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ENHANCING WORKPLACE PRODUCTIVITY AND HEALTH: THE IMPACT OF PREVENTIVE MEDICAL SCREENING FOR EMPLOYEES IN BULGARIA

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ABSTRACT
Purpose of this study is to outline the importance of regular preventive medical examinations of employees for prevention and health promotion, to improve productivity in the workplace.
Materials and methods. Literature data, regulatory documents and the experience from the activities of the LOT-CONSULT Occupational Health Service were used.
Results. The most common health problems detected during preventive examinations are: musculoskeletal problems, cardiovascular diseases, respiratory problems, mental and emotional problems. Preventive examinations contribute to the prevention of diseases and occupational accidents, reducing occupational risks, adapting the work environment to the needs of workers, improving productivity and reducing sickness absence, and others.
Conclusions. Integrating preventive examinations and the motivation for their regular implementation into the culture of healthy and safe working conditions is key to improving employee health and productivity in the workplace. The formation of clear policies for prevention and health screening, as well as the awareness and motivation of employees create an overall healthy work environment.

Keywords: preventive examinations, occupational health service, safe and healthy working conditions, preventive programs at the workplace

INTRODUCTION
The regular examinations of workers are a key factor in ensuring healthy and safe working conditions as an obligation of employers [1,2] and as part of the National Strategy for Health and Safety at Work (2022-2024) [3] with a range of different tests and biomarkers depending on the risk. The mandatory periodic medical examinations of the workers are carried out with a view to diagnosing early forms of diseases and revealing risk factors for the occurrence of widespread, socially significant and occupational diseases [2,4].

MATERIALS AND METHODS
Regulatory documents, literary data and results achieved from the practical experience of the LOT-CONSULT Occupational Health Service are used.

RESULTS
Regular preventive examinations contribute to the occupational safety and health of workers by helping to:
Preventing diseases and accidents through early detection of health problems caused or complicated by specific working conditions. For example, for workers exposed to extreme heat, screenings can help detect cardiovascular problems that could be exacerbated by high temperatures.
Reducing the risks associated with occupational diseases by diagnosing occupational diseases at an early stage or identifying health problems related to toxic environments (e.g. in heavy industry, chemical and pharmaceutical industries).

Adapting the work environment to the needs of workers by changing work schedules or adding appropriate safety measures to provide additional protection and adequate measures for individuals with specific health needs.

Improving productivity and reducing sick leaves. Healthy employees have greater commitment to work and a lower risk of accidents.

The main health problems most often detected during preventive examinations are:

Musculoskeletal problems – when working with repetitive physical movements or in awkward postures (e.g. in construction, industry and transport sectors). The early detection and the recommendations for ergonomic adjustments as well as the use of appropriate work chairs and tables, can significantly reduce pain and sickness absence, which increases employee productivity and comfort.

Cardiovascular disease: High blood pressure, elevated cholesterol, and other cardiovascular risk factors are common in employees working under stress or in physically demanding conditions. Early detection and recommendations for improved nutrition and physical activity can prevent more serious health problems, such as heart attack or stroke, which reduces the likelihood of long-term absences and loss of productivity.

Respiratory problems: Workers in industries or in environments with exposure to dust and harmful chemicals are more susceptible to respiratory diseases. Detecting early signs of respiratory problems allows measures to be taken, such as improving ventilation, using protective masks and other protective equipment, which reduces morbidity and prevents long-term health damage.

Mental and emotional problems: Stress, anxiety and depression are common in work environments with high demands and tension. Prevention includes detecting early signs of emotional strain and providing psychological support to employees that increases their concentration and motivation at work.

A prerequisite for the effective conduct of preventive medical examinations is their good planning, coordination, and development of a schedule with the assistance of the Occupational Health Services [5]. There is an increasing need for employers and Occupational Health Services to conduct information campaigns and seminars to increase awareness, engagement, and motivation of employees regarding the benefits of regular examinations and the importance of preventing occupational diseases [6].

A good practice in Bulgaria is the provision of mobile health services, especially for large enterprises or workers in remote areas - examinations are performed on site, minimizing interruptions to the work process and providing flexible hours for examinations, including opportunities for visits outside of working hours.

DISCUSSION

The implementation of preventive examination programs in enterprises is a significant part of the activities of LOT-CONSULT. According to literature data [6,7] and our experience with companies from different economic sectors, a clearly expressed positive effect of preventive examinations on the health and safety of employees, as well as on workplace productivity, is established.

The specific results observed by our customers are:

1. Reduction of sick leaves, timely treatment or preventive measures taken that reduce the frequency of sick leaves. This is especially important in sectors where labour is intensive and the absence of key employees can slow down the production process.
2. Improvement of employee motivation and commitment; they feel more protected and confident that their well-being is a priority.
3. Improved productivity.
4. Reducing the risks of work accidents and occupational diseases, as specific preventive examinations allow to identify diseases and conditions that increase the risk of workplace accidents.

5. Creating a culture of prevention among workers – this is an important long-term result that makes employees more aware of their health and encourages safe behaviour in the workplace.
The data highlight the need to maintain and strengthen the Workers' Health and Safety Policy with an emphasis on surveillance aimed at promoting and protecting workers' health, based on the development of the epidemiological health profile and, consequently, the implementation of strategies for positive impact.
The results with our customers indicate a significant reduction in health and safety risks, as well as higher employee satisfaction and loyalty. The systematic implementation of these programs helps build sustainable work practices that lead to better financial and organizational results.
The recommendations for employers are:
To create clear policies and schedules for preventive examinations that cover all employees, adapting to their individual specifics and to the risks of the different workplaces.
To actively inform their employees about the benefits of regular medical examinations, e.g. through workplace health and safety campaigns, internal communication channels, presentations and workshops. These actions build a culture of prevention in which employees recognize the benefits of prevention.

CONCLUSIONS

Integrating preventive examinations as part of a healthy and safe workplace culture is key to improving employee health and workplace productivity.
Medical surveillance of workers and preventive examinations should be part of a broader health and safety strategy, operating in the context of a comprehensive occupational health program that also includes safety training measures, regular training and stress prevention, and providing motivation and incentives to create an overall healthy work environment.

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RELATIONSHIP OF PHYSICAL ACTIVITY LEVEL TO DEGREE OF OVERWEIGHT IN INDIVIDUALS WITH SARCOPENIC OBESITY

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ABSTRACT
A sedentary lifestyle stands as the fourth leading cause of death due to chronic non-communicable diseases. The **purpose** of the study is to evaluate the level of physical activity and its correlation with the degree of overweight in individuals with sarcopenic obesity.
Materials and Methods: The sample of 109 men and 155 women aged 19–60 years with normal weight, overweight, and obesity is not representative of the city of Sofia. Anthropometric indicators are employed to evaluate nutritional status, and the "Tanita BC 420 MA" professional apparatus is used to determine body composition. The International Physical Activity Questionnaire (IPAQ) is implemented to assess the physical activity intensity and sitting time of study subjects.
Results: People with a normal BMI spend more time sitting (7.40±2.61 hours/day) than overweight and obese individuals (6.78±3.35 hours/day). Overweight and obese people show a higher percentage (81.3%) of low physical activity than normal-weight people (76.4%); however, the difference is not statistically significant.
Conclusion: The studied groups of people with normal, overweight, and obese BMI have found no statistically significant differences in their levels of physical activity.

Keywords: physical activity, overweight, sarcopenic obesity

INTRODUCTION
A sedentary lifestyle is the fourth leading cause of mortality from chronic noncommunicable diseases with about 5.3 million avoidable deaths annually. It increases physical incapacity, lowers healthy life expectancy by 8–10 years, doubles obesity risk compared to moderate physical activity, and prolongs hospital admissions by 38%, etc. [1]. Physical activity plays a crucial role in lifestyle modification interventions aimed at preventing and losing weight, as well as maintaining positive outcomes [2]. Moderate physical activity helps reduce weight, but the level, kind, and intensity impact obesity symptoms like weight loss, non-weight-related body composition changes, active muscle mass increases, and better muscular strength and function [3].

THE PURPOSE of the study is to evaluate the physical activity level and the relationship with the degree of overweight in people with sarcopenic obesity.

MATERIALS AND METHODS The sample, which is not representative of the city of Sofia, includes 109 men and 155 women aged 19–60 years, with 72 having a normal BMI of 18.5–24.9 kg/m^2, 65 overweight (BMI 25.0–29.9 kg/m^2), and 127 obese (BMI above 30.0 kg/m^2). Nutritional status has been measured using anthropometrics. The "Tanita BC 420 MA" device has determined body composition and distribution. All study subjects have been assessed applying the IPAQ to evaluate their physical activity and sitting time. In addition to the time spent sitting, the total physical activity of participants has been quantified in MET minutes per week (1 MET minute represents the amount of energy the human body expends at rest for 1 minute, depending on the intensity of physical activity).

RESULTS
The sample averaged 158.13±523.47 minutes per week of moderate physical activity, meeting the minimal requirement of 150 minutes per week. Participants walked an average of 69.94 ± 91.08 minutes per day, above the recommended 45–60 minutes of moderate physical activity (e.g., walking). Participants sit an average of 6.95±3.17 hours daily.
Overall, 79.9% of study participants are inactive. Compared to men (73.4%), women (84.5%) exercise less. Men show a much higher relative proportion of average physical activity (26.6%) compared to women (15.5%).

Table 1 compares study participants with normal BMI (18.5–24.9 kg/m^2) and overweight (BMI > 25.0 kg/m^2). Average values of vigorous and moderate physical activity duration, sitting time, daily walking minutes, and days with at least 10 minutes of walking are assessed.

Table 1. Average values of days/hours/minutes in intensive/moderate physical activities and sitting; minutes spent in walking on a day while walking; and days with at least 10-minute walking of the studied group—differentiated by BMI.

INDICATOR	**Normal weight (BMI=18.5–24.9 kg/m^2) n= 72**		**Overweight and obesity (BMI > 25.0 kg/m^2) n= 192**		**P**
	$\overline{X}$	**SD**	$\overline{X}$	**SD**	
Vigorous physical activity (days)	1.39	1.97	1.06	1.63	0.285
Vigorous physical activity (minutes)	46.39	88.26	41.69	77.11	0.342
Moderate physical activity (days)	1.47	2.19	0.99	1.84	0.055
Moderate physical activity (minutes)	42.78	95.68	42.58	107.17	0.161
Moderate physical activity (minutes per week)	150,83	372.49	160.86	570.71	0.135
Days when there is at least 10-minute walking	**5.67**	2.15	4.74	2.68	**0.013**
Minutes spent walking on days when walking occurred	70.56	82.39	69.71	94.35	0.643
Hours spent sitting	7.40	2.61	6.78	3.35	0.321
Minutes spent sitting	444.17	156.55	407.50	201.01	0.338

The analysis of the results shows that participants with normal BMI spend more time sitting (7.40±2.61 hours/day) than those with overweight and obesity (6.78±3.35 hours/day).

Table 2. Percentage distribution of participants categorised by BMI and physical activity level

Physical activity level	**Statistics**	**Normal weight**	**Overweight and obesity**	**P**
Low	n	55.0	156.0	0.392
	%	76.4	81.3	
Medium	n	17.0	36.0	
	%	23.6	18.8	

BMI does not significantly affect physical activity levels in the study groups. Overweight and obese people have a greater percentage (81.3%) of low physical activity than those with normal body weight (76.4%); however, this difference is not statistically significant (Table 2).

DISCUSSION

IPAQ is an easy, inexpensive method to collect internationally comparable data on health-related physical activity, incl. BMI and sex. A 2020 study of health risk factors among Bulgarians aged 25–64 years found that over 60% are insufficiently physically active during their leisure time [4, 5]. Low physical activity often coexists with hypertension, dyslipidaemia, obesity (14.7% of men and 12.3% of women), and other cardiometabolic diseases in most of the study individuals aged 25–64 years [5].

The CORE study in Ukraine, Kazakhstan, and Azerbaijan have found that overweight and obese people have more “low activity” IPAQ scores than “moderate” and “high” scores [6]. Inactivity rates in Ukraine are 12.4% for overweight persons and 5.2% for those with normal weight ($p < 0.001$). In Kazakhstan and Azerbaijan, overweight (including obese) people exercise less than normal-weight people (24.7% vs. 23.8% in Kazakhstan; 18.5% vs. 14.6% in Azerbaijan). Nonetheless, these differences do not attain statistical significance [6]. The current study shows

no significant difference in physical activity indicators between normal BMI and overweight or obese people [23.6% vs. 18.8%, (p = 0.392)].
A Spanish study of Colombian students finds that 26.47% have low physical activity levels (as measured by the IPAQ) [7]. A large Mexican research study discovers a correlation between decreased physical activity in adults and obesity, age (60–69 years), and high socioeconomic position [8]. Tehard et al. report that approximately one third of 757 obese men and women in their study are not adequately active [9].
The current study reveals a higher prevalence of physical inactivity than previous studies, but it is important to acknowledge that the IPAQ evaluates participants' self-reported physical activity. Therefore, people living with overweight or obesity may interpret "vigorous" or "moderate" activity differently compared to normal-weight people. They may walk slower or cover shorter distances yet report higher physical activity than those with a normal BMI. BMI and physical activity level should be better correlated in future research using objective assessment methods like watches/bracelets or other devices with real-time activity tracking.

CONCLUSION

IPAQ can be used to measure physical activity in young and middle-aged people with varying BMIs to assess the risk of low or absent physical activity and take steps to raise it. In the long run, this prevents sarcopenia, overweight, and sarcopenic obesity, as well as cardiometabolic, respiratory, and other disorders.

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DYNAMICS IN THE STRUCTURE AND MAIN EPIDEMIOLOGICAL INDICATORS OF INFECTIOUS INCIDENCE IN BULGARIA

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ABSTRACT

Purpose. A retrospective analysis of the distribution and structure of infection diseases (ID) (excluding Covid-19, AIDS and sexually transmitted infections) for the period from 2013 to 2023.

Material and Methods. Official statistical data from state institutions - National Statistical Institute, National Center for Public Health and Analysis, Regional Health Inspections and other accessible (available) data were used.

Results. The total morbidity of ID varied over the years with no specific trend, with the highest rates in 2013 at 932.65 end 2016 - at 856.65/100,000, the lowest - in 2021 (172.8/100,000), after which there is a rapid increase in 2022 (440.7/100,000) and even more pronounced in 2023 - 685.3/100,000 population. The highest relative share are cases of chicken pox, followed by scarlet fever and viral hepatitis. Diphtheria, poliomyelitis, typhoid and anthrax were not registered during the analyzed years, only a case of tetanus was registered in 2016.

Conclusion. There are dynamic changes in the frequency of the considered infectious diseases, caused by various hygienic and social factors related to reluctance and refusal of vaccination, non-compliance with the necessary anti-epidemic measures, as well as lack of habits among the population for regular preventive examinations and for timely seeking of medical help. A complex impact of factors that arose and acted in the development of the COVID-19 epidemic is also established.

Key words: prevalence, morbidity from infectious diseases.

INTRODUCTION

The data on communicable diseases subject to mandatory reporting/registration in accordance with ***Ordinance No. 21 on the procedure for reporting and registration of communicable diseases*** [1], have been reviewed and analyzed. According to the Ordinance, a Quick Notification is sent for a case of a sick person (possible, probable or confirmed case), carrier or deceased from a infection diseases is important to avoid false positive, false negative results, asymptomatic course or omission of cases.

MATERIALS AND METHODS

A retrospective analysis of the general and nosological morbidity of CD municable diseases subject to mandatory reporting in Bulgaria (excluding Covid 19, AIDS and sexually transmitted infections) was carried out in the period from 2013 to 2023. Official statistical data from state institutions were used [2-7], based on the annual reports prepared on the basis of the Quick Notifications of diseases with a definitive diagnosis. **Statistical analyses -** IBM SPSS Software version 21 (New York, USA statistical package. Variation analysis were used. A p-value $P<0.5$ (<0.001) was considered statistically significant.

