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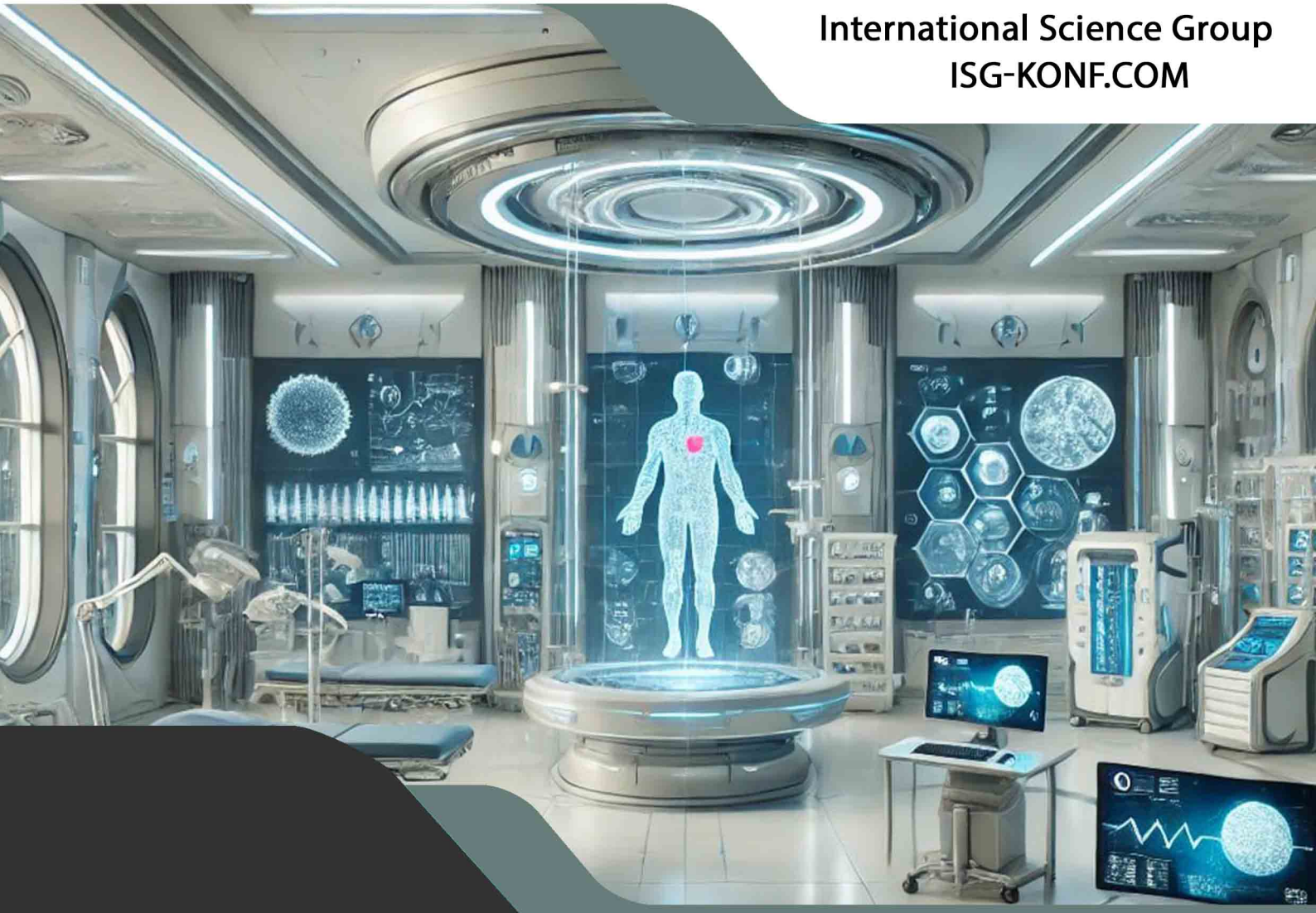

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SECTION 1. CARDIOLOGY

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1.1 Clinical impact of whole-food, plant-based diets on cardiovascular health

1.1.1. Introduction

Cardiovascular diseases (CVD), remain the leading causes of morbidity and mortality worldwide accounting for an estimated 17.9 million deaths annually. Conventional approaches to CVD prevention and treatment typically rely on pharmacologic and surgical interventions. However, growing evidence supports the use of lifestyle modifications especially dietary changes as effective, sustainable and low risk alternatives or complements to standard care. Among these, whole-food, plant-based (WFPB) nutrition has gained increasing attention for their role in reducing cardiovascular risk factors and even reversing established disease. This work reviews the clinical evidence supporting plant-based diets as effective interventions in cardiovascular medicine, highlighting their role in disease progression reversal, risk factor modification, and overall improvement in cardiovascular function.

A WFPB diet emphasizes the consumption of unrefined plant foods—vegetables, fruits, whole grains, legumes, nuts, and seeds—while minimizing or eliminating animal products, oils, and processed foods. The works of leading physicians and researchers like Dr. Caldwell Esselstyn, Dr. Dean Ornish, Dr. Michael Greger, Dr. Neal Barnard, and Dr. Milton Mills have brought clinical and public awareness to the power of plant-based nutrition in cardiovascular care. This chapter reviews the evidence, mechanisms, and clinical implications of this approach. By integrating these insights, this chapter aims to provide clinicians, researchers, and healthcare professionals with a comprehensive understanding of the therapeutic potential of plant-based nutrition in combating cardiovascular disease and promoting sustainable heart health.

1.1.2.Understanding the Whole-Food, Plant-Based Diet (WFPB)

A WFPB diet differs from vegan or vegetarian diets in that it focuses not only on excluding animal products but also on emphasizing nutrient-dense, unprocessed plant foods. Unlike many modern dietary patterns, WFPB eating avoids refined sugars, white flour, and heavily processed plant-based substitutes. This diet is naturally high in dietary fibre, complex carbohydrates, unsaturated fats, and phytochemicals, while being low in saturated fat, cholesterol, and sodium.

Key Components:

- Vegetables and leafy greens
- Whole grains (e.g., brown rice, oats, quinoa)
- Legumes (e.g., lentils, beans, chickpeas)
- Fruits
- Nuts and seeds (in moderation)
- Minimal or no oil, salt, or sugar

1.1.3. Mechanisms of Cardiovascular Protection Through Plant-Based Nutrition

Plant-based nutrition exerts a profound impact on cardiovascular health through several interrelated biological mechanisms, leading to both the prevention and reversal of heart disease. These effects are not due to a single nutrient but stem from the synergistic action of whole plant foods. The following are the principal mechanisms supported by clinical research and expert practice.

1.1.3.1. Reduction of LDL Cholesterol and Atherogenesis Inhibition

• Mechanism: Diets centred on whole grains, legumes, vegetables, fruits, seeds, and nuts are inherently low in saturated fat and dietary cholesterol. They enhance the liver's expression of LDL receptors and reduce the hepatic synthesis of cholesterol.

• Clinical Support: Esselstyn's patients experienced an average LDL level drop to <80 mg/dL, with many achieving levels below 60 mg/dL, associated with arrest and even reversal of atherosclerotic plaques.

Ornish's Lifestyle Heart Trial demonstrated a 37.2% LDL cholesterol reduction in one year, with angiographic regression of coronary lesions.

1.1.3.2. Improvement in Endothelial Function

• Mechanism: Endothelial cells regulate vascular tone and homeostasis through nitric oxide (NO) production. Plant-based diets, rich in nitrates (beets, leafy greens) and antioxidants (vitamins C, E, polyphenols), improve NO bioavailability and reduce oxidative damage.

• Clinical Support: Studies have shown increased brachial artery flow-mediated dilation (FMD) in patients following a plant-based diet for as little as 3 weeks.

Esselstyn's work emphasized the preservation of endothelial integrity as a cornerstone in preventing myocardial infarction.

1.1.3.3. Anti-Inflammatory Effects

• Mechanism: Chronic inflammation is central to the pathogenesis of atherosclerosis. Plant-based diets lower circulating levels of C-reactive protein (CRP), interleukin-6 (IL-6), and TNF-alpha, in part due to high fibre, polyphenols, and absence of inflammatory animal-derived compounds (e.g., endotoxins, TMAO).

• Clinical Support: In patients on a plant-based diet, CRP levels can decline by over 30%.

Barnard and Ornish have both reported decreased inflammatory markers alongside improved metabolic control.

1.1.3.4. Blood Pressure Reduction

• Mechanism: Plant-based diets are naturally high in potassium, magnesium, and arginine, which help lower systemic vascular resistance. The absence of saturated fat and improved arterial compliance also contribute.

• Clinical Support: The DASH-style vegetarian patterns and Barnard's vegan interventions lowered systolic BP by 7–13 mmHg in hypertensive patients.

In Dean Ornish's program, significant BP reductions were seen within weeks of starting the dietary intervention.

1.1.3.5. Enhanced Insulin Sensitivity and Glucose Metabolism

• Mechanism: Insulin resistance contributes to endothelial dysfunction and atherosclerosis. A high-fibre, low-fat plant-based diet reduces intramyocellular lipid accumulation and enhances glucose transport.

• Clinical Support: Barnard's randomized trials in patients with type 2 diabetes showed HbA1c reductions ≥1.2%, improved insulin sensitivity, and decreased CVD risk. Lower postprandial glucose spikes also reduce glycation end-products and vascular stiffness.

1.1.3.6. Weight Reduction and Central Adiposity Control

•Mechanism: Plant-based diets are energy-dense yet low in calories and fat, promoting satiety via fibre and reducing total caloric intake. This leads to decreased visceral fat, which is closely linked to metabolic syndrome and CVD risk.

•Clinical Support: The Broad Study (2017) documented an average weight loss of 12 kg over six months in participants eating ad libitum on a WFPB diet. Reduction in waist circumference has been linked to improved lipid profiles and decreased cardiac risk.

1.1.3.7. Antioxidant and Anti-Thrombotic Effects

• Mechanism: Flavonoids, carotenoids, and vitamin C in plants reduce lipid oxidation, platelet aggregation, and thrombosis risk.

•Clinical Support: Higher intake of leafy greens, berries, and legumes has been associated with lower levels of oxidized LDL, and lower platelet activity.

Greger emphasizes these findings in his Daily Dozen, advocating foods like turmeric, berries, and cruciferous vegetables for vascular resilience.

1.1.3.8. Gut Microbiome and TMAO Reduction

• Mechanism: Carnitine and choline from animal foods are metabolized by gut bacteria into TMAO (trimethylamine N-oxide), a compound linked to vascular inflammation and plaque instability. Plant-based diets shift microbiota composition, lowering TMAO levels.

•Clinical Support: Studies show that long-term plant-based eaters have minimal TMAO production even when exposed to carnitine-rich foods. Improved gut microbiome diversity is also linked to reduced CVD risk and systemic inflammation.

1.1.3.9. Comprehensive Lifestyle Impact

• Mechanism: Plant-based diets often accompany other healthy lifestyle factors, such as increased physical activity, stress management, and smoking cessation — especially in structured programs like Ornish's.

•Clinical Support: The Multifactorial Lifestyle Program of Dean Ornish not only reversed CVD but also improved mental well-being and reduced all-cause mortality over time.

Combined diet and stress reduction lowered angina frequency, medication use, and hospital readmissions.

1.1.4. Review of Key Clinical Studies

1.1.4.1. Dr. Caldwell Esselstyn – Reversal of Coronary Artery Disease (CAD)

Dr. Esselstyn's pivotal research demonstrated that a strict low-fat whole-food, plant-based diet can not only halt but potentially reverse coronary artery disease.

• In a 1995 longitudinal study involving 22 advanced CAD patients, 18 who adhered to the dietary protocol had no further cardiac events over 12 years.

LDL cholesterol dropped to <150 mg/dL, and angiographic data showed regression of atherosclerosis.

• In a 2014 study of 198 patients, 89% of adherents remained free of major cardiac events.

1.1.4.2. Dr. Dean Ornish – The Lifestyle Heart Trial

Published in The Lancet (1990) and followed up in JAMA (1998), this was the first randomized controlled trial to show that comprehensive lifestyle changes including a low-fat vegetarian diet could reverse coronary artery plaques.

• Participants showed a 2.2% regression in atherosclerosis versus 3.4% progression in the control group.

• Angina frequency decreased, and lipid profiles improved significantly.

• Results persisted over 5 years, confirming long-term benefit.

1.1.4.3. Dr. Neal Barnard – Diabetes, Lipids, and Cardiovascular Risk

In a 2006 study in Diabetes Care, Barnard and colleagues compared a low-fat vegan diet with the conventional ADA (American Diabetes Association) diet in patients with type 2 diabetes:

• HbA1c reduction was significantly greater in the vegan group (1.23% vs. 0.38%).

• LDL cholesterol dropped by 21.2%, with improvements in weight and BP.

• The diet improved insulin sensitivity, which contributes to reducing cardiovascular disease risk.

1.1.4.4. Dr. Michael Greger – Translating Evidence into Action

Dr. Greger's work focuses on public education through evidence synthesis:

• His book How Not to Die presents meta-analyses showing that plant-based diets lower risk of ischemic heart disease, stroke, and all-cause mortality.

• He emphasizes endothelial health, nitric oxide preservation, and fibre-rich, antioxidant-dense foods.

• He popularized the "Daily Dozen" checklist for practical plant-based prevention.

1.1.4.5. Dr. Milton Mills – Addressing Cardiovascular Health Disparities

Dr. Mills emphasizes structural inequities and nutrition's role in cardiometabolic health among minorities:

• He advocates plant-based diets to address higher rates of hypertension and heart failure in African American and Latino populations.

• He stresses culturally relevant, plant-based solutions and public policy change.

• His work also focuses on lactose intolerance and its implications in cardiovascular risk via inflammation and metabolic dysfunction.

1.1.4.6. Additional Major Studies Supporting Plant-Based Diets

Adventist Health Study 2

•Over 96,000 participants

•Vegetarian men had 32% lower IHD risk; vegetarians overall had 22% lower all-cause mortality

EPIC-Oxford Study

•48,000 participants; vegetarians had lower rates of IHD

•Highlights importance of nutrient balance in vegan diets (e.g., B12, omega-3)

1.1.5. Implementation in Clinical and Public Health Settings

1.1.5.1. Integration in Clinical Practice

Plant-based nutrition can be implemented in cardiology and general medical practice by:

• Dietary counselling during clinic visits, emphasizing whole, unprocessed plant foods.

•Use of evidence-based resources such as Greger's Daily Dozen, Ornish's Lifestyle Medicine protocols, and Barnard's PCRM guidelines.

• Cardiac rehabilitation programs that incorporate plant-based meal plans, modelled after Dr. Esselstyn's and Ornish's programs, shown to reduce event recurrence and improve functional capacity.

1.1.5.2. Multidisciplinary Approach

The success of plant-based interventions is strengthened when integrated by:

- Physicians
- Dietitians/nutritionists
- Clinical psychologists (for behaviour change support)
- Physiotherapists (in cardiac rehab settings)
- Public health educators (for community awareness and prevention)

1.1.5.3. Public Health Campaigns and Policy

Public health models have successfully incorporated plant-based dietary guidelines:

- Blue Zones initiatives: These longevity zones emphasize predominantly plant-based diets.
- School and hospital menu changes: Inspired by Dr. Barnard's and Dr. Mills' advocacy.
- Policy reforms: Including USDA updates and plant-based options in federal food programs.

1.1.6. Discussion and Limitations

1.1.6.1. Benefits and Strengths of Plant-Based Nutrition

- Demonstrated reduction in LDL, blood pressure, BMI, and inflammatory markers.
- High fiber and antioxidant intake supports endothelial health.
- Avoids harmful effects of saturated fats and cholesterol common in animal products.

1.1.6.2. Challenges and Limitations

- Adherence and sustainability: Strict dietary changes require long-term motivation and support.

- Nutritional adequacy: Risk of deficiencies in B12, iron, omega-3 fatty acids, and vitamin D if not carefully planned.
- Limited RCTs: While many cohort and intervention studies exist, large-scale RCTs directly comparing dietary patterns over decades are scarce.
- Sociocultural barriers: Traditional eating habits, food accessibility, and socioeconomic factors can influence patient compliance.

1.1.6.3. Addressing Limitations

- Supplementation and monitoring: Ensuring B12 and omega-3 intake, either via fortified foods or supplements.
- Education and behaviour support: Through motivational interviewing, cooking classes, and culturally adapted meal plans.
- Healthcare provider training: Enhancing nutrition literacy in medical education to equip doctors with tools for dietary guidance.

1.1.7. Conclusion and Future Directions

The clinical evidence strongly supports whole-food, plant-based nutrition as an effective and sustainable approach for the prevention and treatment of cardiovascular diseases, type 2 diabetes, hypertension, and atherosclerosis. Compared to conventional dietary guidelines, plant-based diets demonstrate superior outcomes in improving metabolic health, reversing disease progression, and reducing medication dependency.

Future research should focus on large-scale, long-term randomized controlled trials to further validate these findings across diverse populations. Additionally, mechanistic studies exploring the molecular and cellular pathways of cardiovascular protection will deepen understanding and optimize personalized nutrition strategies. Integrating plant-based dietary counseling into mainstream clinical practice could significantly reduce the global burden of chronic cardiovascular diseases.

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1.2 Features of modern management patients with heart failure

The heart is a hollow fibromuscular organ of the cardiovascular system, thanks to which blood circulates throughout the body, which provides all the metabolic needs of our body. In order for there to be adequate metabolism, a full cardiac output is required, which is calculated by multiplying the stroke volume by the number of contractions per minute [7].

There are many factors that affect the dysfunction of cardiomyocytes, which causes systolic dysfunction, cardiac overload, diastolic dysfunction, which actually affect the deterioration of cardiac output and subsequently lead to heart failure. Such factors include: excess fat accumulation, aging, heredity, diabetes, hypertension, myocardial infarction, ischemic heart disease, kidney disease and others [8].

Heart failure (HF) is a set of symptoms, i.e. a syndrome that occurs due to insufficient functioning of the ventricles of the heart, which do not provide normal filling and ejection of blood [9]. At the moment when cardiac output is disturbed, compensatory mechanisms begin to work. Normally, compensatory mechanisms work to eliminate temporary disturbances in the functioning of the cardiovascular system, such mechanisms include: the Frank- Starling mechanism , neurohumoral activation, sympathetic nervous system, renin -angiotensin - aldosterone system, natriuretic peptides. In the presence of reasons that complicate the work of the heart muscle, the above-described mechanisms are unable to maintain adequate perfusion, which leads to disruption of their functioning, and this in turn will lead to the development of HF [10].

Acute heart failure is a clinical syndrome that has a sudden and rapid onset in the form of impaired pumping function of the heart and occurs due to a number of causes, including: acute myocardial infarction, hypertensive crisis, cardiac tamponade, pneumothorax, life-threatening rhythm disturbances, etc. In contrast, chronic heart failure (CHF) develops as a result of long-term impaired cardiac output and is usually

diagnosed in a patient with an existing chronic disease of the cardiovascular system[11].

According to 2019 data from the UK's National Institute for Health and Care Excellence (NICE), the main reason for hospital admissions in people over 65 years of age is HF, and only about 21% of such patients are able to return home within a month [12].

In 2019, the Heart Failure Association of the European Society of Cardiology developed the “Heart Failure Association Atlas”, which surveyed the number of Europeans with CHF. Almost all European countries participated in the study (42 out of 44 countries that were invited). The average prevalence of this pathology was 17.20 cases per 1000 people [13].

As for Ukraine, the Center for Demography and Human Ecology of the Academy of Sciences has considered several scenarios of population aging in the country. According to the "slow aging" scenario, by 2050, people of retirement age will account for up to 33% of the population, which in absolute terms is more than 8 million, among whom the share of people with CHF will be about 63% [14].

At the same time, it is worth considering the polymorbidity of patients, in particular the appearance or progression of heart failure in patients with diabetes. In particular, according to WHO, the number of patients with diabetes increased from 108 million in 1980 to 422 million in 2014. In addition, due to the fact that the global increase in the prevalence of diabetes has not decreased, but has increased at least twice, this will lead to a significant deterioration of the epidemiological situation in terms of cardiovascular complications, in particular, the number of patients with HF will increase [15].

The exact relationship between type 2 diabetes and HF is not yet fully understood, but there are assumptions about the mechanisms involved, which include: macro-, microvasculopathy, perfusion disorders independent of vasculopathy. myocardial dysfunction [16]. In patients with diabetes, macrovascularization increases the release of reactive oxygen species, which activates protein kinase C and leads to low levels of NO and endothelial dysfunction. dysfunction , and this further contributes

to the development of a thrombotic state, leading to atherothrombosis. With microvascularization, pathological changes occur in the capillaries, leading to hypoperfusion . If we consider vasculopathy- independent myocardial dysfunction , then in this case, the following processes are involved: hyperglycemia, which causes an increase in the amount of glycation end products , which subsequently leads to their binding to extracellular matrix proteins , increased fibrosis and impaired diastole; impaired mitochondrial uncoupling, due to an excessive amount of reactive oxygen species, with subsequent energy deficiency, will lead to impaired calcium uptake, since this is an energy-dependent process, and this in turn leads to abnormalities in cardiac contraction and relaxation [17].

The relevance of the issue of HF lies not only in the paradigm of prevalence and impact on life expectancy, but also in the significant importance of the quality of life of patients with this pathology. Thus, in 2023, Hryhorets D. K. and her team assessed the quality of life and activity status of patients with CHF in the Bukovina region of Ukraine. During the study, 70 patients aged 30–85 years with a diagnosis of HF stage II-A (40%-28 patients), stage II-B (32.8%- 23 patients) and stage I (27.1%-19 patients), who were undergoing inpatient treatment in the “Chernivtsi Regional Clinical Cardiological Center”, were interviewed. According to the results of the study, it was determined that 56 patients out of 70, while in satisfactory material and living conditions, had a high indicator of low quality of life (70.8 points) and a low test indicator of physical and emotional activity (less than 20%). [18] .

In 2021, Khanyukov O. O. and Smolyanova O. V. developed a predictive model for predicting hospitalizations within 6 months in elderly patients with CHF to reduce the number of hospital admissions and improve quality of life. The study criteria were the age of patients (from 60 to 74 years), the presence of CHF stage II, arterial hypertension stage II and chronic kidney disease stage II- IIIa . According to the results of multiple logistic analysis, adherence to treatment, a decrease in glomerular filtration rate below 59.9 ml/min/1.73m2, the presence of wheezing in the lungs, as well as NYHA FC are statistically significant predictors of hospitalization for CHF in elderly patients [19].

Classification of HF plays an important role in the subsequent management of the patient. There are different types and several ways of dividing, but the most common classification is the division into left- or right-ventricular HF [20].

According to the degree of left ventricular contractile function impairment and left ventricular ejection fraction (EF) indicators, the following types are distinguished: with reduced left ventricular EF (less than 40%), with moderately reduced EF (41-49%), and with preserved ejection fraction (more than 50%) [21].

In addition, there is a classification of the New York Heart Association, where patients can be divided into 4 types depending on the reaction and appearance of symptoms to physical exertion:

Grade 1: no complaints during rest and moderate physical activity.

Grade 2: There are no complaints at rest, but shortness of breath and fatigue are detected during physical activity, which prevents exercise.

Grade 3: Moderate discomfort and fatigue occur at rest, shortness of breath, fatigue, and tachycardia occur during minor physical activity.

Grade 4: obvious signs of HF at rest, no physical activity possible [22].

The new classification is important for predicting the development of HF.

In stage A, also called increased risk of developing HF, there are no objective / subjective signs of HF, including laboratory ones, but risk factors are present.

Stage B, called preCH , has objective signs of heart damage or function changes or a positive natriuretic peptide result, but no symptoms of HF are present at the time of examination or in the anamnesis.

Present HF is designated as stage C, which is characterized by both objective and subjective symptoms of HF.

Severe HF (stage D) is characterized by severe symptoms at rest and frequent hospitalizations despite modern treatment approaches. Patients with this stage should consider major interventions such as heart transplantation, mechanical circulatory support, or palliative care [23].

There is no pathognomonic symptomatology for heart failure. The most typical symptoms that we include during diagnosis are: shortness of breath, orthopnea ,

paroxysmal nocturnal dyspnea, fatigue, edema of the lower legs and other parts of the body, and difficulty with physical activity. Typical signs that occur in HF include increased pressure in the jugular vein, cardiomegaly , lateral displacement of the apical impulse, Cheyne -Stokes breathing, a third heart sound, a total gallop between the third and fourth heart sounds. It is possible to suspect the presence of HF if the patient has risk factors, symptoms and signs of impaired heart function, and changes on the electrocardiogram [24].

If a patient is suspected of having HF, according to the ESC 2021 recommendations, the following tests should be performed [25]:

1. Electrocardiogram (if not previously performed) to identify the cause of the development of functional heart disorders. However, it is worth noting that it is impossible to diagnose HF with only an ECG.

2. Measurement of natriuretic peptides is one of the “gold standards” for diagnosing a patient with suspected HF. Concentration of B-type natriuretic peptide (BNP) <35 pg /mL, N-terminal pro-B-type natriuretic peptide (NT -proBNP) <125 pg /mL, or mid-regional proatrial natriuretic peptide (MP - proANP) <40 pmol / l makes the diagnosis of HF unlikely. It is worth noting that the number of natriuretic peptides can increase with age, as well as due to non- cardiac diseases and conditions: renal dysfunction , burns, subarachnoid hemorrhage, thyrotoxicosis, anemia, COPD, paraneoplastic syndrome, ischemic stroke. Therefore, this indicator should be evaluated in conjunction with the clinical picture as a whole.

3. Echocardiography is recommended as a key investigation for assessing cardiac function. In addition to determining left ventricular ejection fraction, it also provides information on chamber size, left ventricular myocardial and interventricular septal thickness, regional wall motion abnormalities (which may indicate etiological causes such as ischemic heart disease, Takotsubo syndrome , or myocarditis), right ventricular function, pulmonary hypertension, valvular function, and markers of diastolic function.

4. Basic investigations such as serum urea and electrolytes, creatinine, complete blood count, cholesterol metabolism, liver and thyroid function tests to

differentiate HF from other conditions, provide prognostic information, and guide potential therapy.

5. A chest x-ray is recommended to investigate other possible causes of dyspnea (e.g., pulmonary disease). It may also provide confirmatory evidence of HF (e.g., pulmonary congestion or cardiomegaly).

In case of confirmation of the diagnosis of HF, it is considered mandatory to indicate the degree of ventricular damage and the value of EF. If heart failure was not confirmed by tests and examinations, other causes of symptoms should be considered [26].

Before starting treatment, it is important to determine the cause of the occurrence in order to further select adequate therapeutic options. After all, the approach to treatment is not only limited to pharmacological treatment, but also possible surgical interventions on the heart valves, interventional approach in case of rhythm disturbances, as well as endovascular techniques in case of proven atherosclerotic lesions of the coronary arteries [27].

According to the updated recommendations of the European Society of Cardiology [25], new concepts have emerged for the treatment of CHF, including:

1. A new simplified algorithm for treating patients with reduced EF.
2. Adding a treatment algorithm with reduced EF according to phenotypes.
3. Updated treatment methods for most non-cardiovascular vascular diseases, including diabetes mellitus, hyperkalemia , iron deficiency , and oncological conditions.
4. Updates in cardiomyopathies sections , including the role of genetic testing and new treatments.

In addition, new drugs of choice have appeared for the treatment of CHF with reduced EF, which include: dapagliflozin and empagliflozin Dapagliflozin is a sodium-glucose cotransporter 2 inhibitor that was previously only used to treat type 2 diabetes. Dapagliflozin has now been shown to be effective in the treatment of HF and chronic kidney disease [28] .

Scott D. Solomon, MD, and others from the DELIVER trial conducted a study in which patients with HF and EF >40% received dapagliflozin or a matching placebo in addition to their usual care. Over 2.3 years, the primary outcome was observed in 512 of 3131 patients (16.4%) in the dapagliflozin group and in 610 of 3132 patients (19.5%) in the placebo group. Dapagliflozin reduced the combined risk of progression to HF or cardiovascular death in these patients, even if EF was preserved. Adverse events leading to discontinuation of dapagliflozin or placebo were reported in 182 patients (5.8%) in the dapagliflozin group and 181 patients (5.8%) in the placebo group. However, it is worth noting that fatal outcomes were also described, which were registered in 1361 patients (43.5%) in the dapagliflozin group and in 1423 patients (45.5%) in the placebo group, without a significant difference between them [29].

Kieran F. Docherty and his team conducted a study on the efficacy of dapagliflozin in patients with HF. In the study, the team showed that dapagliflozin not only improved outcomes when added to background therapy, but also had a consistent benefit regardless of whether the background therapy included ivabradine or sacubitril / valsartan . In summary, the researchers found a consistent advantage of dapagliflozin over placebo, regardless of background drug therapy. These results suggest that the effects of dapagliflozin are gradual and complementary to conventional therapy, especially in patients with reduced left ventricular ejection fraction [30].

An American study reviewed and demonstrated that the effectiveness of dapagliflozin was worth the cost, with the cost of the drug ranging from $953/year to $6,188/year depending on the dosage of the drug and the bulk purchase, the amount of the drug for patients [31].

In Ukraine, this drug is not included in the list of state purchases and the patient will not be able to get it for free. On average, the price of 1-month treatment with dapagliflozin costs an average of 1,148 UAH for 30 tablets, that is, a patient needs to spend approximately 14,000 UAH per year to reduce the risk of hospitalization and complications in existing CHF. This information should be taken into account by primary care physicians at the stage of communication with the patient [8 12].

Empagliflozin also belongs to the group of sodium-glucose cotransporter 2 inhibitors, which increases the excretion of glucose in the urine, and was used specifically for the treatment of diabetes mellitus, and now also in patients with cardiovascular diseases and kidney diseases [33].

Milton Packer and his team evaluated the effect of empagliflozin in their study . In the study, the combined risk of cardiovascular death or hospitalization for HF was 25% lower among patients receiving empagliflozin than among those receiving placebo, a difference that was mainly due to a 31% lower risk of hospitalization for HF. These benefits were observed in patients receiving any of the currently recommended HF medications, including sacubitril-valsartan , and were observed regardless of the presence or absence of diabetes [34].

Matthew Griffin and his team investigated the effects of empagliflozin on heart failure and its mechanism of action. They found that empagliflozin causes significant natriuresis , especially when combined with loop diuretics. diuretics , which results in a reduction in cardiac preload from circulating blood volume. This favorable diuretic profile may offer a significant advantage in managing volume status in patients with HF and may be a mechanism contributing to the better long-term outcomes observed with these drugs [35].

The EMPULSE trial also reported positive results for empagliflozin in reducing hospitalizations for CHF exacerbations. However, the study also reported negative results, including mortality, complications in 20% of subjects, and the need for dose adjustments for the heart failure drug [36].

If a patient is diagnosed with HF with moderately reduced EF, well-known drugs such as ACE inhibitors, angiotensin receptor blockers , beta -blockers , mineralocorticoid receptor antagonists , sacubitril / valsartan can be used for pharmacological treatment [27].

For example, Rui's research Zhang et al . showed that sacubitril / valsartan can improve cardiac function and exercise capacity, reduce cardiac remodeling , and reduce the risk of cardiovascular mortality and hospitalization in patients with HF. Meta-analyses and observational studies have shown that sacubitril / valsartan also has

benefits in lowering HF biomarkers , improving quality of life and antiarrhythmic effects , improving renal dysfunction , and regulating metabolism in patients with HF [37] .

Thus, HF is a complex symptom complex that arises from a number of cardiac causes and in the context of the patient's polymorbidity . Establishing the diagnosis of HF is of key importance, as each of the classification points requires an individual monitoring and treatment strategy, including determining the risk of developing HF/existing symptoms of the disease, functional and structural state of the heart muscle, tolerance to physical exertion and the possibility of daily activity.

When treating a patient with HF, it is worth using not only “classical” therapeutic approaches (in particular, ACE inhibitors, diuretics , beta-blockers), but also modern drugs that, in addition to cardioprotective properties, also have a positive effect on the kidneys and metabolic metabolism, taking into account the patient's frequent comorbid pathology.

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1.3 Current view on cardiocytoprotection - ranolazine, changes in classification and precision approach to prescribing

A precision approach in cardiology, in line with modern management and therapeutic perspectives, should be examined using the example of ranolazine, a drug belonging to the group of late sodium current inhibitors. It has been included in the updated classification of antiarrhythmic drugs [38] for the creation of the novel Class Id [39]. The earlier approach considered ranolazine a piperazine derivative with a molecular structure similar to lidocaine—thus classified as a Class IB antiarrhythmic agent according to E. Vaughan Williams' classification.

Although the drug does not belong to classical pFOX (partial fatty acid oxidation) inhibitors, which aim to reduce fatty acid oxidation in the myocardium to increase glucose utilization efficiency for energy production—thereby reducing oxygen consumption by the heart and improving its function under ischemic conditions—ranolazine instead enhances the metabolic efficiency of the myocardium through a different mechanism. It inhibits the late sodium current, reducing intracellular calcium accumulation and positively affecting the heart’s energy balance.

Representatives of pFOX inhibitors include: Trimetazidine (used for treating angina, it improves myocardial energy balance by reducing ischemic stress), Perhexiline (used for treating angina and heart failure but may have side effects, limiting its application), Etomoxir (a carnitine palmitoyltransferase I (CPT-I) inhibitor that also affects fatty acid oxidation, mainly used in experimental studies), Mildronate/Meldonium (though not a classical pFOX inhibitor, its action is also directed at modifying myocardial metabolism, particularly by reducing fatty acid utilization).

The issue of cardioprotection—measures that prevent or mitigate heart damage regardless of the injurious stimulus—more specifically involves reducing the size of myocardial infarction (MI) and coronary microvascular obstruction by decreasing oxygen demand during heart contraction through hemodynamic manipulation (which

might be unsuccessful, as ischemic myocardium does not contract anyway). This includes the phenomenon of ischemic conditioning (activating self-defense mechanisms through short-term coronary occlusion and reperfusion, which themselves do not cause MI but protect against sustained myocardial ischemia with reperfusion, which leads to MI). Thus, cardioprotection achieved through ischemic conditioning includes: (1) activation of sarcolemmal receptors by neurohormones, autacoids, cytokines, and growth factors; (2) activation of intracellular enzymes (kinases) through the stimulation of these sarcolemmal receptors, as well as small molecules (calcium, nitric oxide, and hydrogen sulfide); (3) Effects of these pathways on mitochondria, where respiration is preserved, ROS (reactive oxygen species) production and mitochondrial permeability transition pore opening are reduced, thereby suppressing cell death activation. Ischemic conditioning can be activated before sustained ischemia (preconditioning), during early reperfusion (postconditioning), or through remote conditioning (ischemia/reperfusion in tissues distant from the heart) [40].

In this process, the main types of programmed cell death are involved [40]:

- type I cell death or apoptosis: Cytoplasmic shrinkage, chromatin condensation, nuclear fragmentation, and cell membrane “blebbing” (vesicle budding from the membrane)—the entire cell content disintegrates into vesicles (apoptotic bodies), which are phagocytosed by neighboring cells and broken down in their lysosomes;
- type II cell death or autophagy: In the cytoplasm of the dying cell, numerous vacuoles are formed, which are subsequently phagocytosed and destroyed by neighboring cells;
- type III cell death or necrosis: Characterized by a complete absence of features typical of apoptosis and autophagy. Residual material from the destroyed cell triggers inflammation.

Additionally, processes such as:

- necroptosis: Formation of intracellular complexes called “necrosomes,” triggered by death receptors (tumor necrosis factor receptor 1);

- pyroptosis: Release of cell contents outward, dependent on caspase-1, with interleukin IL-1β and IL-18 secretion leading to inflammation;
- ferroptosis: Iron-dependent lipid peroxidation

Is it time to recommend cardiovascular system protection for everyone? The known effects of basic medications require supplementation with cardiocytoprotection. Beyond the proven endothelial protective function and blood pressure (BP) reduction of β-blockers (nebivolol) through inhibition of NADPH oxidase activity, prevention of eNOS uncoupling, and promotion of eNOS activity to increase nitric oxide (NO) production (with impacts on antioxidant properties and improved endothelium-dependent vasodilation), calcium channel blockers (CCBs), particularly dihydropyridines, reduce ROS production to protect the endothelium. These help prevent LDL oxidation, increase antioxidants, and reduce oxidative damage during endothelial dysfunction. Furthermore, groups of medications like ACE inhibitors, ARBs, CCBs, and vitamin C are potential therapeutic strategies for oxidative stress processes, while statins exhibit a mild antihypertensive effect through vascular endothelium by inhibiting ROS production, reducing circulating pro-inflammatory cytokines, and suppressing the expression of adhesion molecules in vascular endothelial and smooth muscle cells [41].

The concept of cellular health under ischemic conditions, within the framework of cardiocytoprotection and endothelial dysfunction, determines the potential to influence the likelihood of atherosclerotic damage. It encompasses effects on obesity, hypertension, dyslipidemia, hyperglycemia, platelet hyperactivity, and endothelial dysfunction, which are mediated through the imbalance of nitric oxide (NO), prostacyclin (PGI2), and the loss of regulation of endothelium-dependent hyperpolarization (EDH). This includes the influence of thromboxane A2 (TxA2) and the upregulation of endothelin-1 (ET-1), subsequently affecting pro-inflammatory and oxidative stress through the formation of reactive oxygen species (ROS) in endothelial mitochondria, vascular growth and remodeling stimulation, platelet activation, NO depletion, increased ROS production, and impacts on vasoconstriction mediators [42].

Ranolazine, an inhibitor of late inward sodium current, enhances myocyte relaxation and ventricular compliance by reducing intracellular calcium. It improves angina symptoms and myocardial perfusion reserve in myocardial viability assessment (MVA) and significantly reduced coronary flow reserve (CFR) due to impaired vasodilation [43].

In the CorMicA randomized controlled trial (Coronary Microvascular Angina), under the baseline therapy of aspirin, statin, and ACE inhibitors for all, another important area of ranolazine use has been identified in stratified medical therapy. This involves invasive coronary function testing, evidence-based treatment, and prognosis of INOCA (Ischemia with Non-Obstructive Coronary Arteries).

Thus, for confirmed microvascular angina via invasive testing:

- first-line treatment: β-blockers;
- second-line treatment: Replacement with non-dihydropyridine calcium channel blockers (CCBs);
- third-line treatment: Addition of amlodipine (if on β-blockers), nicorandil, or ranolazine.

