where the fire extinguishers are located should not exceed 1.5 m. The choice of the type of fire extinguisher depends on the fire category of the room.

The choice of the type of fire extinguishers depends on the fire and fire-explosion hazard category and purpose of the premises (it can be public, as in the case of a dispensary), as well as the class of possible fires that may occur in the building. In this regard, it is necessary to adhere to the Fire Safety Rules of the AR to select fire extinguishers and their quantity for each facility.

The location of fire extinguishers should be such that the fire extinguisher itself is not damaged and is protected from direct rays and heat flows. It should also be clearly visible in case of emergency, for this purpose, location signs should be placed above the fire extinguishers; Fire

extinguishers should be placed close to places where there is a possibility of fire. Fire extinguishers weighing no more than 15 kg should be placed at a height of no more than 1.5 m above the floor level. Fire extinguishers weighing more than 15 kg are installed at a height of no more than 1 m above the floor level or on the floor with mandatory fixation.

1. Fire hydrants − Fire protection systems and requirements for internal water supply, medical facilities and the presence of people there day and night, the number of fire hydrants on the floor should be one, and the minimum water flow for extinguishing a fire should be up to 2.5 liters per second in one stream.

The height of the location in the facility is not higher than 1m 35cm. Fire water supply inspections should be carried out by the company servicing the crane twice a year. Hose rolling should be carried out at least once a year. A separate pipeline should be laid for fire extinguishing needs in medical institutions. The pressure of the fire extinguisher is considered to be in accordance with the standards when the water column is 15.7 m. Internal fire water supply pipelines are made of 50 mm diameter electrically welded steel and plastic pipes. The minimum water consumption for internal fire extinguishing on all floors is 2.5 l/s per flow. Cranes should be equipped with hoses and shafts in accordance with the requirements. Inspections should be carried out in accordance with the standards.

2. Fire source isolation covers − These include fire blankets and fire extinguishing equipment. They are used to isolate the source of combustion from access to oxygen. Such covers are available in laboratories where flammable liquids are present in medical facilities.

3. External networks − External networks include fire water supply, located outside the building in an open area and helping to extinguish a fire from the street in emergency situations. External fire water supply in medical dispensaries is provided by two fire hydrants in accordance with the requirements within a radius of 200 meters in the PQ-1 wells on the territory of the institution and PQ-2 wells opposite the facade.

4. Medical institutions must have anti − Smoke (filtering) masks

(Kurzawski, Cabrera, & Ezekoye, 2020, pp. 445-467).

Conclusion

The main purpose of this research work is devoted to the study and improvement of fire safety in medical institutions. Here, an analysis of regulatory documents for medical institutions and an analysis of the fire safety situation were carried out. As a result of the analysis of the fire safety situation, it was determined that the following work is mainly necessary to ensure safety:

− Evacuation routes and exits;
− Alarm system and fire extinguishers;
− Primary fire extinguishing equipment;
− Design of building structures;
− Organizational measures to ensure fire safety.

The main solutions implemented in this regard:

− Preparation of working documents (instructions) on fire safety issues. Instructions for staff, instructions for inpatients and instructions for conducting building evacuation drills;

− Development of a fire extinguishing equipment scheme for a protected facility and calculation of the types of fire extinguishing equipment recommended for use;

− Preparation of orders in a new form on the appointment of persons responsible for fire safety and persons responsible for the operation of primary fire extinguishing equipment.

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Clinical Evaluation of Pregnant Women with Preeclampsia and Children Born by Them

Abstract

The article provides information about a research study conducted to study the frequency of preeclampsia among pregnant women and its impact on newborns. During the study, 110 pregnant women diagnosed with preeclampsia were observed among 1238 pregnant women. In the study, arterial pressure measurement, general blood analysis, cardiotocography, urine general analysis, 24-hour urine protein determination, liver functional tests, USM, creatine concentration calculation were performed in pregnant women. Pregnant women diagnosed with preeclampsia were divided into 3 groups by age: younger than 20 years old, between 20-35 years old, and older than 35 years old. According to parity, it was divided into nulliparous, multiparous, grandmultiparous ones. A higher risk of preeclampsia was observed in pregnant women aged 35 years and older and in grandmultiparous women. In order to study the effect of preeclampsia on the newborn, 114 newborns (4 of them twins) born from 110 preeclamptic pregnancies were clinically evaluated. Laboratory tests, neurosonography, echocardiography, audiometry, and X-ray examination were performed on newborns whose examination is important. As a result, it was observed that preeclampsia causes intrauterine growth retardation, premature birth, intrauterine hypoxia, low birth weight and low Apgar children, a number of heart, brain and respiratory system problems, and an increase in the frequency of operative completion of childbirth (Ashley et al., 2019).