RESULTS

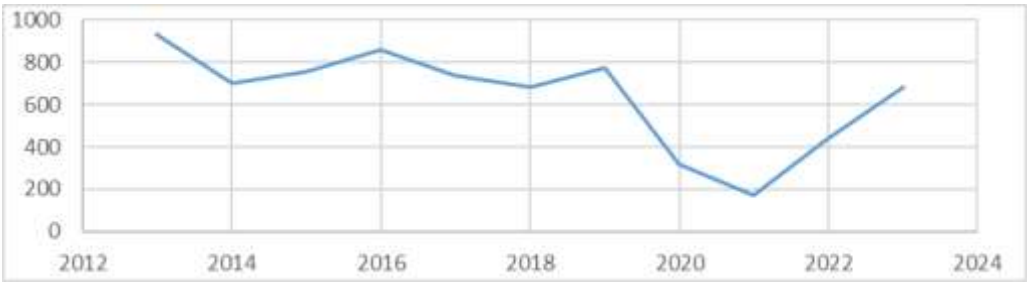
The total incidence of notifiable communicable diseases has varied over the years without a specific trend, with the highest levels in 2013 and 2016, the lowest - in 2020 and 2021 (Table 1).

Table 1. Morbidity from infectious diseases in Bulgaria (2013 – 2023)

	Number diseased	Morbidity per 100,000
2013	67 916	932,65
2014	50 800	701,11
2015	54 471	756,31
2016	61 283	856,65
2017	52 393	737,74
2018	48 092	682,15
2019	54 397	777,10
2020	22 261	320,23
2021	11 956	172,86
2022	19826	440,76
2023	30 827	685,30

Morbidity dynamics - since 2013 there has been a variation at a relatively constant level, with a sharp decline in 2020 and 2021, followed by a rapid increase in 2022 and even more pronounced in 2023, but without reaching the highest levels since the beginning of the analyzed period (Fig. 1).

Fig. 1. Dynamics of the incidence of infectious diseases per 100,000 inhabitants by year



In the structure of infectious morbidity, the cases with the highest relative share are varicella, followed by scarlet fever and viral hepatitis. Diphtheria, poliomyelitis, typhoid fever and anthrax were not registered in the analyzed years, a case of tetanus was registered only in 2016. The remaining diseases have different frequencies over the years (Table 2) [6,7].

Table 2. Structure of infectious morbidity in Bulgaria 2013 – 2023 (per 100,000 inhabitants)

		2013	***2014***	***2015***	***2016***	***2017***	***2018***	***2019***	***2020***	***2021***	***2022***	***2023***
1.	***Diphtheria***	-	-	-	-	-	-	-	-	-	-	-
2.	***Scarlet fever***	57,9	53,5	69,9	67,6	52,1	54,5	44,3	14,6	2,7	16,5	18,5
3.	***Measles***	0,2	0,0	0,0	0,0	2,4	0,2	17,5	3,9	0,0	0,0	0,0
4.	***Pertussis***	1,2	0,7	0,5	1,4	1,6	1,6	1,0	0,4	0,0	0,3	0,3
5.	***Rubella***	0,1	0,1	0,1	0,0	-	0,0	0,0	0,0	0,0	0,0	0,0
6.	***Varicella***	530, 2	316, 2	345, 0	455, 6	353, 4	339, 9	439, 1	176, 9	94,7	411, 3	484, 2
7.	***Mumps***	0,4	0,4	0,3	0,3	0,2	0,4	0,7	0,2	0,2	0,2	0,2
8.	***Meningococcal meningitis and sepsis***	0,2	0,2	0,2	0,2	0,1	0,1	0,2	0,1	0,0	0,0	0,0
9.	***Poliomyelitis***	0,3	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1	***Q fever***	0,3	0,2	0,3	0,3	0,4	0,7	0,6	1,5	0,5	0,2	0,8

0.												
11.	***Crimean hemorrhagic fever***	0,1	0,1	0,1	0,1	0,0	0,1	0,0	0,0	0,0	0,0	0,0
12.	***Lyme disease***	5,2	5,6	6,5	4,1	5,7	8,5	5,4	2,3	0,7	1,3	3,0
13.	***Malaria[1)]***	0,1	0,1	0,2	0,4	0,1	0,1	0,1	0,1	0,1	0,1	0,2
14.	***Typhoid/Paratyphoid***	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
15.	***Dysentery***	6,7	7,1	5,7	4,1	4,4	3,3	3,2	0,7	0,4	0,8	1,2
16.	***Viral Hepatitis***	34,1	16,9	23,1	30,4	44,3	28,0	32,2	24,0	13,9	9,8	12,1
17.	***Anthrax***	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
18.	***Leptospirosis***	0,1	0,6	0,2	0,2	0,1	0,2	0,1	0,0	0,1	0,1	0,0
19.	***Tetanus***	0,0	0,0	0,0	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0
20.	***Bacterial Meningitis***	1,7	1,6	1,5	1,6	1,8	1,4	1,4	0,6	0,3	0,8	1,4
21.	***Viral Meningitis and Meningoencephalitis***	3,2	3,2	2,5	2,8	2,2	2,3	2,8	1,0	0,6	0,8	1,4

[1)] All cases are imported from abroad

DISCUSSION

The resuts show the impact of pandemic in 2020 and 2021, dominance of Covid-19 cases and the complex impact of factors that arose and acted in the development of the pandemic. During this period, in addition to the strong invasion of the new virus and its antagonism with other seasonal viruses, there was an increased degree of personal and public hygiene, disinfection, greatly reduced social contacts, isolation of people, immunizations.

The type and spread of infectious diseases in modern times can be attributed to the influence of a number of factors called "determinants" [8], such as increased share of elderly people and risk of complications after suffering from infectious diseases; significant migration and a lot of international travel, greater urbanization and crowding of many people in one place are prerequisites for the circulation of various infectious agents and a higher epidemic risk.

Ecological and climatic changes towards global warming alter the structure and increase the infectious diseases typical for warm climates. Technological improvements are leading to a decrease in some diseases (such as cholera) but also to an increase in others (Legionnaires' disease).

Modern food production methods and the global food market can lead to large outbreaks of enteric infections that are difficult to control because food products are transported around the world and sometimes stored for long periods of time [9].

Lifestyle and some harmful habits can also play a key role in the development of infectious diseases such as hepatitis (drug abuse), intestinal infections (diet and behavior, poor hygiene)[10], and smoking, alcohol use and obesity facilitate infection and worsen the course of infectious diseases. Understanding the determinants of a disease is very important in determining the best way to prevent and control it. The means available to detect and prevent epidemic

outbreaks are getting better, but it is a challenge to ensure their sufficient and effective use. Is important that some socially significant diseases such as cancer, ulcers, etc. may be etiologically related to infectious agents [10], which determines the great importance of prevention in infectious diseases.

CONCLUSION

The main challenges in infectious diseases are increasing prevention, active use of early detection methods, increasing the role of public health care. Among the Bulgarian population, negative attitudes towards immunizations are spreading, whereby many infections are increasing (measles, mumps, etc.), and together with the increased exchange of tourists, the use of antibiotics and the subsequent resistance of microorganisms otherwise eliminated infectious diseases may appear or "return" and threaten much of the progress made so far in terms of eradicating or reducing infectious morbidity.

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BENEFITS OF IMPLEMENTING AND MAINTAINING A HEALTH AND SAFETY MANAGEMENT SYSTEM AT WORK

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Abstract
The health and safety management system according to the ISO 45001:2018 standard allows any organization to manage occupational health and safety risks and improve its performance in this area. The aim of this study is to evaluate the impact of implementing the Health and Safety Management System (ISO 45001:2018) in a Bulgarian port by analyzing the temporary incapacity of workers in high-risk jobs over an 11-year retrospective period. The observation involves 1,700 port workers. The results showed that after implementing ISO 45001:2018, there was a significant drop in negative health indicators in 2018 compared to 2008. The total number of sick leave cases has decreased. There's also a recorded reduction in the number of days lost due to illness, as well as a lower incidence of workers experiencing temporary incapacity due to illness. The introduction of ISO 45001:2018 provides improved health and safety outcomes for port workers.

Keywords: Occupational Health and Safety Management System, ISO 45001:2018 Standard, health indicators, temporary incapacity for work, port workers.

INTRODUCTION

Implementing an Occupational Health and Safety Management System (OHSMS) based on the ISO 45001:2018 standard is a key step for organizations looking to minimize risks for their workers. Despite the benefits, the process can come with a number of challenges, especially in high-risk work environments. Some of these challenges are related to risk assessment, which requires a thorough understanding of the specific hazards associated with work activities and the use of adequate risk analysis methodologies. The need to instill a culture of proactive safety management may demand time and significant effort. Introducing new procedures and changes to work organization can disrupt existing processes and create stress among employees. There's often resistance to change from workers who are accustomed to certain practices. High-risk professions require specialized training programs, which can be costly and time-consuming.

Regardless of the stated obstacles, the Occupational Health and Safety Management System (OHSMS) based on the ISO 45001:2018 standard provides organizations with a framework for managing risks and opportunities related to occupational health and safety (OHS) by implementing a health and safety management system. The ultimate goal of the OHSMS is to prevent work-related injuries and illnesses, improve working conditions, and ensure safe and healthy workplaces. The OHSMS enables the organization to manage its OHS-related risks and enhance its performance [1].

Implementing a health and safety standard is linked to reducing sick leaves, decreasing workplace injuries, providing a better working environment, improving reputation, and gaining a competitive edge to attract the best workforce.

OBJECTIVE

Assessment of the impact of implementing and maintaining a Health and Safety Management System (ISO 45001:2018) through analyzing temporary incapacity to work among employees in high-risk jobs at a port over an 11-year retrospective period.

MATERIALS AND METHODS:

The subject of observation is 1,700 workers, of which 1,000 hold high-risk positions: 12-hour shifts, night work, set targets, manual labor with heavy loads, unfavorable microclimate, noise,

dust, and chemical agents, with over 10 years of work experience, operating at the two largest port terminals in Bulgaria and on the external border of the European Union [2,3,4,5]. The source of information is hospital records. Indicators of temporary incapacity for work, relative share indicators, and frequency distribution indicators have been used – intensity per 100 workers, and extensiveness per 100 sick workers [6].

RESULTS AND DISCUSSION

The largest port in Bulgaria has implemented a Health and Safety System (ISO 45001:2018). After assessing risks related to jobs and technological processes, measures were taken to eliminate, limit, and reduce those risks. The procedures introduced to mitigate heavy physical labor include the implementation of technical tools, mechanization of processes, use of assistive devices, training in "best practices for manual handling of weights," purchasing new cranes and forklifts, and introducing a physiological work and rest regime. Various procedures and programs have been developed and implemented to enhance the skills of workers, for the proper use and maintenance of personal protective equipment, promoting health, and training for managing workplace stress among employees.

The analysis of the data from the study shows that after the targeted and scientifically grounded implementation of the Occupational Health and Safety System, there has been a decrease over the specified retrospective period in: the frequency of employees with illnesses leading to temporary incapacity by 23%, the frequency of cases of temporary incapacity by 42%, and the frequency of lost workdays by 45%. The rate of frequently and long-term ill individuals in the organization has been reduced by 57% over 11 years. (Table 1).

In the structure of temporary morbidity, the highest share is among people over 45 (over 60%), which calls for dynamic monitoring and looking for connections with the working conditions of those employed in high-risk jobs.

Table 1. Indicators characterizing the health of port workers

Indicators characterizing the health of port workers	**2008**	**2018**
Frequency of people with illness with temporary disability	48.89	39.87
Frequency of cases of temporary disability	106.98	75.43
Frequency of days lost with temporary disability	1147.26	791.38
Average duration of a case with temporary disability	10.72	10.49
Frequency of workers with incidence of permanent disability	2.07	2.39
The proportion of often and long-suffering workers	14.88	9.46

The introduced procedures aimed at limiting heavy physical labor have significantly reduced the incidence of temporary disability related to the musculoskeletal system by 88% and to the nervous system by 45% (Figure 1).

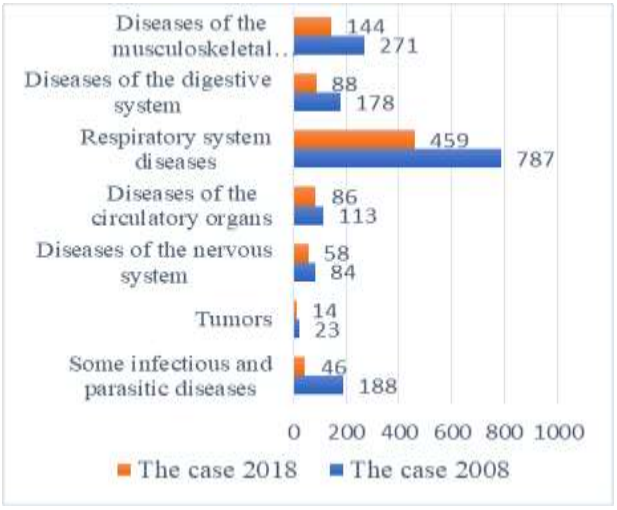

Figure 1. Number of cases of temporary incapacity for work – comparison for 2008 and 2018

The class "Diseases of the musculoskeletal system and connective tissue," along with the class "Diseases of the nervous system," accounts for the highest share of days lost to illness during the study period (Figure 2).

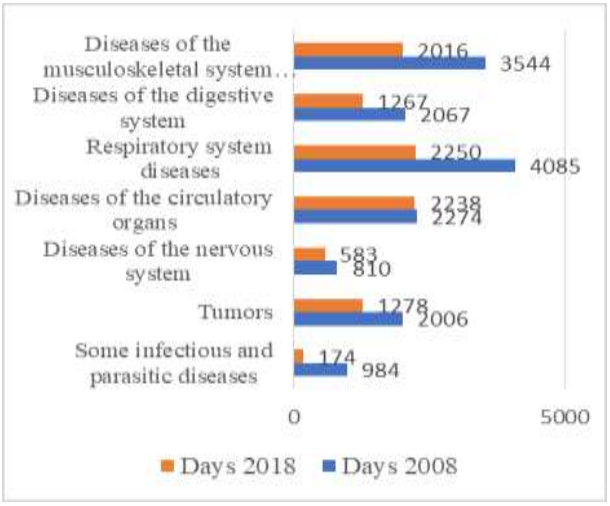

Figure 2. Number of days lost to work due to illnesses with temporary incapacity for work – comparison for 2008 and 2018

CONCLUSION

After implementing ISO 45001:2018, a significant improvement in the health indicators of the workers in the studied organization was observed. The various procedures and programs developed and implemented under this standard have a direct positive effect on health and safety and allow the organization to better protect its workers and manage OH&S risks [1].

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NECESSITY AND APPLICABILITY OF SPECIALIZED SOCIAL SERVICES FOR CANCER PATIENTS

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ABSTRACT

Purpose. Analyze the need and importance of the implementation of specialized social services in the implementation of care for patients with oncological diseases.

Materials and methods. 65 professionals providing social services and support to cancer patients in oncology wards were surveyed, answering questions assessing the type and applicability of these services.

Results. A priority aspect for social work with oncological patients is "care for social relationships", followed by help for "restoring the reduced quality of life", with an important share being taken by the restoration of "patients' working relationships" and "social isolation", which can be both a "result of such a diagnosis" and a "main feature of oncological diseases." The most preferred form of social work with patients is "group discussions of the social aspects of the disease" and "individual conversations with patients", the involvement of relatives is also important. The respondents rate the impact of specialized social services on the disease as high and very high, positive, but their scope and accessibility are still insufficient.

Conclusion: Specialized social services for cancer patients have the greatest impact on social skills to overcome the negative consequences of the disease, significantly greater opportunity to quickly return and be included in work and social life, but the planning and organization of services needs optimization with a focus on social problems of oncological patients throughout the period of the treatment and after it.

Key words: cancers, social services for cancer patients.

INTRODUCTION

Cancer patients have various psycho-social problems - anxiety, depression, social isolation, difficulty coping in everyday and work environments. Experience significant emotional and psychosocial distress during illness, treatment and follow-up care, and also as long-term survivors [1]. Counseling services and specialized social support (assistance) are needed for cancer patients and their families at all stages of the disease [2].

The purpose of the study is to establish and analyze some basic elements such as the need, importance and implementation of social services for cancer patients.