For confirmed vasospastic angina:

- first-line treatment: Dihydropyridine CCBs;
- second-line treatment: Addition of isosorbide dinitrate;
- third-line treatment: Replacement of nitrates with nicorandil.

For a combination of microvascular angina and vasospastic angina:

- first-line treatment: Dihydropyridine CCBs;
- second-line treatment: Nicorandil нікорандил [44].

Thus, for patients with the vasomotor endotype of INOCA (epicardial or microvascular spasm), the recommended treatments are calcium channel blockers (CCBs), nitrates, nicorandil, or their combination. Meanwhile, for patients with the structural endotype of INOCA (microvascular dysfunction), it is recommended to use drugs that reduce myocardial oxygen consumption (β-blockers or CCBs, with

ivabradine also being a potential option) along with other agents (ranolazine, trimetazidine, and nicorandil) [45].

From the perspective of evidence-based medicine, ranolazine has a high level of evidence in the latest recommendations for chronic coronary syndrome (CCS). It is stated that the use of long-acting nitrates or ranolazine should be considered as additional therapy for patients with inadequate symptom control during treatment with β-blockers and/or calcium channel blockers (CCBs), or as part of initial treatment for appropriately selected patients [IIa B], particularly emphasizing its role in the treatment of obstructive coronary artery disease and microvascular dysfunction [46].

In the recommendations for the treatment of heart failure with reduced ejection fraction (HFrEF) in the context of chronic coronary syndrome (CCS), it is established that β-blockers are the cornerstone therapy for HFrEF and ischemic heart disease (IHD) due to their prognostic benefits. Ivabradine should be considered as an alternative to β-blockers (in cases of contraindications) or as additional antianginal therapy for a heart rate ≥70 bpm. Other antianginal agents (amlodipine, felodipine, nicorandil, ranolazine, and oral or transdermal nitrates) are effective for symptom relief, although evidence of their impact on outcomes is neutral or lacking. Trimetazidine appears to have additive effects, such as improving left ventricular function and exercise capacity in patients with HFrEF and CCS who are already on β-blockers [47].

In the context of heart failure with preserved ejection fraction (HFpEF) and ischemic heart disease (IHD), nitrates are used (although routine use of nitrates for the treatment of HFpEF is not recommended based on the results of the NEAT-HFpEF randomized controlled trial regarding activity/tolerance). Dihydropyridine calcium channel blockers (CCBs) may be beneficial if there is a concurrent need to manage hypertension, and ranolazine can be used when limited by heart rate (HR) and blood pressure (BP) [48].

In the ESC guidelines for managing patients with ventricular arrhythmias in the prevention of sudden cardiac death, the antiarrhythmic role of ranolazine is considered through its ECG effects, including a reduction in sinoatrial node rate and QT interval prolongation. It is indicated for the treatment of ventricular rhythm disorders, such as

ventricular tachycardia (LQTS3), at doses ranging from 750 to 2000 mg, with an evaluation of potential adverse effects, both cardiac (sinus bradycardia, hypotension) and extracardiac (dizziness, nausea, constipation, gastrointestinal disturbances, headache, rash). Contraindications include severe dysfunction of the sinoatrial node, significant heart failure, and LQTS except for LQTS3. Precautions must also be considered, such as concomitant treatments associated with QT interval prolongation [49].

Regarding atrial fibrillation (AF), a meta-analysis of 8 randomized controlled trials (RCTs) indicated that ranolazine significantly reduced the incidence of AF compared to the control group in various clinical scenarios (after cardiac surgery, in acute coronary syndrome (ACS), and following electrical cardioversion of AF). The relative risk (RR) was 0.67 ($p = 0.002$). Moreover, a higher conversion rate of AF was demonstrated with the combined use of ranolazine and amiodarone compared to amiodarone monotherapy ($RR = 1.23$; $p = 0.002$), with the conversion time being significantly shorter in the ranolazine and amiodarone group compared to the amiodarone group (weighted mean difference [WMD] = –10.38 hours; $p = 0.009$) [50]. At the meeting of the Expert Council of the Association of Arrhythmologists of Ukraine on October 5-6, 2022, it was established that long-term use of ranolazine for angina reduces the risk of atrial fibrillation (AF). However, the combination of ranolazine with other Class IA and III antiarrhythmic agents (except amiodarone) is prohibited.

Regarding acute coronary syndrome (ACS), the RIMINI randomized controlled trial (Effect of Ranolazine on Ischemic Myocardium IN Patients With Acute Cardiac Ischemia) should be mentioned. In this study, ranolazine reduced the risk of recurrent ischemia and worsening angina in ACS (non-STEMI) patients, possibly by improving myocardial perfusion, reducing the area of ischemic myocardium in ACS patients, and optimizing contractility as assessed by speckle-tracking echocardiography [51].

In the MERLIN-TIMI 36 randomized controlled trial (Metabolic Efficiency With Ranolazine for Less Ischemia in Non-ST Elevation Acute Coronary Syndromes), ranolazine impacted the primary endpoint [a combination of cardiovascular death,

myocardial infarction (MI), or recurrent ischemia] with a hazard ratio (HR) of 0.92 (p = 0.11) and the secondary endpoint with an HR of 0.96 (p = 0.50). In the context of diabetes mellitus (DM), the results were positively influenced by ranolazine, with a reduction in recurrent ischemia (hazard ratio [HR], 0.87; p = 0.03). In the context of ischemia, the results of the RAND-CFR randomized controlled trial should be mentioned. Ranolazine reduced T-wave heterogeneity (TWH), a marker of arrhythmogenic repolarization abnormalities predictive of sudden cardiac death (SCD), at rest compared to placebo. Ranolazine lowered arrhythmogenesis in ischemia independently of coronary artery blood flow [52].

In the context of STEMI, ranolazine has optimized markers of myocardial electrical instability and ischemia according to its own studies. The EQ-VAS analog scale indicates a positive effect of ranolazine on the quality of life of patients with STEMI, with reductions in heart rate (HR), QT interval dispersion, and an increase in the peak velocity ratio (PVR) based on differentiated ECG. It also lowered the probability of recording reduced heart rate variability (HRV) as measured by SDNN (Standard Deviation of NN intervals), which reflects good autonomic nervous system function and high HRV—an indicator of good physical condition and the body's ability to adapt to stress [53].

As a result of the analysis of ranolazine use according to a study conducted by the Department of Internal Medicine, Physical Rehabilitation, and Sports Medicine of Bukovinian State Medical University [54, c. 18], in patients with chronic coronary syndrome (CCS, angina) comparing three groups—baseline medical therapy (BMT: antiplatelets, β-blockers, nitrates, statins) with the addition of lercanidipine and enalapril in the composition of the "polypill" drug vs. BMT plus lercanidipine and enalapril in the "polypill" drug and ranolazine vs. BMT plus ramipril and ranolazine—and in acute coronary syndrome (STEMI) comparing two groups (BMT vs. BMT and ranolazine), optimization of clinical and diagnostic indicators for both angina and STEMI was observed in the groups with the addition of ranolazine.

In all groups for chronic coronary syndrome (CCS), an improvement in quality of life was observed according to the EQ-VAS scale, along with a reduction in the peak

velocity ratio (PVR) in differentiated ECG lead V2. This marker is used to assess hypertrophic changes in the left ventricle (LV) as determined by the differentiation of digitized ECG data. A decrease in this parameter indicates a reduction in hypertrophic modifications of the LV (in both cases, $p<0.05$), as illustrated in Figure 1.

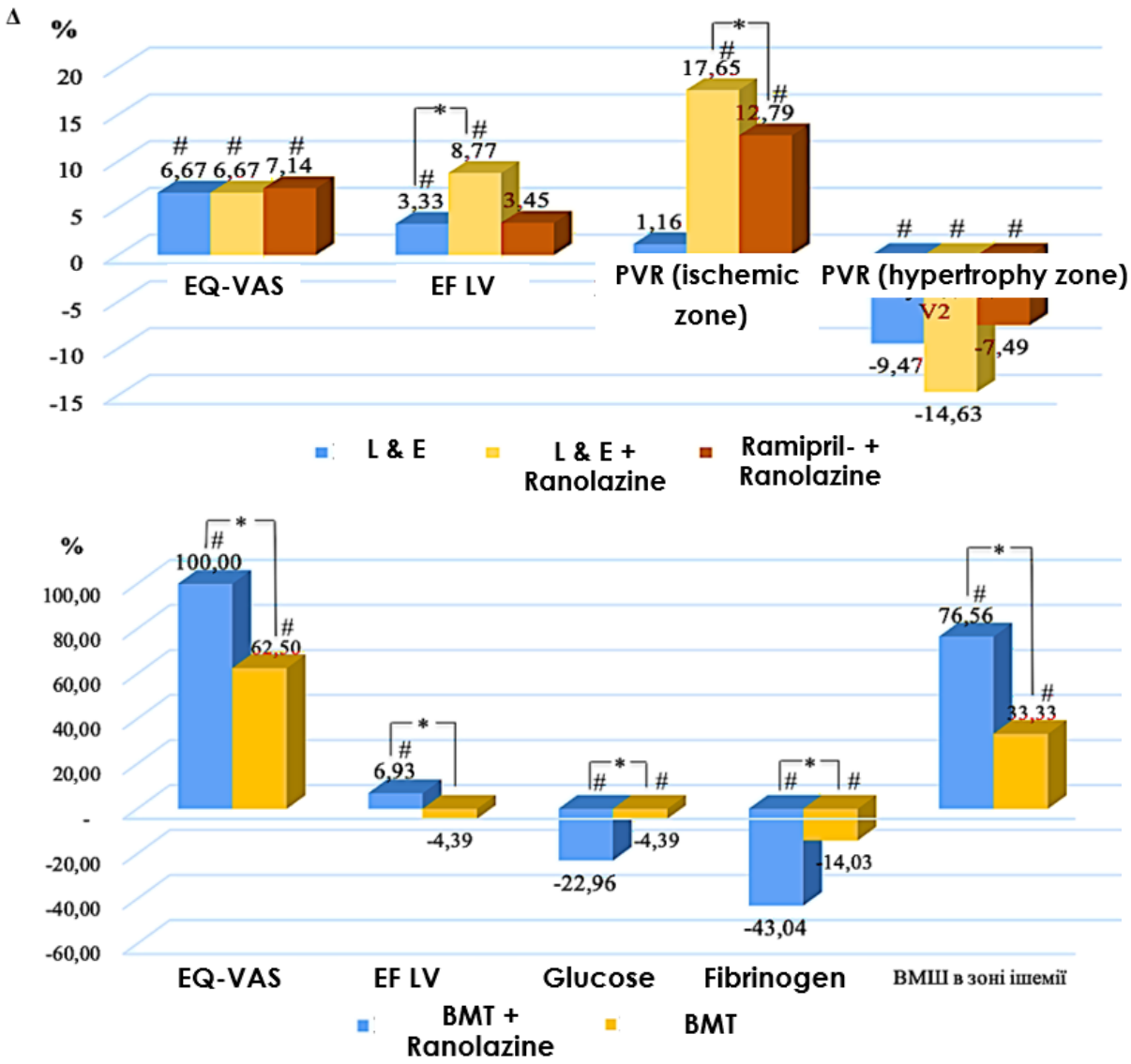

Figure 1. Dynamics of clinical and diagnostic indicators for stable angina and STEMI in groups with the addition of ranolazine compared to baseline medical therapy (BMT), including the analysis of ramipril, lercanidipine, and enalapril as part of the "polypill" drug. The focus is on improvements in quality of life (EQ-VAS), contractility (LVEF), the peak velocity ratio (PVR) in differentiated ECG in the ischemic zone and lead V2, and an analysis of LV hypertrophy based on the treatment received.

The most optimal therapy for chronic coronary syndrome (CCS) was identified as the inclusion of lercanidipine and enalapril in the composition of the "polypill" drug, alongside ranolazine in baseline medical therapy (BMT). This was evidenced by an increase in left ventricular ejection fraction (LVEF) (Δ +8.77%, $p<0.001$) and the most effective rise in peak velocity ratio (PVR) in the ischemic zone (Δ +17.65%, $p<0.001$), corresponding to a reduction in electrical instability of the ischemic myocardium.

The addition of ranolazine to baseline medical therapy (BMT) in patients with STEMI improved quality of life according to the EQ-VAS scale ($p<0.001$), reduced fibrinogen levels ($p<0.05$), optimized glucometabolic homeostasis through a decrease in glucose levels ($p<0.05$), enhanced myocardial contractility with an increase in LVEF (Δ +6.93%; $p<0.001$), and significantly raised the peak velocity ratio (PVR) in the ischemic zone (Δ +75.56%; $p<0.001$). These outcomes describe the positive impact on stabilizing electrogenesis during primary changes in the repolarization phase (illustrated in Figure 1).

According to recommendations for the comprehensive management of patients with diabetes mellitus and ischemic heart disease (IHD), optimization of myocardial oxygen supply can be achieved through long-acting nitrates or calcium channel blockers (CCBs) or by reducing oxygen demand using β-blockers, non-dihydropyridine CCBs, ranolazine, or ivabradine. Thus, ranolazine, which reduces myocardial ischemia at the cellular level, also has a unique effect of normalizing glycated hemoglobin, particularly in patients with poor metabolic control [56].

In the guidelines for cardiomyopathies, it is noted that for chest pain during exertion in patients without obstruction of the left ventricular (LV) outflow tract, ranolazine may be considered to improve symptoms in patients with angina-like chest pain, even in the absence of cardiovascular insufficiency or obstructive ischemic heart disease (IHD) [IIb C]. Regarding antiarrhythmic therapy for patients with arrhythmogenic right ventricular cardiomyopathy (ARVC), there is strong evidence for the use of β-blockers [I C], amiodarone [IIa C], flecainide after β-blockers [IIa C], and catheter ablation [IIa C]. The experience with other antiarrhythmic agents (dofetilide,

ranolazine) is mentioned, although it is limited due to the small number of randomized controlled trials (RCTs) [57].

In conclusion, it should be noted that the key messages and critical approach of the ESC 2024 recommendations on chronic coronary syndrome (CCS), compared to previous guidelines, emphasize a shift. Previously, nicorandil, ranolazine, ivabradine, and trimetazidine were considered second-line agents, recommended only after β-blockers, calcium channel blockers (CCBs), and long-acting nitrates had been tried or excluded due to intolerance or contraindications. In contrast, the new guidelines highlight the lack of studies confirming the superiority of any one antianginal drug over others. They propose considering long-acting nitrates and ranolazine as additional therapy for patients with inadequate symptom control on β-blockers and/or CCBs, or even as part of the initial treatment in selected patients [58].

Ranolazine (500 mg twice daily) or placebo, in combination with optimal medical therapy, reduces the phenomenon of slow coronary blood flow after two months. This is accompanied by improvements in quality of life according to the EuroQol-VAS questionnaire ($p = .013$), reduction in physical limitations ($p = .041$), improvements in stable angina ($p = .016$) and its frequency of occurrence ($p = .042$), as well as increased satisfaction with treatment ($p = .037$) in the ranolazine group [59].

Patients with coronary microvascular dysfunction have an increased risk of developing heart failure with preserved ejection fraction (HFpEF). Ranolazine treatment improves the myocardial perfusion reserve index (ΔMPRI, $r = 0.26$, $p = 0.04$) but does not affect the Seattle Angina Questionnaire (ΔSAQ, $r = 0.03$, $p = 0.80$) or NT-proBNP levels [60]. Evidence supports the beneficial effects of renin-angiotensin-aldosterone system blockers, ranolazine, and sodium-glucose cotransporter-2 inhibitors (and potentially anti-inflammatory agents in the future) for coronary microvascular dysfunction [61].

SECTION 2. MEDICAL PSYCHOLOGY

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2.1 Strengthening the mental health of ukrainians through innovative approaches to medical and psychological rehabilitation to improve the quality of life and adaptive capabilities of military personnel and people with visual impairments

2.1.1. A retrospective analysis of scientific research on the medical and psychological adaptation of people with visual impairments in Ukraine and the world: challenges and prospects

2.1.1.1 Rehabilitation of people with visual impairment around the world: a systematic approach

As part of the WHO Global Plan of Action on Disability (2017), guidelines were developed for the provision of rehabilitation services to people with visual impairment at all levels of health care: primary, secondary and tertiary. It is especially important to introduce rehabilitation at the primary health care level, as many people in need may not receive specialized care, but will need long-term rehabilitation in their communities. Primary care rehabilitation is consistent with the principle of comprehensive lifelong care, contributes to improving the quality of life, and is the most effective and cost-efficient approach for any country.

At the same time, in many countries, including Ukraine, such services are mostly available in secondary and tertiary care facilities that are concentrated in cities and regional centers, leaving rural and remote areas underserved [62-65].

To draw attention to the importance of rehabilitation, the WHO initiated the Rehabilitation 2030: A Call to Action campaign, emphasizing that rehabilitation is necessary not only for people with disabilities, but also for all those who have lesser capacities and functionality, in particular for the prevention of disability. In 2020, as part of this initiative, the Rehabilitation Competency Framework was published, which guarantees everyone access to quality rehabilitation services provided by a multidisciplinary team of specialists for timely and comprehensive care [66].

The WHO Guidelines for the Rehabilitation of Persons with Visual Impairment

(VIP) are based on the principles of accessibility, comprehensiveness and integration of rehabilitation services into the health care system:

1. **Accessibility of rehabilitation services** is enshrined in the UN Convention on the Rights of Persons with Disabilities (2006), which guarantees their support and prevention of disability among people with functional limitations.

2. **The WHO Global Plan of Action on Disability** for the first time emphasised the importance of preventing blindness, restoring vision and including rehabilitation services in eye care.

3. **The European Standards** for the Rehabilitation of Visually Impaired Persons were developed by the European Union of the Blind in 2015 as part of the implementation of the WHO General Plan of Action. In the same year, the Standards for the Rehabilitation of Sight were adopted at an international conference in Rome.

4. **The organisation of the rehabilitation process** was clearly defined in 2017, when the WHO emphasised the importance of integrating rehabilitation services into the healthcare system, ensuring inter-sectoral cooperation between social, educational and other services.

5. **The 2030 goal**, set by the United Nations General Assembly in 2021, envisages global prevention of visual impairment and calls on member states to ensure effective measures to preserve residual vision.

6. **The International Standards for Vision Rehabilitation**, developed by WHO in collaboration with the Italian National Centre for the Prevention of Blindness in 2022, regulate the provision of rehabilitation services at three levels of care, involving specialists from different fields.

7. **The WHO recommendations** include key documents such as the Eye Care Package, the WHO Eye Care Competency Framework and the corresponding manual, which provide a comprehensive and interdisciplinary approach to eye care at all levels of the healthcare system, taking into account the age of patients and the degree of visual impairment [67-72].

The WHO concept of rehabilitation care in the healthcare system defines the main types of rehabilitation services and their optimal combination. According to these

provisions, rehabilitation of people with visual impairments is provided at different levels of medical care and in different settings. The experience of the United States, Germany and the United Kingdom shows that such services are provided in outpatient clinics, primary health care centres, specialised rehabilitation centres, hospitals, relevant departments and units, educational institutions, workplaces, within territorial communities, as well as in the form of independent rehabilitation or informal support. They can be provided by both public and private institutions working in the field of rehabilitation of people with visual impairments. In accordance with the International Standard for the Rehabilitation of Sight, the process of providing care involves narrowly focused specialists who are part of a multidisciplinary team. These include ophthalmologists, optometrists, rehabilitation therapists, orientation and mobility specialists, specialists who help develop skills for everyday life, as well as psychologists and psychotherapists. Depending on the age of the patient and the level of their functional capabilities, other specialists may be involved, including teachers, vocational counsellors and social workers [73].

The American Academy of Ophthalmology notes that the composition of the rehabilitation team varies depending on the age group of patients. For adults with visual impairments, the team includes an ophthalmologist, occupational therapist, rehabilitation teacher, orientation and mobility specialist, adaptive technology specialist, social worker, counsellor and other necessary specialists. This approach ensures comprehensive rehabilitation and helps improve the quality of life of visually impaired people and their effective integration into society [74].

The provision of rehabilitation services for people with visual impairments is based on a number of important principles. In particular, the approach to rehabilitation should be individualised, based on a detailed examination and assessment of each person's condition. The main goal of such services is to improve the quality of life, increase the level of satisfaction, provide opportunities for learning, communication, mobility, self-care, active participation in everyday life, social interaction and community activities. This is especially important for people with irreversible or progressive visual impairments. The implementation of such services includes medical,

social, educational, vocational, psychological and pedagogical, and physical and sports rehabilitation. The International Standard of Vision Rehabilitation (ISVR), based on the experience of the United States, Germany and the United Kingdom, provides for an interdisciplinary approach to rehabilitation implemented at different levels of the healthcare system. It covers primary healthcare, specialised secondary and tertiary care, and community-based support. In particular, it includes home care, organisation of self-help groups, provision of social and educational services, leisure and recreational programmes, and psychological counselling. All these levels function in a single electronic communication system, which allows the use of tele-rehabilitation services for each patient. The WHO and the ICRC consider the rehabilitation of people with visual impairments as a continuous interdisciplinary process that lasts throughout life, regardless of age or degree of visual loss (Table 1) [75].

Table 1.

Levels of rehabilitation services provided for VIPs

Levels	**Levels of service provision**	**Specialists**	**Services involved in providing rehabilitation**
Primary level	provision of non-optical rehabilitation aids and training in their use in everyday activities, informing and providing referrals for tracking the rehabilitation services used	health care professors ophthalmologists; rehabilitation therapists, instructors, teachers and others who are able to assess needs and provide basic rehabilitation and rehabilitation	ophthalmological and medical facilities, maternity and child care facilities, schools, social services, community-based rehabilitation facilities and other NGOs

Continuation of Table 1

Secondary level	selection and training in the use of additional rehabilitation aids (there is an approved list for this level), training in the use of vision with and without correction aids, training in everyday skills, orientation and mobility; Braille's code and environmental changes, training in the use of additional technologies (Braille's code, audio, etc.), psychosocial support, case management, telephone /internet communication for consultations referral to other levels of rehabilitation	specialists in the field of ophthalmology, allied health professionals, rehabilitation specialists, instructors, teachers, psychologists, counsellors, self-help organisations, social workers	ophthalmological and medical institutions, schools, rehabilitation centres, NGOs
Tertiary level	prescription and provision of optical correction devices, training in the use of visual skills, including optical correction devices in everyday activities, orientation and mobility, during environmental changes, training using additional technologies (Braille's code, audio, etc.), psychological support, professional counselling referral to other levels of rehabilitation, medical specialists, other services and institutions	ophthalmologists, allied health professionals, rehabilitation specialists, O&M instructor, education specialists, psychologists or trained staff, vocational counsellor, rehabilitation staff	specialised eye and medical centres, district hospitals, rehabilitation centres, schools, workplaces, home environments and community organisations

One of the key elements of rehabilitation is the provision of inclusive education, which includes services in professional (technical), pre-university and higher education institutions, and is an important aspect in creating an accessible educational environment and providing psychological and pedagogical support for people with special educational needs [76-78].

According to the US Rehabilitation Service, about one million veterans have visual impairments, and this number is growing every year due to age-related diseases, including macular degeneration, diabetic retinopathy and glaucoma. In the United States, rehabilitation services for people with visual impairments are provided in a wide range of settings: outpatient clinics, hospitals, inpatient facilities, community-based institutions, workplaces, educational institutions, and homes. In addition, there are

local care centres, regional clinics for visually impaired people at various levels, VISOR outpatient programmes, inpatient training programmes at rehabilitation centres for the blind, and vocational rehabilitation centres. Each state has a Department of Rehabilitation for the Visually Impaired, which is managed by the Territorial Services for the Blind. These services provide a wide range of specialised and comprehensive rehabilitation services in Orientation Centres for the Blind. Here, patients are trained in household skills for independent living, the use of assistive technology and spatial orientation. The decision to apply for such services is made jointly between a person with a visual impairment and their rehabilitation consultant at the Department. At the outpatient level, ophthalmologists, rehabilitation specialists and other professionals work as part of an interdisciplinary team to provide a wide range of services. These include training in orientation and mobility skills, low vision care, assessment and training in the use of assistive computer technology, and the development of skills needed for everyday life. This comprehensive approach ensures effective adaptation of visually impaired people to the social environment and facilitates their integration into society [79].

In Germany, the Federal Working Group on Rehabilitation, which is subordinated to the Federal Ministry of Labour and Social Affairs, coordinates the rehabilitation of visually impaired persons (VIPs). It is responsible for creating a common regulatory framework for rehabilitation processes across the country. The German social security system has a large number of organisations and institutions involved in the rehabilitation of VIPs. These include rehabilitation centres, clinics, vocational rehabilitation facilities, organisations for people with disabilities and self-help associations. All these structures interact with each other to ensure a comprehensive approach to rehabilitation. The list of services provided as part of rehabilitation is approved by representatives of health insurance funds, after which a contract is concluded between the visually impaired person and the service provider. The German Association for the Training and Employment of Blind and Visually Impaired Persons is also involved in the process of approving rehabilitation measures. In the UK, responsibility for rehabilitation services for VIPs lies with local authorities

acting under the National Health Service (NHS) Care Act. This system has been in place for almost 70 years and provides free, reliable support for people with visual impairments. The main aim of such services is social and psychological rehabilitation, development of daily living skills and mobility training, enabling people with visual impairments to feel like full members of society. Rehabilitation services can be provided either directly by local authorities through specialised rehabilitation teams or through external providers, including the NHS, charities working in the field of support for the disabled and private institutions. An important element of the UK rehabilitation model is the state social policy based on respect for people with visual impairments and providing strong psychological and social support. The basis of rehabilitation in this country is a multidisciplinary approach, which involves the involvement of specialists in various fields to provide comprehensive care (Table 2) [75, 80].

Table 2.

Comparative characteristics of the levels of organisation of rehabilitation assistance to the VIPs in different countries

Levels of rehabilitation care organisation according to WHO	**USA**	**Germany**	**UK**	**Ukraine**	
				The Ministry of Health of Ukraine	**Ministry of Social Policy of Ukraine**
Specialised, highly effective rehabilitation	provided	provided	provided	provided	not provided
Rehabilitation services integrated into tertiary	provided	provided	provided	provided	not provided
Rehabilitation services integrated into primary	provided	provided	provided	not provided*	not provided
Community-based rehabilitation services	provided	provided	provided	not provided	provided**
Self-rehabilitation and informal rehabilitation	provided	provided	provided	not provided	not provided

* dispensary monitoring

** One rehabilitation centre for VIPs, funded from the local budget; the centre is funded, not the services provided

While analysing rehabilitation services in Ukraine, the Uniform Clinical Guidelines for glaucoma (primary and secondary levels) and cataracts (at all levels of care - primary, secondary and tertiary) were chosen. This is due to the fact that both diseases are chronic, progress over time, can lead to significant visual impairment or even blindness, and therefore require long-term and comprehensive rehabilitation [81, 82].

According to the International Standard on Visual Rehabilitation (ISVR), the process of providing rehabilitation care to people with visual impairments involves various specialists. They include ophthalmologists, optometrists, VI rehabilitation specialists, orientation and mobility specialists, and experts who help to develop life skills. In addition, depending on the age and level of functional capabilities of the VIPs, the rehabilitation team involves teachers, vocational counsellors and social workers [83].

The training of specialists to provide rehabilitation services in the US, Germany and the UK is carried out in accordance with international and regional standards that meet the requirements of the ISVR. It includes mandatory certification in specific areas of rehabilitation, such as orientation and mobility, rehabilitation of people with visual impairments, education of children with visual impairments, life skills, low vision therapy and work with assistive technologies.

For adults with visual impairments, the multidisciplinary rehabilitation team usually includes an ophthalmologist, low vision specialist, occupational therapist, rehabilitation teacher, mobility and orientation expert, adaptive technology specialist, social worker and counsellor. As for children, their rehabilitation support involves an ophthalmologist, a low vision specialist and a typhlopedagogue.

The list of social rehabilitation services provided in the United States, Germany and the United Kingdom almost fully complies with the requirements of the ISVR, providing a comprehensive approach to supporting people with visual impairments (Table 3) [75].

Table 3.

Provision of rehabilitation services to VIPs in countries around the world

№	Country	Name of the rehabilitation facility	Services provided
1	USA	The Territorial Service for the Blind	orientation and mobility, development of skills necessary for everyday life, cooking, shopping, Braille's code comprehending and communication skills, computer access technologies, management of personal resources banking and methods of paying bills and tracking), preparation for vocational rehabilitation, psychological support, information consultations on rehabilitation services, organisation of mutual support groups health classes in the fitness room
2	Germany	The Frankfurt Foundation for the Blind and Visually Impaired (Polytechnic Society)	social and psychological support, Braille's code, IT basics and electronic aids, use of rehabilitation aids, spatial orientation and mobility, life skills lessons, creative design in an art workshop, consultations on the use of optical aids, visual function assessment, language integration courses for refugees vocational reintegration
3	UK	PrioritEyes	mobility and independent living skills training, assessment and training in the use of visual aids, independent mobility training, IT assessment and training for people with visual impairments, dual sensory skills assessment, information accessibility advice, training in visual impairment, professional care and case management, telephone support service

In 2016, the World Health Organization (WHO) developed a list of priority assistive devices. It includes the 50 most important assistive devices selected on the basis of their prevalence and impact on quality of life. The WHO emphasises that this list is not exhaustive and can be used as a guide for the development of a national list, taking into account the specifics of the country and available resources.

Among the auxiliary aids recommended by WHO for people with visual impairments are:

- Braille displays;
- Braille typewriters;
- various types of magnifying devices (digital and manual);

- magnifying glasses;
- glasses according to ophthalmological indications;
- canes for the visually impaired.
- audio players that support the DAISY format;

In Ukraine, the provision of auxiliary aids and medical devices is carried out in accordance with the list provided for in the Individual Rehabilitation Programme for Persons with Disabilities. The procedure for its formation is regulated by Order of the Ministry of Health of Ukraine No. 623 of 2007, as well as its update by Order No. 2067 in 2024 [84, 85].

The main principles of providing vision rehabilitation services in accordance with ISVR are defined as follows**:**

1. The rehabilitation process should be multidisciplinary and person-centred, not institution-centred.
2. It is important to ensure close cooperation between all professionals involved in the rehabilitation process.
3. Interventions should have a multi-level structure, taking into account the patient's personal goals and possible risks.
4. Data on the patient's condition is collected at the initial stage of rehabilitation, and then refined, analysed and transferred between levels of rehabilitation.
5. The earlier rehabilitation measures are started, the more effective the result will be.
6. Rehabilitation services and support should be evaluated [75].

2.1.1.2. Ways to overcome and prospects for medical and psychological rehabilitation of Ukrainian people with visual impairments

Ukrainian legislation defines rehabilitation of persons with disabilities as a comprehensive, interdisciplinary assistance. It covers a system of medical, psychological, pedagogical, physical, professional, labour, physical culture and sports, and social and household activities aimed at restoring or compensating for impaired

body functions. The main goal of rehabilitation is to promote social and material independence, labour adaptation, integration and reintegration into society. It also provides for the provision of auxiliary rehabilitation equipment and medical devices to persons with disabilities [86].

In Ukraine, rehabilitation functions are distributed among various government agencies, including:

- The Ministry of Healthcare of Ukraine (MoH) — is responsible for medical rehabilitation;
- The Ministry of Social Policy of Ukraine (MoSPU) — provides social rehabilitation;
- The Ministry of Veterans Affairs of Ukraine — coordinates medical care and rehabilitation of veterans.

Despite the existence of relevant structures, the legislation does not clearly define the mechanism of responsibility for the rehabilitation of persons with visual impairment (VIP). There is a lack of coordination between ministries responsible for different areas of rehabilitation.

At the level of the Ministry of Health, there is the Directorate of Medical Services, which deals with the regulatory and legal regulation of rehabilitation issues in the healthcare sector. The Ministry of Social Policy has an expert group on rehabilitation, and the Ministry of Veterans Affairs has a Department of Rehabilitation and Medical Services. Although other ministries are involved in the rehabilitation sector, there is no established mechanism for information exchange between them, which makes it difficult to address problems in a coordinated manner and hinders the development of rehabilitation programmes.

According to unofficial data from 2020, there were about 144,000 visually impaired people in Ukraine, including 40,000 with profound visual impairment. As a rule, for every million people, there are about 1,000 people with complete vision loss who have the status of a person with a disability. More than 10,000 children in Ukraine have disabilities due to visual impairment, and every year about 12,000 more people are recognised as persons with disabilities due to visual impairment.

The growth in the number of children with visual impairments is an alarming trend - every year their number increases by about 250,000, and over the past 10 years the rate of childhood visual disability has increased by 2.5 times. Blindness and severe visual impairment rank 4th among the causes of childhood disability in Ukraine.

According to the National Health Service of Ukraine (NHSU), in 2021, 17,478 people were diagnosed with a visual impairment, and in 2022, this figure increased to 19,551 people. This represents an increase in the number of cases by almost 1.1 times, which is largely due to military operations - missile strikes, kamikaze drone attacks and mine-blast injuries. Despite the severity of the problem, the exact number of people with visual impairments in Ukraine remains unknown, as the Ministry of Health does not keep formal statistics on these indicators. The lack of detailed statistics makes it difficult to plan rehabilitation measures and provide the necessary support to visually impaired persons [87].

According to the UNDP monitoring (2023), the system of comprehensive medical, psychological and social care for persons with visual impairment (VIP) in Ukraine has a number of unresolved problems. First of all, the legislation does not contain clear provisions on the list of rehabilitation services, their scope and the qualifications of specialists who should provide them (ophthalmologist, optometrist, rehabilitation vision therapist, orientation and mobility specialists, psychologist, vocational counsellor, social worker, etc.) The sources of funding for rehabilitation services are not defined, and rehabilitation activities at home and in the community are not enshrined in the Law ‘On Rehabilitation of Persons with Disabilities in Ukraine [87].

The absence of a national standard for the rehabilitation of VIPs significantly complicates the organisation of this sector. Without a single regulatory document that would regulate the planning and implementation of rehabilitation measures, interaction between government agencies, ministries and other stakeholders remains inefficient. This, in turn, does not ensure the continuity of rehabilitation services.

Currently, there is no single mechanism for monitoring the quality of rehabilitation services in Ukraine. Their effectiveness is assessed on the basis of

reporting indicators based on the International Classification of Functioning, Disability and Health. However, there is a problem of data dispersion: in the healthcare sector, data is entered into the electronic healthcare system, while information on the rehabilitation of persons with disabilities is entered into the centralised disability data bank. The lack of a unified framework complicates coordination between providers of medical, psychological and social rehabilitation. In addition, the Clinical Guideline 'Comprehensive Eye and Vision Examination' does not contain specific provisions for the rehabilitation of impaired vision. Although the document contains general recommendations for vision therapy and rehabilitation, it does not specify the meaning of the concept of 'vision rehabilitation', the types of services and specialists who should provide them.

An analysis of the educational programmes for occupational therapists shows that they are not sufficiently prepared to work with VIPs. According to the regulations on the multidisciplinary rehabilitation team, occupational therapists are supposed to carry out rehabilitation activities for visually impaired people, but their training does not include proper training in this area. In addition, the multidisciplinary team does not include an optometrist, which is contrary to international standards for vision rehabilitation, as this specialist is responsible for preventing the loss of visual functions, restoring or compensating for them.

There are also no components in the educational programmes for optometrists that address the ethics of working with VIPs. There is no training for vision therapists that meets international standards, and educational programmes for physical therapists and occupational therapists lack mandatory disciplines dedicated to working with ophthalmological diseases. There are also serious gaps in the field of typhlopedagogy: Ukraine does not train specialists who would specialise in the rehabilitation of visually impaired people, including teaching spatial orientation, Braille, the use of technical rehabilitation equipment, etc. In addition, the National Classification of Professions of Ukraine does not include the position of "typhlopedagogue", although there is a "rehabilitation teacher", but its competences are not detailed. This creates confusion about the training and role of such specialists.

Ukraine lacks programmes to improve the qualifications of social workers working with visually impaired people, even though they play a vital role in the social adaptation process. The inadequate training of these specialists can lead to breaches of ethical standards and poor-quality rehabilitation services. Ophthalmologists who specialise exclusively in vision rehabilitation are not trained in Ukraine. The absence of this profession in the National Classification of Professions limits the provision of quality vision rehabilitation services. At the same time, the existing list of rehabilitation services in the field of social rehabilitation, approved by the Resolution of the Cabinet of Ministers of Ukraine 'On Approval of the State Model Programme for the Rehabilitation of Persons with Disabilities' (No. 1686 of 08.12.2006), is outdated and needs to be updated in line with international experience (USA, Germany, Great Britain) [88].

Currently, Ukraine does not have a formalised reporting system on the effectiveness of medical, psychological and social rehabilitation services for persons with disabilities. Existing lists of rehabilitation aids, although they do exist, remain incomplete. There is also no clear definition of what technical aids should be available in rehabilitation centres or in the arsenal of specialists providing rehabilitation services. Until Ukraine resolves these structural and regulatory issues, adults with visual impairments will not receive the necessary and high-quality assistance in full. This negatively affects their safety, level of independence, quality of life, social integration and opportunities for professional adaptation [89].

Based on the results of the analysis and with the support of the United Nations Development Programme (UNDP), a new model of medical, psychological and social rehabilitation for people with visual impairments (VIP) was proposed to countries around the world. The main goal of this model is to meet the urgent needs of people with visual impairments, improve their quality of life and ensure access to necessary medical, psychological and social rehabilitation services. Key areas include vision rehabilitation, development of necessary physical skills, medical and social assistance, etc.

Pilot models have already begun operating in Lviv (Centre for the First Territorial Medical Association) and Vinnytsia (Podillya Centre for Comprehensive Rehabilitation of People with Disabilities). They have moved on to the long-term rehabilitation stage, focusing on life skills training and the work of multidisciplinary teams to ensure a comprehensive approach to rehabilitation.

The model, developed by Ukrainian experts in collaboration with the United Nations Development Programme, consists of five stages:

- mastering mobile technologies – using special programmes for object recognition and communication;
- orientation – learning how to use a white cane indoors and outdoors;
- developing life skills – becoming independent in everyday tasks;
- psychological support – helping to accept change and find new opportunities for self-fulfilment;
- learning Braille (optional).

Scientists, including Butkin G., Gudonis V., Kantor V., Morgulis I., Sinyova E., and Fedorenko S., have studied the socio-psychological aspects of adaptation of VIPs. According to Sinyova E. (2020), adaptation depends on the microenvironment that influences personality development. Age and social environment create a special situation for adaptation and learning [90].