Keywords: *preeclampsia, intrauterine growth retardation, intrauterine hypoxia, low birth weight newborn*

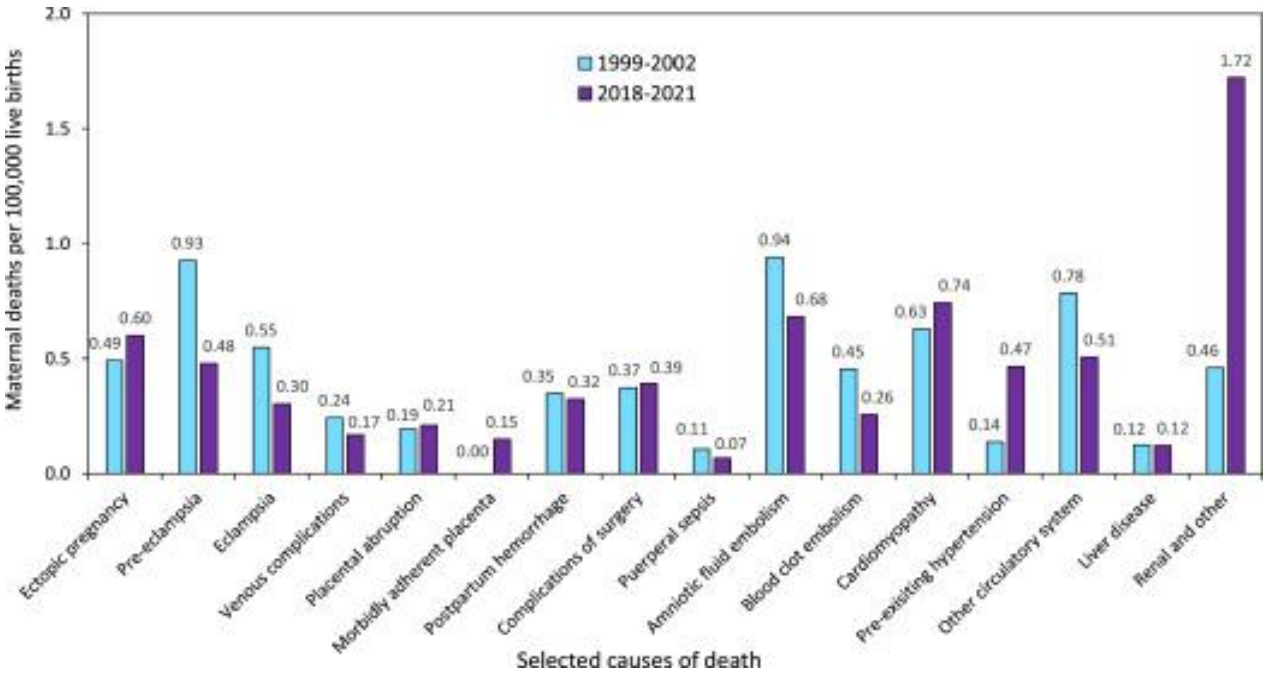
Introduction

Preeclampsia is a specific pregnancy pathology, a syndrome characterized by arterial hypertension, edema, significant proteinuria (>0.3 g/l in daily urine) or signs of dysfunction of one or more organs that develop after the 20th week of pregnancy (Asheber et al., 2011). It affects 2-8 % of all pregnant women. According to the research conducted by the World Health Organization in 2003-2009, among the causes of maternal death, it ranks second with 18 % after hemorrhagic problems, which make up 27.1 %. Compared to 1999-2001, there was a decrease in the number of mothers who died from preeclampsia in 2018-2021 (Joseph et al., 2024). It can lead to lack of an umbilical cord, retardation of intrauterine development of the fetus, increase in the frequency of premature birth and operative delivery. It accounts for 8-10 % of all premature births (Anouk et al., 2016). Although the mechanism of the risk of neurodevelopmental, cardiovascular, brain and metabolic diseases in newborns born to pregnant women with preeclampsia is not fully known, it is possible that the preeclamptic environment has a negative impact on the development process.