MATERIALS AND METHODS

65 specialists providing social services to persons with oncological diseases were surveyed. The questions are related to the presence of psycho-social problems in cancer patients, the need for social services, the type and quality of services offered.

Statistical analyses - IBM SPSS Software version 21 (New York, USA statistical package). Variation analysis were used. A p-value $P<0.5$ (<0.001) was considered statistically significant.

RESULTS:

Social aspects of illness and priorities in patient care are presented in fig. 1. The relationship between the presence of oncological disease and social isolation - Fig. 2

Fig. 1 Social aspects of illness and priorities in patient care

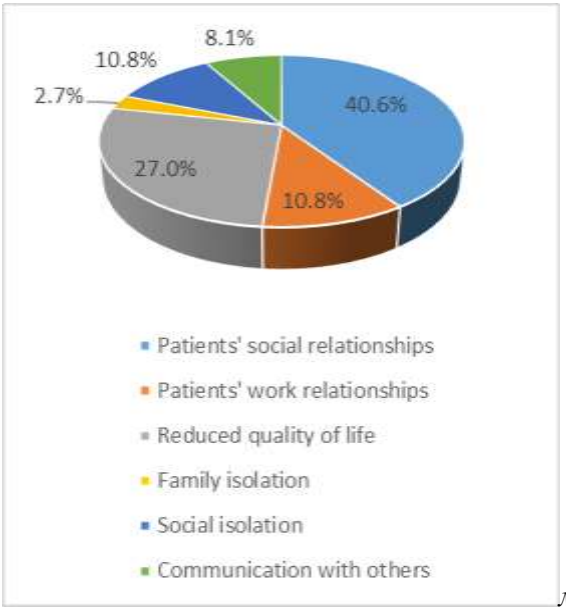
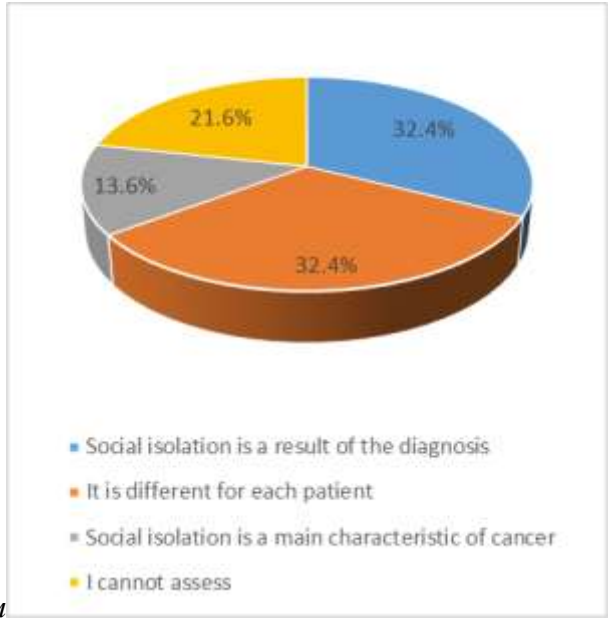


Fig. 2 Cancer and social isolation



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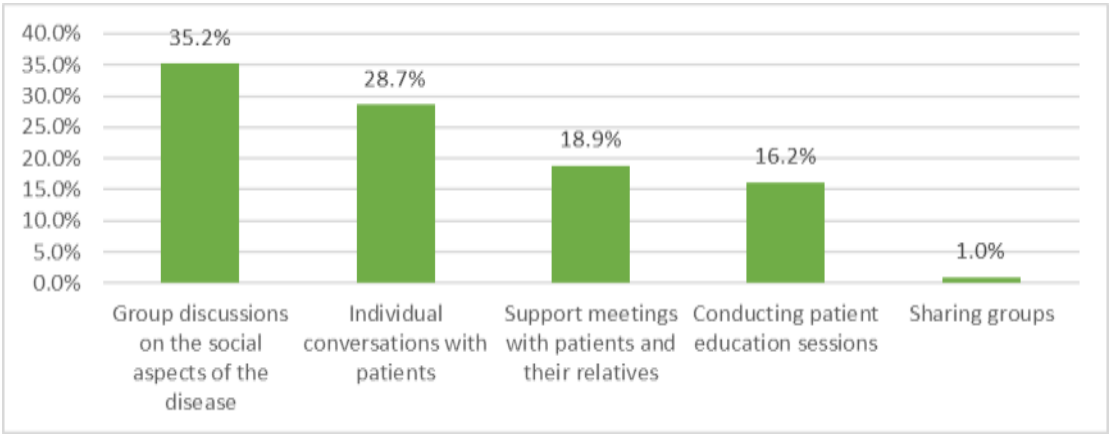
The forms of working with patients and their relative importance were studied (Fig. 3).

Fig. 3 Forms of social work with patients to ensure social well-being



The degree of influence of specialized social services on the disease was assessed by the respondents as "high" (56.8%) and "very high" (24.3%), with a positive effect, but only in about 1/3 (32.4 %) of the cases, patients receive the absolute range of services that is satisfactory for their condition.
Half of the respondents cannot assess the degree of research into the social problems of the patients, 37% define it as "average", only 5.4% as "high". Almost all respondents (78.4%) define the participation of a psychologist in the team of treating doctors as essential for providing social support to persons with oncological diseases.

DISCUSSION

Social isolation, anxiety and depression, low self-esteem and low self- evaluation, fear of depersonalization, of suffering and pain, of job loss, of the unknown, are just some of the negative emotions experienced by those diagnosed with cancer [2,3]. Authors define about 1/3 of cancer patients as high-risk for psychosocial problems [4].
A preferred form of support is 'patient group work', also confirmed in other studies [5] - an approach that can help cope with the psychosocial impact of cancer. The involvement of the family and close environment of the sick is a successful approach in caring for the overall process of treating the disease.

The greater survival rate of cancer patients leaves great scope for psychosocial interventions, but the responses of the surveyed social workers show that patients do not receive the absolute set of services that are satisfactory for their condition, therefore the scope of specialized social services is insufficient and does not reach all persons in relation to whom a serious health risk has arisen. Results from foreign studies also show that only 15-25% of those diagnosed with cancer manage to receive psychosocial services [4], end the most important, accessible and used by the respondents are the social services for providing food.[6,7,8] Lack of awareness was the most frequently cited barrier and suggests that more efforts are needed to educate and offer patients other important social services.
The results show that the planning and organization of specialized social services for oncology patients needs optimization, in accordance with modern concepts of psycho-oncology, integrative oncology, as well as complex psycho-oncology programs, responding to the need for specialized social activities for cancer patients, aimed at improving the social relationships of patients and the process of psycho-social support to start already at the beginning of the treatment [9]. Maintaining a high quality of life is a feasible idea through psycho-social care for patients with oncological diseases, as the main pillar in this process is occupied by qualified social care providers.

CONCLUSION

Specialized social services for cancer patients have the most tangible impact on adaptive household and social skills for full inclusion/return to society, communication skills of persons with illness, overcoming social isolation and a significantly greater opportunity to quickly return and be included in work and social life.
The planning and implementation of social services needs to be optimized in accordance with modern concepts of integrative oncology, psycho-oncology, as well as complex psycho-oncology programs in which the psychosocial problems of cancer patients are in focus throughout the entire treatment period and after it.

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MUSCULOSKELETAL DISORDERS IN THE EDUCATION SECTOR

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ABSTRACT

Introduction: Musculoskeletal disorders represent one of the most common and important occupational health problems in the teaching profession, which, although long neglected, has been of increasing concern in recent years. The education sector is one of the risk sectors of the Bulgarian economy in most of the elements of working conditions. An interesting characteristic of this economic activity is the high proportion, compared to other economic sectors, of employees who perform part of their duties at home.

Methods: The analysis is based on the submitted and posted sick leave documents for 2022 for an average number of employees – 382. The used statistical method is Batix-Lekarev. The analysis of the health status is based on the characteristics of those working on different attributes and their variations.

Results: The distribution by sex indicates that 281 of the respondents are female and 139 are male. There were 131 primary hospital admissions diagnosed with Diseases of the musculoskeletal system and connective tissue. There have been justified 16 cases with 131 lost work days.

Discussion: Work-related factors such as prolonged standing, sitting and forced work posture are known to be positively associated with musculoskeletal disorders. Research has shown that psychosocial factors such as high workload/demands, high stress levels, low social support, low job control, low job satisfaction and monotonous work are most likely to be associated with musculoskeletal disorders among teachers

Keywords: musculoskeletal disorders, education sector, health and safety at work, prevention

INTRODUCTION

Musculoskeletal disorders represent one of the most common and important occupational health problems in the teaching profession, which, although long neglected, has been of increasing concern in recent years. [1] By definition, musculoskeletal disorders include a wide range of inflammatory and degenerative conditions affecting muscles, joints, tendons, ligaments, nerves, bones and the localised circulatory system, which may be caused or aggravated by work tasks and the effects of the immediate environment in which work is performed.[2]

The education sector is one of the risk sectors of the Bulgarian economy in most of the elements of working conditions. [3] An interesting characteristic of this economic activity is the high proportion, compared to other economic sectors, of employees who perform part of their duties at home. [4] The specific nature of work in education makes it possible for some work to be carried out remotely from home, whether or not there is a connection to the office via the internet or email - for example, checking homework, control papers, course projects, preparing lessons, lectures, etc. [5] The 'Lifelong Learning' model that has emerged in recent decades means that the workflow of teaching and non-teaching support staff extends from kindergarten through to graduate study at university. [6] The economic activity of education includes the activities of: preschool education, primary education, lower and upper secondary education, secondary and vocational education, higher education and other educational activities. The studies report that teachers in general compared to other occupational groups reported high levels of musculoskeletal disorders. [7] A teacher's job involves not only teaching students, but also preparing lessons, assessing student work, and extracurricular activities such as sports. The teachers surveyed reported suffering from musculoskeletal disorders in the back, neck and upper limbs. [8] Therefore, a number of studies have focused on the specific study of musculoskeletal disorders of the back and neck and fewer studies have been conducted for the whole body and

even fewer for the lower limbs. [9] While musculoskeletal disorders is positively associated with employment duration, research findings are somewhat inconsistent in this regard, with some studies reporting that longer work experience is positively associated with musculoskeletal disorders, while others have found that younger teachers are more likely to report musculoskeletal disorders. Similar, albeit contradictory, findings have been observed for the age indicator. [10]

METHODS

The analysis and assessment of the musculoskeletal disorders is based on the data recorded in the following sources of information: documental and statistical methods of collecting and processing the necessary health information. It has been used program product information system, allowing individual and generalized characterization of negative changes in the health status of all employees in the education sector. The assessment of the indicators of temporary disability is carried out by comparison with indicative-normative groups according to a statistical system of Batix-Lekarev, which refer to a one-year period.

RESULTS

In the presented health analysis the overall number of workers with registered illnesses according to data from sick sheets was118. The data about employees in the enterprise is distributed as it follows: average roster composition 382, men 139, women 281. The absolute number of cases (from all primary hospital records) - by professional and age groups, in total and by nosological structure, according to ICD 10 is 194. Regarding the number of days with temporary disability (total from all sick leaves - initial and continuation) were registered 1445 cases.

In 2023, from the reviewed medical documentation, the actual morbidity with temporary incapacity has the following characteristics: the frequency of cases with temporary incapacity for work – in 2023 – 50.79 per 100 workers, i.e. lower; The average duration of 1 case - for 2023 - 7.44 - under the average (10 days) for the country; The number of workers with 30 or more days of temporary incapacity for work due to illnesses for 2023 - 10;

The „Diseases of the musculoskeletal system and connective tissue" are with registered 16 cases with 131 lost work days, with the following diagnoses:

- Lumbar and other spinal disc injuries with radiculopathy - 5 cases with 44 lost days
- Low back pain - 2 cases with 14 lost days
- Damage to the intervertebral discs in the cervical region with radiculopathy - 1 case, with 5 lost days of work, etc.

Employees with diseases of the musculoskeletal system, connective tissue and nervous system should observe a physiological regime of work and rest and limit manual work with weights.

Table 1

XI	**Diseases of the musculoskeletal system and connective tissue**	**16**	**131**
1	Joint contracture	1	9
2	Joint pain	1	3
3	Other specified inflammatory spondylopathies	1	13
4	Damage to the intervertebral discs in the cervical region with radiculopathy	1	5
5	Damage to the intervertebral discs in the lumbar and other parts of the spine with radiculopathy	5	44
6	Intervertebral disc injury, unspecified	1	10
7	Radiculopathy	1	5
8	Low back pain	2	14
9	Other specified injuries of the synovium and tendons	1	4
10	Fibromatosis of the palmar aponeurosis [Dupuytren]	1	10

11	Peroneal tendonitis	1	14

By definition they include a wide range of inflammatory and degenerative conditions affecting muscles, joints, tendons, ligaments, nerves, bones and the localized circulatory system, which may be caused or aggravated by work tasks and the effects of the immediate environment in which work is performed. The following measures could help to effectively manage musculoskeletal disorders in schools.

- Appropriate seating to meet the needs of the workforce.
- Teacher health and safety (ergonomics) is considered when purchasing new chairs, furniture and equipment.
- Chairs, furniture and equipment to be in good working order and meet health and safety requirements.
- Equipment is checked and maintained at regular intervals in accordance with the manufacturer's recommendations and maintenance schedules.
- Unsafe equipment to be removed from service immediately
- Furniture and equipment to be stored safely with clear access to minimise lifting, carrying and awkward postures by teachers.

DISCUSSION

Work-related factors such as prolonged standing, sitting and forced work posture are known to be positively associated with musculoskeletal disorders. [11] Research has shown that psychosocial factors such as high workload/demands, high stress levels, low social support, low job control, low job satisfaction and monotonous work are most likely to be associated with musculoskeletal disorders among teachers. On the other hand, factors such as regular exercise and job satisfaction may have a protective effect in this occupational group. [12]

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METHODOLOGY FOR ESTIMATION OF DISEASE PREVALENCE AND SENSITIVITY AND SPECIFICITY OF A DIAGNOSTIC TEST WITHOUT A STANDARD REFERENCE TEST

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ABSTRACT
The COVID-19 pandemic raised a question about clinical accuracy of diagnostic tests. This article presents a method for estimating the important measures of a diagnostic test without a standard reference. The sensitivity and specificity along with prevalence disease are estimated based on experimental probability and latent class model analysis. A mathematical model and a computer simulation are developed to test and validate the proposed methodology. An example of implementation and evaluation is given.
Keywords: diagnostic test, prevalence, sensitivity, selectivity, latent class model, example of implementation

INTRODUCTION
The COVID-19 pandemic raised a question about clinical accuracy of diagnostic tests. Estimation of sensitivity *Se* and specificity *Sp* of a diagnostic test is necessary to assess disease prevalence rate *DP*. The task becomes difficult when all these parameters are unknown and the reference standard is not available.
The traditional method to evaluate the performance of a diagnostic test is to establish a group of individuals with known disease status (i.e., classify the individuals as positive or negative by a standard reference method). However, several other approaches have been developed for evaluation of tests in absence of a reference standard, see [2][3] for a review of existing methods. The methodology discussed below uses latent class model and simulated experimental observation of the events frequencies. The class of models where the disease status of the individuals is unknown are traditionally referred to as latent class models as the disease status is latent: existing but not presently evident or realized [1]. The first stage of the methodology is essentially a computer simulation of this latent phase of the spread of a disease where random persons in the population are marked as having that disease. The second stage simulates an experimental examination of a population group with a diagnostic test for which sensitivity and selectivity are not accurately determined. The third stage involves finding a theoretical frequency of examination results that is as close as possible to the experimental ones in order to find the values of the unknown disease prevalence and sensitivity and specificity of the diagnostic test.