Current problems of socio-psychological adaptation of VIPs require consideration of the degree of vision loss and the age stage of adaptation. Effective solutions to these problems are possible through the work of a multidisciplinary team that promotes social and material independence, labour adaptation and integration into society [91, 92].

In a study on the psychological adaptation strategies of the Ukrainian population to the conditions of military conflict, the author notes that adaptation is a process of selecting optimal behavioural strategies that enable people with visual impairments to find effective ways to overcome difficulties. Korobka emphasises the importance of

cognitive and emotional adaptation mechanisms that help people maintain psychological balance in difficult life situations [93].

Research into the psychosocial adaptation of people with visual impairments, analysing the key stages of their integration into social life, has identified the main components of successful adaptation as the development of social and everyday skills, involvement in active community life and the formation of a strong motivation for self-fulfilment. The author emphasises the need to create special social support programmes to provide assistance at every stage of the adaptation process. [94].

The researcher identifies two key approaches to the social rehabilitation of persons with visual impairments: social and domestic rehabilitation, which aims to develop self-care and independent living skills, and social and environmental rehabilitation, which helps persons with visual impairments adapt to an open social environment. The author pays particular attention to providing persons with visual impairments with specialised technical aids: walking sticks, orientation systems, adapted household appliances, and typhlotechnical devices for learning and working [95].

The importance of social and psychological adaptation of visually impaired people in Kharkiv during military operations creates additional challenges for people with visual impairments, as vision is the main source of information about danger. The study showed that 22% of respondents have a high level of stress resistance, and 26% use adaptive emotional strategies to cope with stress. At the same time, the cognitive strategies used by visually impaired people can complicate their adaptation to stressful situations. Thus, the social and psychological adaptation of visually impaired people is a complex process that requires a comprehensive approach, the participation of multidisciplinary teams and the implementation of specialised rehabilitation programmes to ensure the successful integration of visually impaired people into society [96].

Ukrainian legislation and regulations identify two main areas of rehabilitation: health care (HC) and rehabilitation for persons with disabilities. Despite the declared principle of continuity of rehabilitation services, this division creates significant obstacles to the coordination of rehabilitation measures between different levels and

sectors, and also complicates the integration of the rehabilitation system for people with visual impairments (VIP).

The current regulations contain two lists of rehabilitation aids: one is contained in the State Standard Programme for the Rehabilitation of Persons with Disabilities, and the other in the Procedure for Providing Assistive Rehabilitation Devices (Technical and Other Rehabilitation Devices) to Persons with Disabilities, Children with Disabilities and Other Specific Categories of the Population and for Paying Cash Compensation for the Cost of Such Devices Purchased Independently, and the List of Such Devices. The existence of two separate lists creates certain difficulties in the process of providing rehabilitation services for persons with disabilities.

At the local community level, there is no comprehensive, multidisciplinary, and inter-sectoral rehabilitation for people with disabilities. Most rehabilitation measures set out in the Unified Clinical Protocols for the Provision of Medical Care are divided into mandatory (monitoring compliance with recommendations, lifestyle changes, medical check-ups, frequency of follow-up examinations) and desirable (sanatorium-resort treatment in specialised institutions for ophthalmic patients). However, in practice, such measures are not fully implemented, nor are they carried out by all the necessary specialists, which makes it impossible to develop an effective rehabilitation pathway for people with visual impairments and violates the principle of a comprehensive approach.

The existing list of rehabilitation measures in the field of healthcare includes such areas as physical and rehabilitation medicine, physical therapy, occupational therapy, speech therapy, psychological assistance, prosthetics and orthotics, as well as the provision of rehabilitation aids. However, the lack of a single standard for rehabilitation of persons with disabilities prevents the effective development and implementation of individual rehabilitation plans in accordance with rehabilitation pathways [75].

Current legislation does not contain clear rules on the provision of rehabilitation services outside specialised institutions, in particular at home or within local communities. In theory, such services can be provided within the healthcare system,

but due to the lack of relevant regulations, the mechanism for their implementation remains unregulated. In addition, regulatory provisions concerning the rehabilitation of persons with disabilities do not actually provide for rehabilitation services within local communities. This significantly limits the access of persons with disabilities to necessary services and requires that this problem be addressed at the state level.

The rehabilitation system for persons with disabilities lacks a sufficient number of specialised rehabilitation centres that meet the needs of adults with disabilities in accordance with International Standards for Vision Rehabilitation (ISVR). In particular, comprehensive, multidisciplinary and inter-sectoral rehabilitation measures for adults with disabilities are limited and do not meet current international standards. Currently, social rehabilitation is mostly limited to social and domestic care, occupational therapy and social skills training. However, this approach does not contribute to achieving the key goals of rehabilitation – the development of independence, financial independence, occupational adaptation and social integration of people with disabilities [75].

The absence of psychological rehabilitation measures in the list of rehabilitation services for people with visual impairments is a significant problem. Currently, the emphasis is mainly on psychological and pedagogical rehabilitation, which does not cover the comprehensive resolution of issues related to the psychosocial adaptation of people with visual impairments to changed life circumstances.

2.1.1.3. Medical and psychological rehabilitation: an analytical review of scientific information sources on the quality of life and adaptation possibilities of people with visual impairments

Irreversible vision loss significantly affects a person's quality of life and mental state. VIP's psychological reactions may include high levels of stress, anxiety, panic attacks, feelings of loneliness, low self-esteem, depressive disorders, and in some cases even suicidal thoughts. Depression is one of the most common mental disorders among people with visual impairment, along with anxiety and somatoform disorders [91, 94].

According to the study, more than 80% of people with complete vision loss have concomitant mental disorders or experience severe emotional distress. Psychological dissatisfaction in this category of people is often associated with a reduced ability to live independently, limited opportunities for social interaction, difficulties in professional fulfilment, and reduced access to familiar leisure activities [97].

The quality of life of people with visual impairments is significantly lower than that of people without such impairments, which is explained by limitations in daily activities, reduced physical activity and difficulties in adaptation. To improve physical and mental health, it is necessary to raise awareness of the benefits of physical activity, balanced nutrition and healthy sleep patterns. It is important to develop effective mechanisms for accessing relevant recommendations tailored to the needs of people with visual impairments. Specialists play a central role in the rehabilitation process and should develop specialised programmes that take into account the level of physical activity, psychological and cognitive characteristics, and socio-economic status of patients. It should be borne in mind that many people with visual impairments have coexisting chronic diseases, which further complicates their adaptation. Effective work requires coordination of a multidisciplinary team, which should include an ophthalmologist, vision therapist, occupational therapist, rehabilitation teacher, orientation and mobility specialist, adaptive technology specialist, social worker, psychologists, and physiotherapists. Only a comprehensive approach will ensure long-term improvement in the quality of life of people with visual impairments [98].

The study highlights the importance of investigating the relationship between visual impairments and the level of social activity. Its results contribute to the improvement of rehabilitation services aimed at social integration and improving the overall health of people with visual impairments. The study found that 29.5% of respondents with visual impairments participated in a survey of their satisfaction with their daily lives and social activity. One of the key factors influencing social interaction was job satisfaction: people who felt confident in their work were much more likely to participate actively in social life. Moreover, those who had stable employment and higher income levels demonstrated more pronounced social integration. These findings

once again confirm that economic stability and professional support are important elements for increasing the level of social participation of people with visual impairments [99].

An analysis of physical activity and overall quality of life among working-age people with visual impairments revealed key factors influencing the effectiveness of rehabilitation services. The results showed that regardless of the degree of vision loss, people with visual impairments have a lower quality of life. At the same time, physical activity, particularly sports, has been shown to be highly effective in improving physical, psychological, emotional and social well-being [100].

The study highlighted the significant impact of physical activity on health-related quality of life, accounting for approximately 6% of the variation in this indicator. The study also found gender differences in the relationship between physical activity levels and overall quality of life. This suggests that physical activity affects men and women with visual impairments differently. People with visual impairments generally report a significantly lower quality of life compared to people without such limitations. Regular physical activity and reducing the amount of time spent sitting have a positive impact on health and overall well-being. This further confirms the need to develop specialised programmes and rehabilitation services aimed at increasing physical activity among people with visual impairments [101].

The study also found that low levels of physical activity are a significant problem for people with visual impairments, directly affecting their overall health. In a cross-sectional analysis of adults aged 18 to 95, only 60.0% of participants reported engaging in moderate or vigorous physical activity for at least 30 minutes per day. It was found that individuals with complete vision loss exhibited lower levels of physical activity, spending more time in a seated position and participating less frequently in sports activities. In contrast, those who had partial vision impairment or were able to move around without assistance demonstrated higher levels of physical activity, spending more time on light or moderate physical activity. In addition, the study found that the key factors contributing to low physical activity among people with visual impairments were total blindness and dependence on assistance for mobility.

Individuals with lower visual acuity and who moved with support were in the group with the lowest level of physical activity. This confirms the need for a targeted approach to rehabilitation that includes adaptive physical activity programmes for such individuals.

Low physical activity among people with visual impairments remains a serious problem worldwide. Therefore, specialised institutions and government agencies should develop effective programmes aimed at promoting physical activity among people with visual impairments. In particular, attention should be focused on high-risk groups with low activity levels in order to develop effective rehabilitation measures aimed at improving the overall level of physical activity and social integration of persons with visual impairments. Research findings confirm the need to improve rehabilitation services to enable these individuals to lead full and active lives in society [102].

Based on recent studies, it has been found that adolescents with uncorrected refractive errors or non-refractive visual impairments do not demonstrate a higher level of sedentary lifestyle, nor do they have reduced levels of moderate and high-intensity physical activity compared to their peers with normal vision. Similar patterns are observed among adults aged 20 to 49, where no significant association between vision and high-intensity physical activity has been found.

However, data analysis shows differences between men and women. In particular, women aged 20–49 with non-refractive visual impairments spend significantly more time sitting than women with normal vision. As for people aged 50 and older, their level of physical activity decreases significantly, especially among women, who on average show an 82.0% lower level of physical activity than their peers without vision impairments. These findings highlight the need to develop and implement measures aimed at increasing physical activity and reducing the time spent in a seated position. It is particularly important to focus on adults with visual impairments, especially women, who need additional support to engage in an active lifestyle [103].

People with visual impairment have a higher prevalence of chronic diseases and significantly lower levels of physical activity compared to people without visual impairment. The study identified several key components of physical activity that have a positive impact on the physical performance of people with visual impairment:

- exercises that help prevent falls and improve balance;
- walking as a basic form of activity;
- yoga and dance exercises that improve coordination;
- aerobics and strength training to maintain muscle activity.

The results show that involving people with visual impairments in physical activity not only improves their physical characteristics but also contributes to overall health, increased mobility and quality of life. Thus, yoga, dancing and other exercises can be an effective means of rehabilitation and physical fitness for people with visual impairments [104]. Rehabilitation programmes for people with visual impairments are aimed at optimising the use of residual vision, developing compensatory skills and improving functioning in everyday life. According to an analysis of scientific studies conducted in different regions of the world (Australia, North America, Europe and Asia), there are several approaches to rehabilitation [75].

1. **Psychological support** – helps adapt to changes in life after vision loss, reduces anxiety and depression.

2. **Vision improvement methods** – use of optical and electronic devices to maximise the use of residual vision.

3. **Multidisciplinary programmes** – combination of medical, psychological, social and educational methods to provide comprehensive assistance to people with visual impairments.

Studies have shown that compared to individuals who did not participate in rehabilitation programmes, people who received psychological support demonstrated a 7.3% improvement in quality of life, while vision improvement methods contributed to a 6.8% increase in this indicator. More comprehensive approaches, including multidisciplinary programmes, had an even greater positive effect [105].

People with visual impairments are more vulnerable to traumatic events in emergency situations, which significantly increases the risk of developing post-traumatic stress disorder (PTSD). Studies [106] show that the prevalence of PTSD among people with visual impairments is significantly higher than in the general population. In particular:

- among men, the rate is 9.0% (compared to 3.8% in the general population);
- among women, the rate is 13.9% (compared to 8.5%).

The main factors contributing to the increased rate of PTSD among people with visual impairments are:

1. **Young age** – the younger the person, the higher the risk of developing PTSD, as they have less experience of traumatic events.
2. **Female gender** – women with visual impairments are more likely to be victims of sexual violence, which significantly increases the risk of developing PTSD (17.4% compared to 10.0% in the general population).
3. **Loss of vision due to trauma or illness** – is a serious psychological factor that influences the risk of developing PTSD.

To reduce PTSD and improve the mental health of persons with visual impairments, it is necessary to:

- develop medical and psychological assistance programmes;
- implement universal design principles to create a safe environment;
- strengthen measures to prevent physical and sexual violence;
- raise public awareness of the needs of persons with visual impairments.

Research confirms that physical activity, effective rehabilitation and mental health support measures are important components of improving the quality of life of people with visual impairments. Particular attention should be paid to at-risk groups, such as women, young people and people who have lost their sight due to trauma. An integrated approach that includes rehabilitation, physical activity and psychological support will promote social adaptation and improve the well-being of people with visual impairments [107]. He analysed in detail the range of emotional, behavioural,

physical and cognitive manifestations that can arise as a result of traumatic events. The researcher found a close relationship between the nature of traumatic experiences and the development of mental disorders. According to the data obtained, the prevalence of mental disorders among people with visual impairments is 4.0%, depression – 21.2%, substance abuse – 32.0%, and dysthymia – 0.9%. The scientist emphasises that people with visual impairments are vulnerable to traumatic events that have a significant impact on their mental health. In this regard, particular attention should be paid to ensuring access to specialised medical and psychological care, including the services of psychologists and psychiatrists. Another important aspect is the creation of a safe environment in communities, including the development and implementation of universal design principles in public places [108].

In a follow-up study, Brunes A. (2021) found that among people with visual impairments, 68.0% had experienced at least one traumatic event in their lifetime, which exceeds the corresponding figure for the general population (60.0%). This statistically significant difference indicates that such individuals are more vulnerable to traumatic events and emergencies. Among the most common traumatic events experienced by people with visual impairments are fires, explosions (including those resulting from armed conflicts), serious accidents, sexual violence, life-threatening illnesses and serious physical injuries. These results confirm that people with visual impairments are at higher risk of experiencing events that can lead to significant mental and emotional consequences [109].

Research by scientist [110] shows that the incidence of post-traumatic stress disorder (PTSD) among people with visual impairments varies from 4.0% to 50.0%. The main factors contributing to the development of this disorder are traumatic events associated with vision loss due to illness or injury, physical and sexual abuse. A distinctive feature is that the very fact of visual impairment creates additional barriers to the perception and processing of information during traumatic events, which complicates adaptation to new circumstances and contributes to the development of PTSD. People with visual impairments have limited ability to orient themselves in stressful situations, which can significantly complicate their timely response to danger.

In addition, visual impairment affects the nature of PTSD symptoms: altered types of intrusive memories, increased avoidance symptoms, and more pronounced hyperarousal may be observed.

Depression and anxiety disorders are common among people with visual impairment, but often go unnoticed or underdiagnosed. According to the study participants, the main reasons for this include a focus on daily difficulties, low awareness of mental health issues, and misinterpretation of symptoms of depression and anxiety as consequences of other life circumstances.

During the discussions, participants emphasised that feelings of vulnerability and inequality that accompany living with visual impairment prevent them from acknowledging mental health issues. They also stressed that social support and assistance from healthcare professionals are critical in addressing these issues. However, many noted that doctors and psychologists lack the specialised knowledge and skills to work effectively with such patients. Therefore, a key area for action is the training of healthcare professionals to improve the diagnosis and treatment of depression and anxiety disorders in people with visual impairments.

Research shows that a significant proportion of people with visual impairments face financial difficulties that hinder their access to necessary assistive technologies. In particular, 60.0% of respondents have low incomes, which limits their ability to purchase such devices, and 40.0% are not even aware of the existence of modern assistive devices. At the same time, over 70.0% of those who use assistive technologies note their effectiveness in increasing independence and improving quality of life. The study also found differences between users depending on when they lost their sight. People who have had visual impairments since birth are more likely to adapt to using modern technologies, while those who lost their sight later in life may face difficulties in learning how to use them. The main barriers remain the high cost of equipment and a lack of awareness about available solutions [112].

In today's world, assistive technologies play a key role in ensuring a fulfilling life for people with visual impairments. They are becoming more than just tools; they are true helpers that open doors to independence, education, professional fulfilment

and social integration. Professionals working with this community must not only be knowledgeable about these technologies, but also understand their impact on each individual's life.

A study conducted in 2020 clearly demonstrates the positive assessment of assistive technologies by both people with visual impairments (72.2%) and professionals (92.6%). These figures emphasise that technology does not simply make everyday tasks easier, it gives people the opportunity to feel like full members of society, capable of achieving their dreams.

However, there are serious obstacles on the road to full accessibility of technology. The biggest one is the high cost of assistive devices, which is noted by 75.0% of people with visual impairments and 96.3% of specialists. This creates inequality and limits opportunities for many who need these technologies.

To overcome these barriers, a comprehensive approach is needed, including:

- **Improving social policies**: The government and community organisations should create programmes that provide financial support and access to assistive technologies.
- **Development of affordable technologies:** Innovative solutions must not only be effective, but also affordable for a wide range of users.
- **Raising awareness**: Information campaigns and educational programmes will help dispel myths and stereotypes associated with visual impairments and raise awareness of available technologies.
- **Cooperation**: Technology developers, experts, people with visual impairments and their families should work together to create solutions that meet real needs [113].

The study identified a critical lack of information needed to develop products and environments that meet the needs of people with visual impairments. The lack of data on their travel routes and specific needs creates significant barriers to inclusive design. The aim of the study was to identify the information needs of this group, including: performing daily tasks, navigating complex urban environments, using

sensory cues (texture, noise, smell), detecting cues that impede movement or create hazards, and perceiving safety while moving [114].

People who have experienced complete or significant vision loss have found that they rely on tactile sensations, such as changes in surface texture and level differences, as well as non-visual cues, such as sounds and smells, to navigate their environment. Unfortunately, information presented in Braille has proven to be ineffective due to its limited availability in everyday environments.

In terms of safety, crossing the street is one of the most serious sources of risk for this group of people. Auditory, olfactory and tactile signals have been identified as key to obtaining information while moving around.

This study highlights the critical importance of a thorough analysis of existing tactile signals and their location in space. Strategies and technologies need to be developed that effectively use these cues to improve the safety and independence of people with visual impairments. This requires a multidisciplinary approach that includes the development of innovative technologies, improvements in urban planning and raising public awareness of the needs of this group of people.

According to the study, a meta-analysis of the effectiveness of rehabilitation services without the use of assistive devices was conducted, involving people over 55 years of age (over 80%). The results of rehabilitation interventions were evaluated, both separately and in combination with the use of technical aids, with a focus on the emotional state, functional ability, self-efficacy and social activity of the participants. The meta-analysis covered 14 studies divided into two groups: 43% involved people with hearing impairments and 57% with visual impairments. The results showed that rehabilitation services that did not involve the use of devices did not demonstrate a statistically significant effect on improving the emotional state, functional ability, self-efficacy or social activity of the participants. However, the analysis found that the method of problem solving can have a positive effect on improving the emotional state of participants [115].

The study conducted examined in depth the needs of people with visual impairments in mastering assistive technologies, including smartphones and

specialised applications. The results revealed a noticeable difference in the availability of formal education between Australia and Singapore: 55.9% of Australian participants had access to formal training, compared to only 32.3% in Singapore. However, self-learning remained the most common method in both countries, with 85.0% of Australians and 64.7% of Singaporeans relying on self-study. Participants rated both types of training highly, but expressed a clear preference for one-to-one sessions with experienced and patient trainers. They also emphasised the importance of accessible training materials, including flexible online formats and group sessions with peers, which create a supportive learning environment. The researcher recommends that occupational therapists use a combination of formal and informal approaches, actively raise awareness of formal training opportunities, and ensure that training is tailored to the needs of each person with visual impairments. This will significantly improve smartphone and app skills, opening up new opportunities for independent living and social integration [116].

Smartphones have become the primary assistive devices for people with visual impairments around the world. Most research in this area (48.0%) focuses on creating interfaces and applications that better meet the needs of users with limited vision. However, only a small proportion of work (5.0%) is dedicated to training and support in the use of these technologies. Effective training plays an important role in this process, enabling people with visual impairments to use smartphones to actively participate in social life, increase their independence and improve their quality of life. Smartphones and applications can be convenient and effective tools for people with visual impairments, and new technologies open up additional opportunities for their use. However, the lack of training and support programmes limits the full use of these opportunities. In order for smartphones to become a real assistive tool, additional courses and support need to be introduced. It is important to take a personalised approach that takes into account the degree of visual impairment, age and experience with new technologies. Particular attention should be paid to the difficulties that people may encounter when switching from mobile phones with physical buttons to touch screens. Healthcare professionals should take these difficulties into account and

provide appropriate assistance to facilitate the process of adaptation to modern technologies [117].

2.1.2. Changes in the psycho-emotional state of military personnel after participation in combat actions who are undergoing medical and psychological rehabilitation

The modern living conditions of military personnel are subject to powerful influences from numerous psycho-emotional and informational stresses, rapid socio-political changes, moral and psychological distortions, and other negative factors of everyday reality. Psychosocial risks, along with their detrimental impact on mental health, are becoming one of the most pressing and complex problems. They not only directly affect individuals, but also indirectly harm the overall combat capability of military units: they weaken collective cohesion, coordination, morale and the ability to effectively perform combat tasks. Prolonged stay in a combat zone, high probability of traumatic situations and constant exposure to extreme physical and psychological stress beyond the limits of normal human experience create a fertile ground for the development of professional burnout. In today's world, which is in a state of global military and political instability, especially against the backdrop of the armed conflict in Ukraine, the issue of ensuring and rehabilitating the mental health of military personnel is becoming critical. Emotional burnout is one of the key issues in military structures that is actively analysed in scientific literature. According to scientific research conducted by C. Maslach in 2016, emotional burnout can cause significant long-term consequences that affect various aspects of human life. In particular, it can cause serious psychological disorders, physical problems and negative changes in behaviour, which together impair the overall quality of life of the individual. In addition, these consequences have a significant impact on their professional activities, reducing productivity and efficiency. Emotional burnout thus becomes a risk factor not only for personal well-being but also for professional stability and development. At the same time, most studies tend to take a generalised approach or focus on male military personnel, ignoring the specific characteristics of other categories of military

personnel. At the same time, women in military service face difficult and often unique challenges that significantly influence the development of emotional burnout, determining its nature, dynamics and consequences. These specific conditions and stress factors create a special environment that shapes not only psychological responses but also the associated long-term recovery and adaptation to new realities [118-120].

Emotional burnout is a complex psycho-emotional phenomenon that occurs due to prolonged professional stress that is not balanced by sufficient resources for psychological recovery. According to the classic definition formulated by American researchers Christine Maslach and Susan Jackson in 1981, emotional burnout is described as a syndrome consisting of three key components:

- Emotional exhaustion manifests itself as a feeling of depletion of internal resources, lack of energy and motivation to act.
- Depersonalisation, or impersonalisation, is characterised by the emergence of negative, cynical or emotionally detached attitudes towards people who are part of professional interactions, such as clients, patients or colleagues.
- A decline in personal achievements manifests itself through feelings of professional ineffectiveness, a drop in self-esteem and a decrease in the subjective importance of one's own work.

Modern scientific concepts presented in Schaufeli's work consider the phenomenon of professional burnout as a complex process arising from an imbalance between the demands of the work environment and the resources available to the employee to meet those demands. These approaches pay particular attention to the multidimensional nature of this condition, where various factors interact: individual psychological characteristics, specific working conditions, and the broader social context in which the individual functions [121].

Emotional burnout is not a mental disorder in the narrow medical sense, but the problem of professional burnout is discussed in the section ‘Factors influencing health status or contact with health services ’in the 10th edition of the International Classification of Diseases (ICD-10). On 20 May 2019, the World Health Organisation (WHO) presented the updated 11th edition of the ICD at the World Health Assembly

in Geneva. In this edition, the concept of professional burnout has been given a broader interpretation. According to the ICD-11 classification, QD85 burnout is defined as a syndrome that develops under the influence of prolonged chronic stress related to professional activities that has not been successfully managed [122]. The diagnostic criteria include the following signs:

- feelings of energy depletion or fatigue;
- increasing mental detachment from work, the emergence of negative or cynical attitudes towards professional activities;
- decreased professional performance [123].

The growing number of women serving in the Armed Forces of Ukraine during the full-scale war with Russia creates an urgent need for a comprehensive study of their psycho-emotional state. This analysis aims to examine key aspects of the impact of stress factors on their professional activities and overall well-being. In addition, it is important to develop effective strategies to ensure psychological resilience, prevent emotional burnout while maintaining high performance, and provide medical and psychological rehabilitation when necessary. After all, stability and motivation are critical for the performance of combat tasks in such difficult conditions. As of 1 January 2025, the number of women in the Armed Forces of Ukraine exceeds 70,000 [124]. Research shows that female military personnel are much more likely than their male counterparts to face serious challenges such as chronic stress, depression, anxiety disorders and emotional burnout [125, 126]. These problems not only affect their physical and mental health, but also have a significant impact on their professional activities and overall quality of life. Women in military service face challenges that are significantly different from those faced by men. These differences influence the development of emotional burnout, determine its dynamics and consequences [127]. The process of emotional burnout in female military personnel occurs gradually, passing through three key stages:

- stage of increased emotional stress: constant stress due to service and gender adaptation, the emergence of psycho-emotional tension due to role conflict;

- stage of chronic emotional exhaustion: decreased energy levels, loss of motivation, physiological symptoms appear, increased social isolation;
- stage of professional destruction and personal alienation: apathy, depression, cynicism towards service, loss of meaning in work, psychosomatic disorders, high risk of suicidal thoughts.

High levels of stress in the closed military environment and the specific nature of military service affect the condition of military personnel, predisposing them to health problems and emotional burnout [128]. In combatants, emotional burnout syndrome can manifest itself as a protective subconscious mechanism in the form of partial or complete emotional shutdown in response to psychotraumatic influences. Emotional burnout syndrome (EBS) is part of occupational personality deformation [129].

The survey was conducted among 35 female military personnel who sought inpatient care for somatic diseases, aged 21 to 58 years. The length of stay in treatment ranged from 5 to 24 days. The questionnaire for diagnosing emotional burnout developed by V. V. Boiko was used. The study found that 20.0% of female military personnel scored above 183 points in the emotional burnout zone, in the balance zone up to 108 points in 42.9%, in the zone of formation of EBS with a range of responses from 109 to 183 points in 37.1% of respondents (Fig. 1).

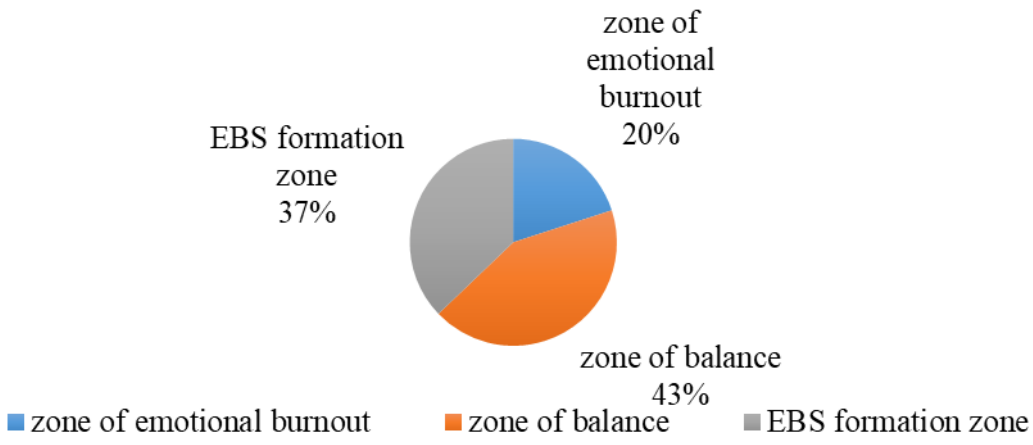

Fig. 1. Distribution of balance zones, formation of EBS, emotional burnout in female military personnel, %

The highest scores were obtained for the emotional burnout zone – 289 points, for the balance zone – 105 points, and for the EBS formation zone – 183 points. The lowest scores were recorded for emotional burnout (210 points), balance (16 points) and the formation of EBS (119 points). The data are shown in Fig. 2. The range of the sample was 273 points, the average value of the indicators was 133.2 points, and the median was 180 points.

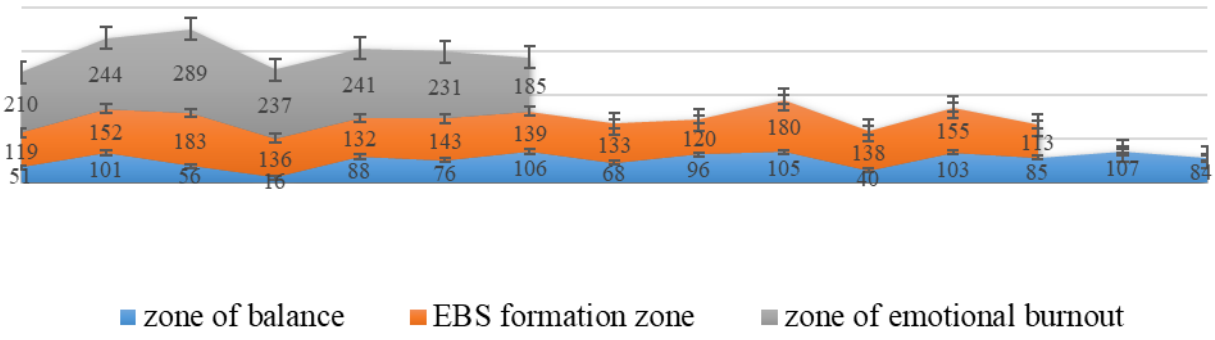

Fig. 2 Distribution of zones by scores: in the balance zone, formation of EBS, emotional burnout.

Analysis of scientific sources shows that Emotional Burnout Syndrome is considered a natural protective mechanism of the body, which manifests itself through emotional alienation, loss of empathy and a general decrease in performance. It performs an important adaptive function among combatants, helping to reduce the impact of stress factors and maintain stability under conditions of high psycho-emotional stress. However, this mechanism also has a downside: it can lead to the development of long-term negative consequences that significantly impair mental and physical health.

2.1.3. Ways to solve problems in the field of medical, psychological and social rehabilitation in Ukraine for military personnel and persons with visual impairments

In order to establish adequate, high-quality, multidisciplinary, and interdisciplinary rehabilitation care in Ukraine, a number of comprehensive measures

covering various aspects of the rehabilitation system must be implemented.

1. Consolidation of management and coordination:

- **Establishment of interdepartmental working groups:** For the successful implementation of the national rehabilitation strategy, permanent working groups should be set up to develop and implement a nationwide strategy for the rehabilitation of military personnel who have been in combat zones and persons with visual impairments. This will help ensure coordination between various ministries and agencies, such as the Ministry of Health, the Ministry of Social Policy, the Ministry of Veterans Affairs, the Ministry of Education and Science of Ukraine, civil society organisations and other stakeholders. The main goal is to ensure effective communication and cooperation between them.
- **Developing a national strategy:** It is important to develop a comprehensive strategy that takes into account the needs of individuals at all stages of rehabilitation. The strategy must be backed up by clear goals, objectives and implementation mechanisms to ensure its effective implementation and the achievement of the desired results.
- **Development of regulatory documents:** It is necessary to develop and approve regulatory acts governing the provision of rehabilitation services at the local community level. This will help ensure the accessibility and quality of rehabilitation services for all persons in need of medical and psychological rehabilitation, guaranteeing a unified approach to their provision.

2. Legislative framework:

- **Adoption of a single law on rehabilitation:** For the proper development of the rehabilitation system, it is important to adopt a law of Ukraine that establishes clear legal norms ensuring the continuity, accessibility and quality of rehabilitation services for all persons with disabilities. The law should define the rights and obligations of persons with disabilities and those who provide rehabilitation services, creating a legal basis for the effective implementation of the rehabilitation system.

3. Development of state standards:

- **State standard for the rehabilitation of persons with disabilities:** It is important to develop a national rehabilitation standard for all persons that complies with international norms and is adapted to the specificities of the Ukrainian reality. Representatives of all stakeholders should participate in the development of the standard: scientists, practitioners, organisations working with persons with disabilities.
- **Model regulations for rehabilitation centres:** Clear regulations are needed to define the requirements for the organisation and operation of specialised rehabilitation centres for persons with disabilities. This will establish social standards for such institutions and ensure an adequate level of service.

4. Strengthening the system for providing rehabilitation aids:

- **Cooperation with WHO:** The current situation in Ukraine regarding assistive technologies for persons with disabilities needs to be assessed and integrated into the national rehabilitation strategy. This will ensure that assistive devices for persons with disabilities are relevant and effective.
- **Improving the list of assistive devices for rehabilitation:** Taking into account international WHO recommendations and rehabilitation standards, the existing list of assistive devices should be improved by adding new and most effective technologies for persons with disabilities.
- **Information campaigns:** Active information campaigns should be conducted to raise public awareness of the latest methods of rehabilitation for persons with disabilities. This will not only improve access to rehabilitation services but also stimulate demand for them among citizens.

5. Improvement of rehabilitation service packages:

- **Analysis and improvement of existing services:** It is important that the Ministry of Health, the National Social Security Service, the Ministry of Social Policy, the Ministry of Education and Science, and other responsible authorities conduct a comprehensive analysis of existing rehabilitation service packages for persons with disabilities. It is necessary to identify problems and limitations that have arisen during

their implementation and develop measures to improve the effectiveness and accessibility of these services.

- **Expanding the list of rehabilitation aids:** Given the individual needs of persons with disabilities, it is important to review and expand the list of aids provided to them. This will ensure more accurate and personalised services.
- **Funding rehabilitation services:** Introducing the principle of 'money follows the patient' will allow for more transparent funding of rehabilitation services, increase their accessibility and ensure the effective use of budget funds.

6. Ensuring human resource capacity:

- **Training qualified specialists:** In order to provide effective rehabilitation services, it is important to train occupational therapists, psychotherapists, rehabilitation specialists, psychologists, physical therapists, social workers, orientation and mobility instructors, etc.
- **Advanced training for specialists:** Regular advanced training for specialists such as occupational therapists, physical therapists, psychologists, social workers and others is necessary to ensure the provision of high-quality services. This will allow practices to be adapted to the latest standards and technologies.

7. Collection of statistical data:

- **Inclusion of questions in the census:** Including data on the functioning of persons with disabilities in the census will enable accurate statistics to be collected. This will contribute to effective planning and evaluation of the effectiveness of rehabilitation programmes.

8. Creation of a unified information system:

- **Single electronic system:** It is important to create an integrated information system that will provide convenient access to data on rehabilitation services and help reduce information gaps between government agencies, medical and social services, and other services.

9. Expanding access to rehabilitation services:

- **Provision of services regardless of the severity of disability:** Rehabilitation services must be made accessible to all persons, regardless of the severity of their disability.
- **Establishment of specialised rehabilitation facilities:** For more effective service delivery, specialised rehabilitation facilities and centres should be established at the regional or interregional level, with the necessary infrastructure and specialists to provide assistance [75].

The main principles of providing high-quality, qualified rehabilitation care are as follows:

1. Adaptation and application of the international model of rehabilitation for persons with disabilities:

- The International Standard for Rehabilitation of Persons with Disabilities is a basic model for creating a high-quality rehabilitation process that takes into account the unique capabilities of each region and country as a whole. This model helps to streamline all stages of rehabilitation, focusing on the accessibility and effectiveness of assistance to persons with disabilities.

The key aspects of the model are:

Subordination of rehabilitation facilities: determining who rehabilitation facilities report to in order to ensure the clear organisation of their work.

Material and technical support: availability of necessary resources to ensure the proper functioning of rehabilitation facilities.

Staff qualifications: importance of highly qualified specialists working with persons with disabilities.

Network of rehabilitation facilities: availability of a well-developed network that ensures access to assistance in different regions.

- This model emphasises the importance of **close cooperation** between healthcare professionals, education specialists, medical professionals and rehabilitation specialists working with persons with disabilities. This multidisciplinary approach allows rehabilitation services to be better tailored to the individual needs of patients.

2. Three-level vision rehabilitation system:

- The vision rehabilitation system should consist of a clear **three-level structure:**

Primary level: at this stage, an initial assessment is carried out and basic assistance is provided.

Secondary level: more specialised services are provided here, requiring qualified specialists.

Tertiary level: this is highly qualified assistance for people with complex disabilities, where complex treatment and rehabilitation methods must be used.

- All these levels must be **interconnected**, ensuring effective information exchange and coordination between specialists in different fields.
- Such a system allows rehabilitation to be organised in conditions where each stage interacts with the others, thereby improving the quality of services provided and taking into account the individual needs of each patient.

3. Individual approach and constant monitoring:

- Within the framework of European standards, it is important to understand that rehabilitation periods may vary for each person depending on the severity of their disability. Therefore, an **individual approach** is the fundamental principle on which the rehabilitation process is based.
- To achieve maximum results, it is necessary to conduct **ongoing monitoring** of the services provided. This allows for regular assessment of the effectiveness of rehabilitation measures and adjustment of programmes to ensure they meet the changing needs of patients.

4. Improving patients' quality of life through rehabilitation services:

- Rehabilitation should be aimed at **improving the quality of life** of people suffering from irreversible and progressive disorders. The key objectives of rehabilitation include:

Prevention of loss of functions of the underlying disease: implementation of preventive measures.

Slowing the progression of disorders: using methods to reduce the rate of deterioration in the patient's condition.

Restoring functions: using techniques that can help improve or even restore impaired functions.

Maintaining the current condition: providing assistance to preserve the existing state of vision so that the patient can continue to lead an active life.

Development of self-care and mobility skills: teaching patients spatial orientation, communication and independence in performing everyday tasks.

Active participation in social and civic life: promoting the integration of persons with disabilities into society through participation in various aspects of life.

- All these services should be coordinated by medical institutions, educational establishments, social services and community organisations to ensure a comprehensive approach to rehabilitation.

5. Comprehensive list of rehabilitation services for adults:

- In order to provide comprehensive assistance to persons with disabilities, it is necessary to create a clearly defined **list of rehabilitation services**, which includes:

Provision and training in the use of assistive devices: providing the necessary tools and training patients in how to use them.