Research

Women with antiphospholipid antibody syndrome had the highest pooled rate of pre-eclampsia. Those with prior pre-eclampsia had the greatest pooled relative risk. Chronic hypertension ranked second, both in terms of its pooled rate and pooled relative risk of pre-eclampsia. Pregestational diabetes, prepregnancy body mass index (BMI) >30 and use of assisted reproductive technology were other prominent risk factors (Emily et al., 2016).

Bar Chart 1



Bar Chart 2

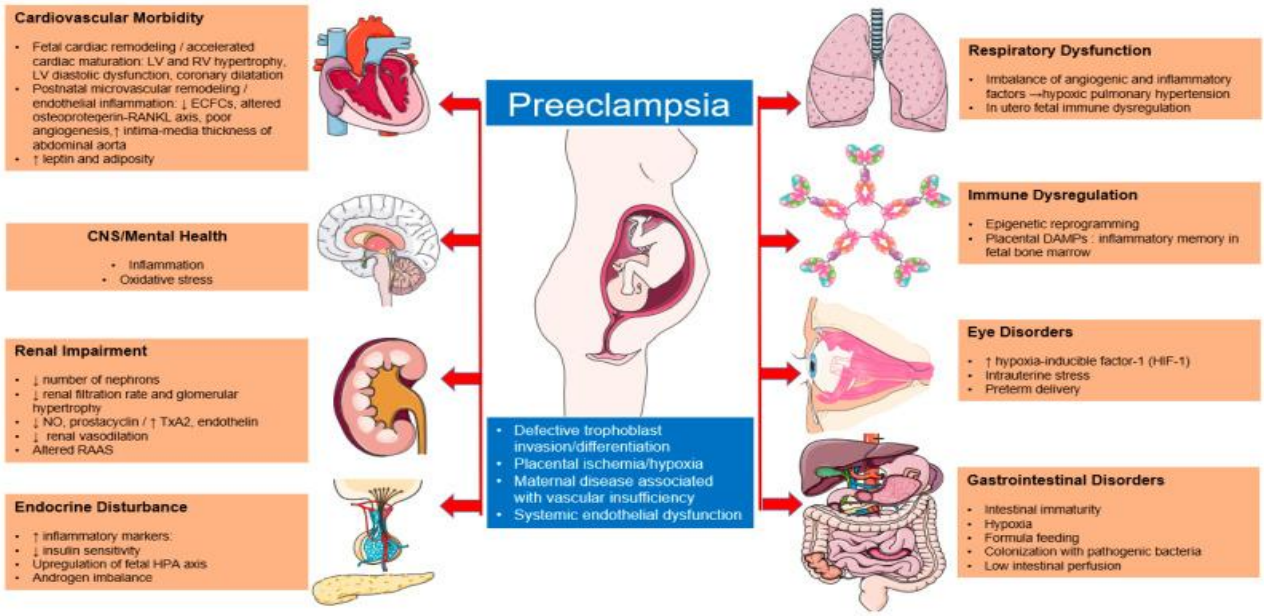


Table 1

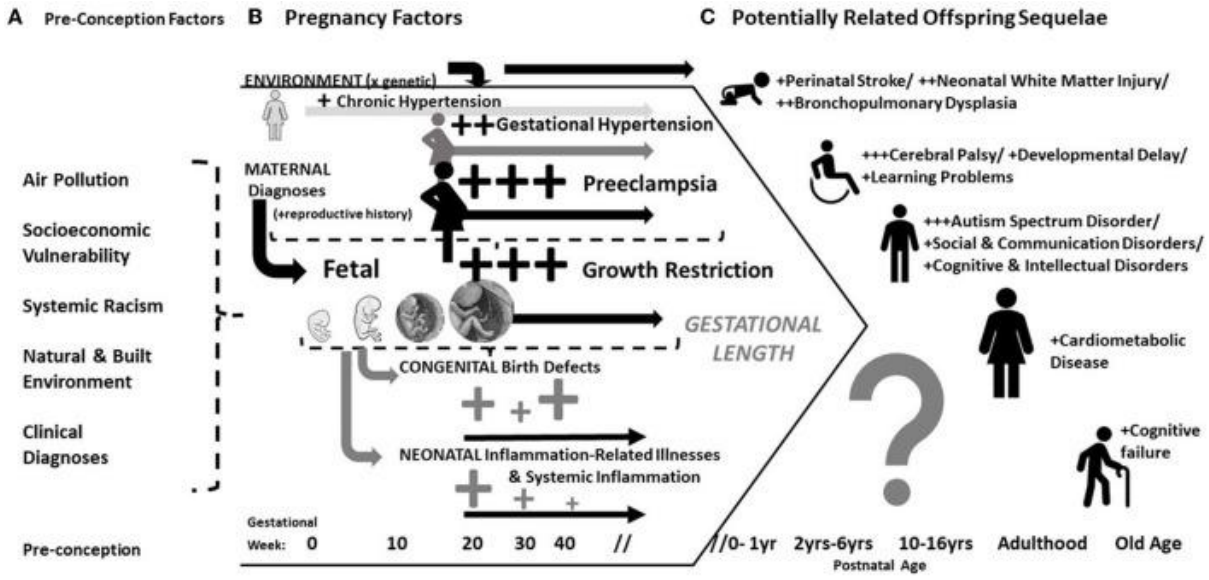
A patient with preeclampsia is diagnosed with "severe preeclampsia" if one or more of the following are present (pre-eclampsia and eclampsia Guideline 2019)