MATERIALS AND METHODS
A diagnostic test has two basic characteristics sensitivity and specificity. Sensitivity is the proportion of true positives tests out of all patients with a condition [4]. In other words, it is the ability of a test or instrument to yield a positive result for a subject that has that disease. The equation for sensitivity *Se* is [5]:

$$Se = \frac{TP}{TP + FN} \quad (1)$$

where *TP* – true positives and *FN* – false negatives.
Specificity is the proportion of true negatives out of all subjects who do not have a disease or condition [4]. In other words, it is the ability of the test or instrument to obtain negative results for a person who does not have a disease. The formula to determine specificity *Sp* is as follows [6]:

$$Sp = \frac{TN}{TN + FP} \quad (2)$$

where *TN* – true negatives and *FP* – false positives

Disease prevalence *DP*, sometimes referred to as prevalence rate, is the proportion of persons in a population who have a particular disease or attribute at a specified point in time or over a specified period of time [6]. The formula to determine prevalence is:

$$DP = \frac{TP + FN}{TP + FN + TN + FP} \quad (3)$$

The prevalence *DP* could be interpreted as the unconditional probability of being diseased *D*, *Se* – as the conditional probability to test positive being diseased and *Sp* – as the conditional probability to test negative being healthy or not diseased *ND*.

The three unknown variables *Se*, *Sp* and *DP* can be estimated by matching the values of observed experimental probabilities with the corresponding theoretical probabilities. Theoretical probabilities of events that happen in sequence during the diagnostic testing process can be derived from the law of total probability or directly form corresponding parts of the event tree. As the unknown variables are three, it is necessary to choose three independent equations for calculating the event probabilities.

The further step that should be taken is to determine an appropriate sample size group of subjects which will be tested. Depending on the aimed accuracy of the results *n* random subjects will be chosen among the population target group. Each subject will be tested two or three times. The record of consecutive results for each subject will be kept. For the following example tracking of these three consecutive events will be used: Twice positive test *PP* – the individuals who have two consecutive positive tests; Twice negative test *NN* – the individuals who have two consecutive negative tests; Two alternate tests followed by a positive one *PNP* or *NPP* further both denoted as *PNP* – the individuals who tested twice with different results are tested third time and the test is positive.

The theoretical probabilities of the aforementioned events form a system of equations:

$$\begin{cases} PP = DP.Se^2 + (1 - DP)(1 - Sp)^2 \\ NN = Dp(1 - Se)^2 + (1 - DP)Sp^2 \\ PNP = 2(Dp.Se^2(1 - Se) + (1 - DP)Sp(1 - Sp)^2) \end{cases} \quad (4)$$

The experimental values of *PP*, *NN* and *PNP* events found in practice or by computer simulation are substituted in (4). The unknown values of Se, Sp, and DP are estimated by solving the system (4) with appropriate tolerance. The roots of interest are in the interval [0,1] as by definition *Se*, *Sp*, *DP* $\in$[0,1]. In this interval the system has two roots (*Se*,*Sp*,*DP*) and (*1-Se*,*1-Sp*,*1-DP*).

RESULTS

To check and validate the mathematical model and computer simulation, the calculated values of *Se*, *Sp* and *DP* should be matched to the respective values of known disease prevalence and diagnostic test parameters.

For the following example is supposed that actual disease prevalence is *DP* = 5%, the sensitivity and specificity of an unknown medical test are *Se* = 85% and *Sp* = 95%.

A sample size of $n = 10^4$ individuals are being tested. The result of the simulation is:

Table 1. Statistical data of the consecutive diagnostic test events *PP*, *NN* and *PNP* of $n = 10^4$ individuals where *DP* = 5%, *Se* = 85%, *Sp* = 95%

Test results (CI = 95%)	**Number of individuals**			**%**
	Lower bound	**Mean**	**Upper bound**	**Relative error**
PP – twice positive	349	385	427	10.6
NN – twice negative	8518	8585	8656	0.8
PNP – followed by a positive	133	154	184	17.6

The probability of each event obtained in Table 1 is substituted in system (4). This system of equations is nonlinear and it is easier to be solved numerically. The solutions of the system on the mean and boundary values of the confidence interval are:

Table 2. Estimated disease prevalence, sensitivity and selectivity calculated from *PP*, *NN* and *PNP* events

Experimental probabilities of the events	**%**		
	Se	**Sp**	**DP**
Lower bound, PP = 0.0349, NN = 0.8518, PNP = 0.0133	88.7	94.2	4
Mean, PP = 0.0385, NN = 0.8585, PNP = 0.0154	**84.9**	**95**	**5**
Upper bound, PP = 0.0427, NN = 0.8656, PNP = 0.0184	81.2	96	6.2
Average relative error	4.4	0.9	22

As could be seen the result for the mean is close to the actual values of the parameters. The deviation of the boundary solutions is due to the relative error of rare events. In the above sample simulation, the *PNP* is less frequent than both other events *PP* and *NN*. The following rare events can occur in sampling phase when trying to estimate a highly accurate diagnostic test: P events when the disease prevalence is low; N events when the disease prevalence is high; Alternate events; Any of the events due to small sample size.

In every particular case a rare event can be replaced by supposedly more frequent event. Eventually this can be combined with the increase of sample size.

Let's look at previous example and try to replace the *PNP* event in (4) with *PPP* event which is twice as frequent. The equation for the *PPP* event is

$$PPP = DP.Se^3 + (1 - DP)(1 - Se)^3 \quad (5)$$

The simulated process will give:

Table 3. Statistical data of the consecutive diagnostic test event *PPP* with three positive results of $n = 10^4$ individuals where *DP* = 5%, *Se* = 85%, *Sp* = 95%

Test results (CI = 95%)	**Number of individuals**			**%**
	Lower bound	**Mean**	**Upper bound**	**Relative error**
PPP – triple positive	273	308	342	11.2

Table 4. Estimated disease prevalence, sensitivity and selectivity calculated from *PP*, *NN* and *PPP* events

Experimental probabilities of the events	**%**		
	x	**y**	**z**
Lower bound, PP = 0.0349, NN = 0.8518, PPP = 0.0273	85.3	94.3	4.4
Mean, PP = 0.0385, NN = 0.8585, PPP = 0.0308	**85.2**	**95**	**5**
Upper bound, PP = 0.0427, NN = 0.8656, PPP = 0.042	84	95.8	5.8
Average relative error	0.8	0.8	14

The average combined deviation of all three parameters in Table 4 is less almost two times compared to the deviation of the same parameters in Table 2.

DISCUSSION

When trying to apply this method in practice, the following assumptions should be considered:

1. Disease prevalence, selectivity and specificity remain unchanged during the testing period. Supposedly, the selectivity and specificity are constants for a given diagnostic test implemented in similar conditions, which cannot be stated for disease prevalence. The prevalence is variable and changes over the time. For the oncology diseases the changes are slow but for some infectious diseases the changes are fast, so the duration of the testing period should be assessed according to the specific situation.
1. The demonstrated methodology is appropriate when mass diagnostic testing is affordable as in COVID-19 pandemic period.

2. The methodology could be implemented when no other reliable standard test reference is available.

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REPLACEMENT OF ECONOMIC DIRECTORS IN PUBLIC HEALTH INSTITUTIONS WITH SPECIALISTS IN HEALTH ECONOMY, OPPORTUNITY TO OVERCOME THE CURRENT FINANCIAL PROBLEMS IN HEALTH INSTITUTIONS

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ABSTRACT
Purpose. Analysis of the economic justification in health institutions in the Republic of N.Macedonia and the place of the position of economic directors in the public health institutions.
Materials and methods. Materials and methods. Analysis of the previous experience in the functioning of the economic directors of health institutions in the Republic of North Macedonia, the management style and the achieved results in terms of improving economic stability and financial efficiency
Results. The wide range of tasks that health economics solves makes it an integral part of any modern health system. The economic approach in healthcare has its place in solving problems related to recruitment, distribution and efficient use of resources. All these challenges require the modern healthcare manager to have deep knowledge of the theory and economics of management, mastery of skills, as well as the possibility of economic and health motivation of the decisions made.
Conclusion. It is necessary to introduce specialized studies in health economics, establish departments of health economics in the faculties of medical sciences, and reorganize public health institutions.

Key words: economic directors, healthcare institutions, health system, health economy.

INTRODUCTION
In healthcare, economic attitude is usually measured according to the requirements of the relevant health doctrine for the scope and quality of medical care, which corresponds to the normatively defined medical standards and therapeutic recommendations. The position of economic directors in health insurance institutions is regulated by the Health Act [1], and its amendments from 2004 are the basis for the formation of "economic" and "medical" directors.
The rules for decentralization of healthcare institutions allow organizing healthcare institutions as legal entities with autonomy in management, including the appointment of economic directors, with an important role in managing financial resources, preparing budgets and ensuring the financial stability of the institutions.
The systematization of institutions with over 1000 employees has the status of University Clinics, Clinical Hospitals and Institutes, Multi-profile Hospitals, Hospitals with Extended Activity, Health Homes, but due to the small number of such institutions in the RSM (only 2), the transition is made to the creation of economic directors in all Public health institutions (PHI) in the country. This form of PHI organization exists until 02.07.2024, when, by a decision of the Republic of North Macedonia (RNM) government on amendments and additions to the Health Care Law [1], the economic directors in health institutions are abolished and the two management positions - economic and medical director - are merged. Health economics [2][3][4] studies the application of general economic theory to problems and phenomena related to health and health care. It is considered from two aspects:

*Health economics as part of the global economy with the subject of action application of economic laws in the health sector.
*Applied type: covers a complex of economic issues in the field of health care organization in the health system - economic aspects, financial justification of the internal structure and material and technical base of health care, personnel training, labor organization, financial plan of health care, salaries and allowances of employees, the market in the health system, principles of health insurance.
Health care and the health system have the characteristics of humanity, but are closely related to economic analysis. Health workers are financially dependent on the financial stability of the health care organization in which they have an employment relationship and expect financial benefits from their activities. Health care economics prepares specialists in health care economics [5][6] to generate economically justified recommendations to the management of the health care institution and decisions that the management must make in connection with strategies for managing the health care organization. The wide range of tasks that health economics solves makes it an integral part of any modern health system. All these challenges require from the modern health manager in-depth knowledge of management theory and economics, mastery of skills, as well as the ability to economically and healthily motivate decisions.

PURPOSE
Analysis of the economic justification in health institutions in the Republic of Macedonia and the place of the position of economic directors in the public health institutions.

MATERIAL AND METHODS
To achieve the goal, data analysis methods have been set that are available in the period 2004-2024. Analysis of the changes in the Health Care Law of Republic of North Macedonia 2004-2024, Analysis of the financial Annual reports of the Health insurance fund (HIF), for the period 2004-2023 financial year [7][8][9][10].

RESULTS
In 2004, the Skopje Clinical Center was transformed into 32 Public health institutions, in which 54 managers were appointed. In each new Public Health Institution as a new legal entity, the management position is shared by two managers with related signatures. The analysis and comparison of the total debt of Public Health Institutions in 2004 with 2023 shows an increase in debt with an increasing nature every year. According to the analysis made in part of the PHIs in the period 2004-2023, there was a period of only one manager who had the absolute opportunity to make decisions related to the work of the PHIs. According to the annual financial statements of the HIF of the Republic of North Macedonia in 2021, the total debt of all PHIs amounted to approximately 97,000,000 euros. According to the reports of the HIF of the Republic of Macedonia, in the period 2004-2024, a decrease in the number of employed specialist doctors, as well as of middle medical staff, is reported.

DISCUSSION
The change in the Health Care Act of 2004 for structural change in the management of Health Institutions did not lead to a positive result and this conclusion is based on the analysis made for the period 2004-2024. Analyzing the period, it can be stated that the change made in 2004 led to an unproductive increase in the number of employees in the PHIs in managerial and administrative terms, as well as in the members of the management boards. This change further increased the share of expenses, and with the hiring of new staff, no new services were received that would contribute to revenue. An average of 90,000 denars was paid per month for one economic director in some PHIs, and the amount for the management boards is not available in the financial statements, which are easily accessible on the HIF website. In the period 2004-2024

There have been a series of media disputes between the medical and economic directors of various health institutions, with their cooperation being minimal, and in some institutions non-existent. It can be concluded that the amendment to the Health Law in 2004 in the part on the management of the PHI is erroneous and does not meet expectations. At the suggestion of the North Macedonian Ministry of Health, the 2004 decision was repealed and all economic directors of PHIs with over 1,000 employees were dismissed.

CONCLUSION AND RECOMMENDATIONS

Changing the management structure of the HIF is wrong, without a concept and a preliminary analysis and strategy, and 20 years later it can be assessed as unsuccessful. It is appropriate to establish a department of Health Economics in each Health Institution, to specialize medical and non-medical personnel for participation in economic decisions in health institutions. The medical faculties as part of the universities in the Republic of Macedonia, together with the Faculties of Economics, can create Centers for training and specialization in health economics.

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ASSESSMENT OF KNOWLEDGE OF HEALTHY EATING PATTERN AND LIFESTYLE IN INDIVIDUALS LIVING WITH OVERWEIGHT AND OBESITY

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ABSTRACT
Overweight and obesity are linked to unhealthy diet, alcohol consumption, nicotine dependency, and inactivity. The **purpose** of the study is to assess the knowledge of healthy eating patterns and lifestyle in overweight and obese individuals aged 19–60 years.
Materials and methods**:** Overweight and obesity risk factors (diet, eating habits, healthy eating and lifestyle information, anthropometric measures) in 264 Sofia citizens have been studied. Structured interviews and questionnaires on health, diet, and lifestyle are used to collect data. Anthropometric indicators and indices measure nutritional status, and bioelectrical impedance analysis determine body composition and distribution (Tanita BC 420 MA).
Results: The improved eating pattern (with breakfast) [91.7% vs. 78.6%, $p < 0.05$] and the 3-meals/d pattern [36.1% vs. 18.8%, $p < 0.05$] were more prevalent in normal-weight participants compared to overweight and obese ones. People with overweight and obesity tried weight loss more often than those with normal weight, using hypocaloric diets [(22.4% vs. 6.9%, $p < 0.05$)] and fasting (4.7% overweight vs. 2.8% normal).
Conclusion: People with a normal BMI generally follow a healthier diet and have better knowledge of proper nutrition and approaches to managing body weight than those who are overweight or obese.

Keywords: healthy eating, overweight, obesity

INTRODUCTION
In all WHO regions, unhealthy diets, alcohol consumption, nicotine dependence, and inactivity are identified as the main behavioral risk factors [1]. The rising prevalence of obesity, sarcopenia, and sarcopenic obesity is beyond conventional clinical approaches [2]. The focus is shifting from pharmaceutical therapies to primary prevention through the management of modifiable lifestyle risk factors (eating habits, diets, smoking, alcohol consumption, yo-yo dieting etc.).

THE PURPOSE of the study is to assess the knowledge of a healthy eating pattern and lifestyle in overweight and obese individuals aged 19–60 years.

MATERIALS AND METHODS
A cross-sectional study of 264 Sofia residents aged 19–60 assessed food, eating habits, physical activity, and anthropometric characteristics as risk factors for sarcopenic obesity in 2014 and 2015. The control group consisted of 72 normal-weight people with BMIs of 18.5–24.9 kg/m^2. It also included 65 overweight adults with BMIs of 25.0–29.9 kg/m^2 and 127 obese ones with BMIs of 30.0 kg/m^2 or above. Structured interviews and questionnaires collected health, nutrition, lifestyle, sickness, and hereditary data. Bioelectrical impedance analysis assessed body composition and distribution, whereas anthropometrics measured nutrition (Tanita BC 420 MA) [3].

RESULTS

Table 1 displays the percentages of the participants, both overall and by body mass index (BMI), with their levels of knowledge of a healthy eating pattern.