Orientation and mobility training: helping to develop mobility and spatial orientation skills.

Development of visual perception and compensatory mechanisms: helping to develop other senses to compensate for vision loss.

Te-rehabilitation services: providing services via remote technologies for those who cannot visit rehabilitation facilities.

Organising self-help groups: creating support groups for sharing experiences and mutual assistance.

Training in the use of technical rehabilitation aids: ensuring the mastery of special technical devices to facilitate everyday life.

Home management training: developing the skills needed to run a household independently.

Adaptation of living and working environments: assessing and adapting living and working conditions to ensure safety and comfortable functioning.

Social and educational services: access to education and social services to improve integration into society.

Leisure and recreation programmes: promoting active leisure and supporting physical health.

Psychological counselling: providing support to overcome psychological difficulties.

Career counselling: assistance in career choice and professional orientation.

Monitoring of rehabilitation services: assessment of the effectiveness of services provided to adjust rehabilitation programmes to the needs of patients.

6. Specialists involved in providing rehabilitation services must hold relevant certificates obtained after completing ISVR programmes to ensure that services are provided at all stages of the rehabilitation process [75]. The main objective of the study was to examine key aspects that need to be considered when adapting mental and mental health treatment for persons with disabilities. The author highlights several important factors that influence the effectiveness and quality of therapy:

1. **Features of visual impairments:** The degree and nature of visual impairments have a significant impact on the choice of treatment methods. Therapeutic approaches should be individualised, as different types of visual impairments require different treatment approaches.

2. **Environment:** The space in which therapy is provided should be as accessible and comfortable as possible for people with disabilities. It is important that this space does not create additional difficulties and is adapted to the specific needs of clients.

3. **Stress factors:** All external and internal factors that may cause stress or negatively affect the mental state of patients must be taken into account. These can be both physical and psychological aspects of a person's life, which should be considered during treatment.

4. **Emotional state of the patient:** People with disabilities often face emotional difficulties due to limitations in their perception of the world around them, which can lead to depression, anxiety or feelings of isolation. These emotional aspects must be taken into account when developing therapeutic strategies.

5. **Role of the specialist:** Specialists working with patients with disabilities must be particularly attentive to their needs. They should create an atmosphere in which the patient does not feel uncomfortable due to insufficient or incorrect visual information. It is important that the specialist understands and supports the patient at every stage of therapy.

6. **Individualisation of treatment:** The approach to each patient should be personalised, taking into account their pathology. Treatment should be adapted to the individual needs of the person, which allows for increased effectiveness of therapy and greater comfort during the recovery process.

7. **Accessibility of information materials:** All information and therapeutic materials used in the treatment process should be accessible to persons with disabilities [75, 130].

2.1.4. Cinema-therapy as an innovative method of medical and psychological rehabilitation and social adaptation

In the context of full-scale war in Ukraine, the number of people with mental health disorders (anxiety, depression, suicidal attempts, PTSD) has increased significantly [131].

Due to the war, which has been ongoing since 2014 and escalated in 2022, many veterans of the Armed Forces of Ukraine and civilians are in need of psychological assistance. This is because they have experienced combat, occupation, loss of home, violence and destruction. Therefore, the development of effective methods for overcoming psychological trauma is extremely important.

Research has shown that film-therapy, i.e. the use of films for therapeutic purposes, can help reduce anxiety and improve emotional well-being. Audio description, which makes films accessible to people with visual impairments, is

particularly important. In Ukraine, audio description appeared in 2013, when a typhlo commentary was created in Lviv for the cartoon ‘Sunny Bread-Loaf’. Since then, the number of films with audio description has been growing, which indicates the development of this area [132].

The war in Ukraine, which has been ongoing since 2014, and especially its escalation since 2022, has caused widespread psychological trauma among the population. Physical and emotional violence, constant stress, loss of homes and loved ones are just some of the horrors faced by Ukrainians. The war not only destroys the environment and the economy, but also inflicts deep cognitive, emotional and psychological wounds. Post-traumatic stress disorder (PTSD) has become one of the most serious problems facing both military personnel and civilians.

In the search for effective methods of rehabilitation for people with PTSD, film therapy has emerged as a promising approach. This type of art therapy uses films and visual art as tools for emotional healing. Film therapy creates a safe space where patients can freely express their feelings, experiences and fears.

By watching films, patients can identify with characters who are going through similar traumatic events. This immersion in the film's story helps reduce anxiety and depression and promotes the restoration of internal resources to overcome traumatic experiences. Cinema-therapy allows patients not only to work through their fears, but also to find ways to recover emotionally and return to a full life [133, 134].

Cinema-therapy has become popular not only among specialists in the field of psychology and psychotherapy, but also among patients themselves, as it is accessible and effective for restoring cognitive, emotional and mental functions. This form of art therapy combines effective methods such as catharsis, identification with characters and reflection, which promotes a deeper understanding and processing of cognitive-emotional trauma and fears [135].

Mental health disorders, in particular post-traumatic stress disorder (PTSD), are serious conditions that arise as a result of a deeply traumatic experience and have a significant impact on a person's emotional and physical state. This disorder develops

under the influence of intense psychological stress and is accompanied by a wide range of symptoms that significantly impair normal functioning in everyday life [136].

One of the main manifestations of PTSD is intrusive memories of traumatic events, which can manifest as flashbacks — intense re-experiences of the event, during which the person feels as if they are reliving the trauma in real time. These memories can be triggered by certain triggers, such as sounds, smells or images that remind you of the events, and are accompanied by intense emotional and physiological distress [137].

Nightmares are a common symptom of post-traumatic stress disorder (PTSD). They cause intense feelings of fear, panic attacks, insomnia, headaches, rapid heartbeat, excessive sweating, and muscle tension. Sleep disturbances caused by nightmares are exhausting, lead to chronic fatigue and increase the risk of developing depression. People suffering from PTSD are often in a state of constant anxiety and tension, which manifests itself in increased sensitivity to external stimuli such as loud noises or sudden movements. These stimuli can trigger unexpected panic or defensive reactions.

One of the characteristic aspects of PTSD is nightmares that cause intense fear and panic, leading to insomnia and sleep disturbances, accompanied by physical symptoms such as headaches, rapid heartbeat, sweating, and muscle tension. Sleep disturbances worsen the overall condition of the body, causing chronic fatigue and depression. Another manifestation is increased anxiety and tension, manifested in hypersensitivity to external stimuli: loud noises or sudden movements can trigger panic or defensive reactions. A constant state of tension exhausts the nervous system [138].

Another characteristic feature of PTSD is emotional detachment and social isolation. People with this disorder may lose interest in activities that previously brought them joy and avoid communication with family, friends or colleagues. They consciously try to avoid situations that may remind them of the traumatic experience. For example, war veterans often avoid information about combat operations, as this can trigger painful memories. Military personnel also often experience problems with concentration, difficulty performing cognitive tasks and distractibility, which reduces their effectiveness in everyday life [139].

In the context of full-scale war, the issue of restoring the psychological health of both military personnel and civilians who have experienced traumatic events becomes particularly relevant. Effective medical and psychological assistance plays a key role in the process of returning to normal life, contributing to the improvement of emotional state and reintegration into society. Comprehensive methods combining traditional approaches, such as psychotherapy and medication, with modern psychotherapeutic techniques are used to treat post-traumatic stress disorder (PTSD). Among them, cinema therapy stands out as an important and effective tool [140].

Cinema-therapy is a psychotherapeutic technique that belongs to art therapy and is used in psychological assistance to improve the psycho-emotional state of individuals suffering from mental disorders or facing psychological difficulties that negatively affect their lives. This approach promotes emotional stability, self-reflection and the development of adaptive mechanisms through the viewing, analysis and discussion of cinematographic works [141].

Cinema-therapy, also known as directed film therapy, is an effective method of psychotherapeutic intervention that uses cinematographic works to achieve therapeutic results, particularly among individuals who have experienced physical, psychological or combined trauma. The basic principle of this method is to create psychological distance between the patient and their own experiences. This is achieved through identification with film characters, which allows the patient to indirectly process their traumatic experiences, minimising the risk of their psychological reprocessing and further traumatisation. In modern medical and psychological rehabilitation programmes for people who have suffered as a result of combat, physical trauma or loss of sensory functions, including vision, film therapy plays an important role in the recovery process. It not only helps to reduce the level of social isolation, but also actively stimulates social integration and adaptation to new life circumstances. Military trauma, including physical injuries or sensory impairments, significantly affects the psychological state of victims, reducing their ability to integrate and adapt to society. That is why, in the rehabilitation process, special attention should be paid to a comprehensive approach in which film therapy is an important but additional tool. It

plays an important supporting role in promoting the psycho-emotional recovery of patients by enabling them to relive traumatic experiences through safe identification with film characters, thereby reducing stress levels and helping to restore emotional stability. Recovery from trauma, especially those affecting physical and mental health, requires a multifaceted approach, and film therapy is an indispensable part of this process [142].

Cinema-therapy is an innovative method of psychotherapeutic intervention that helps improve emotional state and provides comprehensive psychological recovery and social reintegration for people who have experienced traumatic events. The process of medical and social adaptation of victims is complex and multifaceted, including both physical rehabilitation and psycho-emotional stabilisation, with a gradual return to an active social life [143].

In war, when people are exposed to the horrors of combat, psychological trauma, such as post-traumatic stress disorder (PTSD), is often combined with severe physical injuries, such as amputations, head injuries, concussions or loss of vision. This significantly complicates the adaptation process, exacerbating maladjustment and social isolation.

People with PTSD often exhibit the following symptoms:

- Impaired social communication: they avoid interacting with other people, experiencing difficulties in establishing and maintaining relationships.
- Emotional detachment: they may feel emotionally empty, lose interest in life, and have difficulty expressing emotions.
- Depressive disorders: they often feel sad, hopeless, and lose motivation.
- Increased anxiety: they are in a state of constant tension, fear and expectation of danger.
- Suicidal intentions: in severe cases, they may have thoughts of suicide.
- Tendency to be lonely: they avoid social contact, feeling misunderstood and isolated.

These symptoms require an individualised and comprehensive approach to rehabilitation that takes into account both the psychological and physical needs of the patient [144].

In this context, film-therapy acts as a powerful psychotherapeutic tool that helps to work with traumatic memories through identification with film characters and deep reflection on the plots. The main principle of this approach is catharsis, which allows patients to experience emotions while watching films, followed by cognitive and emotional reflection. This method allows you to create psychological distance between your own traumas and the content of the film, which helps reduce anxiety and develop healthy strategies for coping with stressful situations [145].

Cinema-therapy is an important tool when working with people with disabilities, particularly those with visual impairments, as participation in cultural and social life is a crucial factor in maintaining their psychological and emotional well-being. For people with partial or complete vision loss, audio description is used — a technology that makes visual content accessible through verbal descriptions of events on the screen, characters' actions, scene changes, facial expressions, gestures, etc. Audio description creates an inclusive environment that allows people with visual impairments to participate in cultural activities and promotes their social integration.

Cinema-therapy involves an individual approach to selecting films, focusing on the patient's emotional state, the thematic features of the films and the therapeutic effect. An important stage is the discussion of emotional reactions after viewing, which allows the patient to rethink their experiences, reduce emotional tension and gradually integrate the traumatic experience into the broader context of their life [145].

Cinema-therapy is an effective method of psychotherapeutic influence that uses cinematographic works to improve the psycho-emotional state of patients. This method combines watching films with in-depth analysis and reflection, allowing patients to better understand their emotional experiences and find ways to process them. The therapeutic effect of cinema therapy is based on several key mechanisms that promote self-understanding, emotional recovery and the development of adaptive strategies, which are important for overcoming traumatic experiences.

The main mechanisms of influence of cinema-therapy:

1. Identification with characters

One of the most important aspects of film therapy is the identification of the patient with film characters. This process allows the patient to identify with characters who are going through emotional experiences similar to their own. This allows the person to experience emotions that are difficult to express in words through the lens of someone else's experiences. Identifying with characters can be especially helpful for people suffering from post-traumatic stress disorder (PTSD). Watching films that depict combat, loss of loved ones or trauma allows patients to safely experience emotions that they are afraid to express in real life. It also allows them to understand their inner experiences and dare to work through them in the therapeutic process.

2. Catharsis — emotional cleansing

Catharsis is another important mechanism of film therapy, which involves emotional release through watching films that evoke strong feelings. While watching a film, patients may experience emotions ranging from sadness to anger or joy, which helps release suppressed emotions. People who have difficulty verbalising their feelings or face obstacles in expressing their emotions in everyday life can find relief through the catharsis that occurs while watching such scenes. This is especially important for people who have experienced traumatic events, such as military conflicts or violence, as catharsis helps to relieve emotional tension and stress that build up due to the inability to openly express feelings. This process of releasing emotions can be an important step on the path to mental recovery and acceptance of one's own experiences.

3. Reflection — contemplation and analysis

Reflection is an important stage of film therapy, allowing patients to comprehend what they have seen and apply this experience to their own lives. After watching a film, patients have the opportunity to discuss it with their therapist, analysing the behaviour of the characters, their decisions, and themes that may be related to their own emotional experiences. This allows the patient to see parallels between their own experience and what is happening in the film. For example, people who have experienced trauma may

begin to reflect on their reactions to events in the film that mirror their own experiences and thus find ways to overcome their emotions, either on their own or with the help of a therapist. Reflection helps patients rethink their emotional reactions, see new ways of adapting and accepting their experiences, allowing them to move towards psychological and emotional recovery.

Cinema-therapy helps patients restore social connections and improve self-esteem. During group film viewing sessions, patients have the opportunity to discuss their experiences and thoughts, which helps reduce feelings of loneliness and isolation from loved ones and society. This is important for those who feel that their feelings are not understood by others. Film therapy creates an opportunity for shared reflection and support, which strengthens social bonds and promotes better understanding between participants [145].

Cinema-therapy is an effective method of medical and psychological rehabilitation that allows patients to process their emotional experiences in a safe and controlled environment under the supervision of a psychotherapist. Through the use of cinematographic art as a therapeutic tool, patients are able to experience and analyse their own emotions, which promotes their awareness and further integration into their inner mental space. The main mechanisms of film therapy are the processes of identification, catharsis and reflection, which help patients express their feelings, release emotional tension and rethink difficult life situations [146].

Cinema-therapy occupies a special place among art therapy methods, as it combines the aesthetic influence of cinema with deep psychotherapeutic processes. It is used to improve the psycho-emotional state of individuals suffering from mental disorders, who have experienced traumatic events or faced social difficulties. Watching films allows you to create a certain emotional distance between the individual and their experiences, which greatly facilitates the process of reflection, adaptation to new realities and the development of new behaviour patterns. Thanks to the possibility of identifying with film characters, patients gain space for expressing emotions, developing empathy and self-awareness.

Audio description plays a special role in inclusive film-therapy, making cinematic content accessible to people with visual impairments. This ensures equal opportunities in cultural and social life, promoting the harmonious inclusion of such individuals into society. Cinema-therapy can be conducted in individual sessions or in groups, serving not only as a psychotherapeutic method but also as a means of social adaptation, which is particularly relevant for people with special needs [147].

The effectiveness of cinema-therapy in working with military personnel who have experienced combat and are dealing with the effects of post-traumatic stress disorder (PTSD) should be noted separately. Cinema-therapy sessions help veterans rethink their experiences by creating a safe environment for them to confront their traumatic memories. Watching films on military themes allows them to distance themselves from their personal pain by experiencing it through the stories of the characters. This facilitates the gradual processing of trauma, reduces emotional tension and improves psychological well-being.

The catharsis mechanism, which plays a key role in cinema-therapy, helps release suppressed emotions, contributing to emotional relief and clearing the mind. Thanks to the opportunity to revisit their own experiences through cinema, veterans can not only become aware of their emotions, but also find constructive ways to live with and overcome them. In addition, film-therapy is a powerful motivational tool: the stories of characters who overcome difficulties give hope and faith in one's own strength.

An important aspect of therapy for military personnel is its role in the process of social reintegration. After returning from war, many veterans experience alienation and difficulties in communicating with the civilian population. Group film therapy sessions create a space for discussing shared experiences, which helps build social connections, share experiences and gradually restore emotional communication. Such meetings contribute to the formation of a sense of support and mutual understanding, which reduces the level of social isolation and improves the psychological state of participants.

Comparing themselves to film characters who face similar difficulties helps veterans see their own problems from a different perspective. This facilitates emotional distancing from traumatic memories and allows them to assess their experiences more objectively. Cinema-therapy also promotes the development of reflective skills, helping patients to gain a deeper understanding of their internal processes and find effective ways to overcome psychological difficulties.

Scientific research confirms that the systematic use of cinema-therapy leads to a reduction in anxiety, depression and other manifestations of PTSD. Watching films activates emotional responses, allowing patients to release suppressed feelings, which is an important factor in their psycho-emotional stabilisation. Military personnel who have participated in film therapy sessions report a significant reduction in emotional tension, a decrease in aggression and an increase in adaptability.

In addition, film-therapy increases veterans' openness to other psychotherapeutic methods, helps them better cope with the difficulties of everyday life, and strengthens their communication skills. This has a positive effect on their relationships with their families, loved ones, and society as a whole. As a result, film-therapy is not only a powerful tool for alleviating psychological distress, but also a means of promoting deeper integration of veterans into social life, helping them find harmony in peaceful existence [148].

Cinema-therapy is an effective method of psychotherapeutic assistance for civilians who have suffered the effects of war, been caught up in conflict or survived captivity. Events such as the loss of loved ones, forced displacement, destruction of homes, witnessing violence and occupation can have a profound impact on the cognitive, emotional and behavioural levels of the individual. Recovery from such experiences is a complex process and requires the use of special therapeutic methods. Cinema-therapy provides a safe environment for processing trauma, helping patients to experience their emotions through watching films accompanied by a psychotherapist in a specially equipped art room. This allows a certain distance to be created between the person and their traumatic experience, promoting emotional release and psychological recovery [149].

Within the framework of art therapy, film-therapy provides an opportunity to work with painful memories in a controlled space, helping people to become aware of and reflect on their experiences. This is especially important for those who have gone through war or other catastrophic events, as watching films allows them to delve deeper into their experiences while minimising the risk of re-traumatisation. This approach provides the necessary level of protection and support to help people work through their emotions without becoming overwhelmed.

One of the most important mechanisms of film-therapy is the identification of the viewer with the characters in the film, whose experiences are similar to their own life experiences. This makes it possible to better process traumatic memories, integrate them into consciousness and regain control over one's emotional state. Films help to make sense of feelings that are difficult to express in words, which is especially important for children and adolescents who do not yet have sufficient experience in verbalising their emotions. Thanks to its visual and narrative context, film therapy becomes a means of recognising, understanding and expressing emotions, which helps to process and accept them.

Cinema-therapy also plays an important role in restoring the ability to express emotions that may have been suppressed after traumatic experiences. It can be a source of inspiration, as watching stories about overcoming difficulties and triumph helps patients believe in their own ability to recover. For those who have experienced difficult life challenges, films that show the path to healing can be a powerful motivator to change their lives for the better, even after serious losses.

In addition to an individual approach, film-therapy is effective in a group setting, as interacting with others who have had similar experiences promotes socialisation, empathy and the creation of a supportive environment. This is especially important for those who feel isolated because of what they have been through. Collective discussion of the material viewed allows patients to share their own experiences, reducing feelings of loneliness and promoting emotional support.

Cinema-therapy is particularly beneficial for people with post-traumatic stress disorder. According to the Ukrainian Ministry of Health, PTSD can develop in 20-30%

of people who have experienced traumatic events, including military personnel, volunteers, internally displaced persons and civilians who have been under occupation. Symptoms of this condition include flashbacks, intrusive thoughts, increased anxiety, depression, destructive behavioural reactions and hyperarousal, which significantly impairs quality of life. Watching films in a therapeutic context helps to release accumulated emotional tension, as patients can see their own difficulties reflected in the experiences of the characters. This promotes a deeper understanding of their own condition and facilitates the process of reflection, which helps to find ways to overcome psychological difficulties [150, 151].

Providing qualified psychological assistance to victims of military conflicts is an extremely important task. One of the newest but already proven methods of rehabilitation in Ukraine is film therapy, which helps restore emotional balance and overcome the effects of psychological trauma. Ukrainian specialists – psychotherapists, psychologists and social workers – actively use this approach to support various categories of victims. The use of cinema therapy combines the art of cinema with therapeutic methods, allowing people to safely address their traumatic experiences, analyse them and gradually improve their psycho-emotional state.

Films depicting the realities of war, the struggle for freedom, human dignity and moral values, which take on exceptional importance during military conflict, are of particular significance. Such films not only promote emotional cleansing, but can also become a source of hope and inner strength for people who have endured severe trials. Stories of heroism, indomitable spirit and the pursuit of justice help viewers find inspiration and faith in the future.

Cinema-therapy is effectively used when working with veterans, volunteers and internally displaced persons. It promotes emotional relief, creates space for mutual support and exchange of experiences, which plays an important role in overcoming the consequences of traumatic events. Group sessions help participants share their experiences, emotions and thoughts in a safe environment where there is no fear of judgement or misunderstanding. This format of therapy provides the necessary level of social support, which is key to the psychological recovery process.

The discussion of the film is equally important, as it allows participants to express their accumulated emotions, analyse them and find ways to heal emotionally. The feeling of belonging to a community and the understanding that their experiences are shared by others helps people overcome feelings of loneliness. This form of group work allows them to realise that the process of returning to normal life is not only a personal struggle, but also part of a joint effort for the future [152].

Film-therapy plays a special role in working with children and adolescents who have been affected by war, occupation or captivity. Due to their age, they find it difficult to verbalise their feelings and may hide their pain, fear and anxiety for their loved ones. In such cases, film-therapy helps them identify their emotions, become aware of them and gradually process them. Films that are appropriate for the age of children and adolescents promote emotional disclosure and reflection on their experiences [153].

Animated films or feature films that show the difficulties, losses or changes caused by war can help young viewers better understand their feelings and find inner resources to overcome difficulties [154].

In the context of the war in Ukraine, film-therapy is becoming an important tool for the rehabilitation of victims and contributes to the restoration of the mental health of society as a whole. War leaves a deep mark on people's psyche, so it is necessary to implement modern methods of psychological assistance that meet their needs. In the realities of full-scale conflict, this method becomes an important component of psycho-emotional support for those who have experienced loss, stress and traumatic situations. Films that show the realities of war, the struggle for freedom and universal human values help people to live through their traumatic experiences in a safe environment. This helps to restore inner balance, strengthen faith in one's own strength and rebuild social ties through shared emotional experiences.

4. Conclusions

1. In many countries, such as the United States, Germany and the United Kingdom, rehabilitation for persons with disabilities is provided through the health care system, which coordinates activities involving specialists from various fields,

including social services and education. It operates at several levels – primary, secondary and tertiary – ensuring close cooperation and accountability between specialists, which allows services to be provided effectively in accordance with the needs of each patient, taking into account their functional abilities.

2. Training of specialists in the field of medical and psychological rehabilitation abroad is carried out in accordance with the international classification of functioning, activity limitations and health, based on international and regional standards. After training, certification in the main areas of rehabilitation work is mandatory.

3. Ukraine is actively implementing regulatory and legislative documents governing the support of persons with disabilities in accordance with international standards, in particular those of the UNDP. The new state standards duplicate the European standard (EN 301 549), which contributes to the harmonisation of Ukrainian legislation with international requirements for web accessibility.

4. The network of centres for persons with disabilities under the Ministry of Health, the Ministry of Social Policy and the Ministry of Veterans Affairs of Ukraine is expanding. They are equipped with special modern medical equipment.

5. Comprehensive rehabilitation assistance involves specialists from various fields who have undergone special training under UNDP programmes in cooperation with the National Assembly of Persons with Disabilities. These include occupational therapists who help patients master social and daily living skills, psychologists who work with persons with disabilities, and digital literacy trainers who teach the use of specialised software, voice assistants and artificial intelligence for navigation and information retrieval.

6. Cinema-therapy is a modern method of psychological support used in both group and individual settings to overcome the effects of traumatic events related to war. This approach works effectively for military personnel, civilians, volunteers, internally displaced persons, as well as children and adolescents who may feel isolated or have communication difficulties.

7. The method of cinema-therapy helps restore emotional balance and mental health by creating conditions for the safe expression of feelings in specialised art therapy spaces or during psychological relief sessions. By watching and discussing films, participants can identify with the characters, which facilitates the process of psychotherapeutic recovery and social adaptation.

8. In addition, cinema-therapy can play an important role in raising public awareness of mental health issues, especially in times of war. It helps overcome stigma and promotes open discussion of traumatic experiences. Creating a supportive social environment is key to restoring mental health on a national level. Further research and the development of effective methodological approaches are needed to fully implement film-therapy in medical and psychological care.

SECTION 3. NEUROLOGY

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3.1 Особливості змін в неврологічному статусі у бійців ЗСУ при ушкодженні нижніх кінцівок та хребта при остеохондрозі поперекового відділу хребта та деякі зміни теплометричних та вегетативно-спектрометричних показників при цій патології

3.1.1. Вступ

За даними експертів ВООЗ, нині в розвинених країнах больові синдроми вертеброгенної природи дуже поширені, що досягають розмірів епідемії та набувають статусу найважливішої медико-соціальної проблеми. Дорсопатії є однією з провідних причин інвалідності, що значно позначаються на якості життя пацієнта та його працездатності, а також залишаються основними причинами звернення за медичною допомогою у будь-якому віці [155].

Біль у спині є однією з найбільш частих скарг, з якою пацієнти звертаються до лікаря. За даними деяких зарубіжних авторів кількість амбулаторних візитів зі скаргою на біль у нижній частині спини (БНЧС) у загальній картині звернень посідає друге місце, поступаючись лише респіраторним захворюванням [156]. Було показано, що в розвинутих країнах від 60 до 90 % населення відчували БНЧС мінімум раз у житті, а щорічний приріст цього показника становить 5 % [157]. Діагностика та лікування БНЧС часто є складним завданням, що пов’язано з етіологічною неоднорідністю захворювання.

Більшість випадків БНЧС мають доброякісний характер і м’язово-скелетне походження. Такий БНЧС називається неспецифічним і на відміну від специфічного обумовлений підтвердженою первинною патологією (інфекція, пухлина, деформація, остеопоротичний або травматичний перелом хребця, запальний процес, радикулярний синдром, стеноз хребетного каналу та ін.). Незважаючи на те, що немає точних даних про співвідношення специфічного і неспецифічного БНЧС, загально прийнято вважати, що 95 % випадків припадає на неспецифічний БНЧС [158, 159]. Більш виражені болі в спині спостерігаються у осіб віком 50–64 років . Зпрогнозовано, що у найближчі 10-15 років біль у

нижньому відділі спини при дегенеративно-дистрофічній патології хребта стане головною причиною інвалідизації дорослого населення України.

Особливо актуальною стала ця проблема сьогодні, коли сотні тисяч бійців України зі зброєю в руках захищають нашу батьківщину від нашестя ординців. Розгрузка, яку вони вимушені носити, дає додаткове навантаження на хребет бійця вагою 40 – 60 кг. Тривалі статико-динамічні навантаження теж відіграють свою роль у виникненні болю в поперекково-крижовому відділі хребта.

3.1.2. Огляд літератури

Вертеброгенні поперекково-крижові больові синдроми, що виникають внаслідок дегенеративно-дистрофічно-деструктивних змін хребта, належать до найпоширеніших неврологічних захворювань [160, 161]. БНЧС є також однією з найбільш частих причин інвалідизації пацієнтів працездатного віку. В розвинутих країнах від 60 до 90 % населення страждали на біль у спині хоча б раз у житті, а щорічний приріст цього показника становить 5 % [160]. У віці від 20 до 64 років від болю в спині страждають 24 % чоловіків і 32 % жінок [156]. У більшості випадків (80 %) гострі епізоди болю в спині вирішуються протягом 6 тижнів, однак у 20 % пацієнтів хвороба набуває хронічного перебігу [161]. Саме ця група хворих характеризується несприятливим прогнозом для одужання, і на неї припадає близько 89 % всіх витрат охорони здоров'я на лікування.

І хоч на сьогоднішній день є незаперечним той факт, що остеохондроз хребта є поліфакторальним, багатоморфмним захворюванням, чимало аспектів патогенезу цієї патології не вивчено і досі.

Епідеміологічні дослідження, проведені в різних країнах, свідчать, що поширеність дегенеративно-дистрофічно-деструктивних змін (ДДДЗ) хребта серед дорослого населення в різних популяційних групах становить від 40 % до 100 %, причому впродовж життя 80 % людей мають вірогідність відчути біль у нижній частині спини, що робить цю проблему другою причиною звернення за медичною допомогою у світі після гострих респіраторних захворювань [162 , 163]. У структурі захворюваності України вертеброгенна патологія, що

супроводжується тимчасовою втратою працездатності, займає друге місце та становить 20 – 30 % від загальної кількості хворих [164].

Пацієнти з гострим, підгострим і хронічним болем у спині відрізняються прогнозом одужання та відновлення працездатності, а також за підходами до діагностики та лікування [165]. Гострим болем вважається біль тривалістю менш як 6 тижнів, підгострим – від 6 до 12 тижнів, а хронічним – понад 12 тижнів [166]. Як демонструють останні дослідження, серед пацієнтів із хронічним болем у нижній частині спини (БНЧС) повноцінне одужання (зникнення больового синдрому та відновлення функціональної активності) спостерігається значно рідше ніж серед пацієнтів із гострим БНЧС [156,167].

Дегенеративно-дистрофічні та деструктивні зміни хребетного стовпа можуть мати різні прояви за даними нейровізуалізації. Більше того, ДДДЗ хребта часто не відповідають характеру, інтенсивності та тривалості больового синдрому [168]. За даними клініко-нейровізуалізаційних порівнянь, інтенсивність болю не корелює зі ступенем випинання міжхребцевого диска чи механічною компресією нервового корінця [169, 170]. Це може створювати труднощі в практичній діяльності, оскільки немає чітко визначених і патологічно обгрунтованих факторів, які дозволяють сформувати прогноз та, з їх урахуванням, розробити ефективну лікувальну програму для кожного пацієнта.

Як свідчать дослідження, ноцицептивний і невропатичний механізми відіграють провідну роль у формуванні вертеброгенних больових синдромів із або без іррадіації в нижню кінцівку [171]. Стимуляція й активація ноцицепторів при ВПКБС відбувається шляхом механічного розтягнення, компресії нерву, а також у відповідь на хімічне подразнення простаглантинами й іншими запальними медіаторами [172]. Передача болю в спинномозковому шляху сприяє синтезу субстанції Р, що є специфічним медіатором болю та може слугувати маркером його інтенсивності [173, 174].

Формування больового синдрому залежить не лише від інтенсивності ноцицептивного стимулу, але і від комплексу психологічних факторів, оскільки біль пов’язаний із тривогою, страхом, психологічним стресом, зниженням

адаптивних можливостей індивідуума [175,176]. Оцінка даних факторів, а також порівняння їх у пацієнтів із гострим і хронічним болем є актуальним, оскільки сприяє покращенню лікування ВПКБС.

Більшість дослідників вказують, що лікування гострого та хронічного БНЧС відрізняється [159]. Основним документом, що регламентує надання стаціонарної медичної допомоги при дорсалгіях є протокол затверджений наказом МОЗ України № 487 від 17.08. 2007 р., проте в ньому немає чітких рекомендацій, щодо диференційованого лікування гострого та хронічного вертеброгенного больового синдрому [177. 178]. В клінічній практиці стаціонарне лікування пацієнтів з ВПКБС практично не відрізняється, і тривалість больового синдрому здебільшого не є вирішальним фактором вибору схеми лікування.

Аналіз доступної на даний час інформації продемонстрував, що відмінності гострого та хронічного болю, роль окремих маркерів хронізації в патогенезі та клінічних проявах болю є недостатньо вивченими.

З огляду на зазначене вище, потребує доопрацювання пошук серед клініко-параклінічних показників, вірогідних маркерів ефективності діагностики та лікування больового синдрому у пацієнтів при гострих і хронічних вертеброгенних захворюваннях попереково-крижового відділу хребта, що і зумовило напрямки нашого дослідження.

В Україні вертеброгенна патологія та захворювання периферичної нервової системи займають друге місце після цереброваскулярної патології (показники захворюваності становлять 520 випадків на 100 тис. населення). У світі ця патологія превалює серед захворювань, які зумовлюють тимчасову непрацездатність, а в Європі - є другою за частотою звертань до невролога. Оцінка поширеності вертеброгенних больових синдромів в Європі варіює, наприклад у літніх пацієнтів від 32,9 % до 60 % [160]. Відомо також, що у третини пацієнтів гострий біль переходить в хронічний. Досліджено, що кількість хворих з неврологічними проявами поперекового остеохондрозу хребта має тенденцію до зростання [159]. Характер реабілітаційних

міроприємств при вертеброневрологічних проявах дегенеративно-дистрофічних ураження хребта визначається в першу чергу клінічними проявами, стадією захворювання та наявністю супутньої патології як із боку хребта, так і організму в цілому. Недиференційований підхід неприпустимий, оскільки може привести до зриву компенсаторних процесів [159].

На сьогоднішній день встановлено, що найчастіше причиною болю в поясниці є грижа диска – фокальне випинання між хребцевого диску внаслідок дегенеративно-дистрофічних процесів (остеохондрозу). Основні клінічні ознаки грижі між хребцевого диску можуть проявлятися окремо або в поєднанні з наступними синдромами: локальний біль (люмбалгія), відображений біль (люмбоішіалгія), корінцевий синдром (радикулопатія), синдром ураження спинного мозку (мієлопатія).

Останнім часом в клінічній практиці лікарів нейроортопедичного спрямування почастішали випадки звернення пацієнтів з приводу стійкого больового синдрому в попереково-крижовому відділі хребта, зумовленого стенозом хребетного каналу, лінійною нестабільністю в цьому відтинку хребта. [162].

Спінальний стеноз – небезпечне захворювання, яке характеризується звуженням (зменшенням) хребетного каналу. Хвороба носить поступний характер і без належного лікування може призвести до інвалідності. Лікуванням спінального стенозу займається хірург.

Причини захворювання:

• вроджена патологія хребта (синдром Дауна, хвороба Кніста, спондилоепіфізарна дисплазія);

• дегенеративно-дистрофічні зміни (остеохондроз, спондильоз, спондилолістез);

• травми хребта – основна причина стенозу поперекового відділу хребтового каналу;

• гіперплазія капсули дуговідросткового суглоба, незрощення дуг хребців;

- метаболічні захворювання (флюороз, акромегалія, псевдоподагра);
- гематоми, пухлини нервової тканини, інфекції;
- специфічні медичні маніпуляції.

Фактори ризику – надмірна вага і гіподинамія.

В залежності від локалізації стеноз може бути центральним і локальним. Центральний – зменшення розміру між дужкою підстави остистого відростку і задньою поверхнею хребця від 12 до 10 мм. Латеральний – звуження корінцевого каналу менше 4 мм.

Клінічні прояви залежать від форми захворювання і причини, що його викликала. До загальних симптомів стенозу хребетного каналу належать:

- швидка стомлюваність;
- порушення чутливості;
- біль;
- порушення кровопостачання спинного мозку і нервових корінців;
- атрофія м'язів.

Однак ці симптоми можуть свідчити не тільки про стеноз, але й бути проявом іншої патології. Тому вкрай важливо звернутися за кваліфікованою допомогою і пройти необхідну діагностику, за результатами якої лікар поставить діагноз і призначить курс лікування. Під час консультації лікар розповість про те, що таке стеноз хребетного каналу на рівні L4- L5 або L5 - S1 і чим він небезпечний.

В залежності від вираженості клінічних проявів лікарі виділяють чотири ступені тяжкості захворювання:

- 1 ступінь – поява різкого болю в литкових м'язах при ходьбі (переміжна кульгавість);
- 2 ступінь – невелике порушення ходьби з незначним больовим синдромом;
- 3 ступінь – неможливість пересуватися без сторонньої допомоги;
- 4 ступінь – важкі прояви кульгавості з вираженим больовим синдромом.

Це патологія, що швидко прогресує, тож рекомендують починати лікування якомога раніше. Тільки такий підхід допоможе зупинити захворювання і вберегтися від інвалідності.

За статистикою, звуження спинномозкового каналу найбільш часто зустрічається у людей старшого та похилого віку, структурні елементи хребта яких зазнали вікових змін. Але події останніх двох років, які відбуваються в нашій країні, внесли корективи як в розуміння патогенезу цієї патології, так і внесли корективи в її тактику лікування, особливо у бійців ЗСУ молодого та середнього віку. Особливо небезпечним в цій ситуації є поєднання стенозу з лінійною нестабільністю в цьому відділі хребта.

При довготривалому больовому синдромі, наявності симптомів «випадіння» в клінічній практиці досить часто застосовують хірургічні методи лікування гриж між хребцевих дисків у поперековому відділі хребта. Існує ряд сучасних методів лікування такої патології.

Мікродискектомія це мініінвазивна операція, під час якої через невеликий розріз на спині видаляється грижа міжхребцевого диска (herniated disc).

Слово «мікро» застосовується у зв’язку з виконанням операції під операційним мікроскопом спеціальними мікрохірургічними інструментами. Ця технологія пройшла довгий шлях свого розвитку, починаючи з техніки, запропонованої американськими ортопедом і нейрохірургом W. J. Mixter і J. S. Barr в 1934. У ті часи видалення гриж проводилося шляхом широкої ламінектомії, можливо навіть трансдурально. З впровадженням мікрохірургічної технології ця операція стала по-справжньому мінімально інвазивною. Стандартно під час операції застосовується резекція частини дуги (найчастіше нижнього краю верхньої дуги), іноді проводиться резекція медіальної частини міжхребцевого суглоба у разі парамедіанної або медіолатеральної гриж дисків. Використання мікрохірургічного обладнання зі збільшенням в 6–8–10 разів дозволяє чітко візуалізувати нервовий корінець, грижу, а також за необхідності провести коагуляцію епідуральних вен [179].

Одним із способів профілактики розвитку післяопераційного фіброзу є інтраопераційне використання спеціальних гелів. Роботи вітчизняних і закордонних авторів указують на перспективність розвитку цього напрямку, але відзначають, що проблема далека від остаточного рішення [180].

Методики хірургічного лікування гриж між хребцевих дисків поперекового відділу хребта прогресивно змінюють одна одну. І хоча «золотим стандартом» хірургічного лікування гриж між хребцевих дисків є відкрита мікродискектомія, останнім часом з'явилися численні методики, автори яких прагнуть мінімізувати травматичність операційного доступу, не знижуючи радикальності операції [181].