A sharp rise in blood pressure:
SAT ≥160 mmHg twice with an interval of at least 4 hours while the patient is in bed mode or DAT ≥110 mmHg when measured once; Note: in general, antihypertensive therapy should be started on the basis of severe hypertension, which can provide treatment of high AT without waiting 4 hours (Lambert et al., 2014).
Symptoms of central nervous system dysfunction:
Symptoms such as newly emerged cerebral or visual disturbances: Photopsia, scotoma (spots), cortical blindness, retinal vasospasm. Severe headache (ie, disabling, “worst headache I've ever

had") or headache that persists and worsens despite the use of pain relievers and is unexplained by alternative diagnoses.
Liver dysfunction:
Liver dysfunction, unexplained/unrelated to another diagnosis and characterized by serum transaminase concentrations more than 2 times or the upper limit of normal or severe persistent right upper quadrant abdominal or epigastric pain unresponsive to medication.
Thrombocytopenia:
<100.000 thrombocyte/microl(dl)
Kidney dysfunction:
Renal failure (serum creatinine >1.1 mg/dl [97.2 micromol/l] or doubling of serum creatinine in the absence of other renal disease).
Pulmonary edema

In the absence of other indications (bleeding) to terminate birth urgently, stabilize hemodynamics (AT range: SAT 130-149 mmHg, DAT 80-99 mmHg), relieve headaches, take anticonvulsant measures, intensive treatment is carried out for 12-24 hours in order to increase diuresis. If the patient's condition worsens (blood pressure rises above 170/110 mmHg, headaches intensify, readiness for convulsions and nausea, vomiting, pain in the epigastric region are noted) − the pregnancy should be terminated immediately (Clinical protocol on resuscitation of severe preeclampsia and eclampsia Baku-2009).

Diagram 1



The purpose of the study: to study the incidence of preeclampsia among pregnant women and the impact on newborns.

Materials and methods of the research

Between 01.10.2023 and 30.06.2024, 1238 pregnant women who gave birth at Nakhchivan MR Perinatal Center were examined. Pregnant women with blood pressure of 140/90 and above and proteinuria of more than 300mg/lt in 24 hours at least 2 times with an interval of 4 hours were included in the study.

Measurement of arterial pressure. Patients with a measurement result of 140/90 and above were checked after 4 hours. All patients underwent general blood analysis, cardiotocography, general analysis of urine, determination of the amount of protein in 24-hour urine, functional tests of the liver, USM, calculation of creatine concentration. Arterial pressure 160/110 mmHg and above, liver function test abnormalities, more than 4gr/lt Pregnant women with proteinuria, significant

hemolysis and thrombocytopenia, severe epigastric and headache, and visual disturbances were considered as severe preeclampsia. MgSulfate infusion therapy was applied to pregnant women with severe preeclampsia. Neonates were clinically evaluated. Laboratory examinations were carried out. Neurosonography, echocardiography, audiometry, and X-ray examination were performed on newborns whose examination was important.

Conclusion

Taking into account the relevance of the topic, preeclampsia was diagnosed in 110 out of a total of 1238 patients during the research conducted at the Nakhchivan MR Perinatal Center (Abbasova et al., 2017). The incidence of preeclampsia was determined as 8.88 %.

The average age of all patients who gave birth in our center was 25.48. 14 of them (1.13 %) were under 20 years old, 1156 (93.38 %) were between 20-35 years old, and 68 (5.49 %) were 35 years old and older. 603 (48.71 %) were nulliparous, 609 (49.19 %) were multiparous, and 26 (2.10 %) were grand-multiparous. 654 out of 1238 births (52.83 %) ended operatively.