Table 1. Percentages of study participants, both overall and by body mass index (BMI), and their knowledge of a healthy eating pattern - breakfast, diet, salt use, and cooking fats

Questions and answers	Normal weight %	Overweight and obesity %	Total %
Do you have breakfast in the morning?			
Yes	91,7[a]	78,6[b]	82,2
No	1,4[a]	2,6[a]	2,3
Sometimes	**6,9[a]**	**18,8[b]**	15,5
How often do you eat during the day?			
Once	2,8[a]	4,2[a]	3,8
Twice	**15,3[a]**	**27,7[b]**	24,3
3 times	36,1[a]	18,8[b]	23,6
4 times	19,4[a]	17,3[a]	17,9
5 times or more	**0[a]**	**6,8[b]**	4,9
Do you salt your food at the table?			
I do, when the food is not salty enough.	91,7[a]	78,6[b]	82,2
I nearly always salt the food before I try it.	1,4[a]	2,6[a]	2,3
Never.	**6,9[a]**	**18,8[b]**	15,5
What type of cooking fat do you use most often?			
Vegetable oil (oil)	**81,9[a]**	**54,7[b]**	62,1
Margarine/butter consisting mainly of butter	**37,5[a]**	**18,2[b]**	23,5
Lard or other animal fats	**45,8[a]**	**24,5[b]**	30,3
I do not use fat at all	0[a]	**4,2[b]**	3,0

* the identical letters on the horizontal lines indicate show no significant outstanding difference, while differing letters suggest the presence of such a difference ($p < 0,05$)

Breakfast boosts morning mental and physical performance and reduces the weight. Normal-weight people have breakfast more often than overweight and obese ones (91.7% and 78.6%, resp., $p < 0.05$). The highest percentages of participants (24.3%) and (23.6%) have 2 or 3 meals a day. Both overweight and obese individuals are more likely to eat twice daily (27.7% vs. 15.3%, $p<0.05$) than those of normal weight who show a higher rate of the 3 meals/d pattern (36.1%, 18.8%, resp., $p < 0.05$) compared to overweight and obese respondents. Bulgarians consume too much salt. Normal-weight people added salt to their meals at a greater rate (91.7% vs. 78.6%, $p < 0.05$) compared to overweight or obese people. 62.2% of respondents say they cook with vegetable oil.

Fruits, vegetables, whole grains, legumes, seeds, and nuts make a healthy plant-based diet. 84% of respondents say eating lots of fresh produce is healthy, while 87% think beans and bean products are healthful. More normal-weight adults than overweight and obese people agree that fresh produce is god for health [94.4% vs. 80.2%, ($p < 0.05$)]. Over 90% of normal-BMI people and 83% of overweight and obese adults consider milk and dairy products healthful. More normal-BMI people (87.5%) consider sugar a health risk than overweight ones [59.9%, ($p < 0.05$)].

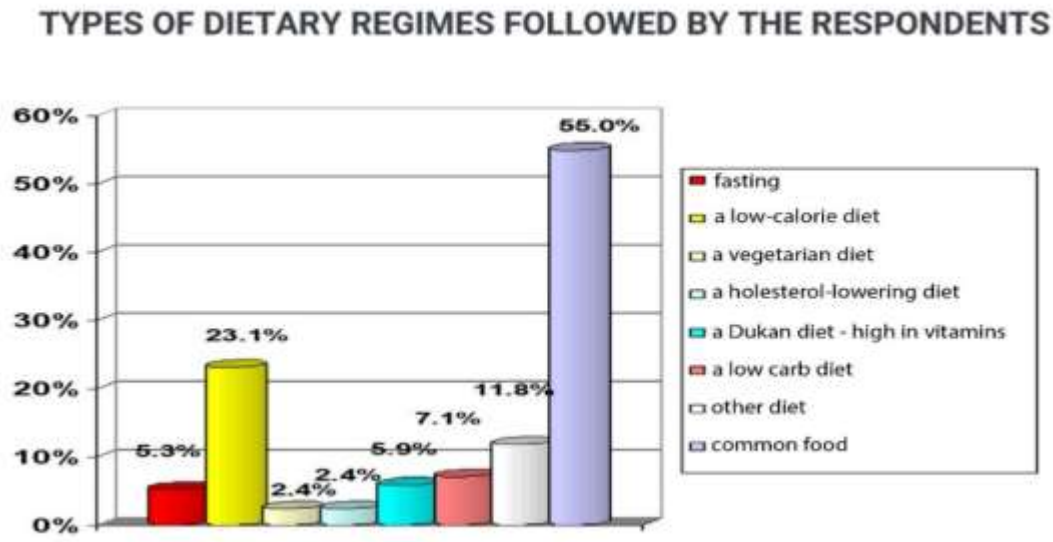

Figure 1. Percentages of people within the overall group with various dietary regimes

Almost 60% of overweight respondents experience weight variation compared to 30.6% of normal-BMI people ($p<0.05$). Nearly 39% of normal-weight participants and 43.2% of overweight and obese individuals have gone on a diet in the last year. Most respondents follow a low-calorie diet (1 in 4), 7.1% a low-carb diet, 6% a high-protein diet (Dukan diet), and 5% fast (Fig. 1). Overweight and obese individuals are more likely to try weight loss employing hypocaloric diets [22.4% vs. 6.9%, ($p < 0.05$)] and engage in fasting therapy (4.7% overweight vs. 2.8% normal).

DISCUSSION

Many surveys have shown inconsistent results on the association between BMI and healthy eating and lifestyle knowledge. Some studies of women, men, children, adolescents, and adults [4, 5, 6] have found no association between BMI and knowledge of healthy eating, while others have established a positive association between BMI and diet, healthy food choices, and lifestyle factors [7]. Education and lifestyle modifications do not reduce adult overweight and obesity, according to Chinese studies conducted on 10,401 individuals in 2006, 2009, and 2011 [8]. A lack of knowledge of healthy food, lifestyles, and adult weight management guidelines may have been the major cause.

Nutrition, balanced diets, and exercise can prevent obesity and related socially significant disorders. A large 2020 Bulgarian study of health risk factors in people over 20 years shows that 53.2% of men and 50.1% of women consume 3 meals a day, 53% of participants have regularly breakfast. Most respondents (62%) add salt to their food when it is not salty enough, with 6.9% always doing so. 11.2% of adults over 20 years follow doctor-recommended diets, and 65.8% follow weight loss diets [9,10].

CONCLUSION

This study reveals comparable results for daily food intake, although only 45% of participants followed a restrictive diet in the last year, with 18.2% preferring a low-calorie diet.

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FACTORS AFFECTING RETURN TO WORK AFTER CANCER

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ABSTRACT
Purpose. To explore some key factors associated with the return to work and labour readjustment of workers with cancer diseases.
Material and Methods. Official statistical data from state institutions [1] and a anonymous survey of 180 working persons with Permanently reduced working capacity due to cancer, in the period 2022-2023, were used.
Results. In 64% of cases, people wanted to return to work willingly after cancer treatment, 20% assessed returning to their workplace as an "ordeal", and 5% - out of necessity. The most common reason is "desire to return to normal life" (72.2%), followed by "I like my job" and "for financial reasons" with almost equal shares (69.8% and 63.8%). Other answers are: "for social contacts" (59.3%), "to feel healthy – 58.3%, "to be useful – 47.2%. Refusal or reluctance to return to work is caused by both "disliking the job" and negative experiences, such as feeling "stigmatized" or "labeled" as a cancer patient, "feeling discriminated against" at the workplace. Respondents assessed the support of medical professionals in the decision to return to work as very positive.
Conclusion. Assessing the factors influencing return to work after cancer and optimizing work (re)integration is important for improvement of the well-being of this vulnerable group and to reduce the disease-related social and economic impacts on businesses and society as a whole.

INTRODUCTION
The impact of cancer on a person's daily life is immediate and overwhelming, accompanied by long periods of sickness absence, impaired social and work adaptation. Most cancer survivors are able to stay or return to work [1] but overall their risk of unemployment is 1.4 times higher than that of healthy individuals. The occupational health problems of oncological workers are expanding their scope.

PURPOSE: To study some main factors related to the return to work and labour readjustment of working persons with cancer diseases, as well as the role of the Health and Safety Office in the process of work (re)adaptation.

MATERIALS AND METHODS
Data from the National Statistical Institute (NSI) were used [2] and 180 working persons with oncological diseases were given an anonymous survey (no personal data was collected from the respondents) with questions about the subjective attitude, motivation and some emotions related to the return to work after cancer. IBM SPSS Software version 21 (New York, USA statistical package. Variation analysis were used. A p-value $P<0.5$ (<0.001) was considered statistically significant.

RESULTS
The results show that individuals with recognized *Permanently reduced working capacity* (PRWC) due to oncological disease in Bulgaria has grown significantly in 2023 compared to 2022 (Table 1).

Table 1 Persons over 16 years of age with permanently reduced work capacity due to oncological disease by degree of disability

	Up to 50% PRWC		***50-70% PRWC***		***71-90% PRWC***		***Over 90% PRWC***		***Total number***
	Number	***%***	***Number***	***%***	***Number***	***%***	***Number***	***%***	

Total number of persons over 16 years of age with PRWC									
2022	6655	13,6	17366	35,5	11518	23,5	13426	27,4	48969
2023	6258	9,7	24610	38,0	16245	25,1	17606	27,2	64719
Total number of persons over 16 years of age with PRWC due to oncological diseases									
2022	108	0,9%	847	7,2	3855	32,8	6903	58,8	11740
2023	140	0,9%	1122	7,8	4752	32,9	8430	58,3	14444

Data from NSI; PRWC – *Permanent reduced work capacity*

The Labor Expert Medical Commission (LEMC) decision on the work capacity of persons with cancer is the first important factor when returning to work [3]. The conclusion of the TELC that the person "Can work" in the position held until now is the so-called "labor readjustment to the same workplace under reduced working conditions" which are determined by the employer and the health and safety service. In about 1/3 of the cases "The person cannot work in the position to which he was assigne" and "labour readjustment in another position or workplace" is required. There are very few cases of "No right to work" - only in case of a very serious condition of the person.

Survey data showed that 64% of people wanted to return to work and were willing to do so after cancer treatment, with even 3 people reporting that they were ready to work before treatment ended. About 20% assessed returning to their workplace as a "hardship" and 5% did it out of necessity.

The reasons given by the respondents are most often "desire to return to a normal life" (72,2%), followed by "I like my job" and "for financial reasons" with almost equal shares (69,8% and 63,8%). Other answers are: "for social contacts" (59,3%), "to feel healthy -58,3%, "to be useful – 47,2%. The response "can't assess/can't give a specific reason" occurs in 12%. (Some respondents indicated more than one answer).

Research on negative emotions and experiences in the workplace shows that an important set of factors that influence successful return to work are the attitudes and behaviors of colleagues and other people, and how they are perceived by the cancer survivor. Refusal or reluctance to return to work was caused except from "disliking the job" and by negative experiences that included feeling "stigmatized" (38,4%) or "labelled" as a cancer patient (37,7%) and "feeling of discrimination" (36,1%) in case of unfair dismissal. The respondents rated the support of medical specialists as very positive when deciding to return to work.

DISCUSSION

The increasing number of people with permanently reduced working capacity due to cancer raises more occupational health questions regarding the adaptation of these individuals upon their return to the work environment. [4]. Major safety and health implications of cancer workers are related to mental, cognitive and physical symptoms, reduced energy levels (described as 'fatigue' or 'exhaustion'), 'emotional strain', mental health, cognitive abilities, problems with attention and memory, which for a different period of time have an impact on work ability and work adaptation, respectively difficulties in performing of usual tasks [5].

Some factors predictive of return to work are the type and severity of the illness and treatment, the nature of the job (workload, unfavorable work environment, lack of flexible working options or lack of reduced working hours), financial capabilities and needs, fear of unemployment or redundancy [6,7,8].

Important for the good (re)adaptation is "adjustment of the workplace" agreed with the worker, it is important the decisions for workers not to be made without their consent. Some workers agree to do inappropriate work in order to avoid being considered "incompetent", "second-rate" or pitied.

Relatively little is known about how employers are affected when a worker is diagnosed with cancer - undertakes to provide and/or readjust the worker in a health-appropriate work. In Bulgaria, there is a tendency for people with *Permanently reduced working capacity* due to

cancer, not to lose their right to work, which allows them to perform appropriate activities and adapt to the work environment. These cases require serious attention from the employer and the Health and Safety office, including the development of optimal working conditions and measures to protect health and safety at the workplace.
The role of the Health and Safety office (especially the occupational medicine doctor) in ensuring healthy and safe working conditions for people with cancer is important, which is also reported by other authors [9]. The occupational health officer consults the employer on the overall process of work adaptation, develops the physiological regime of work and rest of the employed people, recommendations for adapting workplaces, measures to preserve working capacity and protect the safety of workers with health problems.

CONCLUSION

The work capacity and employment opportunities of people with cancer require serious attention from the employer and occupational health services, development of optimal working conditions and measures to protect health and safety at the workplace. Assessment of factors influencing return to work after cancer and optimization of work (re)integration is important for improving the well-being of this vulnerable group and for reducing the disease-related social and economic impacts on business and society as a whole.

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EVALUATION OF NUTRITIONAL STATUS OF CHILDREN AGED 6–12 YEARS APPLYING ANTHROPOMETRIC INDICATORS

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ABSTRACT
The purpose of the study is to evaluate the anthropometric nutritional status, using the InBody 230 equipment, of children aged 6–12 years and its correlation with dental caries in the studied subjects.
Materials and methods: The study comprised 277 children: 158 boys and 119 girls. The subjects' anthropometric statuses have been evaluated by indicators such as height, weight, BMI (kg/m^2), waist circumference/height ratio (WC/H), fat index mass (FMI, kg/m^2), and fat-free mass index (FFMI, kg/m^2).
Results: Regarding the children, half of them, 50.18%, are of normal weight, and the rest are distributed as follows: 13.71% are underweight, 14.8% are overweight, and 21.29% are obese. 92% of children of different body weights have dental caries.
Conclusion: More children of different ages need to be included in order to evaluate the relationship between the various risk factors related to the development of dental caries and anthropometric variables.

Keywords: anthropometric indicators, dental caries, children

INTRODUCTION
Anthropometry is a branch of anthropology that focuses on measuring the weight and proportions of the human body [1]. Due to their affordability, straightforward use, and close correlation with nutritional status, anthropometric measurements are commonly employed to evaluate physical development in both children and adults [1]. A key determinant of children's overall health is their anthropometric nutritional status.

PURPOSE This study employs the InBody 230 equipment to evaluate the anthropometric nutritional statuses of children between the ages of 6 and 12 and their association with dental caries.

MATERIALS AND METHODS
The study included 277 children - 158 boys and 119 girls. To evaluate their anthropometric statuses with the InBody 230 device, the following indicators have been included: height, weight, body mass index (BMI kg/m^2), waist circumference/height ratio (WC/H), and fat mass index (FMI kg/m^2). The InBody 230 applies the two-component model of the human body (fat and non-fat mass) to measure the electrical resistance of tissues using alternating current. Height has been determined with a stadiometer, whereas waist circumference has been measured in a standing position using a plastic flexible ruler.

RESULTS
It has been found that half of the examined children (50.18%) are of normal weight, with the remainder falling into the three groups of underweight (13.71%), overweight (14.8%), and obese (21.29%) children. Overweight and obesity have been evaluated employing the recently revised BMI reference values established by Cole et al. [2], which WHO has applied to date.

Table 1. Anthropometric indices and D1MF(T+t) in children aged 6-12 years

Anthropometric measurements	**Boys (n=158)**	**Girls (n=119)**
	SD	SD
Height (cm) *	146.4±5.11	137.01±5.12
Weight (kg) *	44.52±4.19	38.21±4.56
BMI (kg/m²)	19.22±2.23	17.34±2.17
Weight for age Z score	0.26±1.15	0.08±1.12
Height for age Z score	0.06±1.06	0.14±1.03
BMI for age Z score*	0.33±1.16	0.25±1.17
Fat (%)	18.2±3.36	19.1±2.25
Waist circumference (cm)	59.7±6.43	58.5±4.32
Dental indexes		
D1MF(T+t) *	9.8±9.40	12.2±9.91
D1-4	8.2±3.75	8.6±3.14
Filled **	3.3±1.39	1.63±1.48
Missing	0.36±0.82	0.38±0.90

* p <0,05 ; **p<0.001

The analysis of the anthropometric measurements made, presented in Table 1, shows statistical reliability regarding the height, weight, and BMI of the examined children. Such a dependence is established for the D1MF(T+t) index and the F component.