З появою хірургічних ендоскопів постійно висловлювалася думка, що збільшення, одержуване з використанням мікроскопа, можна отримати з використанням мікроендоскопічної техніки. Перевагою мікроендоскопічної техніки була ще більша мінімізація доступу. Однак ендоскопічна техніка вимагає специфічного інструментарію, специфічних навичок роботи і збільшує тривалість оперативного втручання [182].

Техніку мікроендоскопічної дискектомії описали K. T. Foley і M. M. Smith у 1997 р. Техніка поєднує принципи стандартної мікродискектомії з використанням ендоскопічної візуалізації. Показання до мікроендоскопічної дискектомії такі ж, як і до мікродискектомії. Сучасна мікроендоскопічна дискектомія – високоефективний метод лікування гриж міжхребцевих дисків поперекового відділу хребта. Вона показана за наявності парамедіанних, медіолатеральних гриж міжхребцевих дисків.

Методика позиціонується як менш травматична для м'яких тканин, що дозволяє досягти більш швидкої трудової реабілітації хворих. Згідно з повідомленнями різних авторів, хворі після мікроендоскопічної дискектомії здатні повернутися до роботи через 2–4 тижні після операції [183].

Ускладнення, що зустрічаються при мікроендоскопічній дискектомії, аналогічні таким при мікродискектомії. Нагноєння операційної рани при першій методиці зустрічаються з частотою до 1 %, при другій – до 5 %; дисцити – 1 і 1

% відповідно; пошкодження дурального мішка – 10 і 5 % відповідно; рецидиви гриж – 5 і 7 % відповідно [183].

Одним з недоліків мікроендоскопічної дискектомії є необхідність певного часу на оволодіння хірургами ендоскопічною методикою. Однак з появою сучасних ендоскопічних систем для видалення гриж поперекового відділу цей недолік частково нівелювався. Традиційно показаннями до методики вважалися парамедіанні, медіолатеральні грижі міжхребцевих дисків, стеноз латерального рецесуса. Проте останнім часом цю методику застосовують для декомпресії латерального рецесуса і встановлення міжтілових кейджів у випадках спондилолістезу невеликих ступенів. Ця методика також застосовується з великою часткою ефективності при рецидивних грижах міжхребцевих дисків.

Метою наших досліджень було вивчення характеру неврологічних змін у статусі пацієнтів при остеохондрозі попереково-крижового відділу хребта при проведенні хірургічного втручання у разі видалення гриж між хребцевих дисків при стенозі спинно-мозкового каналу на цьому рівні та визначення клінічного маркеру хронізації больового синдрому у бійців ЗСУ на етапі передопераційної підготовки.

Завданнями дослідження були:

1. Вивчити характер змін в неврологічному статусі у бійців ЗСУ з остеохондрозом поперекового відділу хребта за наявності стенозу спинно-мозкового каналу на цьому рівнів в передопераційному періоді, у котрих діагностували гострий больовий синдром.

2. Вивчити зміни в неврологічному статусі тематичних пацієнтів – бійців ЗСУ, в передопераційному періоді, яким було проведене біпортальне ендоскопічне видалення гриж МХД в поперековому відділі хребта, у котрих спостерігався хронічний больовий синдром.

3. На основі отриманих результатів покращити наявні підходи до лікування ВПКБС у хворих з хронічним перебігом з метою профілактики післяопераційних психо-емоційних розладів.

3.1.3. Матеріали та методи дослідження

Обстежили 62 пацієнтів – військовослужбовців ЗСУ, у котрих діагностований стеноз спинно-мозкового каналу та лінійна нестабільністьна попереково-крижовому рівні і у котрих розвинувся больовий синдром під час несення військової служби.

45 пацієнтів були молодого віку і 17 – середнього віку. Всі вони були прооперовані методом біпортальної ендоскопічної мікродискектомії. У переважної більшості із них переважав центральний стеноз спинно-мозкового каналу при помірних килах та протрузіях міжхребцевих дисків. Групу порівняння склали 15 бійців ЗСУ, котрим було проведено консервативне рефлексотерапевтичне лікування.

У досліджуваних хворих при госпіталізації та в динаміці проведеного лікування вивчалися анамнестичні, суб'єктивні і об'єктивні дані. При зібранні анамнезу та об'єктивному обстеженні хворого враховувалася наступна інформація: стать і вік пацієнта; тривалість хвороби та вік від початку захворювання; тривалість і характер останнього загострення; провокуючі фактори, що посилювали або зменшували біль у спині та нозі; клінічна характеристика першого загострення; конституційний тип хворого; вид вертебральної деформації; характер оперативного лікування, його обсяг. Всім хворим проводилося детальне клініко-неврологічне обстеження.

З метою об'єктивізації даних у хворих визначали наступні показники:

- вираженість больового синдрому та його якісні показники;
- напруження паравертебральних м'язів;
- коефіцієнт симптому Ласега;
- порушення чутливості та характер парестезій.

Симптом Ласега оцінювався за п'ятибальною шкалою [159, 177]. При I ст. піднімання ноги можливе під кутом 90º, але при цьому виникає легкий біль по задній поверхні нижньої кінцівки. II ст. відповідає помірному больовому синдрому при піднятті ноги під кутом 75-89º. III ст. – помірний біль при піднятті ноги під кутом 45-74º. Для IV характерний чи сильний біль при піднятті ноги під

кутом до 45º. При V ст. виникає різкий біль в положенні з витягнутою ногою, вимушене положення – хворий лежить із зігнутою в коліні ногою.

З метою оцінки рухливості поперекового відділу хребта проводили пробу Шобера та пальце-підлогову пробу (ППП).

Суть проби Шобера полягала в тому, що у вертикальному положені пацієнта маркером робили позначку на рівні остистого відростку хребця L_V відміряли вгору 10см і робили другу позначку. Після максимально можливого нахилу вперед повторно вимірювали цю відстань та оцінювали її збільшення. В нормі збільшення повинно складати 4-5 см.

ППП проводилася при прямих колінах. Пацієнта просили дотягнутися пальцями рук до підлоги і вимірювали цю відстань від кінця ІІІ пальця витягнутих рук до підлоги при максимальному нахилі вперед. В нормі вона повинна становити від 0 до 10 см [168,184].

Одним із доведених факторів хронізації болю є виникнення та тривала наявність нейропатичного компонента болю, що має свої специфічні характеристики (дескриптори, розлади чутливості в зоні іннервації певного нерва). Опитувальник DN4 дозволяв оцінити наявність нейропатичного компонента болю, що є вкрай важливим критерієм включення центральних механізмів в розвиток больового синдрому. Він включає 7 пунктів, що стосуються сенсорних синдромів (печіння, відчуття холоду, удару струмом, пощипування, повзання мурашок, поколювання, оніміння, свербіння), а також 3 пункти, що стосуються неврологічного обстеження(гіпестезія до дотику кистю, гіпестезія до поколювання, аллодинія). Кожен пункт оцінювався від 1або 0 балів. Якщо сума балів складала чотири або більше з десяти, це свідчило про наявність нейропатичного компонента больового синдрому.

Силу м’язів, паравертабральних та м’язів нижніх кінцівок оцінювали по п’ятибальній системі, де сила неушкодженого м’язу складала п’ять балів.

Оцінка вираженості напруження паравертебральних м’язів проводилася за трьома ступенями [159, 184]. Для першого ступеня напруження паравертебральних м’язів характерним є м’який м’яз, у який легко занурюється

палець, відмічається лише набухання досліджуваного м'яза. При другому ступені м'яз помірної щільності, випинається, палець вдається в нього занурити лише при певному зусиллі. При III ст. м'яз кам'янистої щільності, його майже неможливо чи неможливо деформувати при пальпації.

З метою комплексної оцінки та порівняння больового синдрому між групами була проведена якісна (дескриптори) його та кількісна (інтенсивність та вираженість) оцінка. Кількісна оцінка передбачала оцінку суб'єктивного судження пацієнта про свої больові відчуття, для чого застосовувалася візуально-аналогова шкала (ВАШ) оцінки болю (відрізок довжиною 10 сантиметрів з позначками від 0 до 10, де 0 – відсутність болю, 10 – найсильніший біль, який коли-небуть довелось відчути пацієнту; суб'єктивна оцінка болю: 1-3 бали – слабкий біль, 4-5 – помірний біль, 6-7 – сильний біль, 8-10 – нестерпний біль.

Для якісної оцінки болю використовували опитувальник Мак Гілла, що містить сімдесят вісім дескрипторів, які описують характер болю. Дескриптори поділені по трьох класах із зростанням смислового значення. Перший клас (пункти 1-13) охоплює сенсорні характеристики болю, другий клас (пункти 14-18) – психоемоційні аспекти, а третій клас (пункт 20) представляє вербальну шкалу інтенсивності болю. Пацієнту пропонували вибрати одне слово з кожного класу, що найкраще відображало його больові відчуття. Результат опитування використовувався для визначення двох основних показників рангового індексу болю (суми порядкових номерів обраних слів або їхнє середнє значення) та кількість обраних слів. Отримані дані не мають абсолютних значень і підлягають статистичній інтерпретації. Ці дані було використано для оцінки не лише болю, але й психоемоційних відчуттів, пов'язаних з болем.

На наступному етапі ми провели дослідження тепло- та термометричних показників поверхні шкіри в ділянці попереку та пошкодженої ноги у цивільних осіб за наявності дегенеративно-дистрофічної патології попереково-крижового відділу хребта без ознак стенозу спинно-мозкового каналу на цьому рівні хребта на багатоканальному приладі конструкції Інституту термоелектрики НАН та

МОН України, який призначений для одночасного вимірювання температури і густини теплових потоків поверхні тіла людини контактним способом. Використовували спеціалізовану комп'ютерну програму « TermoMonitor» для обробки даних з електронного реєстратора, їх накопичення і відтворення у заданому вигляді на персональному комп'ютері, що дає можливість здійснювати моніторинг температурного та теплового стану людини у реальному часі.

В приміщенні, де відбувалось обстеження, постійно підтримувалась температура в межах 20—25 °С, відносна вологість 50—60 %. Були відсутні джерела інфрачервоного випромінювання. Напередодні обстеження пацієнтам відміняли всі фізіотерапевтичні та зігріваючі процедури; їм відміняли також протизапальні, жаропонижуючі, судиннорозширяючі або судинозвужуючі медикаменти. За 3—4 години до обстеження пацієнти повинні були перестати смалити цигарки. За 2—3 години до початку обстеження пацієнтам знімали різноманітні мазьові аплікації і поверхню шкіри обезжирювали сумішшю 40 % етилового спирту та ефіру (в пропорції 4:1). Безпосередньо перед обстеженням хворі проходили на протязі 15—20 хвилин температурну адаптацію. В цей час вони знаходились в руховому спокої, без статичного та динамічного напруження м'язів. Вимірювання теплометричних показників з поверхні шкіри пацієнта проводили в реальному часі протягом 3 хв. Звертали увагу на час термоадаптації (в секундах)– t(скільки часу проходила від моменту початку обстеження до виходу основних показників на теплове «плато»), показники температури та густини теплового потоку на висоті цього «плато», вигляд самих кривих. Датчики накладами симетрично з двох сторін паравертебрально на рівні остистих відростків L_4 – L_5– хребців .

Обстеження пацієнтів проводили в стані фізіологічного спокою з температурою в приміщенні 18-22º С між 9.00 та 12.00 год. дня. Окрім вимірювання теплометричних показників одночасно проводили визначення варіабельності серцевого ритму, оскільки обидва ці показники регулюються

вегетативною нервовою системою, а основні центри регуляції теплового обміну та судинного тонусу знаходяться поруч в стовбурі головного мозку.

Всім їм також вимірювали кардіоваскулярні вегетативні показники.

Статистичну обробку матеріалу проводили за допомогою пакету програм Statistika 6.0.

3.4. Результати дослідження та їх обговорення

Для аналізу відмінностей та порівняння клінічного перебігу після поступлення в стаціонар та початку лікування пацієнти включалися або в групу гострого болю (з тривалістю больового синдрому до 3-х місяців) або в групу хронічного болю (тривалістю більше 3-х місяців). У групі гострого болю ввійшло 15 пацієнтів (всі особи були чоловічої статі, середній вік – 39,8 ±1,2), а групу хронічного болю склали 47 осіб (теж чоловічої статі і середній вік у них склав 52,1 ± 1,7). Групу контролю складали теж 15 військових із гострим больовим синдромом (середній вік у них був 42,4 ± 0,9).

Середня тривалість хронічного болю у осіб з хронічним больовим синдромом складала 19,5 ± 1,2 місяці. В групі військовослужбовці з гострим болем в БНЧС сягала 1,6 ± 0,8 місяців. В групі контрою ці цифри досягали 1,1 ± 0,4 місяці.

Провівши оцінку клінічних симптомів, біль в нижній частині спини був зафіксований у 91,6 % групи гострого болю та у 100 % пацієнтів із групи хронічного болю. Іррадіація болю в ногу перед лікуванням була наявна у 1100 % пацієнтів групи гострого больового синдрому. У осіб з хронічним болем він фіксувався у 45,1% пацієнтів. У пацієнтів обох клінічних груп діагностувалося напруження м’язів спини. У осіб з гострим болем в передопераційному періоді було виражене напруження м’язів у 29,4 % пацієнтів, помірне – у 66,9 % осіб і легке – у 3,7 % військовослужбовців. У пацієнтів в групі з хронічним болем виражене напруження паравертебральних м’язів спостерігалося у 20,8% випадків, помірне – у 69,4 % , легке – у 9,8 % військових. Анталгічний сколіоз виявлявся у 60.2 % осіб з гострим болем і у 24,5 % – з хронічним болем. Різниця

була вірогідною (p <0,05). Симптом Ласега був наявний у 96,2 % військовослужбовців із гострим болем і у 44,7 % – з хронічним болем (p <0,05). Проте, за показником у градусах вираженість його не відрізнялася у групах і дорівнювала відповідно 40,4 ± 3,7° у групі з гострим болем і 44,9 ± 2,5 ° – в групі з хронічним болем (p>0,05).

На наступному етапі провіряли розлади чутливості на рівнях L_5 – S_1 на обох ногах. У пацієнтів з гострим болем виявлені розлади чутливості на гомолатеральній нозі по типу гіпоалгезії до поколювання голкою у 54,7 % військовослужбовців і аллодинія до дотику пензликом – у 12,7 % випадків. У осіб з хронічним болем гіпоалгезія до дотику голкою фіксувалася у 32,1 % осіб і аллодинія до дотику пензликом – у 38,5 % осіб.

У пацієнтів цих двох груп болю спостерігалися зміни в рефлекторній сфері нижніх кінцівок. Тенденція до зниження колінних рефлексів на стороні болю спостерігалася у 10,2 % осіб з хронічним болем та у 4,5 % осіб з гострим болем. Одностороннє зниження (або випадіння) ахілового рефлексу майже однаково часто зустрічалося у осіб з гострим болем (56,3 %) та хронічним болем (49,5 %).

У військовослужбовців з гострим болем частіше зустрічався симптом Ласега, анталгічний сколіоз та іррадіація в одну або обидві нижні кінцівки. У військових з хронічним болем інтенсивність болю дещо зменшувалась, але наростала напруженість паравертебральних м’язів, переважно в ділянці попереку. Анталгічний сколіоз за кутом нахилу зменшувався, але носив постійний характер. Біль зростав з частотою та інтенсивністю бойових дій, які пацієнти проводили на полі бою.

Відомо, що обмеження рухомості хребта може погіршувати результати лікування, формувати обмеження побутової активності та бути одним із факторів хронізації болю [184]. Тому ми в своїх дослідженнях застосували активно проби на дослідження статико-локомоторної функції хребта: пробу Шобера та пальце-підлогову пробу.

Як показали дослідження, проба Шобера виявилася мало інформативною (табл. 1). Зате пальце-підлогова проба дозволяла нам чітко розрізнити гострий та хронічний біль.

Таблиця 1.

Оцінка статико-локомоторної функції хребта у військових при стенозі спинно-мозкового каналу при різних проявах болю.

Показник	Група		
	Контрольна (n = 15)	Гострого болю (n = 15)	Хронічного болю (n = 47)
Проба Шобера, см	5,9 ±0,21	3,4 ± 0,32 $P_к$ >0,05	4,6 ±0,42 $P_к$ >0,05 $P_{гб}$ >0,05
Пальце-підлогова проба см	11,2 ± 3,11	22,18 ± 3,41 $P_к$ <0,05	27,4 ± 2,19 $P_к$ <0,05 $P_{гб}$ <0,05

Примітки: $P_к$ – вірогідність різниці відповідного показника групи контролю; $P_{гб}$ – вірогідність різниці відповідного показника групи гострого болю.

У пацієнтів цих двох груп болю спостерігалися зміни в рефлекторній сфері нижніх кінцівок. Тенденція до зниження колінних рефлексів на стороні болю спостерігалася у 10,2 % осіб з хронічним болем та у 4,5 % осіб з гострим болем. Одностороннє зниження (або випадіння) ахілового рефлексу майже однаково часто зустрічалося у осіб з гострим болем (56,3 %) та хронічним болем (49,5 %).

У військовослужбовців з гострим болем частіше зустрічався симптом Ласега, анталгічний сколіоз та іррадіація в одну або обидві нижні кінцівки. У військових з хронічним болем інтенсивність болю дещо зменшувалась, але наростала напруженість паравертебральних м’язів, переважно в ділянці попереку. Анталгічний сколіоз за кутом нахилу зменшувався, але носив постійний характер. Біль зростав з частотою та інтенсивністю бойових дій, які пацієнти проводили на полі бою.

Як показали наші клінічні дослідження, для пацієнтів з гострим вертеброгеннм болем в ділянці попереку, що розвинувся на фоні лінійної нестабільності та стенозу спинно-мозкового каналу, більш характерним є нестерпний біль в цій ділянці хребта, що поширювався в нижні кінцівки. У них також позитивним симптом Ласега та зниження або випадіння колінних та/або ахілових рефлексів на стороні болю. Для військовослужбовців з хронічним болем більш характерним був помірним або сильним вертеброгенний біль.

За даними опитувальника Мак Гіла, який давав якісну характеристику больового синдрому, було виявлено наступне.

Найчастіше зустрічалися такі дескриптори болю:

- *пекучий* – у 38,9 % (контрольна група) та у 40,% при гострому вертеброгенному болю на фоні стенозу спинно-мозкового каналу; у 55,1 % при хронічному вертеброгенному болю;
- *колючий* – у 31,4 % (гострий біль) та у 30,0 % (контрольна група); і у 31,6 % у осіб з ознаками хронічного болю;
- *такий, що викручує* – у 35,9 % (група з гострим болем) та у 36,4 % осіб контрольної групи);у 46,4 % – пацієнтів клінічної групи при хронічному вертеброгенному болю;
- *такий, що пронизує* – у 40,1 % осіб з гострим болем та у 39,7 % групи контролю; у 43,4 % військовослужбовців при хронічному вертеброгенному болю;
- *такий, що стискає* – у 19,9 % бійців ЗСУ з гострим вертеброгенним болем і у 21,1 % контрольної групи; у 16,5 % при хронічному вертеброгенному болю;
- *тягнучий* – у 31,5 % осіб з гострим вертеброгенним болем і у 29,4 % пацієнтів контрольної групи; у 59,9 % при хронічному вертеброгенному болю.

За результатами анкетування було розраховано індекс кількості вибраних дескрипторів (ІКВД), який представляє кількість (суму) вибраних слів, а також ранговий індекс болю (РІБ) – сума порядкових номерів дескрипторів у підкласах. Показники були розраховані для сенсорної та афективної шкал окремо.

Індекс кількості обраних дескрипторів для сенсорної шкали для осіб з гострим вертеброгенним болем становив 2,27±0,06, а для хронічного болю – 4,02±0,07 ($p< 0,05$). Індекс для афективної шкали – для ГБ – 3,04±0,08 і для ХБ – 3,40±0.05 відповідно ($p >0,05$). Ранговий індекс болю для сенсорної шкали становив 14,09± 1,81 у групі ГБ і 28,15± 2,13 у групі з ХБ ($p< 0,05$), для афективної – для ГБ 16,91±3,08 і для ХБ 21,98±1,04 ($p< 0,05$).

Пацієнти з ознаками хронічного болю давали більш емоційну оцінку больовим відчуттям і тому обирали більш емоційно забарвлені дескриптори, а також кількість обраних дескрипторів була більшою у осіб з хронічним вертеброгенним болем, ніж у осіб з гострим болем.

Між значенням ВАШ і ранговою шкалою болю (РІБ) виявлено значну позитивну кореляцію для груп з гострим болем ($p< 0,05$) та сильний кореляційний зв'язок для груп з хронічним болем ($p< 0,05$). При зростанні інтенсивності болю зростала і значущість відповідного дескриптора в обох групах болю.

За даними опитувальника Мак Гілла пацієнти з груп хронічного болю давали більш емоційну оцінку больовим відчуттям, оскільки обирали більш емоційно забарвлені дескриптори, які оцінювалися більшою кількістю балів ($p<0,05$), а кількість обраних дескрипторів була вірогідно вищою у групі хронічного больового синдрому ($p<0,05$).

На наступному етапі наших досліджень ми провели анкетування тематичних хворих з метою виявлення нейропатичного компоненту болю за допомогою анкети DN4 [184]. Опитувальник DN4 включає 7 пунктів, які стосуються сенсорних симптомів (печіння, відчуття холоду, удару струмом, пощипування, повзання мурашок, поколювання, оніміння, свербіння), а також 3 пункти, що стосуються неврологічного обстеження (гіпестезія до дотику кистю (пензликом), гіпестезія до поколювання, аллодинія). Кожен пункт оцінювався в 1 або 0 балів. Якщо сума балів складала чотири або більше з десяти, це свідчило про наявність нейропатичного компонента больового синдрому. Встановлено, що у осіб контрольної групи нейропатичний компонент дорівнював 2,15 ± 0,91

балів; у осіб з гострим вертеброгенним болем він становив 4,50 ± 1,01 балів ($p < 0,05$); в групі осіб з хронічним вертеброгенним болем він досягав 7,02 ± 0,80 балів ($p < 0,005$).

Нейропатичний компонент у групі осіб з гострим вертеброгенним болем був виявлений у 26,9 % випадків. Вони частіше вказували на такі дескриптори як відчуття оніміння в нозі; печіння, відчуття удару струмом; стріляючий біль. У осіб з хронічним вертеброгенним болем на фоні стенозу спинно-мозкового каналу він фіксувався у 68,5 % осіб. Військові в цій групі частіше скаржилися на відчуття пощипування/ поколювання в нозі; періодично виникали оніміння в нозі на гомолатеральній стороні, відчуття холоду в ній; свербіння. Вірогідної різниці в поширеності сенсорних феноменів (аллодинії, гіпестезії чи гіпоалгезії) між групами не було зафіксовано.

На наступному етапі наших досліджень провели вимірювання густини теплового потоку та температури поверхні шкірних покривів в симетричних паравертебральних ділянках поперекового відділу хребта і в зоні іннервації корінців L5-S1поверхні шкіри стегна, гомілки та стопи як на боці болі, так і на інтактній протилежній нозі у цивільних переважно осіб чоловічої статі молодого та середнього віку. В цій групі цивільних осіб нами було обстежено 71 пацієнт у віці від 39 до 69 років: 20 – з ознаками люмбоішіалгії на фоні гриж міжхребцевих дисків, 20 – з люмбоішіалгією на фоні гриж міжхребцевих дисків в поєднанні зі стенозом та нестабільністю хребців в цій ділянці, 11 пацієнтів лише зі стенозом хребетного каналу та 20 осіб без ознак болю в ділянці попереку з наявністю гриж та протрузій МХД на цьому відтинку хребта (ці особи склали контрольну групу в даній методиці досліджень по відношенню до осіб з вертеброгенним больовим синдромом).

Як показали проведені дослідження, у осіб контрольної групи коливання основних теплометричних показників у паравертебральних ділянках було симетричним і практично не відрізнялось за тестом «зліва/справа». Тепло- та термоадаптація шкірних покривів, що контактують з поверхнею термоелектричних сенсорів, проходила одночасно і мала вигляд пологої кривої з

наявністю чітко видимого насичення. При цьому у всіх осіб контрольної групи зберігався повний об'єм рухів в попереково-крижовому відділі хребта, були відсутні больові відчуття остистих відростків та паравертебральних ділянок в попереково-крижовій зоні, не було ознак розладів чутливості, рефлексів в зацікавлених зонах.У осіб контрольної групи час виходу на теплове «насичення» складав 45,3±0,3сек. Температура шкірних покровів у паравертебральних ділянках була в межах 34,6±0,5 °С, а густина теплового потоку становила17,1±0,1 Вт/м^2.

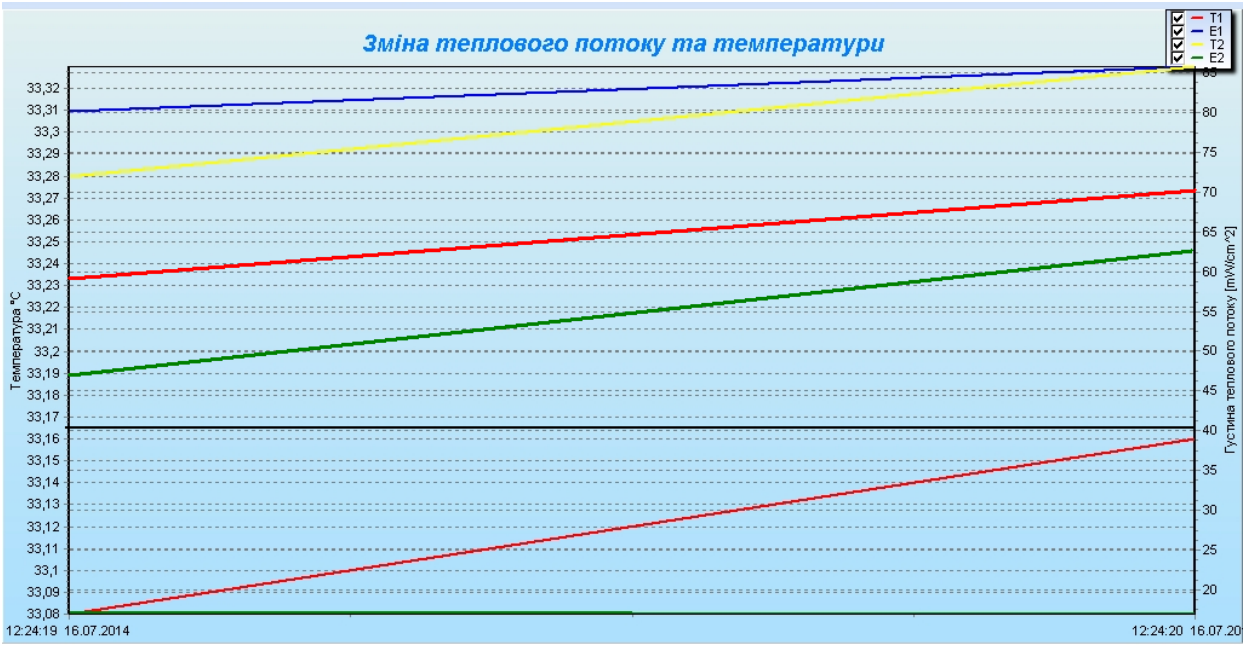


Рис.1. Графічне зображення показників температури і густини теплового потоку у осіб контрольної групи (пацієнт Ч., 41 рік, історія хвороби № 526475).

При клінічному обстеженні пацієнтів з ознаками люмбоішіалгії, причиною якої була наявність гриж або протрузій при стенозі в попереково-крижовому відділі хребта, нами виявлено наступне. Хворі скаржилися на відчуття печії і болі в попереку, нижніх кінцівках, трофічні порушення. Спина у них була фіксована в зігнутому положенні. Позитивними були однобічні симптоми натягу, а у 20 % пацієнтів спостерігався перехресний симптом Ласега. Спостерігалися зниження об'єму рухів в поперековому відділі хребта, напруження м'язів поперекової ділянки, болі при пальпації і перкусії

паравертебральних точок, різке обмеження нахилів у сторону ураження. В положенні лежачи на спині і з зігнутими нижніми кінцівками у кульшових суглобах біль зменшувався. Біль носив тягнучий характер, супроводжувався похолоданням, онімінням і біганням мурашок в нижніх кінцівках. Шкіра була блідою, холодною на дотик, сухою (особливо в ділянці гомілки і стопи) з ознаками гіперкератозу. Відмічався білий дермографізм. У них відбувалося паралельне коливання температури і ГТП на стороні болю і низькі показники на інтактній стороні (рис. 4). Показники температури шкірних покривів на стороні болю були в межах 34,8±0,5 °С, а ГТП становила 101,6±0,3 Вт/м^2, а на та інтактній стороні вони були в межах 30,6±0,7 °С та ГТП =71,8±0,4 Вт/м^2. Час виходу на теплове «насичення» становив 40,1±0,2 сек.

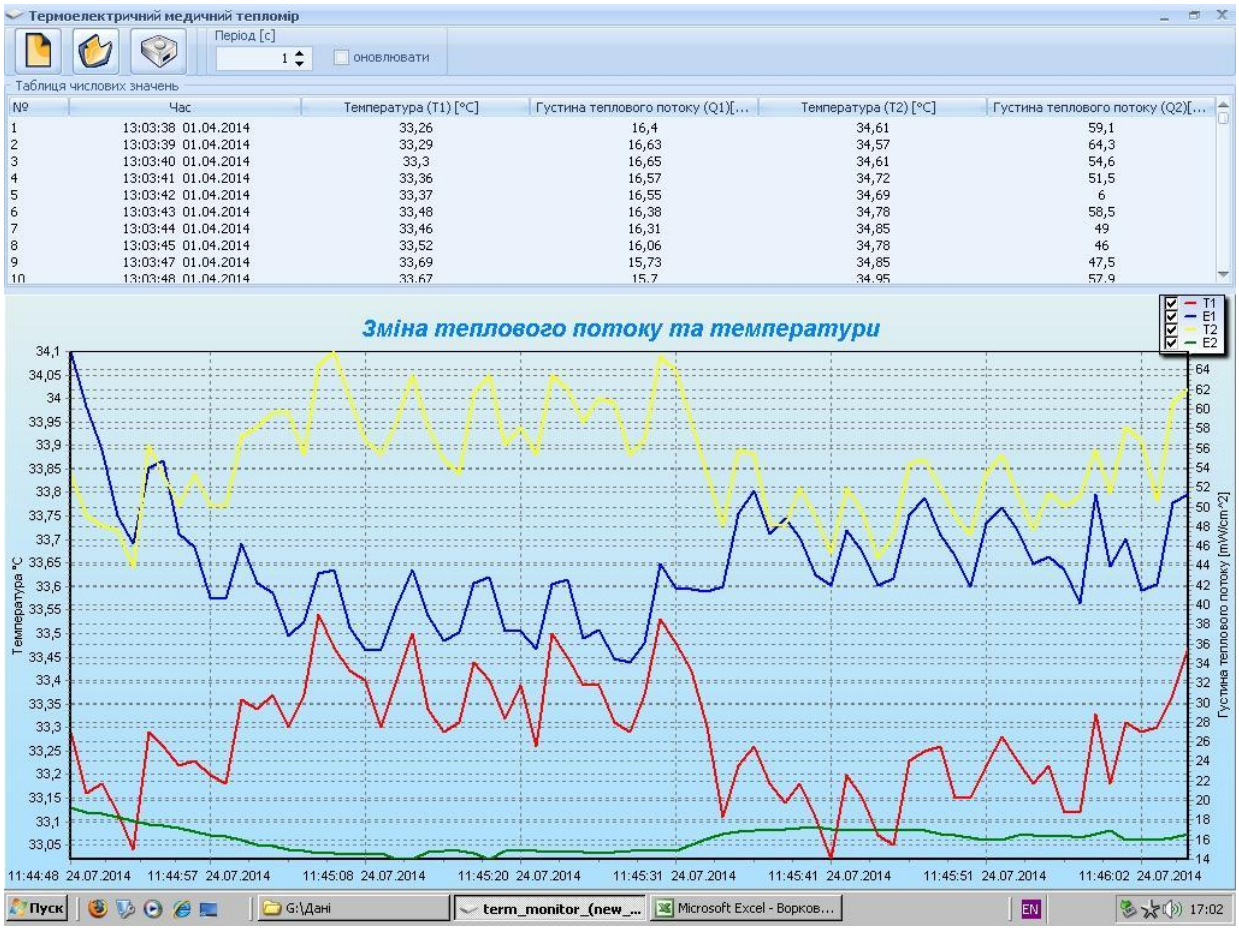


Рис. 2. Графічне зображення показників температури і ГТП у пацієнтів з ознаками люмбоішіалгії при грижах та протрузіях між хребцевих дисків без ознак стенозу та нестабільності в попереково-крижовому відділі хребта (пацієнт С., 36 років, історія хвороби № 563818).

У осіб з ознаками люмбоішіалгії, котра виникла на фоні гриж та протрузій між хребцевих дисків у поєднанні з нестабільністю та стенозом в попереково-крижовому відділі хребта, біль був двостороннім, посилювався при згинанні чи розгинанні хребта і довготривалому сидінні, зменшувався у спокої. Рухи в поперековому відділі хребта були не обмежені, але болючі, особливо при згинанні. При симптомі натягу виникав двобічний біль у попереку. Відмічалися блідість шкірних покривів, відчуття печії, розпирання, асиметрія білого і червоного дермографізму в нижніх кінцівках. Відмічали ціаноз, « мармуровість» шкіри, переважно в стопах. Виявлялися супутні захворювання: варикозне розширення вен нижніх кінцівок і гемороїдальних вен, що вказувало на системну слабкість венозного апарату.

При проведенні теплометричних досліджень у цієї групи пацієнтів спостерігалася тенденція до симптому «ножниць» на стороні болю: різкий підйом густини теплового потоку до 85,4±0,6 Вт/м^2 при майже незмінному показнику температури шкіри на стороні болю (34,7±0,2 °С); час виходу на теплове «насичення» скорочувався до 39,8±0,8 сек. На протилежній стороні в паравертебральній зоні відбувалися незначні коливання теплометричних показників, які не виходили за межі фізіологічної норми (рис.3).

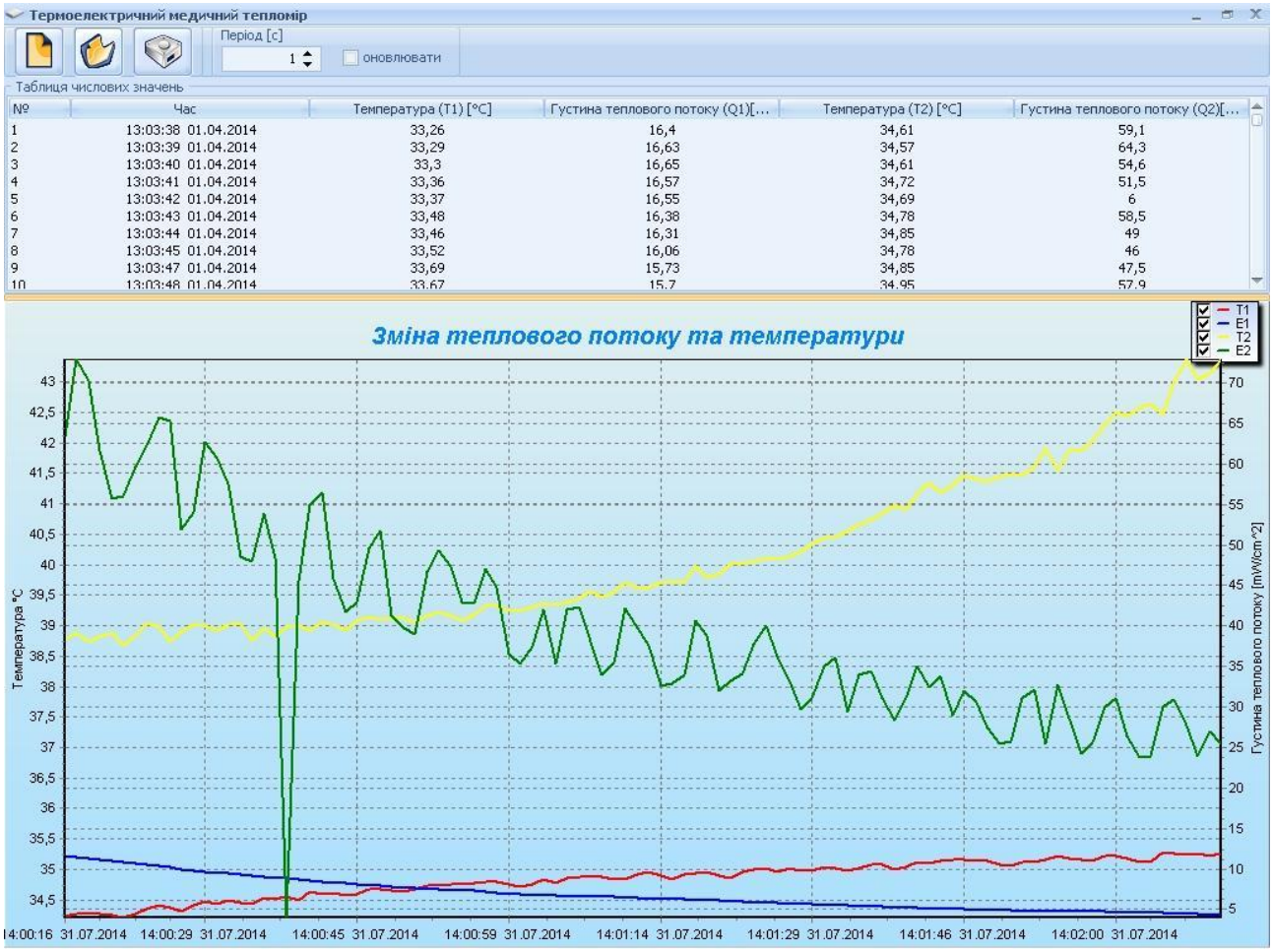


Рис. 3. Графічне зображення показників температури і ГТП у пацієнтів з ознаками люмбоішіалгії при грижах та протрузіях між хребцевих дисків у поєднанні зі стенозом та нестабільністю в попереково-крижовому відділі хребта (пацієнт Л., 50 років, історія хвороби № 563009).