4 (3.64 %) of pregnant women with preeclampsia were under 20 years old, 82 (74.54 %) were between 20-35 years old, 24 (21.82 %) were over 35 years old. The incidence of preeclampsia according to age groups is shown in Table 2.

Table 2

Frequency of occurrence of preeclampsia according to age groups

Age group	Pregnants with preeclampsia	Total pregnants	Frequency of occuring %
Below 20 years old	4	14	28.57
20-35 years old	82	1156	7.09
Above 35 years old	24	68	35.29
Total	110	1238	8.88 %

Thus, the risk of developing preeclampsia was observed to be statistically high in patients over 35 years of age.

63 (57.27 %) of pregnant women with preeclampsia were nulliparous, 38 (34.55 %) were multiparous, and 9 (8.18 %) were grand-multiparous. The incidence of preeclampsia according to parity is shown in Table 3.

Table 3

Frequency of occurrence of preeclampsia according to parity

Parity	Pregnants with preeclampsia	Total pregnants	Frequency of occurence %
Nulliparous	63	603	10.44
Multiparous	38	609	6.23
Grand-multiparous	9	26	34.61
Total	110	1238	8.88

Thus, the incidence rate was higher in nulliparous (10.44 %) compared to multiparous (6.23 %). In grandmultipars, due to the small number of patients, it did not have a significant effect on the statistical results.

In preeclamptic patients, 50 of 110 patients (45.45 %) gave birth by normal vaginal route, 60 (54.55 %) by operative route. This result is considered statistically high when compared to all births (Table 4).

Table 4

Percentage value of delivery methods in all pregnant women and pregnant women with preeclampsia

Way of birth	Total births	%	Pregnants with preeclampsia	%
Vaginal	584	47.17	50	45.45
Operative	654	52.83	60	54.55

When the patients with preeclampsia were evaluated among themselves, 16 of them were accepted as severe preeclampsia (14.54 %). The operative delivery percentage of pregnant women with severe preeclampsia was 75 % (12), while this value was observed as 51.06 % in mild preeclampsia (Table 5).

Table 5

Percentage value of ways to complete delivery depending on the severity of preeclampsia

Way of birth	Severe preeclampsia	%	Mild preeclampsia	%
Vaginal	4	25	46	48.94
Operative	12	75	48	51.06

Out of 110 pregnant women with preeclampsia, 114 babies were born, including 4 twins. 2 (1.75 %) resulted in intrauterine death of the fetus. Both fetuses were older than 36 weeks and weighed more than 2500 grams. The mother visited our center saying that she did not feel the movements of the fetus. After USM and clinical laboratory examinations, the intrauterine death of the fetus was diagnosed and the pregnancy was terminated by vaginal stimulation.

5 (1.99 %) of preeclampsia pregnancies resulted in early neonatal death of the fetus. One of them was a twin pregnancy, 25-26 weeks old, the first pregnant woman (45 years old), and entered our center with the diagnosis of premature discharge of amniotic fluid. The birth was completed operatively. One of the newborns was 700 grams, the other 800 grams was a girl. Apgar score was 3. Deep prematurity neonates were connected to CPAP and could not be kept alive despite the necessary treatments, they died 5 hours later.

2 patients under 34 weeks, first pregnancy, entered our center with the diagnosis of severe preeclampsia. Due to non-responsiveness to antihypertensive treatments, her delivery was terminated operatively. Children were born, weighing one 1000 grams and the other 1700 grams, with 3-4 points on the Apgar scale. During the X-ray examination, atelectasis was found in one, and areas that did not open in the lung in the other. Early neonatal death occurred 2 days later, despite the necessary treatment.

The other patient was admitted to our center with the diagnosis of 39-40 weeks, fifth pregnancy, premature discharge of amniotic fluid, first stage of birth. The birth was completed operatively. A child was born weighing 2700 grams and rated 1-2 on the Apgar scale. Neurosonography showed parenchymatous hemorrhage in the right front and parietal lobes of the brain, and aspiration pneumonia in the lungs during X-ray examination. He died on the 2nd day of his life despite the necessary treatment.

In total, 2 out of 114 neonates born from 110 preeclamptic pregnancies (1.80 %) twin pregnancies were born before 28 weeks and resulted in early neonatal death. 8 (7.21 %) were born between 28-34 weeks and 2 of them resulted in early neonatal death. 101 (90.99 %) were born older than 34 weeks and 1 of them resulted in early neonatal death and 2 in intrauterine death.