Table. 2. BMI, dental caries and the D1MF (T+t) index

	Underweight n (%)	**Normal weight n (%)**	**Overweight and Obesity n (%)**	**χ^2, p**
DENTAL CARIES				
Yes	33 (11.91%)	128 (46.20%)	94(33.93%)	
No	3 (1.80%)	11 (3.97%)	6 (2.16%)	
χ^2, p	χ^2=26.73 **p<0.001**	χ^2=131.46 **p< 0.001**	χ^2=94.49 **p< 0.001**	
D1MFT WHO				
Very light 0,0 - 1,1	2 (0.72%)	19 (6.85%)	1 (0.36%)	χ^2= 28.07 **p < 0.001**
Light 1,2 – 2,6	15 (5.41%)	58 (20.93%)	5 (1.80%)	χ^2=67.03 **p < 0.001**
Medium 2,7 – 4,4	21 (7.58%)	57 (20.57%)	19 (6.85%)	χ^2=32.00 **p < 0.001**
Heavy 4,5 – 6,5	7 (2.52%)	26 (9.38%)	27 (9.74%)	χ^2= 13.7 **p< 0.001**
Very heavy >6,6	4 (1.44%)	7 (2.52%)	9 (3.24%)	χ^2=1.95 p = 0.378
Total	**49**	**167**	**61**	

Table 2 illustrates the data of the children who were evaluated based on their BMI, whether or not they had dental caries, and how frequently cavities were present. By comparing the data vertically between the three groups' children with and without caries, statistical reliability has been demonstrated. A significant difference of ($p<0.001$) was identified between dental caries severity and BMI, with the exception of children from the group with extremely severe caries.

DISCUSSION

A significant concern for dentists is the prevalence of dental caries among adolescents [1, 3, 4]. The aetiology of dental caries is multifaceted, with oral hygiene and food as important risk factors for its onset [3, 4]. Therefore, it is essential to elaborate a personalised preventative training and incentive program to enhance the oral hygiene and dietary practices of each child [3]. Neglecting dental hygiene causes gingiva inflammation [4] and cavitation of the initial carious lesions, allowing bacteria to develop themselves in the carious cavities [5]. Dental caries and weight disorders are two conditions that share several broad risk factors, including genetics, diet [6], socioeconomic status, living conditions, lifestyle, exposure of children to passive smoking and environmental variables [7, 8, 9, 10]. Girls have been reported to have more severe dental caries than boys, a difference that was statistically significant (<0.05). Other authors have had similar outcomes [11, 12]. It is believed that this fact is due to the earlier eruption of permanent teeth in girls [11], as well as other risk factors, such as the composition and amount of saliva, hormonal fluctuations, eating habits, genes, and social status of the family [12].

CONCLUSION

It is necessary to include more children of different ages in order to evaluate the relationship between the various risk factors associated with the development of dental caries and the anthropometric parameters.

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CUPPING THERAPY AND KINESITHERAPEUTIC RECOVERY AFTER SHOULDER ARTHROPLASTY: A PILOT STUDY

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ABSTRACT
The innovations in shoulder surgery require new approaches in the recovery of arthroplasty patients. The challenges that kinesitherapy faces impose an expansion of the methods and means, including those beyond the scope of conventional rehabilitation.
Purpose: to evaluate the effectiveness of cupping therapy during the kinesitherapeutic recovery of shoulder arthroplasty patients.
Materials and methods: *Materials*: The pilot study includes 26 patients who underwent shoulder arthroplasty at the Orthopaedics and Traumatology Clinic at UMHAT "Sveta Marina" - Varna (2020-2022). *Methods*: document and content analysis, historical method, functional examinations, the WHOQOL-BREF and Constant Shoulder Score questionnaires, and statistical methods.
Results: the data from the study of sociodemographic characteristics show predominantly females with urban residence and higher education (mean age of the respondents - 63.5 years). The data collected from functional examinations show significant improvement in range of motion and muscle strength. A positive dynamic is observed in the overall assessment of quality of life after completing the kinesitherapeutic programme, with an increase from 50.2 to 70.5. The change in the overall quality of life is at the expense of all domains but mainly in the "Physical", "Psychological", and "Environment" domains.
Conclusions: The pain in the affected upper extremity is significantly reduced after performing cupping therapy, and the range of motion in the shoulder joint is improved, which enables the facilitation of the kinesitherapeutic complex's implementation. The application of a multimodal kinesitherapeutic programme, incl. cupping therapy, contributes to functional recovery and leads to change in the quality of life of shoulder arthroplasty patients.

Keywords: quality of life, cupping therapy, kinesitherapy, reverse prosthesis

INTRODUCTION
Pathology in the shoulder joint is one of the most common due to its high mobility. Thorough knowledge of the problem would contribute to a timely and correct diagnosis in the general kinesitherapeutic practice. A patient-centred approach in this type of patients is essential for the proper progress of the recovery process and the return of the ability to perform activities of daily living and working capacity [1, 2]. A properly designed kinesitherapeutic programme, incl. a long-lasting strategy directed towards the specific patient in which he takes responsibility and participation, is a significant factor [3]. A number of authors recommend the earliest possible inclusion of kinesitherapeutic procedures for the joint in order to prevent subsequent complications [4, 5]. The selection of kinesitherapeutic means implemented in the programme must take into account the anatomical features of the joint, as well as the patients' individual characteristics [6]. The adequately proposed order of the various stages of the functional recovery process is of great importance for the complete recovery of function of the upper extremity [7, 8].

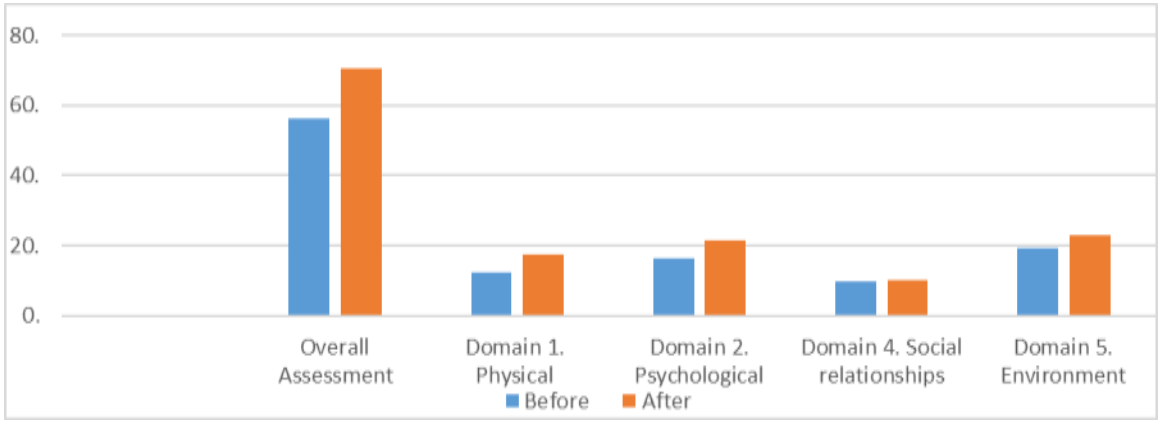
MATERIALS AND METHODS
26 patients admitted to the Orthopaedics and Traumatology Clinic at UMHAT "Sveta Marina" - Varna (from March 2020 until March 2022) for pathology in the shoulder complex

(multifragmented fractures of the proximal humerus, high-grade degenerative changes in the shoulder complex, etc.) accepted to participate in this pilot study. All respondents underwent an orthopaedic intervention of the shoulder joint with Reverse Shoulder Arthroplasty (RSA) [9, 10]. The patients were sporadically divided into two groups - group 1 and group 2. On the patients in group 1, classical kinesitherapy was applied on the 2nd postoperative day, which lasted up to 12 months [11]. In addition to classical kinesitherapy, the patients in group 2 underwent additional cupping therapy after the 4th postoperative week until the 12th month. Before and after the completion of the activities, both groups were examined for quality of life with the generic WHO questionnaire (WHOQOL-BREF), a questionnaire for diagnosis of shoulder conditions with the Constant Shoulder Score, goniometry, and manual muscle testing [12, 13]. The utilised research methods were document and content analysis with research and analysis of the available scientific literature in databases such as Scopus, Web of Science, PubMed, Science Direct, Google Scholar, etc., referring to the problem considered in this study; historical method for researching the main theoretical, methodological, and clinical characteristics of cupping therapy; functional examinations (goniometry and manual muscle testing); sociological methods (WHOQOL-BREF and Constant Shoulder Score); and statistical methods (parametric and non-parametric methods for hypothesis testing) [14]. The statistical software package IBM SPSS for Windows v.24.0 was used for the data processing.

RESULTS AND DISCUSSION

The pilot study was conducted at the Orthopaedics and Traumatology Clinic at UMHAT "Sveta Marina", Varna, over the course of two years (from March 2020 until March 2022). 26 patients with shoulder arthroplasty accepted to participate in this study. The results show that the majority of respondents are female (88.5%) and urban residents (73%) with higher education (84.5% of the sample). The mean age of the respondents is 63.5 years (51÷76 years). The data from the functional examinations show that oedema reduction leads to the subsidence of complaints, such as heaviness and severe pain in the arm, as well as greater joint mobility. The assessment through manual muscle testing indicates improvement in all subjects of the study. Considering the average values for muscle strength of the muscles involved in the abduction of the arm in the shoulder (m. deltoideus, m. supraspinatus), we find an improvement of 1.13 units on the six-point MMT scale. An increase in muscle strength by 1.33 units compared to the initial values is established in the main muscles that perform flexion in the shoulder joint (m. deltoideus, m. coracobrachialis, and m. pectoralis major). The evaluation of the muscles performing extension (m. deltoideus, m. latissimus dorsi, m. teres major) shows a 1-unit increase in the direction of muscle strength improvement. The increase in comparison to the beginning of the programme for the internal rotators (m. subscapularis, m. pectoralis major, m. latissimus dorsi, m. teres major, and m. deltoideus) is 1.4 units. Among the patients with hindered external rotation is reported a 1.47-unit improvement in the muscle strength of the rotator muscles (m. infraspinatus, and m. teres major). The increase in the range of motion of the shoulder joint and muscle strength shifts the quality of life of patients in a positive direction (fig. 1):

Fig.1. Overall self-assessment of quality of life before and after the implementation of the complex kinesitherapeutic programme (n=26)



The overall self-assessment of quality of life is in the average values. A positive dynamic is observed in the overall assessment of quality of life after completion of the kinesitherapeutic programme (from 50.2 to 70.5). This improvement in the overall quality of life is at the expense of all domains but mainly in the "Physical", "Psychological", and "Environment" domains. The data from the descriptive analysis of the self-assessment of quality of life by individual domains and overall quality of life in patients with shoulder arthroplasty establish that the average value is approximately equal to that obtained with the average evaluation of the questionnaire according to the standard conditions. In order to determine the contribution of each domain in the formation of the overall quality of life assessment, classical multiple regression analysis was used. The analysis shows that all domains are statistically significant at a significance level less than the sampling error ($\alpha = 0.05$). The results show that the "Physical", "Psychological", and "Environment" domains are the most affected. The results from the multiple regression analysis in researching the influence on the individual domains of quality of life while determining its overall assessment show that all domains of quality of life hold their weight. The implementation of the multimodal kinesitherapeutic programme leads to a change in the overall self-assessment of quality of life in patients with shoulder arthroplasty. The improvement of the general quality of life is at the expense of all domains, but mainly in the "Physical", "Psychological", and "Environment" domains.

CONCLUSIONS

Shoulder pathology is one of the most common problems in orthopaedic and kinesitherapeutic practice. The implementation of a multimodal kinesitherapeutic programme contributes to functional recovery and leads to a change in the quality of life of patients with shoulder arthroplasty. Including cupping therapy in this programme helps speed up the recovery of patients with shoulder arthroplasty.

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KINESITHERAPEUTIC APPROACH AFTER VENOUS THROMBOLYSIS FOR ISCHEMIC STROKE

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ABSTRACT
Modern treatment of ischemic stroke in the first hours is focused on the early recanalization of the thrombosed artery, the prevention of the infarct zone, or its limitation. The recovery of patients with ischemic stroke poses a significant challenge for neurorehabilitation. To achieve the best possible results, early implementation of appropriately selected methods and kinesitherapy tools is necessary.
Purpose: To test a kinesitherapeutic approach after venous thrombolysis for ischemic stroke and monitor its effect in hospital and outpatient settings.
Methods: Twenty patients with motor deficits following acute ischemic stroke were studied, divided equally into two groups. To evaluate the achieved results, we used the following methods: socio-demographic characteristics of the patients, the Barthel Index test, and statistical methods.
Results: Statistical analysis of the data revealed that the frequency of ischemic stroke in men is twice as high as in women, with an average age of 66.6 years. Data from the Barthel Index test showed improvements in daily living activities in both groups, with Group 2 exhibiting a 100% improvement by the sixth month after discharge.
Conclusions: The developed kinesitherapy program for patients with ischemic stroke treated with venous thrombolysis contributes to faster and optimal functional recovery.

Keywords: ischemic stroke, venous thrombolysis, kinesitherapy, neurorehabilitation, quality of life.

INTRODUCTION
Stroke (Cerebrovascular Accident) is one of the most common socially significant diseases worldwide due to its high incidence, severe complications, resulting disability, and associated mortality. According to the World Health Organization, 15 million people globally suffer from a stroke annually, of whom 5 million die and another 5 million are left permanently disabled. The percentage of stroke survivors who remain disabled ranges from 50% to 75%, depending on the type, location, severity, and extent of the stroke, as well as the type of treatment applied and the patient's individual capacity.
It is important to note that complete morphological recovery after a stroke may never be achieved. However, the possibility of functional recovery offers some optimism, even in cases of permanent disability, which may last a lifetime. In Bulgaria, approximately 1 million people live a "life after stroke" [1].
One of the therapeutic methods in neurology is venous thrombolysis. Currently, thrombolysis with recombinant tissue plasminogen activator (rt-PA) is an established differentiated pharmacotherapeutic treatment for acute ischemic stroke (AIS) within the first 4.5 hours [2, 3]. The application of rt-PA, combined with adequate medical care and a properly selected kinesitherapeutic program, addresses the primary concern of patients - preventing severe disability during the most productive years of their lives [4, 5, 6].
Patients with AIS undergo a prolonged and complex recovery process, which requires significant effort and active participation not only from the patient but also from their relatives and the kinesitherapist. The goal is to achieve functional recovery and independence in daily activities. To achieve the best possible outcomes, it is essential to start and implement appropriately selected kinesitherapy methods and tools early on, tailored to the recovery phase and the individual condition of the patient [7, 8].

PURPOSE

To test a kinesitherapeutic approach following venous thrombolysis for ischemic stroke and monitor its effect in both hospital and outpatient settings.

MATERIAL AND METHODS

Twenty patients with pronounced motor deficits following acute AIS were monitored and rehabilitated. They were divided into two groups: Group 1 consisted of 10 patients treated with thrombolysis and standard kinesitherapy, and Group 2 included 10 patients treated with thrombolysis and author's kinesitherapeutic methodology. To evaluate the results achieved, the following research methods were used: socio-demographic characteristics of the patients, the Barthel Index test, and statistical methods [9].

RESULTS AND DISCUSSION

Twenty patients who had experienced ischemic stroke (IS) and exhibited moderate motor deficits, with an average age of 66.6 years, participated in the kinesitherapy program. Among the 20 patients treated with thrombolysis, 65% (13 patients) were men, and 35% (7 patients) were women. The study was conducted over a two-year period at the Second Neurology Clinic at University Hospital 'St. Marina' in Varna. All participants underwent a detailed medical history, clinical and paraclinical examinations, and assessment of motor deficits and kinesitherapeutic potential.

An individual kinesitherapy program was developed by a kinesitherapy specialist with the goal of achieving the highest possible level of recovery, enabling patients to resume their daily activities [10]. The tasks of kinesitherapy included in the author's methodology were defined based on the recovery period. During the acute phase up to the day of hospital discharge, the tasks focused on improving the general condition, preventing stagnation, avoiding pressure ulcers, maintaining joint ranges of motion and trophism of paretic limbs, stimulating active voluntary movements in the affected limbs, gradual verticalization, improving static and dynamic postural control during sitting, standing, and walking, training in walking, enhancing balance and movement coordination, self-care training, and psycho-emotional toning of the patient.