Пацієнти, у котрих больовий синдром виник на фоні стенозу хребтового каналу в попереково-крижовому відділі хребта, зазначали, що больовий синдром тривав у них більш ніж три місяці і не купіювався звичайними знеболюючими препаратами та міорелаксантами. Приносило полегшення лише застосування епідурального адгезіолізу або дулоксетину. При прицільному обстеженні у них виявлено зменшення показників температури і ГТП з обох сторін, але більш інтенсивно на домінуючій стороні болю (рис. 4).

Рис. 4. Графічне зображення показників температури і ГТП у пацієнтів з хронічним больовим синдромом на фоні стенозу хребетного каналу на попереково-крижовому рівні (пацієнт А., 41 рік, історія хвороби № 578193).

Слід зазначити, що відособлено серед пацієнтів з хронічним болем в ділянці попереку стоять пацієнти з наявністю лінійної нестабільності хребців в цій ділянці хребта. Адже наявність такої патології у бійців ЗСУ, котрі ведуть бойові дії на фронті, створює додаткове навантаження на хребет, загострює біль у воїнів, особливо в умовах гострого стресу в бойовій обстановці. Тому раннє виявлення такої патології теж має вирішальне значення.

Отже, наступним етапом наших досліджень було обстеження 55 пацієнтів з наявністю хронічного болю у попереково-крижовій ділянці хребта зумовленого патологічною рухливістю хребців та стенозом в попереково-крижовому відділі хребта. Біль носив постійний характер, іррадіював в одну із нижніх кінцівок, значно обмежував їхню повсякденну діяльність та посилювався вночі. Поряд з

застосуванням нестероїдних протизапальних препаратів пацієнти змушені були застосовувати антиконвульсанти і антидепресанти. Тривалість захворювання складала 1-5 років. Вік пацієнтів: 49 ± 3,5 років. Всі пацієнти були поділені на дві клінічні групи.

У І клінічну групу увійшли 39 осіб з однобічною люмбоішіалгією за наявності гриж та протрузій міжхребцевих дисків з ознаками лінійної нестабільності та стенозу в попереково-крижового відділу хребта, котрі підлягали консервативному лікуванню (основна група).

У ІІ клінічну групу були віднесені 16 пацієнтів з однобічною люмбоішіалгією за наявності гриж та протрузій міжхребцевих дисків без ознак лінійної нестабільності попереково-крижового відділу хребта, але з поперековим стенозом, котрі також підлягали консервативному лікуванню (група порівняння).

Контрольну групу склали 10 осіб з відсутністю больового синдрому, за наявності гриж та протрузій МХД, без ознак поперекового стенозу та лінійної нестабільності попереково-крижового відділу хребта.

Вік пацієнтів становив - 49± 3,5 років.

Пацієнти першої клінічної групи скаржилися на відчуття печії і болі в попереку, нижніх кінцівках, трофічні порушення. Спина у них була фіксована в зігнутому положенні. Позитивними були однобічні симптоми натягу, а у 20 % пацієнтів спостерігався перехресний симптом Ласега. Спостерігалися зниження об’єму рухів в поперековому відділі хребта, напруження м’язів поперекової ділянки, болі при пальпації і перкусії паравертебральних точок, різке обмеження нахилів у сторону ураження. В положенні лежачи на спині і з зігнутими ногаминижніми кінцівками у кульшових суглобах біль зменшувався. Біль носив тягнучий характер, супроводжувався похолоданням, онімінням і біганням мурашок в нижніх кінцівках. Шкіра була блідою, холодною на дотик, сухою з ознаками гіперкератозу. Відмічався білий дермографізм.

У осіб другої клінічної групи біль був двостороннім, посилювався при згинанні чи розгинанні хребта і довготривалому сидінні, зменшувався у спокої.

Рухи в поперековому відділі хребта були не обмежені, але болючі, особливо при згинанні. При симптомі натягу виникав двобічний біль у попереку. Відмічалися блідість шкірних покривів, відчуття печії, розпирання, асиметрія білого і червоного дермографізму в нижніх кінцівках. Відмічали ціаноз, « мармуровість» шкіри, переважно в стопах. Виявлялися супутні захворювання: варикозне розширення вен нижніх кінцівок і гемороїдальних вен, що вказувало на системну слабкість венозного апарату.

Проведені клінічні дослідження дозволили нам прийти до висновку, що спастичний тип судинних реакцій в ділянці попереку та нижньої кінцівки є прямим показанням для проведення у пацієнтів мануальної терапії; дилятаційний тип судинних реакцій в цій ділянці спини потребує лише проведення у хворих окремих елементів кінезіотерапії.

На наступному етапі наших досліджень ми провели вимірювання термо- та теплометричних показників в паравертебральних ділянках та по ходу нервових корінців L4-S1.Нами отримані такі показники.

Контрольна група: фіксувалися рівномірні показники температури та густини теплового потоку з обох сторін межах: Т= 33,2±0,5ºС, Е = 171,3±0,6 Вт/м^2 .

У осіб першої – основної групи (39 осіб):спостерігався симптом « ножниць» на стороні болю (пересікаються температура та густина теплового потоку на боці болю), при значному пониженні значень густини теплового потоку та помірне зростання температури на ушкодженій стороні. Показники температури в паравертебральній ділянці на стороні болю становили Т = 34,19±1,71ºС, а густина теплового потоку була в межах Е = 26,82±4,98 вт/м^2 .

В групі порівняння – другої клінічної групи – (16 осіб) виявлено помірне пониження густини теплового потоку на стороні болю та незначне підвищення температури на стороні болю. Основні теплометричні параметри були такими: Т = 39,8±6,29ºС; Е = 120,6±99,20 вт/м^2 .

Паралельно у всіх обстежуваних пацієнтів ми вивчали варіабельність серцевого ритму на приладі «ВегетоСПЕКТР», що дозволило нам визначити у

них спрямованість вегетативних реакцій та провести кореляційний аналіз цих показників.

Параметри спектральних та часових характеристик ВСР в обстежених групах представлені нами в табл. 2. та в нижче наведених графіках.

Таблиця 2.

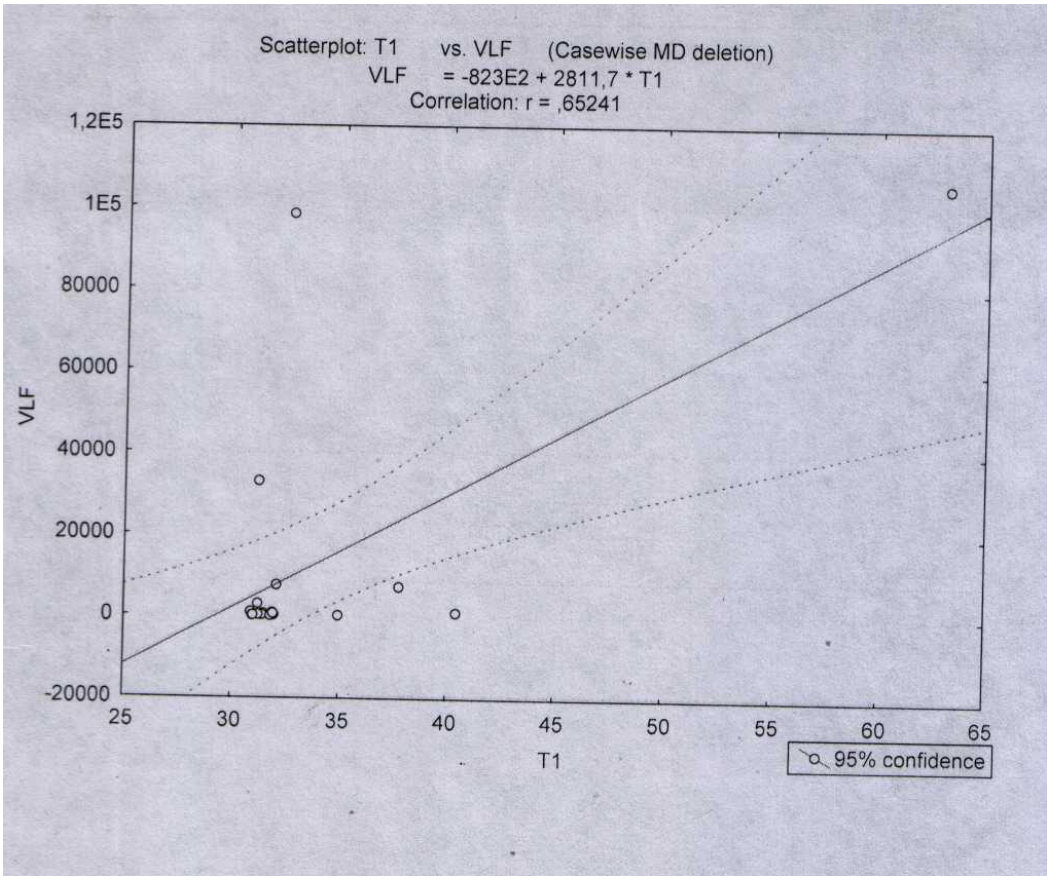
Параметри вегетативних реакцій при стенозі в попереково-крижовому відділі хребта

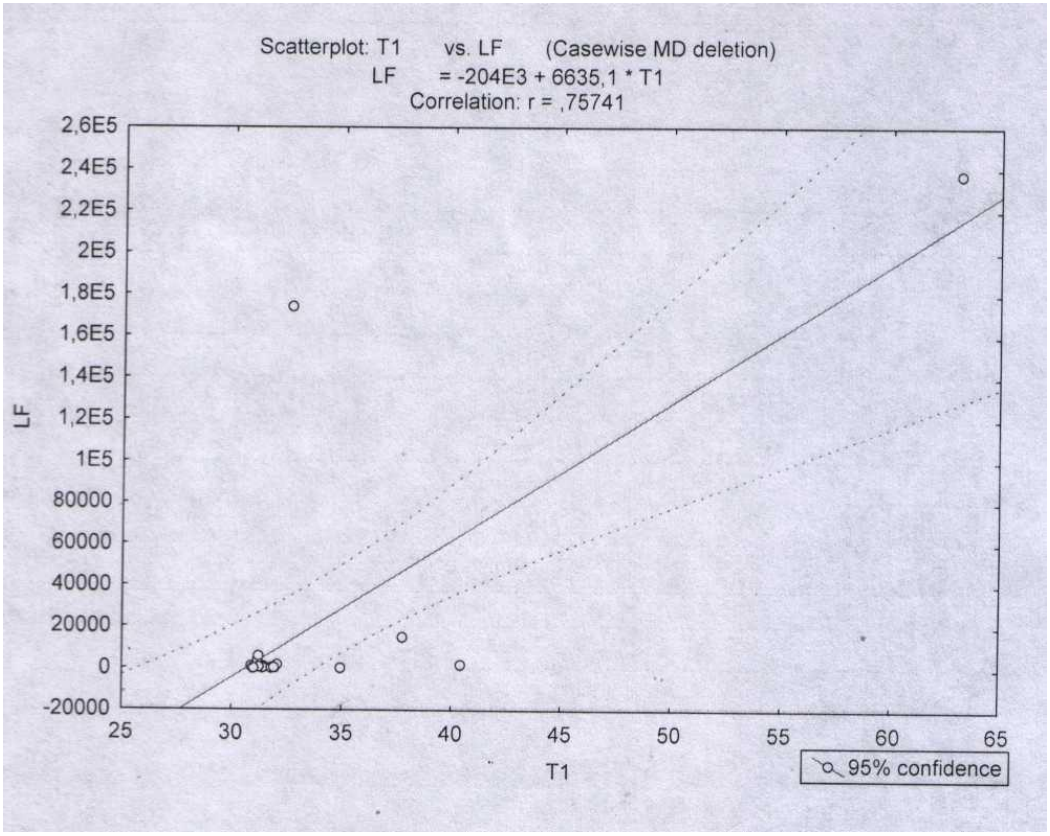
Група I			
N = 39	M±m	T1 (34,19±1,71)	E1 (26,82±4,98)
Показник (спектральні характеристики)		Коефіцієнт кореляції, r	
VLF, мс^2	13768,07±7361,08	0,65	0,28
LF, мс^2	23417,68±14962,65	0,76	0,37
HF, мс^2	32919,18±21321,92	0,84	0,44
LF/HF, ум. Од.	2,01±0,55	- 0,15	0
LFn, %	54,86±4,37	- 0,2	- 0,3
HFn, %	45,14±4,37	0,2	0,3
Показник (часові характеристики)			
SDNN, мс	156,11±61,38	0,76	0,41
pNN50, %	18,35±7,01	0,65	0,57
RMSSD, мс	186,58±86,67	0,81	0,46
Група II			
N = 16	M±m	T2 (39,8±6,29)	E2 (120,6±99,20)
Показник (спектральні характеристики)		Коефіцієнт кореляції, r	
VLF, мс^2	21608,2±11315,41	- 0,09	- 0,10

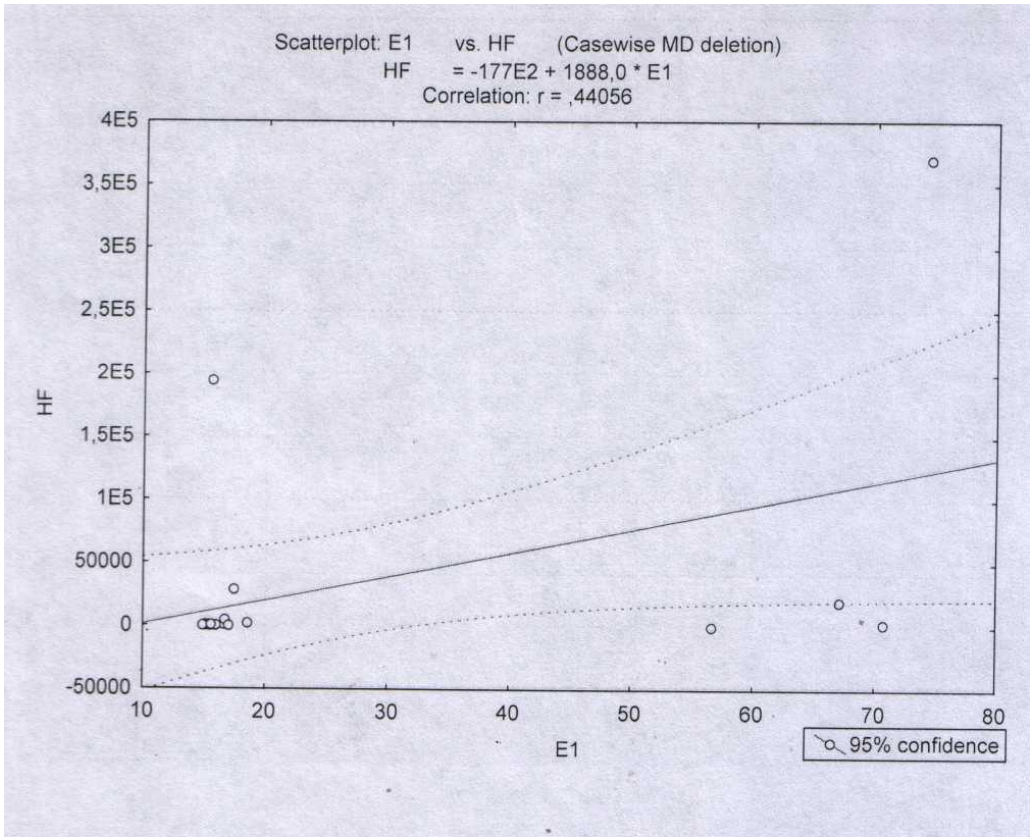
Продовження таблиці 2

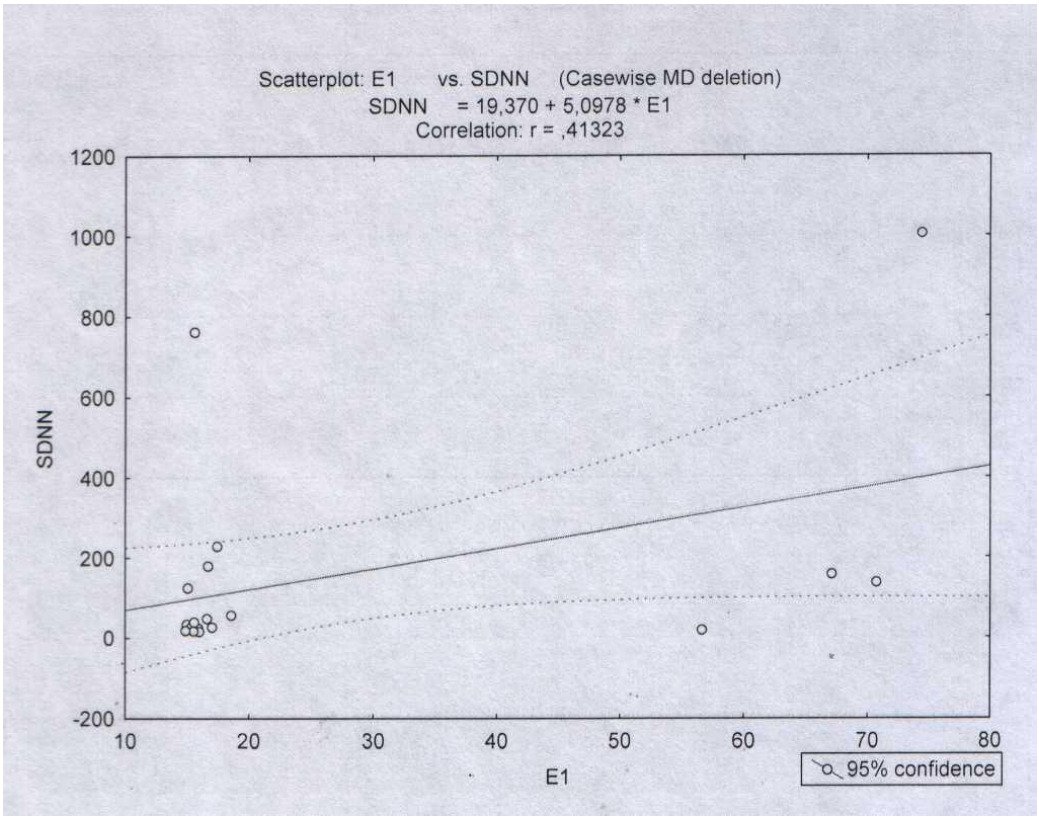
LF, мс^2	60093,9±31361,08	- 0,06	- 0,11
HF, мс^2	114969,2±60523,87	- 0,07	- 0,10
LF/HF, ум. Од.	1,0±0,37	- 0,13	- 0,14
LFn, %	37,4±3,57	- 0,17	- 0,28
HFn, %	60,5±3,72	0,21	0,30
Показник (часові характеристики)			
SDNN, мс	287,5±108,02	- 0,02	- 0,06
pNN50, %	54,0±22,07	0,08	- 0,08
RMSSD, мс	383,7±153,47	- 0,02	- 0,04

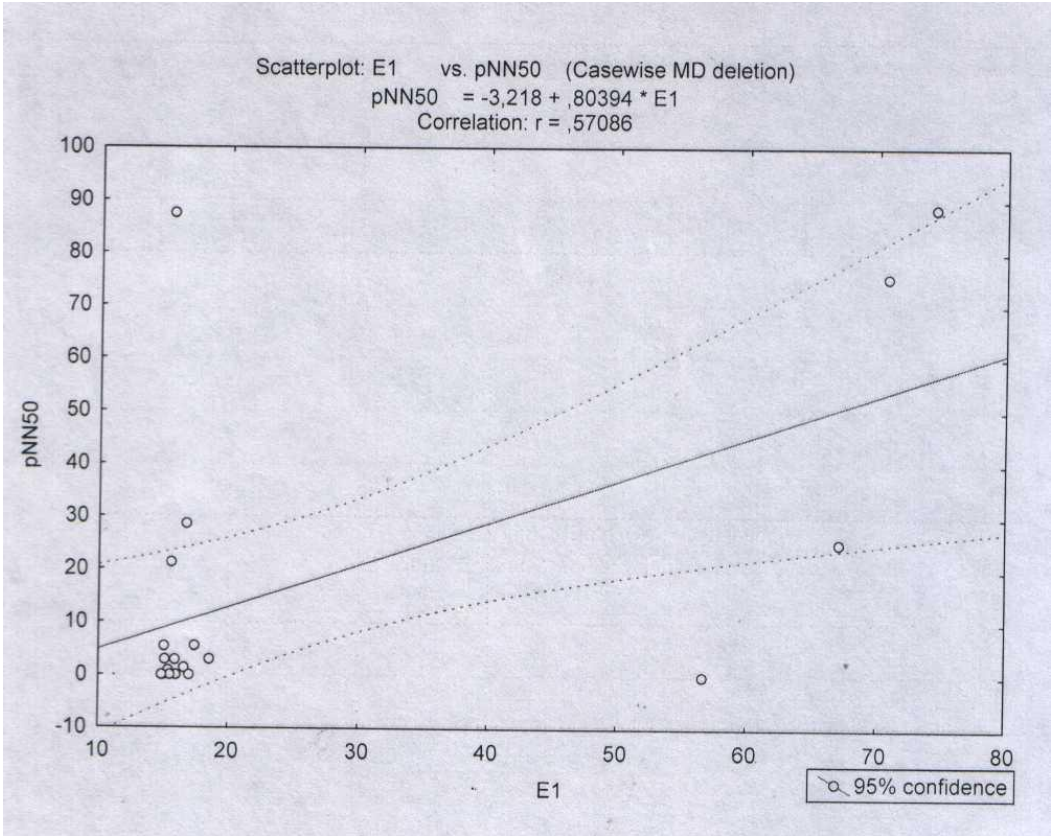
Графіки кореляційного зв'язку між деякими змінними в групах тематичних хворих. Група I

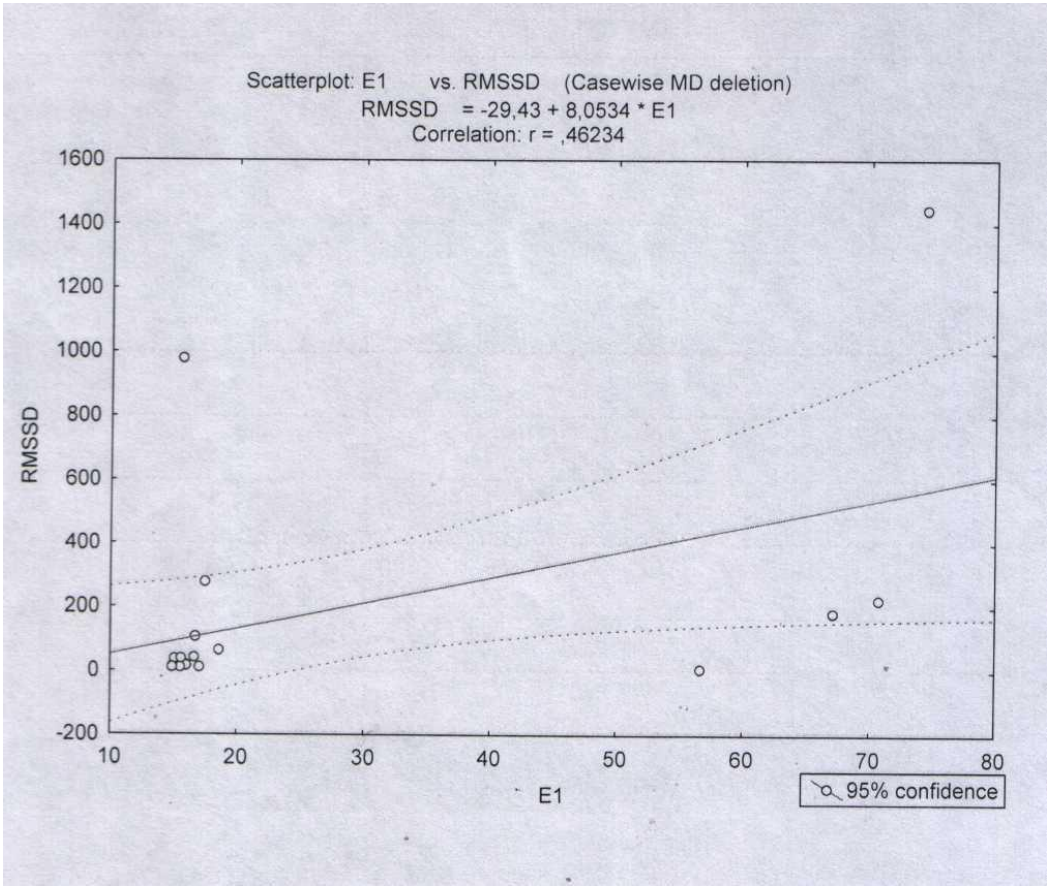


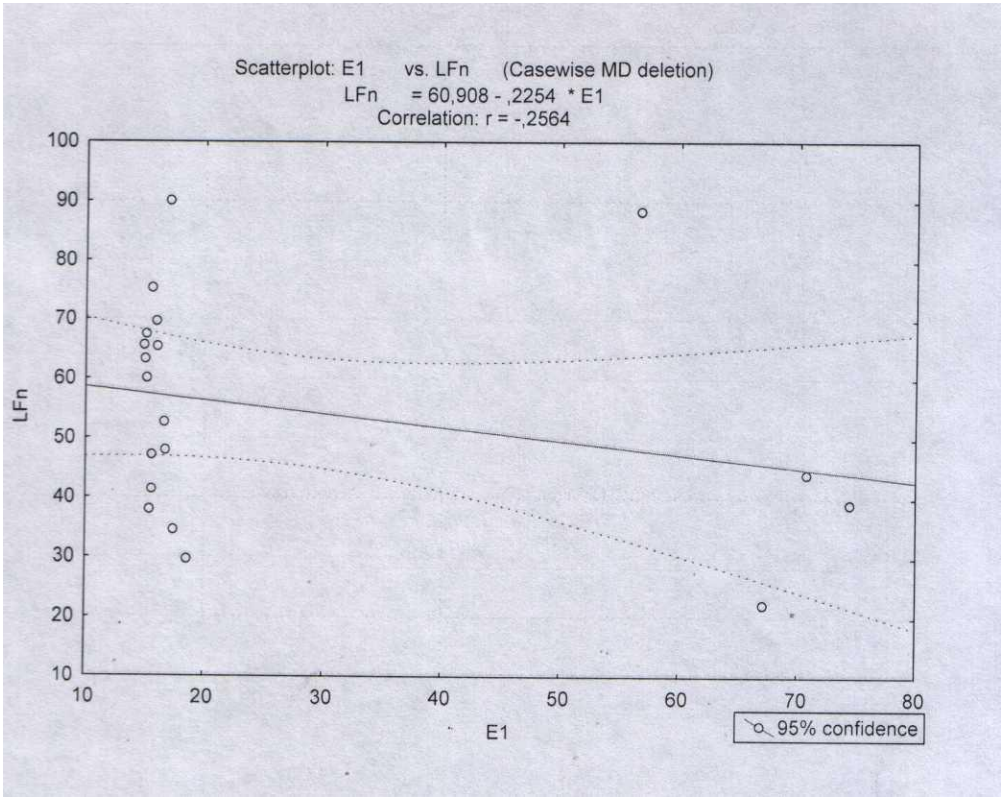

Scatterplot: T1 vs. LF (Casewise MD deletion)
LF = -204E3 + 6635,1 * T1
Correlation: r = ,75741
LF
T1
95% confidence

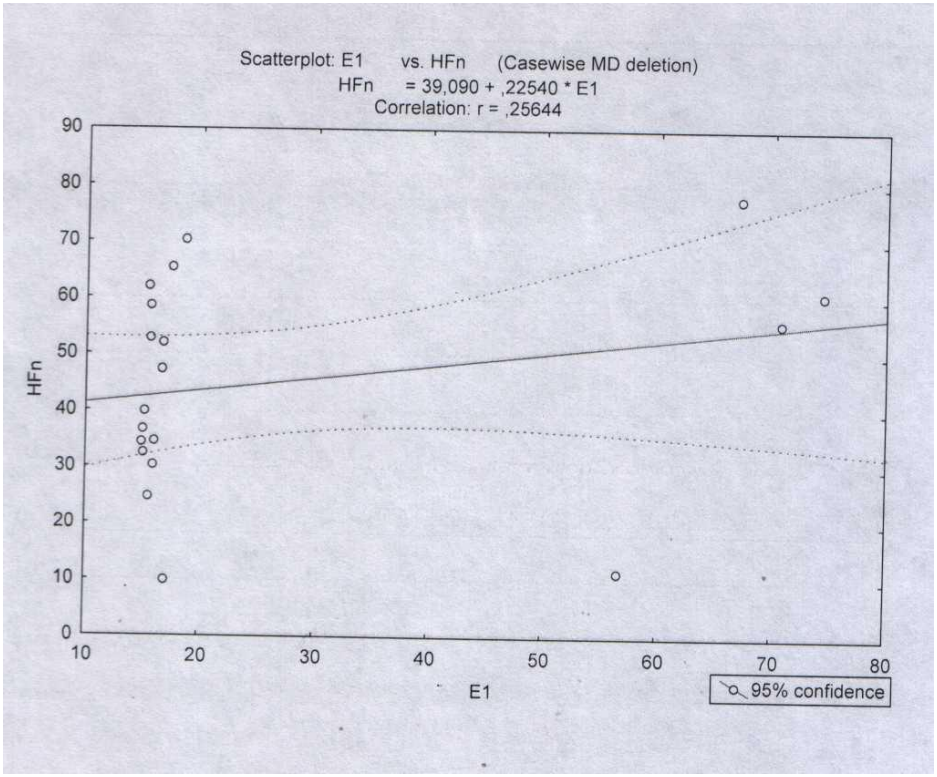

Scatterplot: E1 vs. HF (Casewise MD deletion)
HF = -177E2 + 1888,0 * E1
Correlation: r = ,44056
HF
E1
95% confidence


Scatterplot: E1 vs. SDNN (Casewise MD deletion)
SDNN = 19,370 + 5,0978 * E1
Correlation: r = ,41323
SDNN
E1
95% confidence

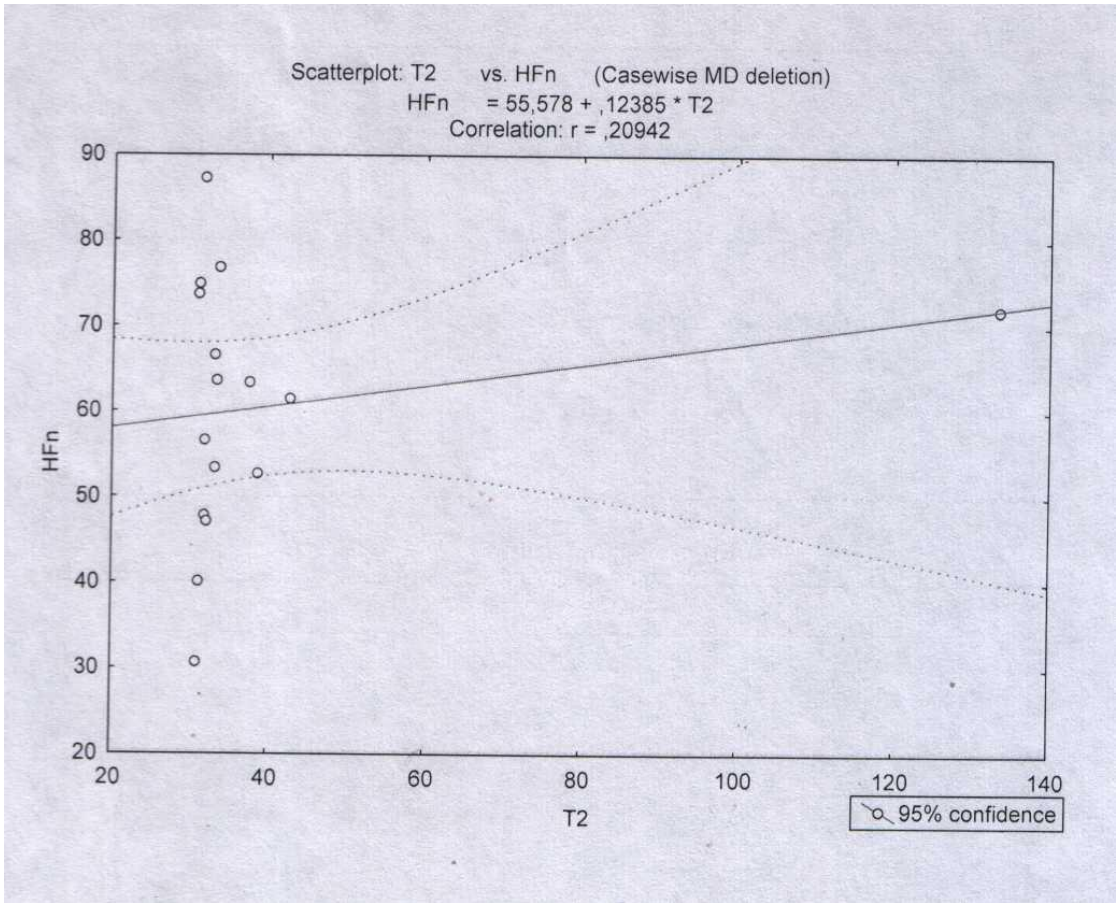

Scatterplot: E1 vs. pNN50 (Casewise MD deletion)
pNN50 = -3,218 + ,80394 * E1
Correlation: r = ,57086
pNN50
E1
95% confidence

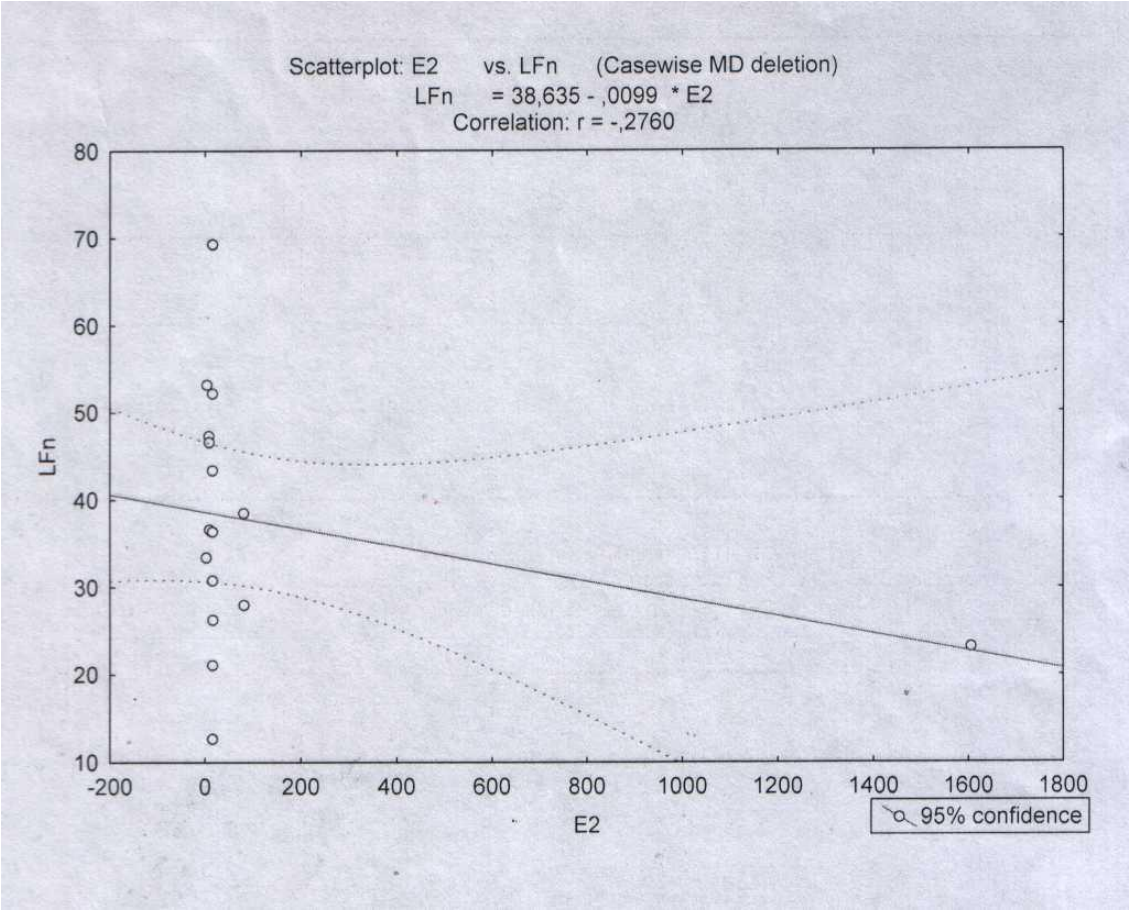

Scatterplot: E1 vs. RMSSD (Casewise MD deletion)
RMSSD = -29,43 + 8,0534 * E1
Correlation: r = ,46234
RMSSD
E1
95% confidence

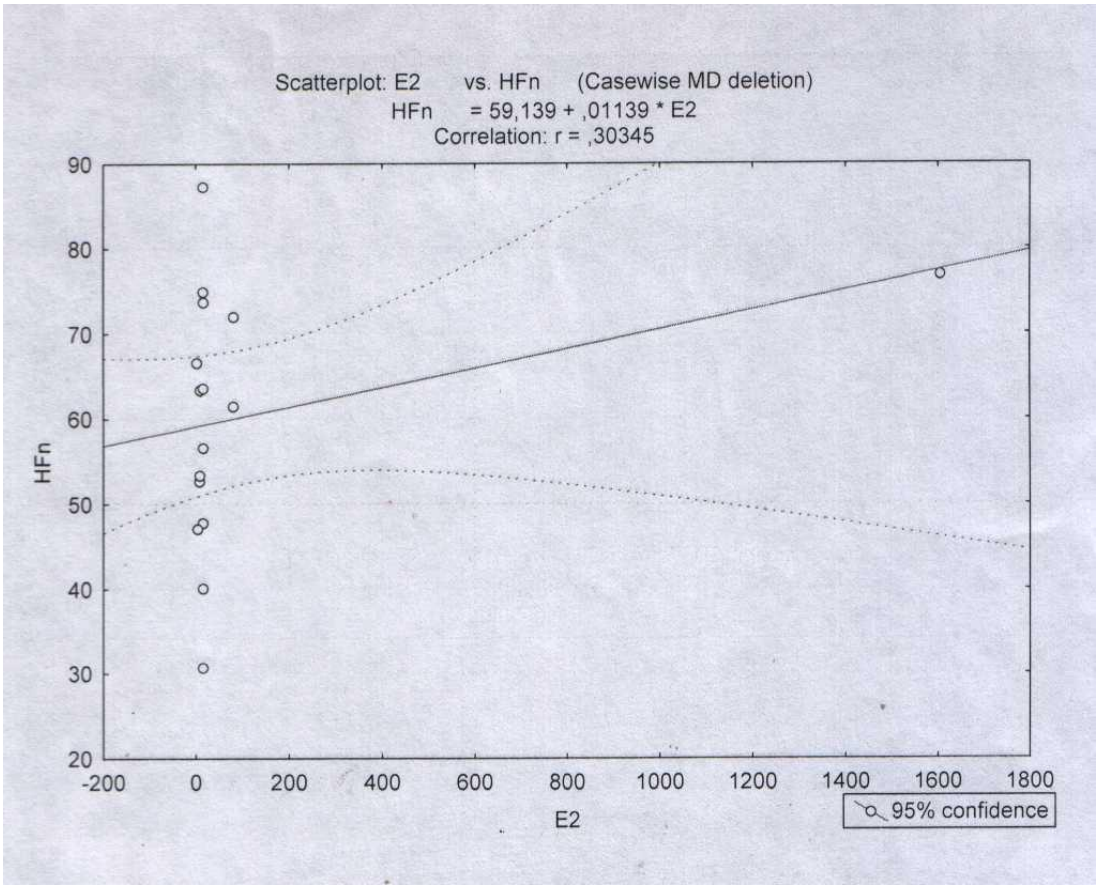

Scatterplot: E1 vs. LFn (Casewise MD deletion)
LFn = 60,908 - ,2254 * E1
Correlation: r = -,2564
LFn
E1
95% confidence



Графіки кореляційного зв'язку між деякими змінними в групах тематичних хворих. Група II




Scatterplot: E2 vs. LFn (Casewise MD deletion)
LFn = 38,635 - ,0099 * E2
Correlation: r = -,2760
LFn
E2
95% confidence


Scatterplot: E2 vs. HFn (Casewise MD deletion)
HFn = 59,139 + ,01139 * E2
Correlation: r = ,30345
HFn
E2
95% confidence

Таким чином, нами вперше встановлена пряма кореляція між показниками температури та густини теплового потоку і показниками спектральних та часових характеристик ВСР в І групі обстежених. Причому, у формуванні показників теплового потоку значну роль відігравав високочастотний (парасимпатичний) HF-компонент ритму серцево-судинних реакцій.