Children born to preeclamptic pregnancies delivered at more than 36 weeks were rated <7 on the Apgar scale at 5 minutes (Table 6).

Table 6

Children born to pregnant women with preeclampsia who delivered more than 36 weeks had an Apgar score of less than 7 at minute 5

Apgar score at minute 5	In those born to pregnant women with severe preeclampsia	In those born to pregnant women with mild preeclampsia	Total
<7	4 (36.36 %)	28 (32.5 %)	32 (34.04 %)
>7	7 (63.64 %)	55(67.5 %)	62 (65.96 %)
Total	11	83	94

In 4 (36.36 %) of 11 pregnant women with severe preeclampsia who gave birth after 36 weeks, in 28 (32.5 %) of 83 pregnant women with mild preeclampsia, the Apgar score at the 5th minute was less than 7. Although there was no significant difference, in children born to pregnant women with severe preeclampsia, an Apgar score of less than 7 at the 5th minute was determined to be at higher risk.

When pregnant women with preeclampsia who gave birth after 36 weeks were examined, although there was no significant difference, the risk of birth of children weighing less than 2500 grams was found to be higher in the group of severe preeclampsia compared to those with mild preeclampsia (Table 7).

Table 7

The relationship between the degree of preeclampsia and the birth of low birth weight children

The degree of preeclampsia	Total number of patients	A newborn weighing less than 2500 grams	%
Severe preeclampsia	11	3	27.27
Mild preeclampsia	83	21	25.30
Total	94	24	25.53

In general, 40 (35.09 %) of 114 newborns born to preeclamptic women were normal; 24 (21.05 %) weigh less than 2500 grams; 32 (28.07 %) had an Apgar score of <7 at the 5th minute; 2 (1.75 %) fetal death in utero; 5 (4.38 %) resulted in early neonatal death. During the research, among the newborns, cyst in the brain (11.40 %), cyanosis (9.64 %), subependymal hemorrhage in the brain (5.26 %), intrauterine hypoxia (5.26 %), subcutaneous hemorrhage (4.38 %), transient tachypnea (3.51 %) , intrauterine growth retardation (3.51 %) was identified as a higher risk than others (Table 8).

Table 8

Examination results of newborns born to pregnant women with preeclampsia

Newborns	**Number**	**%**
Normal	40	35.09
Cyst in the brain	13	11.40
Cyanosis	11	9.64
Grade I intraventricular hemorrhage in the brain	6	5.26
Intrauterine hypoxia	6	5.26
Subcutaneous hemorrhage	5	4.38
Death in the early neonatal period	5	4.38
Intrauterine growth retardation	4	3.51

Transient tachypnea	4	3.51
Intrauterine growth retardation, cyst in the brain, cyanosis	3	2.63
Asymmetric lateral ventricle	2	1.75
The true knot of the umbilical cord	2	1.75
Intrauterine growth retardation, atelectasis, I degree intraventricular hemorrhage in the brain	2	1.75
Intrauterine death	2	1.75
Atelectasis	1	0.88
Hepatitis	1	0.88
A cyst in the brain, a true nodule of the umbilical cord	1	0.88
Mitral valve prolapse, brain cyst, sinus arrhythmia, transient tachypnea	1	0.88
Cyst in the brain, transient tachypone, uni tricuspid	1	0.88
Grade I intraventricular hemorrhage in the brain, intrauterine growth retardation	1	0.88
Intrauterine growth retardation, tricuspid valve dystrophy, left ventricular enlargement	1	0.88
Deficiency of the tricuspid valve	1	0.88
Respiratory distress syndrome	1	0.88
Total	114	

Thus, preeclampsia is the most common complication of pregnancy, and if it is not intervened in time, it can lead to acute kidney or liver failure, pulmonary edema, cerebral hemorrhage, widespread intravascular coagulation and eclampsia, and even the death of the mother and child. In newborns, it can cause intrauterine growth retardation, premature birth, low birth weight babies, brain and cardiovascular system, respiratory system, and other problems. This increases the risk of neurodevelopmental, cardiovascular, brain and metabolic diseases in these children in the future. Taking into account all this, it is recommended that pregnant women come to the field obstetrician-gynecologists' examinations from time to time, and children born to preeclamptic women should be under the supervision of a pediatrician.

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