The tools used during this period to achieve these tasks included position therapy, massage, breathing exercises, active exercises to release the diaphragm, mobilization of the glenohumeral and wrist joints, passive exercises for relaxing the upper limb muscles per G. R. Tkacheva, passive techniques for lower limb relaxation, passive and active-assisted exercises, exercises for unaffected limbs, Proprioceptive Neuromuscular Facilitation (PNF), rhythmic stabilization in sitting and standing, Bobath exercises to improve balance in sitting and standing, gait training, and exercises for balance and coordination.

The kinesitherapy tasks from the day of hospital discharge to the end of the first month after the onset of IS are aimed at restoring psychological resilience, reducing spasticity in the affected limbs, preventing contractures, improving movement coordination, and mastering more complex motor activities of practical value. Additionally, they focus on improving balance during changes in movement direction, overcoming minor obstacles, enhancing sensory perception, positively influencing fine motor skills of the upper limb, training in stair climbing and descending, and increasing the speed of performing daily activities.

During this period, kinesitherapy procedures are conducted at home, with patients visiting the kinesitherapy office twice weekly for supervision to ensure the correct execution of exercises and for adjustments if necessary. The kinesitherapy methods applied include relaxation exercises, general relaxation using the Bobath method, relaxation of the upper limb following Tkacheva, lower limb relaxation in a side-lying position, Proprioceptive Neuromuscular Facilitation (PNF), exercises to improve sensory perception, fine motor skills and perception of the upper limb using a mirror device, open kinetic chain exercises performed in diagonal patterns, the Perfetti method, gait training with sharp directional changes, walking on uneven

terrain and overcoming obstacles, balance and coordination exercises with a fitball, stair climbing and descending exercises, and daily activity exercises.
Patient follow-up continues until the end of the sixth month after the cerebrovascular incident. During this time, patients perform a kinesitherapy exercise program for home rehabilitation. Periodic telephone contact is maintained, and functional tests are conducted at scheduled intervals during visits to the kinesitherapy office.
During the hospital stay, patients in Group 2 perform exercises with a total duration of approximately 45-50 minutes, with special exercises conducted for 20-25 minutes as the main part of the session. Thus, a significant portion of the density of the kinesitherapy procedure (70%) is focused on restoring motor function. The remaining 30% consists of breathing exercises and preparatory exercises suitable for patients with ischemic stroke (IS).
We developed a sample exercise program for patients with IS treated with venous thrombolysis, from the 24th hour to the end of the first month, divided into three phases: from the 24th hour to the 3rd day of hospitalization, from the 4th to the 5th-7th day of hospitalization, and from the day of discharge to the end of the first month. Based on typical post-stroke impairments and a detailed pathokinesiological analysis, we created an author's kinesitherapy methodology.
The standard kinesitherapy methodology was applied to patients in Group 1 and lasts 30 minutes with an individual approach. It is applied under our supervision during hospitalization and after discharge until the end of the first month from the stroke incident. Patients in this group also visit the kinesitherapy office twice a week. Following this period, periodic telephone contact is maintained, and functional tests are performed at scheduled times during visits to the kinesitherapy office. The ratio between the introductory, main, and concluding parts of this methodology is 5:20:5 minutes, respectively.
For patients with IS treated with venous thrombolysis, the Barthel Index test was used to objectively assess the achieved results, conducted before and after the kinesitherapy treatment course in the hospital, as well as on the 30th, 90th day, and at the 6th month. By the end of the first month, patients visited the kinesitherapy office twice a week for outpatient treatment. Afterward, they continued with the home kinesitherapy program developed by us and were invited to attend follow-up appointments on the third and sixth months to assess the results.
Figures 1 and 2 present the Barthel Index test results for better clarity, showing the outcomes on the day of discharge from the hospital for patients in Group 1 and at the 6th month, where we observe significant improvement in the performance of daily activities.

Barthel Index Test Results – Group 1

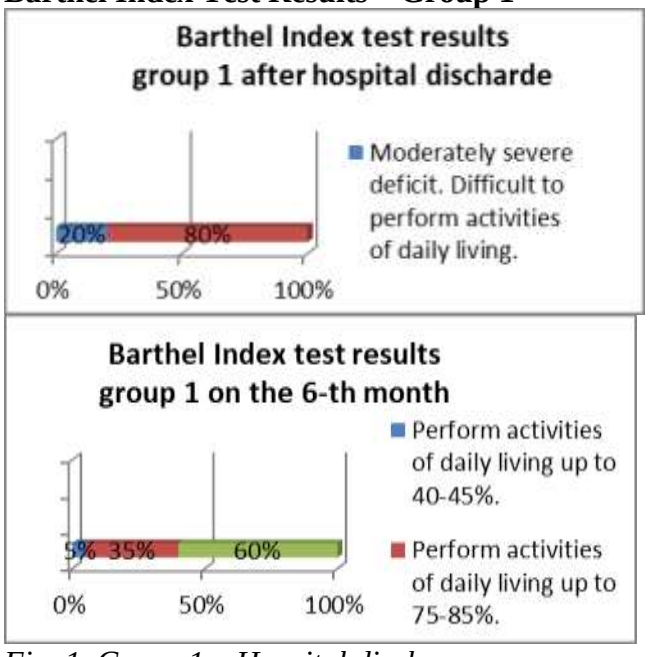

Fig. 1. Group 1 – Hospital discharge.

Fig. *2. Group 1 – 6th month*

Figures 3 and 4 present the results of the Barthel Index test for Group 2 on the day of discharge from the hospital and at the 6th month of the study, where we record a 100% improvement in the performance of daily activities as a result of the applied author's methodology. The difference between the two groups is visible, with clear evidence of the effectiveness of the methodology applied to the respondents in Group 2.

Barthel Index Test Results – Group 2

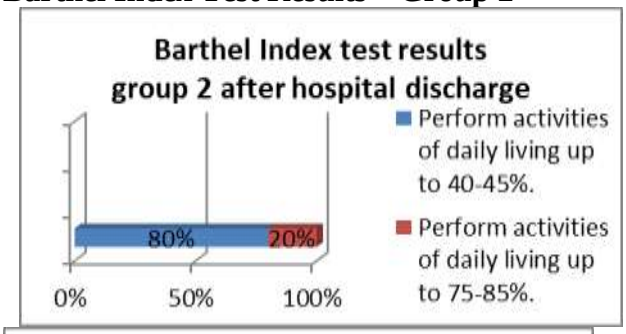

Fig. 3. Group 2 – Hospital discharge

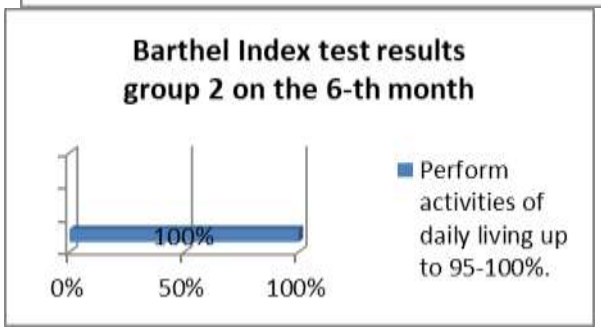

Fig. 4. Group 2 – 6th month

In summary, the author's methodology applied to patients with ischemic stroke treated with venous thrombolysis shows very good results and provides better opportunities for the recovery of stroke survivors.

CONCLUSIONS

This report examined motor deficits in patients after venous thrombolysis. The study demonstrated the benefits of the kinesitherapeutic approach, the prognosis, and the evaluation of the effectiveness of the applied therapy. Overcoming motor deficits proved the primary importance of kinesitherapy in the recovery process following a cerebrovascular incident. The observed changes in balance, gait, and daily activities confirmed that the kinesitherapeutic methodology we applied is an effective approach for their recovery. The results obtained from the conducted research represent our modest contribution to finding solutions for optimizing the kinesitherapeutic approach for patients with ischemic stroke treated with venous thrombolysis.

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SPECIFICS AND THERAPEUTIC DIFFICULTIES IN THE REHABILITATION PROCESS FOR A PATIENT WITH COMPLICATIONS IN THE RECOVERY PHASE AFTER CHEST AND HEART TRAUMA

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ABSTRACT
The goal of this report is to present the specificities and therapeutic difficulties in the rehabilitation process in a patient with a femur fracture that has developed late in the recovery phase after chest and heart trauma, complicated with postoperative cerebral infarction and quadriparesis. Materials and Methods: Rehabilitation was carried out according to an individual rehabilitation program of a male hospitalized in the Department of Physical and Rehabilitation Medicine. Due to an acute laceration in the left thoracic half, hemopericardium, pneumothorax and respiratory failure, the 51-year-old man was admitted as an emergency to the University Hospital Brno, Czech Republic in October 2022. Postoperatively, he developed occlusion of the basilar artery on the fourth day, mechanical thrombectomy and complete recanalization were performed. According to the vital records the male underwent continuous mechanical pulmonary ventilation. On this background, he developed ischemic cerebral infarction with subsequent quadriparesis. He underwent rehabilitation from day 9. In 2023, in a residual neurological and functional deficit condition, following a fall, he fractured his right femur. A metal implant was placed, and he underwent early inpatient rehabilitation at Stara Zagora University Hospital. The rehabilitation included breathing exercises, passive and active exercises, mechanotherapy, cryotherapy, verticalization and training in walking with a walker, training in daily life activities**.** Results: clinical symptoms before and after therapy were assessed. There was improvement in range of motion (SFTR) for the left hip joint from /S/0°-0°-0° to 0°-0°-90° and /F/0°-0°-0° to /F/0°-0°-5°/, reduced extremity spasticity, and Barthel index from severe deficit (5) to moderate (45). Conclusion: The design of a rehabilitation program for patients with pathologic injuries of multiple organs and systems requires precise diagnosis and the properly planned incorporation of specific methodologies to address musculoskeletal impairments on the background of preceding cardiac, respiratory, and central nervous system pathology.

Keywords: rehabilitation, functional recovery, femur fracture, quadriparesis, polytrauma.

INTRODUCTION
The rehabilitation process in patients with polytraumatic injuries (1) combined with subsequent ischemic changes in brain structure and movement disorders is lengthy and can vary considerably depending on the severity of the injury, and the post injury time period. The level of functional activity reached at the end of inpatient surgical treatment is important for the subsequent recovery and rehabilitation phases, but is not determinant for the quality of life (2). A complex rehabilitation is essential for a full recovery.
The rehabilitation strategy foundation (medical, occupational and socio-legal) for such patients is the adequate rehabilitation potential study, combined with good collaboration in the rehabilitation team of specialists and development of an individualized plan for rehabilitation and reintegration into society.
The rehabilitation program is carried out by an interdisciplinary team of medical specialists, led by a physician specialist in Physical and Rehabilitation Medicine and with the active participation of the patient, without whose assistance optimal recovery could not be achieved.

THE AIM of this report is to present the specificities and therapeutic difficulties in the rehabilitation process of a patient with a femoral fracture that occurs during the late recovery phase, after chest and heart trauma, complicated by postoperative cerebral infarction and quadriparesis.

MATERIAL AND METHODS

Rehabilitation was carried out according to an individual rehabilitation program of a male hospitalized in the Department of Physical and Rehabilitation Medicine at the University Hospital "Prof. D-r Stoyan Kirkovich", Stara Zagora. Due to acute stab wound in the left thoracic half accompanied with hemopericardium, pneumothorax and respiratory failure, the 51-year-old man was admitted for emergency treatment at the University Hospital Brno, Czech Republic in October 2022. Postoperatively, on the fourth day, he developed basilar artery occlusion, which required mechanical thrombectomy and complete recanalization of the affected artery. In the intensive care setting, the patient underwent prolonged mechanical pulmonary ventilation. However, ischemic cerebral infarction with subsequent quadriparesis occurred on this background. The patient began rehabilitation on day 9 after the acute incident.

Following a fall injury in 2023, the patient sustained a fracture in the proximal part of the left femur based on persistent residual neurological and functional deficits (Figure 1). The patient was admitted as an emergency to the Clinic of Orthopedics and Traumatology at the University Hospital "Prof. Dr. Stoyan Kirkovich" Stara Zagora, where he was implanted with a metal implant (Fig. 2), after which he started early inpatient rehabilitation corresponding to his objective condition.

Fig. 1 Presurgical X-ray examination

Fig. 2 Postsurgical X-ray examination

After the treatment in the orthopedic ward was completed, the patient was referred to the department of "Physical and Rehabilitation Medicine". His general condition was assessed, including neurological and motor deficits. His rehabilitation potential was determined and an individual rehabilitation program was designed. The rehabilitation process was conducted after the patient's written informed consent and in compliance with the Declaration of Helsinki. The program comprised of: breathing exercises, passive and active limb exercises, mechanotherapy, cryotherapy, stepwise verticalization and training in walking with a walker, training in activities of daily living.

The following functional tests and scales were used to determine rehabilitation potential and to design the individual rehabilitation program:

1. Assessment of joint range of motion (SFTR-methodology) - a test method for measuring active and passive joint range of motion;
2. Activities of Daily Living (ADL) assessment, which is used to test activities of daily living;
3. Brunnström Rating Scale for the degree of functional recovery, including assessment for spasticity after a cerebral infarction;

4. Barthel Index for Activities of Daily Living (ADL), a commonly used scale to determine daily functional activity and the ability to function independently.
Clinical symptoms were assessed before and after rehabilitation, and the patient's general condition was monitored daily for physical activity and exercise in the ADL to be adjusted if necessary.

RESULTS
The patient's rehabilitation potential was initially determined when he was admitted into the ward. The patient occupied a restricted position in bed, with impossible active movements of the left limbs (Brunnström stage 0), left knee joint contracture. Barthel Index - 5 pts, completely dependent on assistance. Test in ADL: unable to perform any activity (washing, eating, etc.) corresponding to stage 0.
After the rehabilitation program conducted during three hospitalizations, improvement in the range of motion (SFTR-method) for the left hip joint from /S/0°-0°-0° to 0°-0°-90° and /F/0°-0°-0° to /F/5°-0°-0°/ was observed. A reduction in limb spasticity was found, as well as an improvement in ADL (activities of daily living) to stage 2 (able to perform independent feeding but needing assistance from others for dressing and toileting), an improvement in Barthel Index from severe deficit (5) to moderate (45). Patient was verticalized on an assistive device and was able to take several steps with assistance from a rehabilitation therapist.

DISCUSSION
The functional recovery of patients with combined pathology that includes traumatic musculoskeletal injury (3,4), central motor neuron injury (5,6,7), chest trauma and the organs located therein (heart and lung), pose a number of challenges in formulating an adequate rehabilitation strategy for their optimal recreation, social and vocational rehabilitation.
Providing well-timed and stepwise rehabilitation is important in the recovery of hip fracture patients. The rehabilitation approaches we applied have been confirmed by the experience of other researchers who also apply therapeutic exercises tailored to the degree of impairment, mechanotherapy, training in ADLs, verticalization and prevention of comorbidities (4,5). An essential element of the rehabilitation program are breathing exercises, specialized methodologies to restore central motor neuron function and reduce spasticity that limits normal movement in the joints of the affected limbs (7).

CONCLUSION
The formulation of a rehabilitation program for patients with pathological injuries of several organs and systems requires precise diagnosis and correct, step-by-step incorporation of specific methodologies for influencing the damage to the musculoskeletal system on the background of preceding cardiac, respiratory and central-nervous pathology. The rehabilitation program is carried out by a rehabilitation team led by a specialist in Physical and Rehabilitation Medicine, who is required to perform an adequate diagnosis, to compose an individual rehabilitation program that includes specialized methodologies for influencing injuries, following the recovery process in collaboration with specialists in orthopedics and traumatology, neurology, cardiology, pulmonology, imaging diagnostics, etc.