На величину показників температури в цій групі значний вплив мали також показники гуморальної регуляції та метаболічних порушень.

В групі порівняння (ІІ клінічна група) виявлені всі від'ємні слабкі кореляційні зв'язки між тепловими показниками та ВСР, окрім показника HFn, що вказувало також на роль парасимпатичних реакцій у формуванні показників густини теплового потоку у пацієнтів з ознаками люмбоішіалгії за відсутності лінійної нестабільності в поперековому відділі хребта.

Слід також відмітити той факт, що нами вперше виявлено значне зниження вироблення теплової енергії у осіб І клінічної групи, коли в неврологічному статусі у пацієнтів фіксуються лише функціональні рефлекторні зміни в периферичному нервовому волокні.

Відомі експериментальні дослідження П. Веселовського (1982 р.), який виявив, що при ушкодженні периферичного нервового волокна першими страждають холодові рецептори, яких у 2-2,5 разів більше, ніж теплових. На наш погляд, цим можна пояснити виникнення симптому "ножниць" у обстежених осіб.

Статистичний набір клінічного матеріалу дозволить нам в перспективі впровадити цей прилад в первинну ланку медичної допомоги як бійцям ЗСУ на передовій в період загострення захворювання, так і на рівні сільської амбулаторії та кабінету сімейного лікаря і автоматично встановлювати діагноз особам з неврологічними вертеброгенними розладами без застосування дороговартісних приладів променевої діагностики.

Такий комплексний підхід дозволив нам удосконалити методи комплексного лікування тематичних хворих: окрім традиційного

консервативного лікування в до- та післяопераційному періоді, яке включало застосування нестероїдних протизапальних препаратів, міорелаксантів та загально зміцнюючого лікування, рекомендувати їм прийом дулоксетину по 60 мг на добу протягом тривалого часу. Це препарат з групи селективних інгібіторів захоплення серетоніну та норадреналіну, який дозволив їм значно покращити якість життя в післяопераційному періоді. В стаціонарних умовах доцільно таким пацієнтам також проводити епідуральний адгезіоліз.

Підсумовуючи проведені клінічні обстеження та вимірювання ряду параклінічних показників у цивільних осіб та військовослужбовців ЗСУ з наявністю вертеброгенного болю в ділянці попереку та підсумовуючи результати анкетування військовослужбовців можна сказати, що нами чітко виявлені дескриптори гострого чи хронічного вертеброгенного болю у військовослужбовців та цивільних осіб на фоні дегенеративно-дистрофічної патології хребта, що дозволило нам більш обдумано підійти до розробки та удосконалення існуючого безконтактного тепломіру у них з подальшим удосконаленням тактики лікування (оперативне чи консервативне), що дозволить чим найскоріше повертати наших бійців у стрій.

3.1.5. Висновки

1. Клініко-неврологічне обстеження пацієнтів – військовослужбовців з болем в поперековому відділі хребта, обумовленого стенозом спинно-мозкового каналу та лінійною нестабільністю на цьому рівні, дозволяє поділити їх на дві основні групи: особи з гострим болем та пацієнти з хронічним вертеброгенним болем.

2. У пацієнтів з гострим перебігом захворювання частіше спостерігалася ізольована грижа МХД. котра нерідко була секвестрованою; біль носив нестерпний характер та частіше поширювався в ногу: спостерігалась анталгічна постава та був вираженим симптом Ласега. У осіб з хронічним перебігом захворювання частіше діагностувалися явища спондилолістезу, супутні протрузії та грижі МХД у вище- та нижче розташованих сегментах; біль носив сильний

або помірний характер; ознаки лінійної нестабільності в попереково-крижовому відділі хребта..

3. Для військовослужбовців з хронічним болем на фоні стенозу спинно-мозкового каналу в ділянці попереку та лінійною нестабільністю характерним був нейропатичний компонент, що підтверджувався даними опитувальника DN4. Біль у них часто носив пекучий характер та супроводжувався онімінням в стопах; нерідко супроводжувався пощипуванням, поколюванням в ногах.

4. Прийом дулоксетину – препарату з групи селективних інгібіторів захоплення серетоніну та норадреналіну, по 60 мг на добу протягом тривалого часу дозволив бійцям ЗСУ значно покращити якість життя в післяопераційному періоді.

5. Вивчення змін теплометричних показників шкірних покривів в попереково-крижовому відділі хребта показало, що цей метод діагностики є високоінформативним і дозволяє правдиво вивчити ці зміни в залежності від віку, статі пацієнта та виявити основні тенденції у зміні їхнього стану протягом певного часу.

6. Одночасне вимірювання температури шкірних покривів та густини теплового потоку приладом, сконструйованим в Інституті термоелектрики НАН та МОН України дозволяє уже на ранніх стадіях процесу встановити характер неврологічних ускладнень при остеохондрозі хребта, навіть не застосовуючи для цього дороговартісне обладнання.

7. Визначення теплометричних показників в попереково-крижовій ділянці хребта у осіб з хронічним больовим синдромом на фоні дегенеративно-дистрофічної патології хребта за наявності гриж і протрузій міжхребцевих дисків дозволяє покращити діагностику неврологічних проявів даної патології, спрогнозувати перебіг цього захворювання та вибрати ефективний метод лікування не лише цивільним особам, але і бійцям ЗСУ, особливо на передовій лінії фронту.

SECTION 4. NORMAL PHYSIOLOGY

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4.1 Місце типів вищої нервової діяльності в регуляторних механізмах гомеостазу цілісного організму

Людська особистість визначається як динамічна організація біопсихосоціальних систем всередині індивіда, за допомогою якої людина формує та унікально адаптується до постійно мінливого внутрішнього та зовнішнього середовища [185]. Ступінь адаптаційно-компенсаторних реакцій організму має тісний функціонально-фізіологічний взаємозв'язок з основними характеристиками нервових процесів (сила, гальмування та збудження, урівноваженість та неврівноваженість, лабільність), які мають вирішальне значення для всіх аспектів здоров'я, включаючи фізичне, психічне та соціальне благополуччя [186, 187, 188].

Основні властивості нервової системи сила, гальмування та збудження, урівноваженість та неврівноваженість, лабільність основних нервових процесів прийнято вважати сукупністю показників вищої нервової діяльності [189, 190]. Формування типу вищої нервової діяльності (темпераменту) має генетичну обумовлену так і фенотипічну структуру, тобто змінюватись внаслідок факторів зовнішнього середовища, насамперед показники лабільності основних нервових процесів, що становить формування індивідуальних аспектів особистості [191, 192, 193]. Дослідження вчених Bornstein M.H., Hahn C.S., Putnick D.L., Pearson R. щодо, оцінки стабільності показників темпераменту дитячого організму (від 3 до 6 років) з врахуванням віку дитини, статі, порядку народження та доношеності, віком, освіти, тривожності та депресії матері, дійшли висновку, що діти мали прояви стабільного типу вищої нервової діяльності, але це не є остаточною характеристикою функціонального стану вищих відділів головного мозку, так як вони мають потенціал зміни в період онтогенезу [192].

Залежно від впливу соціального середовища психологічні риси особистості поділяться на екстраверсію (відкритий, балакучий, соціальний) та

інтроверсію (замкнутий, пасивний, мовчазний). З віком ці особливості стають більш виразними, яскравіше проявляється дратівливість, збудливість, емоційна нестійкість, невпевненість, тривога, що знаходить відображення в поведінкових реакціях [194].

Класифікація темпераментів людського організму здійснюється за характеристикою основних нервових процесів: сила, гальмування та збудження, врівноваженість та неврівноваженість, лабільність. Таким чином виділяють 4 типи темпераментів вищої нервової діяльності: сангвініки, холерик, меланхолік, флегматик (Рис 1.) [189, 195].

Рис. 1. Подібність між виміром Айзенка та емоційними вимірами. Айзенко описав два фактори, що пояснюють варіації наших особистостей: екстраверсія/інтроверсія та емоційна стабільність/нестабільність [195].

Сангвінічний темперамент (жвавий тип) — це сильний врівноважений рухливий тип нервової діяльності. Для сангвініків характерна енергійність і наполегливість у досягненні мети, самоконтроль і вираженою рухливістю нервових процесів, яка полягає у вмінні швидко адаптуватись до ендогенних та екзогенних факторів середовища [196].

Флегматичний темперамент (спокійний тип) — це сильний врівноважений, але інертний тип вищої нервової діяльності. Флегматики характеризуються неквапливістю, енергійністю і високою працездатністю, самоконтролем,

спостерігається значний консерватизм поведінки, прагнення до звичного способу життя, повільність у прийнятті рішень (особливо в екстремальних ситуаціях) [196].

Холеричний темперамент (нестримний тип) — це сильний, але неврівноважений тип нервової діяльності. Особам цього типу властива захопленість, з якою він виконує певну роботу, проте будь-яка дрібниця може звести все нанівець, що свідчить переважання процесів збудження над процесами гальмування [196].

Меланхолічний темперамент (слабкий тип) — характеризується загальною слабкістю нервових процесів, що не дає змоги використовувати для характеристики поняття рухливості і врівноваженості нервових процесів. У меланхоліків швидко розвивається охоронне гальмування під впливом навіть помірних за силою подразнень; має низький рівень нервово-психічної активності, з високою емоційною вразливістю, схильний до пригніченого настрою та з проявами інтровертності [196].

Генетична детермінанта в формування темпераментів має еволюційні підвалини, що допомагають організмам (з ознаками ВНД) адаптуватися до природних змін зовнішніх та внутрішніх подразників, що є важливим для клітинної проліферації та пластичності, стійкості до дегенеративних процесів (пов'язаних зі стресом, травмами та старінням), регуляції імунної та запальної реакції та підтримки вироблення енергії, на додаток до процесів, що опосередковують навчання звичок, емоційну реактивність, когнітивну гнучкість, сенсорну чутливість та різноманітні біоритми [191]. Таким чином ліганди та рецепторний апарат нейронів забезпечують прояви темпераменту, мають вплив загальну резистентність та схильність до захворювань, обтяжуючи сучасне суспільство в результаті прямих та дотичних проявів опосередкованого способу життя [191 , 197, 198].

Будь-яка діяльність живих систем забезпечується енергетичними ресурсами, при цьому координацією діяльності має 3 рівня регуляції фізіологічних функцій цілісного організму. Нервова, гуморальна та імунна

регуляція функції залежить від основних нервових процесів, які характеризують тип ВНД, що в свою чергу має залежність від фізіологічних та енергетичних характеристик починаючи клітинного рівня і до рівня цілісного організму [190, 198, 199, 200].

Регуляторна складова нервової системи забезпечує точність і адресність регуляції – це нейрогуморальне довгодистантне регулювання (здійснюють нейромедіатори та нейропептиди). Гуморальні механізми регуляції здійснюють довгодистантне і короткодистантне регулювання відповідно (здійснюється гормонами залоз внутрішньої секреції і тканинними гормонами) [197].

Імунна компонента забезпечує короткодистантне регулювання (місцевий імунітет) та довгодистантне (імунореактивність організму), що регулює зростання, поділ і диференціацію клітин не тільки імунної системи, а й усіх соматичних клітин в організмі (здійснюється медіаторами нервової системи і гормонами тимуса) [197]. Інтровертні риси особистості мають ослаблену імунну біологічну відповідь, проявляють сильніші поведінкові реакції, через схильність до обережності та уникнення соціальних контактів, що підвищує сприятливість до стрес-факторів і схильності до інфекційних захворювань. Екстравертні аспекти темпераменту мають більшу опірність до стресових подразників, що відповідає більш сильній імунній відповіді, ніж у інтровертів [201].

Згідно з даними авторів Cloninger C. R., Cloninger K. M., Zwir I., та Keltikangas-Järvinen L., вплив ключових фізіологічних та енергетичних позаклітинних стимулів на сигнальні шляхи Ras-ERK (MAPK) та PI3K-AKT-mTOR, що генетично пов'язані з темпераментом, є критичними регуляторами адаптаційних реакцій на добові, сезонні та кліматичні зміни, що забезпечують підтримку клітинного гомеостазу, здорового функціонування та відновлення організму (Табл. 1.) [191].

Таблиця 1.

Вплив фізіологічних та енергетичних позаклітинних стимулів на сигнальні шляхи Ras-ERK (MAPK) та PI3K-AKT-mTOR, пов'язані з темпераментом

Позаклітинний стимул	**Вплив на Ras-ERK**	**Вплив на PI3K-AKT-mTOR**	**Клітинна відповідь**
Температура			
Холодний	Гальмування	-	Спокій (холод уповільнює ріст і метаболізм, сприяє загоєнню травм, зменшує біль і запалення)
Гарячий	-	Активація	Ріст і проліферація (тепло посилює ріст і перемикає клітини з катаболічних на анаболічні процеси)
Освітлення (видиме світло)			
Темний	-	Гальмування	Уповільнює та пригнічує циркадний ритм через mTOR
Яскравий	Активація	Активація	Прискорює та посилює циркадний ритм через mTOR, спрямовує ріст нейритів через Ras-ERK
Електромагнітні поля			
Зовнішній високочастотний (не захищений)	Гальмування	Гальмування	Вплив нетермічних високочастотних електромагнітних випромінювань погіршує функцію гіпокампу, емоційну стабільність, пасивне уникнення навчання та регуляцію імпульсного контролю через пригнічений Ras-Erk, а також пригнічений AKT та напругозалежний кальцієвий канал, що забезпечує самоконтроль.
Зовнішній високочастотний (захищений)	-	-	Введення мелатоніну та омега-3 жирних кислот захищає від шкідливого впливу нетермічних високочастотних електромагнітних полів

Продовження таблиці 1

Низькоінтенсивні та низькочастотні електромагнітні випромінювання	Інгібування або активація	-	Вплив низькоінтенсивних, частотно-модульованих електромагнітних випромінювань може пригнічувати або активувати залежно від частоти, місця розташування та темпераменту. Електромагнітні випромінювання частотою 24 Гц пригнічують проліферацію клітин, пригнічуючи шляхи Ras-ERK (MAPK). Навпаки, транскраніальна магнітна стимуляція дорсолатеральної префронтальної кори частотою 10 Гц зменшує негативний вплив, пов'язаний з темпераментом та шляхом ERK (від'єднання субгенної ACC від мережі за замовчуванням зменшується при вищому рівні уникнення шкоди та посилюється при вищій стійкості). Антидепресивні ефекти включають активацію Ras-Erk з проліферацією нервових стовбурових клітин, що походять з гіпокампу.
Гідратація			
Сухий	Гальмування	-	Зневоднення пригнічує такі компоненти, як AMPK та TSC, що стосуються сигналізації mTOR, тим самим зменшуючи клітинну енергію від споживання глюкози, синтез глікогену, ліпогенез та експресію ERK.
Мокрий	Активація	-	Гідратація сприяє передачі сигналів Ras-ERK та mTOR, збільшуючи доступність енергії в клітинах

Продовження таблиці 1

Харчування			
Голодування	-	Гальмування через виснаження поживних речовин та енергії	Комплекс mTOR залежить від доступності поживних речовин, тому його активність знижується через різні механізми виснаження енергії.
Харчування	-	Активація різними поживними речовинами, зокрема амінокислотами, сигналізацією інсуліну та факторів росту	-
Фізичні вправи			
Неактивний	Низька активність	Низька активність	-
Активний	Активація	Активація	Фізичні вправи активують сигналізацію як ERK, так і mTOR через підвищену експресію генів AMPK, CAMK4 та p38, що призводить до посилення росту клітин, доступності енергії з мітохондріального біогенезу в багатьох тканинах організму, включаючи нейрони та м'язи, а також до підвищення морфологічної пластичності м'язів та підвищення чутливості до інсуліну при діабеті та ожирінні.
Сон			
Позбавлений	Гальмування	-	Дефіцит сну знижує експресію сигнального шляху Ras-ERK, що призводить до порушення навчання та пам'яті, як це спостерігається при парасомніях, пов'язаних зі збільшенням пошуку нового.

Продовження таблиці 1

Безлімітний	Активація	-	Тривалість сну регулюється шляхом ERK шляхом впливу на експресію нейромодуляторів, залежних від активності, таких як норадреналін, під час неспання.

Паралельне еволюціонування емоцій, які є адаптаційною ознакою функціональної зміни вищих відділів центральної нервової системи, впливало на фундаментальні життєві потреби з залучення вегетативної нервової системи, тим самим активуючи фізіологічну реактивность організму на подразники ендогенних та екзогенних факторів [202]. Залежно від типу вищої нервової діяльності, інтровертності або екстравертності, поведінкові реакції особистості та характерні їм реагування на ситуації, впливають на емоційну стабільність [195].

Спорідненена взаємодія різнопланових нейрогуморальних механізмів фізіологічних систем з формуванням та проявом рис особистості, вказує на зв'язки між нейромедіаторами та поведінковими реакціями (Рис. 2) [195].

Рис. 2. Вимірні теорії про емоції та базові емоції з моноаміновими нейромедіаторами [195].

У роботі вчених Jie Dong, Tingwei Xiao, Qiuyue Xu та ін., що розглядали зв'язок між рисами особистості, емоціями та нейромедіаторами, пов'язаними з тривожними рисами, встановлені кореляційні відповідності між волонтерами, що брали участь у досліджені. З точки зору рис особистості, особи з високим показником невротизму частіше відчували тривогу, ніж ті, хто мав низькі показники. Інтроверти відчували вищу тривожність, ніж екстраверти, що свідчить про кореляцію між тривожними рисами, невротизмом та інтроверсією. Вищезгадана робота перегукується з дослідженням Wickett, R. , Muhlert, N. та Niven, K., щодо впливу особистості на регуляцію міжособистісних емоцій у контексті психосоціального стресу, та висвітлює те, що екстраверти мали менший рівень тривожності, вказуючи на ефективніші аспекти адаптаційних процесів [203].

Модель поведінки, яка підпорядковувала такі риси особистості як, більш агресивна, конкурентна, ворожа, запальна, більша усвідомленість часу, постійна зацикленість на дедлайнах, нездатність розслабити, цинічність, вказуються на переважання процесів збудження над гальмуванням та значною силою нервових процесів. Таке співвідношення основних нервових процесів та поведінкових реакцій супроводжується значним ризиком проявів патофізіологічних процесів в діяльності серцево-судинної системи [204].

Різновид моделі поведінки, яка характеризується легкодумністю, більшим контролем над проявом негативних емоцій та зниженою активністю щодо заняття соціально-економічної ніші; такі складові моделі поведінки відповідає сильному, врівноваженому та інертному типу вищої нервової діяльності, що відбивається в значному зниженні проявів патофізіологічних процесів, які викликають ризики розвитку ішемічної хвороби серця (ІХС) [204].

Тип поведінки, який підпорядковує за собою негативну афективність та соціальну загальмованість, що викликана слабкістю нервових процесів та зниженим когнітивним функціонуванням; така конфігурація поведінкових реакцій є більш вразлива для стресових ситуацій, що пояснюється порушенням

гіпоталамо-гіпофізарно-надниркової осі, яка відіграє значну роль в етіопатогенезі ІХС [205, 206].

З вищевикладеного, слід зауважити про тісний зв'язок типів вищої нервової діяльності, поведінкових моделей, соціально-психологічних реакцій особистості та їх емоційного забарвлення мають генетичні підвалини соціальної поведінки. Основні нервові процеси, які формують тип та темперамент поведінки, мають кореляційну залежність від функціональної активності та чутливості гіпоталамо-гіпофізарно-надниркової осі. Нейрогуморальна регуляція фізіологічних та соціальних стрес-реакцій напряму має залежність від типу вищої нервової діяльності. Прояви адаптаційних реакцій стресових подразників впливають на декілька основних функціонально-фізіологічних систем організму, серед яких окреме місце посідає серцево-судинна система. Кардіоваскулярний апарат забезпечує формування генералізованих стрес-реакцій, при цьому відчуває на собі негативний зворотній зв'язок, що призводить до формування патофізіологічних процесів в діяльності серцево-судинної системи.

SECTION 5. ONCOLOGY

10.46299/ISG.2025.MONO.MED.2.5.1

5.1 Impact of environmental pollution with benzapyrenene on respiratory cancer incidence

The rapid improvement of modern industrial technologies and motor transport has led to significant qualitative and quantitative changes in the composition and volume of harmful emissions into the atmosphere. This has caused a constant impact on humans due to a number of harmful anthropogenic factors, including carcinogens, which can lead to the development of cancer [207]. The most important aspect is the presence of carcinogens from the class of polycyclic aromatic hydrocarbons, in particular their main representative – benzo[a]pyrene. This substance, which has the property of being a local carcinogen when inhaled, contributes to the development of malignant tumors, mainly in the respiratory organs. According to the conclusions of experts from the International Agency for Research on Cancer, oncopathology is one of the indicators of the ecological disadvantage of the territory: chemical carcinogenic factors of the environment, everyday life and production determine the development of almost 80% of all malignant tumors [208].

According to the Resolution of the Cabinet of Ministers of Ukraine No. 303, it is envisaged to revise the standards for the content of pollutants in atmospheric air due to changes in national and European Union legislation on limiting the content of pollutants in exhaust gases and the impact of physical factors of mobile sources of atmospheric air pollution. According to the classification of the International Agency for Research on Cancer, benzo[a]pyrene is considered a compound that is definitely carcinogenic to humans [209]. The presence of this substance in atmospheric air is considered by experts as one of the key indicators of aerogenic carcinogenic load on humans.

The materials of the work [207] established stable long-term pollution of atmospheric air in populated areas with carcinogens of priority classes: polycyclic aromatic hydrocarbons (benzo[a]pyrene), nitrosamines (nitrosodimethylamine and

nitrosodiethylamine), heavy metals (cadmium, chromium, nickel, lead), formaldehyde.

In the materials of work [210], the prospects for using radioelectronic devices to measure environmental pollution parameters are considered, and in work [211], a functional scheme of a gas analysis system for monitoring atmospheric air pollution is proposed, as well as its software implementation is performed.

The impact on humans of a number of harmful anthropogenic factors [212], including carcinogens, in particular benzo[a]pyrene, can lead to the development of diseases [213-220], including oncological ones [221-228].

In the article [229], it is stated that the most toxic substance (among pollutants of the first hazard class) is a representative of the class of polycyclic aromatic hydrocarbons – benzo[a]pyrene, which is capable of exerting carcinogenic, mutagenic and other negative effects on living organisms even in nanoquantities.

According to the Resolution of the Cabinet of Ministers of Ukraine No. 303, it is envisaged to revise the standards for the content of pollutants in atmospheric air due to changes in national legislation and the legislation of the European Union on limiting the content of pollutants in exhaust gases and the impact of physical factors of mobile sources of atmospheric air pollution. According to the classification of the International Agency for Research on Cancer, benzo[a]pyrene is considered a compound that is definitely carcinogenic to humans. The presence of this substance in atmospheric air is considered by experts as one of the key indicators of aerogenic carcinogenic load on humans.

In the article [230] an improved mathematical model of pollutant concentrations in the filtrate of municipal solid waste (MSW) landfills was proposed, and in the work [231] the mathematical model of specific energy consumption for cleaning MSW landfill soils from heavy metal contamination was improved. In the materials of work [232], a regression hyperbolic dependence of the concentration of benzo[a]pyrene in the soils of the MSW landfill on the measurement depth was determined, with the help of which it was determined that the dangerous depth of chemical contamination of the soils of the MSW landfill with benzo[a]pyrene is 152 mm. In the materials of the article [233], a regression dependence of the concentration of petroleum products in the soils

on the distance to the MSW landfill was proposed, which made it possible to determine that the safe distance for the placement of MSW landfills from agricultural lands in terms of the level of chemical contamination of soils with petroleum products is 66 m. In the work [234], a regression dependence of the concentration of lead in the soils on the distance to the MSW landfill was determined, with the help of which it was determined that the distance from the MSW landfill at which soil contamination with lead does not exceed the background level (the boundary of the weak contamination zone) is 526 m. The scheme of the meter for the concentration of explosive gases in the air is proposed in the scientific work [235].

The materials of the scientific article [236] are devoted to determining the regression power dependences of the prevalence of diseases of different classes in the adult population of settlements adjacent to the place of MSW removal from the distance to the landfill, which are used to determine the safe distance of MSW landfills from settlements based on the prevalence of diseases of the circulatory system and respiratory pathologies.

The author of the article [237] proposed a methodology for engineering calculations that can be used during a practical lesson "Research on environmental pollution by municipal solid waste and calculation of machine and equipment parameters to minimize negative impact on it" in the discipline of life safety, which will contribute to the deepening of knowledge on environmental protection of future specialists [238-244].

The results of modeling the specific energy consumption of cleaning soils of municipal solid waste landfills from heavy metal contamination are given in the article [245], and the determination of energy consumption for cleaning soils around MSW landfills from heavy metal contamination is published in the paper [246].

The dependence of the level of bacteriological soil contamination on the distance to the municipal MSW landfill is determined in the article [247].

Table 1 shows the concentrations of benzo[a]pyrene in the soils of the Mykolaiv MSW landfill (Velyaka Korenykha village, Mykolaiv region) [248], supplemented by the results of research [229].

Table 1.

Benzo[a]pyrene concentrations in MSW landfill soils [248, 229]

Measurement depth, cm	2.5	12.5	60	150
Concentration of benzo[a]pyrene $C_{20}H_{12}$ in soil, mg/kg	0.05645	0.03246	0.0059	0.005
Literary source	[229]	[229]	[248]	[248]

Table 2 shows the incidence rates of respiratory cancer in the population of Kyiv for different concentrations of benzo[a]pyrene in ambient air [207].

Table 2.

Incidence rates of respiratory cancer in the population of Kyiv for different concentrations of benzo[a]pyrene in ambient air [207]

Concentration of benzo[a]pyrene $C_{20}H_{12}$ in atmospheric air, ng/m^3	1.99	2.65	2.82	3.00	3.09	3.18
Prevalence of respiratory cancer per 100 thousand population	24.5	28.5	34.4	26.5	26.2	35.7
Concentration of benzo[a]pyrene $C_{20}H_{12}$ in atmospheric air, ng/m^3	3.57	3.79	3.97	4.10	4.81	
Prevalence of respiratory cancer per 100 thousand population	30.8	31.6	31.8	37.7	38.1	

The regression data were carried out on the basis of linearization transformations, which allow reducing the nonlinear dependence to a linear one. The coefficients of the regression equations were determined by the least squares method using the developed computer program "RegAnaliz", which is protected by a certificate of copyright registration for the work [249], and is described in detail in the works [250, 251].

The computer program "RegAnaliz" allows for regression analysis of the results of single-factor experiments and other pairwise dependencies with the selection of the best type of function from the 16 most common options according to the criterion of the maximum correlation coefficient with saving the results in MS Excel and Bitmap format.

The results of the regression analysis are given in Table. 3, where the cells with the maximum value of the correlation coefficient R are marked in gray.

Table 3

Results of regression analysis of the impact of environmental pollution with benzapyrene on the incidence of respiratory cancer

No.	Type of regression	Correlation coefficient R	
		$C_{C_{20}H_{12}} = f(h)$	$P_{RC} = f(C_{BP})$
1	y = a + bx	0.79876	0.73041
2	y = 1 / (a + bx)	0.90309	0.73504
3	y = a + b / x	0.93210	0.70527
4	y = x / (a + bx)	0.96806	0.78037
5	$y = ab^x$	0.86158	0.73327
6	$y = ae^{bx}$	0.86158	0.73327
7	$y = a \cdot 10^{bx}$	0.86158	0.73327
8	$y = 1 / (a + be^{-x})$	0.61791	0.71440
9	$y = ax^b$	0.96975	0.73349
10	y = a + b·lg x	0.96081	0.72412
11	y = a + b·ln x	0.96081	0.72412
12	y = a / (b + x)	0.90309	0.73504
13	y = ax / (b + x)	0.74575	0.73572
14	$y = ae^{b/x}$	0.82869	0.72088
15	$y = a \cdot 10^{b/x}$	0.82869	0.72088
16	$y = a + bx^n$	0.65155	0.72544

herefore, according to the results of the regression analysis based on the data in Tables 1 and 2, the following regression dependencies were finally accepted as the most adequate [232, 252]:

$$C_{C_{20}H_{12}} = 0.1187h^{-0.6542} \text{ [mg/kg]}; \quad (1)$$

$$P_{RC} = \frac{C_{BP}}{0.04961 + 0.01694\, C_{BP}} \text{ [cases per 100 thousand people]}, \quad (2)$$

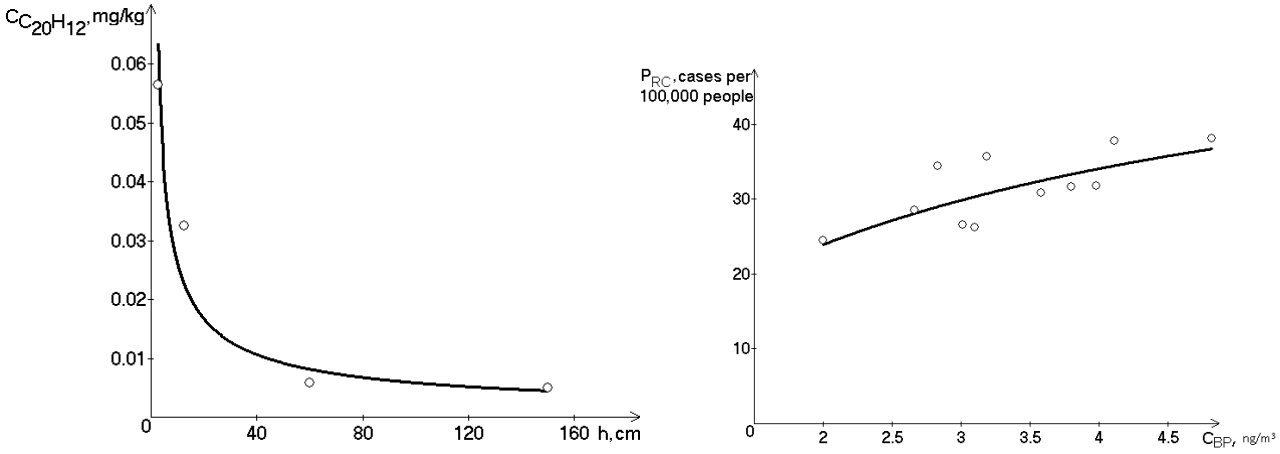
where $C_{C_{20}H_{12}}$ – concentration of benzo[a]pyrene $C_{20}H_{12}$ in soil, mg/kg;

h – measurement depth, cm.

P_{RC} – prevalence of respiratory cancer in the population, cases per 100 thousand people;

C_{BP} – concentration of benzo[a]pyrene $C_{20}H_{12}$ in atmospheric air, ng/m^3.

Figure 1 shows the actual and theoretical graphical dependences of the impact of environmental pollution with benzapyrene on the incidence of respiratory cancer.



a) b)

Figure 1. The impact of environmental pollution with benzapyrene on the incidence of respiratory cancer: actual ○, theoretical — a) $C_{C_{20}H_{12}} = f(h)$, b) $P_{RC} = f(C_{BP})$

Comparison of actual and theoretical data showed that the theoretical impact of environmental pollution with benzapyrene on the incidence of respiratory cancer, calculated using the obtained regression equations (1, 2), does not significantly differ from the data given in the works [229, 248, 207], which confirms the previously determined sufficient accuracy of the obtained dependencies.

It is shown that the concentration of benzapyrene in the soils of the MSW landfill decreases according to a power dependence with increasing measurement depth, and the prevalence of respiratory cancer in the population increases with increasing concentration of benzapyrene in atmospheric air according to a hyperbolic dependence.

Thus, regression dependencies have been determined that describe the impact of environmental pollution with benzapyrene on the incidence of respiratory cancer, which can be used to predict the indicators of such incidence.

SECTION 6. ORGANIZATION OF PHARMACEUTICAL BUSINESS

10.46299/ISG.2025.MONO.MED.2.6.1

6.1 Psychological aspects of the occurence and impact of conflict on the image of pharmaceutical companies

Conflicts are an integral part of the life of any labor collective and organization as a whole. They arise as a result of differences in views, values, interests and goals of various participants in labor relations. In today's conditions of high competition, stress and constant changes in the business environment, the issue of effective conflict management is becoming increasingly relevant to ensure the productivity and psychological well-being of employees, especially in today's conditions during martial law in Ukraine. Pharmaceutical workers are on the front line of protecting the health of citizens of the country both during the Covid-19 pandemic and during the enemy's aggression against our Motherland. Understanding the psychological aspects of the emergence of conflicts and their impact on the development of labor relations is of critical importance for creating a healthy working environment and achieving organizational goals. It should be noted that we paid special attention to intra-organizational conflicts.

Research shows that conflicts in the work team can be both destructive and constructive [253]. On the one hand, unresolved conflicts lead to tension, poor communication, reduced motivation and productivity, and increased staff turnover. On the other hand, properly managed conflicts stimulate innovation, reveal hidden problems, contribute to the personal and professional growth of employees, and strengthen team spirit through joint overcoming of difficulties. Thus, the key factor is not the avoidance of conflicts, but the development of competencies for their constructive resolution [253].

Psychological aspects of conflicts in the collective of a pharmaceutical enterprise cover a wide range of phenomena: from individual characteristics of perception and response to conflict situations to group dynamics and organizational contexts. Particular attention is paid to the mechanisms of formation of conflict situations, the

role of emotional intelligence in their management, the influence of leadership styles on conflict behavior, as well as interpersonal and intergroup aspects of conflicts. Understanding these psychological mechanisms allows developing effective strategies for preventing and resolving conflicts, adapted to specific organizational conditions and needs. In today's rapidly changing business environment, where it is difficult to predict risks, the importance of an organizational culture that recognizes conflict as an integral part of development and uses it as a tool for positive change is growing. Research shows that organizations that implement a systemic approach to conflict management demonstrate higher rates of innovation, adaptability and productivity compared to those where conflicts are perceived exclusively as a negative phenomenon. Furthermore, the ability to effectively manage conflict is becoming an increasingly important competency for leaders and managers at all levels [253].

The aim of this work is a comprehensive study of the psychological aspects of the emergence and role of conflicts in the development of relations in the labor collective of a pharmaceutical enterprise. The work is aimed at identifying the main causes and mechanisms of the formation of conflict situations, analyzing their impact on individual and group productivity, as well as developing recommendations for taking into account the risks of occurrence and constructive management of conflicts to increase the efficiency of the functioning of labor collectives of pharmaceutical enterprises.

6.1.1. The concept and essence of conflict in the workplace, their typology and consequences

Conflict as a socio-psychological phenomenon is a clash of oppositely directed interests, positions, opinions or views of opponents or subjects of interaction. In the context of a work team, conflict acquires special significance, since it concerns the relationship between people who are united by common professional activities and organizational goals [253]. The specificity of conflicts in a work team is that they arise in the process of performing professional duties and affect not only interpersonal relationships, but also the efficiency of work and the image of the pharmaceutical

organization as a whole, whether it is a manufacturing industrial enterprise, an intermediary wholesale company or a pharmacy. Modern conflictology considers conflict not only as a destructive phenomenon, but also as a natural element of the development of social systems, including work teams. Conflict is an indicator of existing contradictions and an incentive to resolve them, which, under the condition of constructive management, can lead to positive transformations. This understanding of conflict is based on the dialectical concept, according to which development occurs through the emergence, exacerbation and resolution of contradictions.

Labor conflicts can be classified according to various criteria. According to the subjects of interaction, they are: intrapersonal (when a person experiences a contradiction between professional requirements and his own capabilities), interpersonal (between employees), between the individual and the group (conflict between an employee and the team or part of it), intergroup (between structural units of the organization). According to functionality, constructive and destructive conflicts are distinguished, according to the method of resolution - antagonistic and compromise, according to duration - short-term, long-term and protracted.

Psychological mechanisms of conflict in the work team are based on a complex of objective and subjective factors. Objective factors include organizational and managerial (imperfect organizational structure, unclear division of responsibilities, limited resources), socio-economic (uneven remuneration, unfair incentives) and technical and technological (unsatisfactory working conditions, imperfect technological processes). Subjective factors include individual psychological characteristics of participants (temperament, character, emotional stability), socio-psychological (management style, psychological climate, group norms) and communicative (violation of information flows, communication barriers) [254].

A special role in the emergence of conflicts is played by cognitive processes, in particular, the perception and assessment of the situation by participants. Inadequate attributions (attribution of negative intentions to the opponent), stereotyping (simplified categorical perception of people), egocentrism (inability to accept the point of view of another) can act as a conflict trigger. Cognitive dissonance, which occurs

when expectations do not match reality, also often becomes the basis for conflict interaction [254].

The emotional-volitional sphere significantly affects the dynamics of conflict situations. Negative emotional states (frustration, aggression, anxiety) reduce tolerance for disagreements and increase confrontation. At the same time, developed emotional intelligence and self-regulation skills contribute to more constructive conflict resolution. Studies show that employees with a high level of emotional intelligence demonstrate a greater ability to empathize, more effectively manage their own emotions and better resolve conflict situations [254].

The typology of conflicts in the professional pharmaceutical environment is characterized by significant diversity, which necessitates their classification according to various criteria. The following types of conflicts can be distinguished by their content:

Organizational-technological conflicts arise due to imperfect labor organization, unclear distribution of functional responsibilities, problems in technological processes or interaction of different departments [255].

Socio-economic conflicts are related to issues of resource allocation, wages, social guarantees and preferences. Such conflicts are especially aggravated in conditions of economic instability or when introducing new reward systems [255].

Socio-psychological conflicts are caused by personal differences of employees, mismatch of individual values, communication styles, as well as group dynamics and formation of coalitions [255].

Administrative and managerial conflicts at pharmaceutical enterprises arise in the process of implementing managerial functions, in particular when making decisions, exercising control, applying sanctions.

By the direction of influence, conflicts are divided into horizontal (between employees of the same level), vertical (between managers and subordinates) and mixed. According to the criterion of clarity, open (manifested in overt confrontation) and hidden (latent) conflicts are distinguished, which are characterized by hidden opposition without overt conflict actions [255].

Of particular note are the innovative conflicts that arise in the process of implementing changes and innovations, which are inevitable in pharmaceutical enterprises. Such conflicts reflect the contradictions between the need for development and the desire for stability, between different approaches to the implementation of innovations [255].

The psychological consequences of conflicts for the individual and the team are extremely positive when they are resolved correctly. The individual gains experience, and the company continues its activities by receiving the necessary resources.

However, conflicts in the work team have various psychological consequences, both negative and positive. The negative consequences include: psycho-emotional tension, stress, decreased performance, deterioration of the socio-psychological climate, destruction of interpersonal relationships, formation of negative attitudes towards opponents. Long-term unresolved conflicts can lead to professional burnout, psychosomatic disorders, destructive personality changes.

At the same time, constructively resolved conflicts contribute to personal and professional growth, stimulate innovative processes, prevent stagnation and formalism, increase team cohesion through the experience of jointly overcoming difficulties. Conflict can serve as a "safety valve", allowing you to identify and relieve accumulated tension, articulate hidden problems and find ways to solve them.

Of particular importance is the impact of conflicts on organizational culture. The style of conflict resolution in an organization forms certain norms and values regarding acceptable ways of resolving contradictions. Organizations with a developed culture of conflict resolution consider conflict as a tool for development and improvement, create conditions for open discussion of problems and implement mechanisms for constructive resolution of contradictions.

The psychological prerequisites for the emergence of conflicts are preceded by the psychological and emotional state of employees and the culture of behavior at the pharmaceutical enterprise as a component of the image of the organization.

The psychological nature of conflicts in the work environment is deep and related to the fundamental features of the human psyche and social interaction. The

emergence of conflict situations is determined by the interaction of external working conditions and internal psychological factors. According to modern researchers, the individual psychological characteristics of employees form a kind of "perception matrix" through which organizational events are interpreted and acquire an emotional coloring. Such features are temperament, character, attitudes, values, motivation, self-esteem and the level of demands [256].

The basic psychological needs of the individual play a special role in the emergence of conflicts. According to the theory of self-determination of R. Ryan and E. Deci, a person has three fundamental psychological needs: autonomy (the desire to be the subject of his own life), competence (the desire to interact effectively with the environment) and relatedness with other people (the need for meaningful relationships). Frustration of these needs in the work environment becomes a powerful source of internal tension and conflict. For example, excessive control from management causes the need for autonomy, insufficient recognition of achievements - the need for competence, and a competitive environment can prevent the satisfaction of the need for relatedness [257].

Cognitive mechanisms also play a significant role in the formation of conflict situations. Selective perception, cognitive distortions, stereotypes and prejudices affect the interpretation of other people's actions and the formation of appropriate reactions. Thus, the fundamental attribution error (the tendency to explain other people's behavior by their personal traits, and one's own by situational factors) often leads to inadequate interpretations of the intentions of colleagues and management. Cognitive dissonance occurs when there is a discrepancy between expectations and reality, causing psychological discomfort, which can manifest itself in conflict behavior.

The emotional sphere is one of the key factors determining the nature of conflict interaction in the work team. Emotions are not only a reaction to a conflict situation, but also an important component of its development and regulation. Negative emotional states (anger, fear, resentment, envy) increase the subjective significance of contradictions, reduce the ability to rationally analyze the situation, and contribute to the formation of destructive behavioral habits. Of particular importance is the

phenomenon of emotional contagion, which increases emotional tension in the team and can lead to conflict escalation. Emotional intelligence, as the ability to recognize, understand, and manage one's own emotions and other people's emotions, becomes an important regulator of conflict interaction. Studies show that leaders with a high level of emotional intelligence demonstrate greater effectiveness in resolving conflicts and maintaining a favorable psychological climate in the team [258].

Volitional qualities of the personality (self-control, perseverance, determination) also significantly affect the course of conflicts. The ability to self-regulate in tense emotional situations allows you to avoid impulsive reactions, maintain a constructive orientation of interaction. At the same time, volitional deficits can manifest themselves both in excessive aggressiveness and in avoiding conflicts, which prevents effective problem solving.

Professional burnout syndrome, which is characterized by emotional exhaustion, depersonalization and reduction of personal achievements, often becomes a factor in increased conflict in the work team. Emotional exhaustion reduces tolerance to frustration, makes a person more vulnerable to stress, worsens communication skills, which together creates a favorable basis for the emergence of conflicts [259].

Individual typological characteristics significantly affect the tendency to conflicts and the specificity of conflict behavior. Temperament as a biologically determined characteristic determines the dynamic features of mental activity: intensity, speed, pace and rhythm of mental processes. Workers with different types of temperament demonstrate different reactions to conflict situations: cholerics are prone to violent emotional reactions and impulsive actions, melancholics - to deep experiences and avoidance of confrontation, sanguine - to rapid changes in emotional states and flexibility of behavior, phlegmatics - to restraint and inertness.

Character as an individual combination of stable mental characteristics determines typical ways of responding to life situations, including conflicts. Character accentuations (excessive strengthening of individual traits) can pose an increased risk of conflict. For example, individuals with a demonstrative accentuation are prone to manipulation and provocation, with a pedantic one - to excessive pickiness, with a

stuck one - to resentment and vindictiveness, with an exalted one - to violent emotional reactions [260].

A significant influence on conflict behavior is exerted by the features of self-esteem and the level of demands. Inadequately overestimated or underestimated self-esteem, a discrepancy between self-esteem and the assessment of others, a discrepancy between the level of demands and real capabilities - all these factors increase the likelihood of conflicts. Employees with overestimated self-esteem often demonstrate criticism of others, low tolerance for comments, and a desire to dominate. Individuals with low self-esteem tend to be overly sensitive to criticism, suspicious, and hurtful. Locus of control—the tendency for a person to attribute responsibility for events in their lives to external factors (external locus) or to their own efforts (internal locus)—also influences conflict behavior. Externals are more likely to blame others for problems, which can exacerbate conflicts, while internals are more likely to seek constructive solutions and take responsibility for their own actions [261].

Conflicts in the work team are formed not only under the influence of individual psychological characteristics of employees, but also socio-psychological processes of group dynamics. The socio-psychological climate of the team, as an integral characteristic of the system of interpersonal relationships, creates a general emotional background against which conflicts unfold. An unfavorable climate, characterized by tension, distrust, alienation, becomes a catalyst for conflict situations.

The status-role structure of the team is an important factor in the emergence of conflicts. The inconsistency of formal (officially fixed in the organizational structure) and informal (actually existing in interpersonal relationships) statuses leads to contradictions and tension. Role conflicts arise when different roles of one person are incompatible, the role does not correspond to the personal characteristics of the employee, the ambiguity of role expectations or role overload.

Group cohesion and group norms also affect the conflict of the team. Too high cohesion can lead to groupthink - a tendency towards unanimity, which suppresses critical thinking and individuality. In such conditions, intra-group conflicts are suppressed, but the risk of intergroup confrontations increases. At the same time,

insufficient cohesion creates the basis for internal conflicts due to the lack of common values and goals [262].

The phenomenon of group polarization is manifested in the strengthening of the extremism of the initial attitudes of group members after group discussion. This can lead to the radicalization of positions in the conflict and complicate the search for compromise solutions. Intergroup hostility arises through mechanisms of categorization of "friends and strangers", the formation of negative stereotypes about another group, the processes of deindividualization and dehumanization of opponents.

Leadership and management style are of particular importance. An authoritarian style can suppress open conflicts, but contributes to the accumulation of hidden tension. A liberal style often leads to uncertainty and chaos, which generates conflicts. A democratic leadership style, which is based on employee participation in decision-making, creates conditions for the constructive resolution of contradictions [263].

6.1.2. Communication barriers as a source of conflict and their impact on the climate in the team and the image of the enterprise

Communicative processes play a decisive role in the emergence, development and resolution of conflicts in the labor collective of a pharmaceutical organization. Communicative barriers - obstacles that arise in the process of communication and lead to the loss or distortion of information - become a powerful source of misunderstandings and conflicts. There are several types of communicative barriers that affect the conflict-proneness of labor relations.

Physical barriers are associated with the organization of physical space and information transmission channels: inconvenient location of workplaces, noise, and technical failures in communication facilities. Semantic barriers arise due to different understandings of the meanings of words, the use of professional jargon, and the ambiguity of terms. This problem is especially acute in multicultural collectives, where employees may have different cultural and linguistic backgrounds.

Psychological barriers include prejudices, stereotypes, and attitudes that affect the perception of messages. The halo effect (spreading a general impression of a person

to the assessment of their individual qualities), the primacy effect (the advantage of the first impression), the novelty effect (the advantage of the latest information) distort the perception of information and can lead to unfounded conclusions and reactions [264].

Social barriers are associated with differences in social status, roles, values, and norms. In an organizational context, hierarchical barriers often prevent open communication between managers and subordinates. Cultural differences in communication styles, non-verbal signals, and politeness norms can cause misunderstandings and conflicts in multicultural teams.

Destructive communication patterns play a special role in the emergence of conflicts: criticism of the personality instead of behavior, accusations, generalizations ("you always...", "you never..."), imposing interpretations, interruptions, and ignoring. Such patterns not only exacerbate existing conflicts but also create new sources of tension [265].

The psychological climate of a work team is an integral characteristic of the system of interpersonal relations, reflecting the socio-psychological state of the team, the nature of the relationships between its members, the dominant mood, the level of satisfaction with the conditions and results of work. This is a complex socio-psychological phenomenon that is formed under the influence of many factors and, in turn, has a significant impact on the effectiveness of the organization's activities, the motivation of employees, their psychological well-being and professional development [266].

The structure of the psychological climate includes several interrelated components. The cognitive component reflects the knowledge and ideas of team members about each other, about the goals and objectives of joint activities, about organizational conditions. The emotional component is characterized by the prevailing emotional states, the level of empathy, the nature of interpersonal attraction. The behavioral component is manifested in specific actions and deeds, strategies of interaction, cooperation or confrontation.

Psychological climate can be considered at three levels: social (reflects social relations and socio-economic conditions of the team's life), collective-group

(characterizes the features of a given professional group and the specifics of joint activities) and interpersonal (determined by direct relations between team members). At each of these levels, conflicts can manifest themselves differently and have different consequences for the overall psychological climate [267]. A favorable psychological climate is characterized by trust, openness, mutual support, constructive criticism, consistency of actions, effective communication, a sense of security and belonging. In contrast, an unfavorable climate is manifested in tension, conflict, low levels of trust, formalism in relationships, misunderstandings, disintegration of the team, dissatisfaction with working conditions and interaction with colleagues.

Conflicts, especially long-term and intense ones, can significantly worsen the psychological climate of the team, negatively affecting all its components. The destructive impact of conflicts is manifested in several key aspects.

Disruption of communication processes is one of the most obvious consequences of conflicts. In a conflict situation, there is distortion of information, blocking of communication channels, spread of rumors and unreliable information, and an increase in the number of communication barriers. This leads to misinformation, misunderstandings, and making wrong decisions, which, in turn, increases conflict tension and forms a vicious circle of increasing destructive processes [268].

The destruction of the system of interpersonal relationships is manifested in the growth of distrust, hostility, and alienation between team members. Negative attitudes are formed towards opponents, which spread to the entire system of interactions. There is polarization of the team, the formation of groups and coalitions that are hostile to each other. This leads to a violation of group cohesion, deformation of the informal structure of the team, weakening of social ties.

Psycho-emotional tension accompanying conflicts negatively affects the psychological health of team members. Prolonged conflicts cause chronic stress, emotional exhaustion, and can lead to professional burnout and psychosomatic disorders. The dominance of negative emotions (anger, fear, resentment, anxiety) forms a general negative emotional background in the team, which significantly worsens the subjective perception of the working atmosphere.

Deformation of the value-orientational unity of the team is a particularly dangerous consequence of conflicts. Conflicts often exacerbate differences in values, goals, and ideas about the fairness and correctness of actions. This can lead to the loss of common guidelines, the erosion of group norms, and a decrease in identification with the team. In such a situation, individual interests begin to prevail over collective ones, which undermines the foundations of joint activity.

The decrease in the effectiveness of the team is manifested in the deterioration of coordination of actions, a decrease in the motivation and involvement of employees, a shift in attention from performing work tasks to conflict interaction. Conflicts are often accompanied by sabotage, hidden confrontation, and a decrease in the quality of work. This aspect of destructive influence has the most obvious negative consequences for the organization as a whole [269].

However, despite the predominantly negative perception of conflicts, they can perform important constructive functions in the formation and development of the psychological climate of the team. The constructive potential of conflicts is realized if they are effectively managed and the energy of confrontation is directed into a productive channel.

The diagnostic function of conflicts is to identify hidden contradictions, problem areas, and dysfunctions in the structure and dynamics of the team. Conflict acts as a kind of "symptom", signaling the presence of problems that need to be resolved. Timely identification of such problems allows prevention of more serious negative consequences in the future. Conflict allows the parties to articulate their positions, make their interests and expectations clear, which creates the basis for constructive dialogue [270].

The integrative function is realized through the strengthening of group cohesion and solidarity in the process of jointly overcoming the conflict situation. A successfully resolved conflict creates an experience of constructive interaction in difficult situations, builds confidence in the ability of team to overcome difficulties. Collective experience and overcoming crisis situations can significantly enhance the feeling of unity and mutual support, especially if it requires joint efforts and mutual concessions.

The stabilization function is manifested in reducing the level of tension in relationships after a constructive resolution of the conflict. The conflict acts as a kind of "valve" for the release of accumulated negative energy, which allows you to avoid more destructive forms of its manifestation. Open discussion of problems and contradictions during conflict interaction contributes to their awareness and taking adequate measures, which, in turn, prevents the emergence of similar situations in the future [271].

The innovative function of conflicts is to stimulate change and development of the team. Conflict disrupts stability, which can be perceived negatively, but this destabilization is often a necessary condition for renewal and improvement. In the process of conflict, new ideas, approaches, and problem solutions are generated, which contributes to the development of the creative potential of the team. Conflict forces you to review established norms, procedures, and methods of interaction, which can lead to their optimization and greater compliance with the needs of the team.

The communicative and informational function is implemented through the intensification of information exchange in the process of conflict interaction. During the conflict, the positions, interests, and values of the parties are clarified, which enriches the understanding of the situation and creates the basis for deeper mutual understanding. Successful conflict resolution is often accompanied by the improvement of communicative processes, the development of active listening skills, and communication, which has long-term positive consequences for the psychological climate of the team.

Conflicts act as a powerful catalyst for changes in the system of interpersonal relations of the work team. The nature of these changes can be both negative and positive, depending on many factors, including the specifics of the conflict situation, the personal characteristics of the participants, the style of conflict management, and the organizational context.

The transformation of interpersonal relationships in the process of conflict interaction occurs at several levels. At the cognitive level, the participants' perceptions of each other change, and the qualities and intentions of opponents are reevaluated.

These changes can be both negative (formation of negative stereotypes, simplification of the opponent's image) and positive (deeper understanding of the other person's personality, their motives and values). A special role is played by the phenomenon of attribution - attributing the causes of behavior, which, under the influence of emotions accompanying the conflict, often leads to a distortion of reality. At the emotional level, changes occur in the emotional attitude towards opponents. The conflict can both exacerbate negative emotions (anger, resentment, contempt), and, when resolved constructively, contribute to the formation of positive emotional ties (respect, empathy, trust). An especially important aspect is the emotional "memory" of the conflict - the tendency to preserve the emotional experience of conflict interaction, which affects future relationships. Positive experience of conflict resolution creates an emotional basis for constructive interaction in the future.

At the behavioral level, new patterns of interaction are formed, which can be consolidated and transformed into sustainable strategies of interpersonal relationships. Successful conflict resolution is often accompanied by the development of skills of constructive communication, cooperation, and finding mutually beneficial solutions. In contrast, destructive experience of conflict interaction can lead to the consolidation of protective mechanisms, avoidance of contact, and aggressive reactions [272].

Special attention deserves the processes of group dynamics that unfold in conflict conditions. In a work team, conflicts often lead to a restructuring of the informal structure of the group, changes in statuses and roles, and the formation of new coalitions and groups. This process can both destroy established ties and contribute to the formation of a more effective team structure that better meets current tasks and conditions of activity.

An important aspect of the transformation of interpersonal relationships is the change in the norms of interaction in the team. Conflicts often act as a factor in revising established rules and norms that regulate interaction. As a result, new, more effective norms can be formed that take into account the interests of different parties and better meet the needs of the team.

A manager at a pharmaceutical enterprise or organization plays a key role in forming a constructive approach to conflicts and their positive impact on the psychological climate of the team. Effective conflict management by management involves not so much avoiding or suppressing them, but directing the energy of the conflict in a constructive direction and using the potential of conflict situations for the development of the team. Leadership style largely determines the general approach to conflicts in the organization. An authoritarian style often leads to the suppression of open conflicts, which can create the illusion of well-being, but contributes to the accumulation of hidden tension. A liberal style is characterized by minimal intervention in conflicts, which can lead to their uncontrolled development. A democratic style, which involves the participation of employees in decision-making and open discussion of problems, creates the most favorable conditions for constructive conflict resolution.

The competence of a manager in the field of conflict management includes several key aspects. Diagnostic competence involves the ability to timely detect conflict situations, correctly identify their causes, dynamics and potential consequences. Procedural competence is the ability to choose adequate methods and strategies for managing a conflict depending on its specifics. Communicative competence includes the skills of effective communication, active listening, assertiveness, mediation, which are necessary for constructive conflict resolution.

A manager can perform various roles in conflict management: an arbitrator (when making decisions on the subject of the conflict), a mediator (when helping the parties to find a solution on their own), a consultant (when providing recommendations for resolving the conflict), a participant (when being a direct party to the conflict). Each of these roles requires specific competencies and approaches [273].

Of particular importance is the ability of the manager to create a system for preventing destructive conflicts through the formation of a favorable psychological climate, the development of an organizational culture that values diversity of opinions and approaches, the improvement of motivation and performance evaluation systems, ensuring transparency and fairness in the distribution of resources, and the

establishment of effective communications. The manager also plays a key role in the formation of the conflict culture of the team - a system of values, norms, knowledge and skills that determine a constructive attitude to conflicts and ways to resolve them. This involves training employees in the basics of conflictology, developing skills for constructive conflict resolution, and creating an atmosphere of openness and trust in which conflicts are perceived not as a threat, but as an opportunity for development [274].

6.1.3. Strategies and tactics of conflict management. Methods of diagnosis and correction of psychological climate in conflict conditions

Effective management of the impact of conflicts on the psychological climate of the team involves systematic diagnostics and targeted correction of problematic aspects. Comprehensive diagnostics of the psychological climate in conflict conditions includes the study of several key aspects.

The assessment of the level of conflict in the team is carried out through the analysis of the frequency, intensity and duration of conflicts, their impact on work processes and interpersonal relationships. Methods of observation, documentation analysis, surveying, sociometry are used. Particular attention is paid to identifying "chronic" conflicts and conflict zones that are systemic in nature.

The study of the socio-psychological climate involves the assessment of its main characteristics: the level of employee satisfaction with various aspects of work, team cohesion, the nature of interpersonal relationships, the level of trust, the presence or absence of an atmosphere of mutual support. Specialized methods are used, such as "Assessment of the psychological atmosphere in the team" (A.F. Fiedler), "Determination of the group cohesion index" (K.E. Sishore), "Express method for diagnosing the socio-psychological climate" (O.S. Mykhalyuk, A.Yu. Shalito), and others [275].

Analysis of behavioral styles in conflicts that dominate the team allows you to identify typical patterns of response to conflict situations. Such methods are used as the Thomas-Kilman test for determining the behavioral style in a conflict situation, the

questionnaire "Strategies for overcoming conflict situations" (D. Johnson, F. Johnson), the method for diagnosing a person's tendency to conflict behavior (E.I. Ilyin), and others.

Based on the results of the diagnosis, psychological climate correction programs are developed aimed at minimizing the destructive consequences of conflicts and strengthening their constructive potential. The main correction methods include:

- Socio-psychological training – aimed at developing skills in constructive conflict resolution, effective communication, and emotional self-regulation. Various training technologies are used: role-playing games, conflict modeling, group discussions, and case analysis. Training allows not only to acquire new skills, but also to transform attitudes toward conflicts and form a constructive attitude toward them.

- Individual and group counseling – on conflict interaction. Individual counseling helps employees understand their own conflict behavior strategies, their effectiveness, and possible alternatives. Group counseling is aimed at resolving specific conflict situations and improving interaction between departments or team members.

- Conflict mediation is a structured process in which a neutral third party (mediator) helps conflicting parties reach a mutually acceptable solution. Mediation is especially effective in cases of intense interpersonal conflicts that cannot be resolved by other methods. It allows not only to find a solution to a specific problem, but also to restore constructive relations between the parties.

- Organizational measures - aimed at optimizing the conditions of activity and interaction: improving the organizational structure, clear distribution of responsibilities and powers, developing fair evaluation and reward systems, improving information exchange, creating effective feedback mechanisms and resolving claims.

- Formation of a conflict culture of the team - through training and educational work. This may include conducting lectures, seminars, workshops on the psychology of conflict, distributing information materials, implementing corporate standards for constructive conflict resolution.

A special role in correcting the psychological climate is played by team-building measures aimed at strengthening team cohesion, forming common values and goals, and developing cooperation skills. Such activities, especially if they are held outside the work environment, allow team members to interact in new conditions, which helps to overcome negative stereotypes and form a more positive perception of each other [276-278].

Conflicts in the work team are an integral part of organizational life. They can arise for various reasons: from resource allocation to personal contradictions between employees. However, it is important to understand that effective conflict management can turn potentially destructive situations into opportunities for development and innovation. In this section, we will consider the main strategies and tactics of conflict management that can be applied in modern organizations.

Conflict management in the work team should be based on understanding the nature of the conflict and applying appropriate approaches to its resolution. Classical approaches to conflict management, developed by K. Thomas and R. Kilmann, include five main strategies: competition, accommodation, avoidance, compromise and cooperation. Each of these strategies can be effective depending on the situation and nature of the conflict [279].

The strategy of competition (or rivalry) is characterized by a high focus on one's own interests and low attention to the interests of other parties. This approach may be appropriate in situations that require quick and decisive action, especially when the decision is unpopular. However, excessive use of this strategy can lead to a deterioration in interpersonal relationships and a decrease in the level of trust in the team.

The adaptation strategy involves a low focus on one’s own interests and a high focus on satisfying the interests of other parties. This approach can be useful for maintaining harmonious relationships, especially when the issue is not critically important to one of the parties. However, constant adaptation can lead to dissatisfaction with one’s own needs and the accumulation of negative emotions.

The avoidance strategy is characterized by a low focus on both one's own interests and the interests of others. This approach may be appropriate when the potential negative consequences of confrontation exceed the possible benefits of resolving the conflict, or when it is necessary to collect additional information before making a decision. However, prolonged avoidance can lead to an escalation of the conflict and a worsening of the situation [280].

The compromise strategy involves a moderate attention to both one's own interests and the interests of the other parties. This approach is often seen as a "golden mean" and can be effective when the parties have equal power and mutually exclusive goals. However, compromise does not always provide the optimal solution, as both parties must give up something.

The collaboration strategy is characterized by a high attention to both one's own interests and the interests of the other parties. This approach is aimed at finding a solution that fully satisfies the needs of all parties involved. Although this strategy is often considered the most effective, it requires significant time, energy, and a willingness to openly discuss the problem.

Research shows that the most effective managers are able to flexibly apply different strategies depending on the context and nature of the conflict. They also understand that the choice of strategy should take into account not only the current situation, but also the long-term consequences for interpersonal relationships and organizational culture [281].

Modern approaches to conflict management go beyond classical strategies and include innovative methods and tools aimed at systemic resolution of conflict situations. One such approach is mediation, a structured process in which a neutral third party helps the conflicting parties reach a mutually acceptable solution. Mediation is especially effective in cases where the parties cannot reach an agreement on their own due to a high level of emotional tension or the complexity of the problem [282]. Another important tool is the facilitation of group processes, which allows you to structure the discussion of complex issues and ensure the constructive participation of all interested parties. The facilitator does not offer his own solutions, but creates

conditions for effective dialogue and joint decision-making. This approach is especially valuable when resolving conflicts in teams and work groups.

In modern organizations, preventive conflict management methods are also gaining popularity, aimed at creating an organizational culture that minimizes the occurrence of destructive conflicts. These methods include the development of clear procedures and policies that regulate potentially conflictual issues, such as resource allocation, performance evaluation, and career advancement [283].

Technological advances also affect conflict management methods. Online dispute resolution (ODR) platforms allow for conflict resolution asynchronously and remotely, which is especially relevant in the context of the growth of remote work. These platforms can include tools for structured discussion of problems, joint generation of solutions, and monitoring the implementation of agreements [284].

An important aspect of modern conflict management is also the development of emotional intelligence among employees and managers. The ability to understand and regulate one's own emotions, as well as recognize the emotions of others, is key to effective conflict resolution. Organizations are investing in emotional intelligence training to increase the ability of staff to respond constructively to conflict situations.

A systemic approach to conflict management involves analyzing the organization as a single system, where conflicts can arise at different levels and between different subsystems. This approach allows you to identify systemic causes of conflicts and develop comprehensive strategies for overcoming them. For example, conflicts between departments can be a symptom of an ineffective organizational structure or processes, and their resolution may require systemic changes.

The leader plays a key role in the process of managing conflicts in the workforce. His position and actions can both exacerbate and constructively resolve a conflict situation. An effective leader must have a set of specific competencies that allow them not only to respond to conflicts, but also to prevent their occurrence and use them as a tool for the development of the organization.

One of the main functions of a manager is to diagnose conflicts at the early stages of their development. The ability to recognize signs of tension in relations between

employees allows you to take preventive measures before the situation turns into open confrontation. To do this, the manager needs to maintain open channels of communication and create an atmosphere of trust in which employees are not afraid to express their problems and concerns [285].

An important aspect of the manager's activity is also the formation of conflict-logical competence of the staff. This includes teaching employees constructive ways to resolve disagreements, developing active listening and effective communication skills, as well as the ability to recognize and manage their own emotions in conflict situations. Research shows that organizations with a high level of conflict-logical competence of the staff demonstrate better performance and innovation.

Leadership style also significantly affects the nature of conflicts in the team. An authoritarian style can lead to the suppression of open expression of disagreements, which creates the appearance of the absence of conflicts, but in fact leads to their transition to a hidden form. On the other hand, a democratic leadership style, which encourages the free expression of opinions and participation in decision-making, creates conditions for constructive conflict resolution. The leader also acts as a moderator in resolving conflicts between subordinates. In this role, it is important to remain neutral and objective, not taking sides with any of the conflict participants. Effective moderation involves creating a structured process for discussing the problem, ensuring equal opportunities for expressing different points of view, and focusing on finding a mutually beneficial solution.

No less important is the ability of a manager to transform conflicts into a source of development and innovation. Constructive disagreements can stimulate critical thinking, promote a comprehensive analysis of problems, and generate new ideas. The task of a manager is to create conditions in which the conflict does not turn into a personal confrontation, but remains in the plane of constructive discussion of work issues.

Regular reflection and analysis of conflict situations is also an important practice for a manager. This allows you to identify systemic problems that may be a source of recurring conflicts, and take measures to eliminate them. This approach turns reactive

conflict management into proactive improvement of organizational processes and structures [286].

A modern work team is a complex social system, where conflicts arise as a natural element of interaction between people with different goals, values and interests. At the same time, excessive conflict can destroy a team and reduce the effectiveness of an organization, and the lack of constructive approaches to resolving contradictions often leads to the accumulation of negative emotions and destructive manifestations. Therefore, the development and implementation of psychological technologies for preventing and resolving conflicts in the work team is one of the priority tasks of modern management and organizational psychology.

Conflict prevention is a system of psychological methods and techniques aimed at preventing destructive conflicts by eliminating or minimizing the causes of their occurrence. Effective preventive work allows you to create a psychologically comfortable microclimate in the team and increase labor productivity while maintaining a constructive diversity of opinions and approaches.

One of the basic components of conflict prevention is the development of a corporate culture that promotes constructive interaction. This includes the formation of common values, the development of clear norms of behavior, and the creation of traditions that unite the team. Studies show that organizations with a strong corporate culture focused on cooperation and mutual respect demonstrate a significantly lower level of destructive conflict [287].

An important area of preventive work is also the optimization of the organizational structure and processes. A clear distribution of responsibilities, transparent performance evaluation criteria, a fair reward system - all this reduces the likelihood of conflicts associated with organizational factors. As L.M. Karamushka notes, it is the imperfection of organizational processes that often becomes a source of chronic conflicts that are difficult to overcome without systemic changes.

Psychological selection of personnel also plays a significant role in conflict prevention. Taking into account not only professional qualities, but also the psychological compatibility of candidates with the existing team allows you to form

teams that are able to interact effectively even in stressful situations. It is worth noting that excessive homogeneity of the team can lead to group thinking and reduced creativity, so the optimal balance is between psychological compatibility and diversity of approaches and views.

Development of communicative competence of personnel is one of the most effective methods of conflict prevention. Training in effective communication, active listening, and assertive behavior allows employees to express their needs and interests in a constructive way without provoking conflicts. Particular attention should be paid to feedback skills, since incorrectly given criticism often becomes a trigger for interpersonal conflicts.

In our opinion, an important aspect of conflict prevention, which is often underestimated, is the creation of a psychologically safe environment in the team. When employees feel that they can freely express their opinions without fear of negative consequences, many potential conflicts are resolved at the initial stage through open dialogue. Psychological safety also contributes to innovation and creativity, since people are not afraid to offer non-standard ideas and approaches.

Developing emotional intelligence in employees and managers is another effective area of preventive work. The ability to understand one's own emotions and the emotions of other people, manage one's emotional states, and build harmonious relationships significantly reduces the likelihood of an emotionally charged confrontation. Research by D. Goleman demonstrates that the level of emotional intelligence of a team is directly correlated with its ability to constructively resolve disagreements and conflict situations [288].

Regular monitoring of the socio-psychological climate in the team allows you to identify potential conflict zones before they develop into open conflicts. This can be done through anonymous surveys, individual consultations, group feedback sessions. It is important to create communication channels through which employees can safely report emerging problems.

Leadership style plays a special role in conflict prevention. Studies show that transformational leadership, which is characterized by an individual approach to

employees, intellectual stimulation and inspiring motivation, contributes to the formation of constructive relationships in the team and a decrease in the level of destructive conflict.

The implementation of a stress management system is also an important component of conflict prevention. High levels of stress reduce tolerance for frustration and increase the likelihood of aggressive reactions to differences in views or interests. Stress management programs can include training in relaxation, work-life balance, and time management.

In my opinion, Ukrainian organizations often do not pay enough attention to creating a space for informal communication between employees. Joint events, corporate holidays, team building - all this contributes to the formation of interpersonal relationships, which become a resource for constructive conflict resolution in the future. When people know each other not only as performers of certain professional functions, but also as individuals with their values and interests, it is easier for them to find a common language in difficult situations. Despite the effectiveness of preventive measures, it is impossible and even undesirable to completely avoid conflicts in the work team, since constructive conflicts are a source of development and innovation. Therefore, it is important to equip managers and employees with effective psychological conflict resolution technologies that allow transforming potentially destructive situations into opportunities for growth.

One of the most universal approaches to conflict resolution is mediation, a structured process in which a neutral third party helps the conflicting parties reach a mutually beneficial solution. The key principles of mediation are voluntariness, confidentiality, neutrality of the mediator, and decision-making by the conflicting parties themselves. Studies of the effectiveness of mediation in an organizational context demonstrate that this method allows for reaching sustainable agreements in 75-85% of cases [289].

The controlled dialogue technique is an effective tool for resolving conflicts associated with communication barriers. This method involves a structured exchange of information, in which each participant, before expressing his position, must

accurately retell the arguments of the other party. This allows you to overcome biases associated with selective perception of information and ensure mutual understanding.

The cognitive-behavioral approach to conflict resolution focuses on transforming destructive cognitive schemes that support conflict behavior. This includes identifying and correcting irrational beliefs, cognitive distortions, and automatic thoughts that escalate conflict. This approach is particularly effective for resolving chronic conflicts that have deep psychological roots [290].

The conflict mapping technique, developed by H. Cornelius and S. Fair, allows you to visualize the structure of the conflict, including the positions, interests, and needs of the parties, which greatly facilitates the search for mutually beneficial solutions. This method is especially valuable for resolving complex multi-sided conflicts where it is difficult to keep all aspects of the situation in view.

In my opinion, an important component of successful conflict resolution is the development of the ability to reframe - to change the interpretation of the situation. The ability to look at the conflict from different perspectives, to see opportunities in it, and not just threats, often becomes the key to breaking the deadlock. Reframing allows you to transform the energy of the conflict from destructive to constructive, turning the struggle into cooperation.

Nonviolent communication, developed by M. Rosenberg, is a powerful tool for resolving emotionally charged conflicts. This approach is based on four components: nonjudgmental observation, expression of feelings, articulation of needs, and formulation of specific requests. Nonviolent communication allows the parties to the conflict to establish an empathetic connection and find a solution that satisfies the basic needs of all participants [291].

The technique of "interest-based negotiation", developed within the framework of the Harvard Negotiation Project, focuses on identifying and satisfying the interests behind the parties' positions. The key principles of this approach are: separating people from the problem, focusing on interests rather than positions, generating mutually beneficial options, and using objective criteria. This method is particularly effective for resolving conflicts related to the distribution of resources and powers.

An interesting direction in the development of conflict resolution technologies is the integration of positive psychology methods. Focusing on the strengths of the conflict participants, their common values, and successful experience of cooperation creates a positive context for resolving disagreements. Research shows that positive emotions expand the cognitive repertoire and contribute to the creative search for solutions.

In our opinion, in the Ukrainian organizational context, the adaptation of Western psychotechnologies of conflict resolution to local cultural characteristics is especially important. Collectivism, high power distance, uncertainty avoidance – these and other cultural dimensions influence the effectiveness of different approaches to conflict resolution. For example, in teams with high power distance, mediation may be more effective if the mediator has a higher status than the conflict participants.

A systemic approach to conflict resolution involves the analysis and transformation of the organizational context in which conflicts arise. This may include changing the structure of communication, reward systems, and decision-making procedures. Such an approach allows not only to resolve a specific conflict, but also to prevent similar situations from occurring in the future.

The implementation of psychotechnologies for conflict resolution in an organization should be systematic and consistent. This includes diagnosing typical conflicts, selecting relevant methods, training personnel, pilot implementation, assessing effectiveness, and adjusting approaches. It is important that the selected technologies are integrated into the overall human resources management system and organizational culture [292].

The future of psychotechnologies for resolving conflicts in work groups is associated with the development of digital tools that will allow scaling effective approaches and adapting them to the specifics of remote work and virtual teams. Online platforms for mediation, systems for diagnosing and predicting conflicts based on communication analysis, and tools for facilitating virtual negotiations are already emerging.

6.1.4. Conclusions

In the process of studying the psychological aspects of conflicts in the work team, it was found that conflicts are an integral element of interpersonal interaction in the organizational environment. They not only pose a threat of destructive influence on the psychological climate of the team, but can also become an important catalyst for positive changes if they are managed correctly.

Conflicts in the work environment arise under the influence of both objective (organizational-structural, economic, technical) and subjective (psychological, socio-psychological, cognitive) factors. A significant role in this process is played by emotional regulation, communication barriers, leadership styles, as well as individual characteristics of employees, in particular their temperament, character, level of self-esteem and locus of control.

The analysis showed that constructive conflict management helps to identify hidden problems, improve communication, strengthen team cohesion and stimulate innovation. At the same time, unresolved or suppressed conflicts lead to emotional burnout, stress, destructive interpersonal relationships and reduced productivity.

One of the key factors in preventing the destructive consequences of conflicts is the formation of a constructive conflict culture, which involves open dialogue, respect for alternative points of view, the ability to negotiate and make compromise decisions. The role of the manager in this process is extremely important. He not only organizes the process of resolving conflicts, but also forms the appropriate values and norms in the team.

Special attention should be paid to conflict prevention. Effective tools in this context are socio-psychological training, the development of emotional intelligence, the creation of a psychologically safe environment, as well as the introduction of mediation and facilitation techniques. Practice shows that a systematic approach to conflict management allows not only to avoid a crisis, but also to transform the conflict into a resource for the development of both the individual and the organization.

In conclusion, it can be noted that conflicts, being an inevitable social phenomenon, are not necessarily a threat. Their outcome depends on the chosen

response strategy, the level of psychological competence of the participants, and the ability of management to constructively manage. That is why an important task of a modern organization is not only the effective resolution of conflicts, but also the formation of an appropriate environment in which such situations are viewed as opportunities for personal and team growth.

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