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INDICATORS OF ACCIDENTS AT WORK IN THE EUROPEAN UNION, RELATED TO THE WORKING-AGE POPULATION: ANALYSIS FOR THE PERIOD 2015-2022

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ABSTRACT
Accidents at work are a crucial indicator for measuring work-related injuries, and fatalities are a key measure of the severity of work-related injuries. EUROSTAT provides detailed data on work-related injuries and fatalities and comparative analysis across countries using the Accidents at Work and Fatal Accidents Indicators, calculated on the basis of the working population.
Purpose: To examine trends and differences in accidents and fatal accidents at work indicators in the European Union member states based on working age in 2015-2022.
Methods: Indicators of accidents at work and fatal accidents at work related to the working-age population were utilized. The percentile method was employed to classify these indicators by level and to group the member states according to the relevant indicators.
Results: The results for the EU from 2015 to 2022 indicate a very high level of the occupational accident indicator (70.07) and a medium level of the fatal occupational accident indicator (0.93) for the working-age population. Overall, there has been a decreasing trend in both the Indicator of Accidents at work (IAW) and Indicator of Fatal Accidents at Work (IFAW) during this period.
Conclusion: The indicators of accidents at work and fatalities among the working-age population provide statistically comparable and reliably classified data. The IAW levels often reflect better reporting, high economic activity, and the specifics of labor dynamics. The IFAW is particularly useful for evaluating efforts to ensure healthy and safe working conditions. Additionally, EU initiatives promoting safe workplaces contribute positively to reducing accidents at work.

Keywords: accident at work, fatal accident at work, EUROSTAT indicators, European Union, classification, trends

INTRODUCTION
EUROSTAT defines an accident at work as a specific event that occurs during work and results in physical or mental harm. This definition encompasses all work-related accidents on the employer's premises or elsewhere. It includes incidents in public places or while using various means of transportation. Additionally, accidents that occur at home during teleworking are also covered. Cases of acute poisoning and intentional acts by others, if they happen during work, are classified as accidents at work as well [1]. Accidents at work serve as an essential indicator for measuring occupational injuries.
EUROSTAT defines fatal accidents at work as incidents that result in the death of an individual within one year of the accident. These accidents are an essential measure of the severity of occupational injuries, highlighting significant deficiencies in providing safe and healthy working conditions.

PURPOSE
To examine trends and differences in the indicators of accidents at work and fatal accidents at work in the European Union (EU) member states in the period 2015-2022 by using the indicators of accidents at work and fatal accidents at work related to the working-age population and to classify the member states based on the calculated values of these indicators.

MATERIALS AND METHODS

Official EUROSTAT data by year for the period 2015-2022 were used regarding the number of accidents at work [2] and fatal accidents at work [3], the population of each of the European Union member states [4], and the relative share of the working-age population (from 20 to 64 years) [5].

The working-age population (ages 20-64) for each EU member state has been calculated for the years 2015 to 2022, based on data regarding the total population and the percentage of the working-age population in each member state.

To ensure that we obtained statistically comparable and reliably classified data, we calculated indicators for accidents at work (per 10,000 working-age individuals) and those resulting in fatalities (per 100,000 working-age individuals). These calculations were based on the absolute number of incidents and the working-age population of each Member State. We classified the data into five groups using the percentile method, specifically the 75th, 50th, 25th, and 10th percentiles.

RESULTS

Based on the obtained values of the Indicator of Accidents at work (IAW), the following five groups are formed: IAW with a Very High Level over 70; IAW with a High Level from 43 to 69.9; IAW with a Medium Level from 23 to 42.9; IAW with a Low Level from 10 to 22.9; and IAW with a Very Low Level up to 9.9.

For 2015-2022, the IAW for the entire EU is 70.07 per 10,000 working-age population, classifying it as a Very High indicator.

The grouping of Member States (2015-2022) is as follows: Countries with Very High IAW levels are Portugal (141.1), Luxembourg (132.3), Spain (113.2), Germany (106.4), France (94), Austria (74.8) and Denmark (70.9). The second group of countries with High IAW levels is formed by Finland (69), Slovenia (66.3), Italy (58), Belgium (56.5), Estonia (47.3), and Malta (43.2). The Netherlands (42.8), Czech Republic (41.9), Croatia (33.3), Ireland (30.5), Sweden (30), Hungary (27) and Cyprus (24.3) have a Medium IAW level. The next group – Poland (21.2), Slovakia (19.3), Latvia (15.9), and Lithuania (11.7) are countries with Low IAW levels. A deficient level of IAW has been calculated for three countries, including ours, which ranks second to last – Greece (6.3), Bulgaria (3.5) and Romania (3.1).

Within the EU, two distinct periods can be observed regarding the IAW. From 2015 to 2019, there was a decrease in the IAW, which fell from 74.2; 74; 74; 73.6 to 73.1. Conversely, from 2020 to 2022, the IAW increased from 61 in 2020 to 66.5 in 2022, followed by a slight decrease to 64.9 in 2022.

The values of the second indicator we calculated – the Indicator of Fatal Accidents at work (IFAW) – are grouped as follows: IFAW with Very High Level: above 1.5; IFAW with High Level: from 1 to 1.49; IFAW with Medium Level: from 0.7 to 0.99; IFAW with Low Level: from 0.5 to 0.69 and IFAW with Very Low Level: up to 0.49.

The EU's IFAW for 2015-2022 is 0.93 per 100,000 working-age population, or we have an indicator with an Medium level. Three countries have a similar Medium IFAW level – Hungary (0.99), Slovakia (0.92) and Poland (0.71). The group of countries with a calculated Very High IFAW level are Luxembourg (2.68), Latvia (1.88), Lithuania (1.75), Malta (1.71), Romania (1.6), Bulgaria (1.58), Portugal (1.54) and Austria (1.52). EU countries with a High IFAW level are Croatia (1.3), Italy (1.17), Estonia (1.17), France (1.17), Cyprus (1.09), Czech Republic (1.03), Slovenia (1.02), Spain (1.02) and Ireland (1). The following countries have a Low calculated IFAW: Belgium (0.67), Denmark (0.65), Germany (0.59) and Finland (0.55). The last group of countries with a Very Low IFAW includes Greece (0.45), Sweden (0.39), and the Netherlands (0.21).

Within the EU, the trend of decreasing the IFAW from 2015 to 2019 has been maintained, from 1.08, 0.95, and 0.92, respectively, and it has remained at 0.92 for the last two years. In 2020,

there was a sharp decrease in the IFAW (0.88), an increase in 2021 (0.91), but below the levels of the previous period (2015-2019), and another decrease in 2022 (0.88).

DISCUSSION

From the analysis, it is striking that countries in the European Union, such as Germany, France, Austria, Spain, Portugal, Denmark, Finland, Italy, and Belgium, which are economically highly developed, have high and very high levels of IAW. Conversely, countries with weaker economies, such as Poland, Slovakia, Latvia, Lithuania, Greece, Bulgaria, and Romania, have low levels of IAW.

Based on published analyses about various industrial sectors in the EU, reports from the European Agency for Safety and Health at Work (EU-OSHA), European statistical data from EUROSTAT, and information from the OSH Barometer [6, 7, 8, 9], it is evident that the reasons for these issues can be examined from multiple perspectives. The most significant aspects include:

Economically developed countries typically have strict legislative requirements and well-established systems for reporting accidents at work. Such legislation tends to reflect the actual number of incidents more accurately than in countries with less effective reporting systems. In these developed nations, better reporting by employers and employees (driven by a high awareness of workers' rights, access to adequate compensation or medical treatment, and strong state oversight) leads to more thorough documentation of incidents. This comprehensive reporting may create the perception that accidents at work occur more frequently than they do.

In countries with developed economies, despite strict safety standards, accidents can remain significant in higher-risk sectors such as construction, heavy industry, and transport.

The large number of employed people in developed countries automatically increases the absolute number of accidents at work. Even with low relative accident rates, the high number of workers makes the accidents significant.

The levels of IAW due to the high number of registered accidents at work do not necessarily indicate lower safety standards but often reflect better accountability, high economic activity, and specific labor dynamics. This highlights the importance of analyzing the data in the context of each country's economic, social, and cultural characteristics.

Unlike the IAW, the IFAW is much more indicative for assessing health and safety at work (HSW) activities in the EU. Due to the nature of the event, systems for recording and reporting OHS are much more effective.

Undoubtedly, there is an inverse relationship between the “level of HSW” and “fatal accidents.” The healthier and safer the working conditions, the lower the IFAW rate. An example is the Member States with low IFAW rates – Belgium, Denmark, Germany, Finland, Sweden, and the Netherlands.

The main conclusion is a reduction in IAW and IFAW over the period studied at the EU level, with 2020 being a year of sharp decline due to the COVID-19 lockdown. The tracking of IAW and IFAW is evidence that EU actions to ensure healthy and safe workplaces, linked to the EU Strategic Frameworks for Health and Safety at Work for 2014-2020 and 2021-2027, positively affect a sustainable reduction in accidents at work.

CONCLUSIONS

The IAW and IFAW related to the working-age population more accurately reflect the differences between EU member states due to the more excellent data reliability than those for the working population.

The IAW can be a valuable tool for evaluating EU countries' economic development and their statistical systems' effectiveness for registering and reporting accidents at work. However, this indicator should not be examined in isolation; it should be considered alongside other factors, such as the structure of the economy, cultural characteristics, and the legislative framework.

The IFAW provided offers valuable insights into the progress made in ensuring safe working conditions, particularly in high-risk sectors. However, to obtain a comprehensive understanding, the IFAW should be examined alongside other indicators, such as the total number of accidents at work and the severity of incidents.
Countries with high IAW and IFAW rates must enhance their occupational health and safety systems and be more transparent and accountable when reporting workplace accidents.

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MENTAL STRESS PATTERNS AMONG MEDICAL STAFF DURING COVID–19 PANDEMIC

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ABSTRACT
Mental stress at the working place is distinguished by extreme tendencies of distress at work, objective response of disturbance of the functional state of Cardiovascular system and autonomic cardiovascular control, subjective feeling of the absence of control, low level of social support and increased working demands. Our research is focused of the effect of COVID-19 pandemic on mental stress level at work.

Key words: mental stress, heart rate variability, physicians, nurses, COVID-19

INTRODUCTION
Workplace stress is the result of the interaction of a wide range of stressors from different factorial areas. Medical personnel are exposed to high-risk factors for occupational stress. Medical teamwork is based primarily on mutual support with colleagues. Teamwork guarantees medical personnel high-quality, precise and reliable work in providing adequate assistance not only in resuscitation and surgical situations, but also in providing all health care. On the other hand, medical workers are mainly individuals whose work is carried out in an environment with multiple contacts among patient flows. Workers who maintain patient care during emergencies on the front line are particularly exposed to the COVID-19 virus. Healthcare workers are mainly affected by the COVID-19 pandemic. The COVID-19 pandemic is a stressor that affects the representatives of the individuals in our study. The pandemic factor potentiates the action of other stressful psychosocial and professional factors and increases their synergistically proven adverse effects on the mental and physical condition of the working individual. Over the last decade, heart rate variability (HRV) has gained popularity in the fields of occupational medicine, psychophysiology, prevention, and various branches of medicine. This trend defines reduced HRV as a predictor of many life-threatening conditions and diseases [1], [2]. Stress at work is associated with changes in HRV indicators, which are an expression of changes in cardiovascular autonomic regulation. In addition to behavioral and cognitive emotional reactions, accumulated professional stress has a detrimental effect on cardiovascular functionality under the controlling role primarily of the autonomic nervous system [3]. Psychological and professional factors have been identified in medical staff. *Psychological factors* include: Psychosocial stress due to exposure to psychosocial risks, such as job control, job demands, workload, social tripartite support from the immediate supervisor, colleagues and family; self-esteem at work, cognitive abilities, psychosomatic complaints; Psychological stress caused by verbal and physical harassment from patients, their relatives and friends; Psychological stress associated with risky emergency, emergency and critical situations in resuscitation conditions when saving human lives and providing therapeutic intervention; Psychological stress associated with the risk of neglecting the human factor, as well as the risk of accidents. *Professional factors* are: Nervous-mental stress; Mental workload; Requirements for high responsibility for the health and life of the patient, public responsibility and responsibility to the patient's family and relatives; Requirements for resuscitation and operational life-saving actions and manipulations requiring critical intervention; Medical diagnostics and therapy; Health care for patients by nursing staff; Medical intervention in emergencies and especially in difficult-to-diagnose cases and treated patients; Working in a time deficit; Security and safety requirements; Requirements for continuous qualification and improvement of skills; Requirements for adequate intervention in terms of speed and urgency; High concentration and distribution of attention at work; Inclusion of higher thinking and associative processes; Dynamics of processes with memory inclusion;

Shift and night work; Visual and auditory load of the analyzers; Static load on the musculoskeletal system from the working posture; Work in a high-risk pandemic environment from COVID-19 and with other biological agents and hazards. The purpose of our research study, analysis and assessment is to determine the psycho-physiological reactions and trends of occupational stress in medical staff in the context of the COVID-19 pandemic.

MATERIAL AND METHODS

Scope of the study - the sample includes 100 medical workers, of which 62 physicians and 38 nurses. The gender distribution is as follows: 28 men and 72 women. There are 34 female physicians and 28 male physicians. All nurses are female. Time and place of observation: Methodological survey among medical personnel conducted from 01.10.2020 to 30.10.2020. Study of HRV indicators from 25.10.2020 to 30.10.2020 at the Municipal Hospital, Emergency medical center and Occupational Medicine Service in Northwestern town of Bulgaria.

Non-invasive functional diagnostic system of analysis of functional state of cardiovascular system (CVS) and autonomic cardiovascular control was applied in medical staff: physicians and nurses. National Institute of Occupational Safety and Health (NIOSH) job stress questionnaire was conducted to be analyzed and evaluated psycho-social factors. Research involving humans has been approved by an institutional ethics committee.

NIOSH methodology for assessing occupational psychosocial stress has been validated and adapted for Bulgarian conditions and language; *Sphygmomanography* of systolic and diastolic blood pressure; Study of the functional state of the cardiovascular system and autonomic cardiovascular regulation with a *diagnostic computerized method of the Heart Rate Variability* Analysis System [4], [5]; *Job Analysis*; *Statistical methods*, descriptive statistics; Using the Analysis of Work Activity, we identified the risk factors responsible for the occurrence of stress in the studied profession. The resulting signs in our study are the following two groups. *Psychological indicators:* control over the performance of work activity; social support from the immediate supervisor, social support from colleagues and social support from the family; job demands, workload; cognitive abilities; self-esteem in relation to work; psychosomatic complaints; extra-work activity. *Physiological indicators:* time-based indicators of HRV (X, SDNN, SDNN5, pNN50, rMSSD, SDSD); frequency-based indicators of HRV (VLF, LF, HF and LF/HF); frequency-based indicators of HRV, corrected for respiratory activity (LFa, HFa, LFa/HFa); indices of HRV (PS, MS, FA, HR).

RESULTS

A work-related situation of high professional stress was determined due to a low degree of control over the performance of work activities and increased demands in the work process in the group of medical personnel without the control group. The average values of the time-based indicators of cardiac variability: pNN50, rMSSD, SDSD in physicians and nurses studied by us, however, significantly differ from the reference values, showing a trend of decreasing parasympathetic activity. The frequency-based indicators of cardiac variability: VLF, LF, HF and LF/HF and those corrected for respiratory activity: LFa, HFa, LFa/HFa in physicians and nurses, significantly differ from the reference values, showing a trend of:

a) an increase in thermoregulation and renin-angiotensin-aldosterone activity based on the study of VLF values, especially in the group of nurses (Figure 1);
b) an increase in sympathetic activity based on the studied values of LF (Figure 2) especially in the group of nurses, LFa, LF/HF, LFa/HFa;
c) a decrease in parasympathetic activity based on the studied values of HF and HFa.

Therefore, in terms of the results of the study of time-based and frequency-based indicators of HRV, parasympathetic inhibition and reciprocal sympathetic activation are observed. Autonomic cardiovascular control indices revealed the increase of sympathetic activity and decrease of parasysmpathetic activity. We found an increase in thermoregulation and renin-angiotensin-aldosterone activity especially in nurses. In terms of the indices of HRV the levels of the mental

stress (MS)were significantly higher in nurses compared to physicians (Figure 3). Based on the average HR values in both groups of physicians and nurces, the autonomic cardiovascular regulation is pre-abnormal. According to the European classification for the study and determination of reference values of blood pressure and determination of categories of arterial hypertension in physicians and nurses, a significant increase in RR diastolic was found in the group of physicians compared to nurses whose blood pressure falls into the category of "normal".

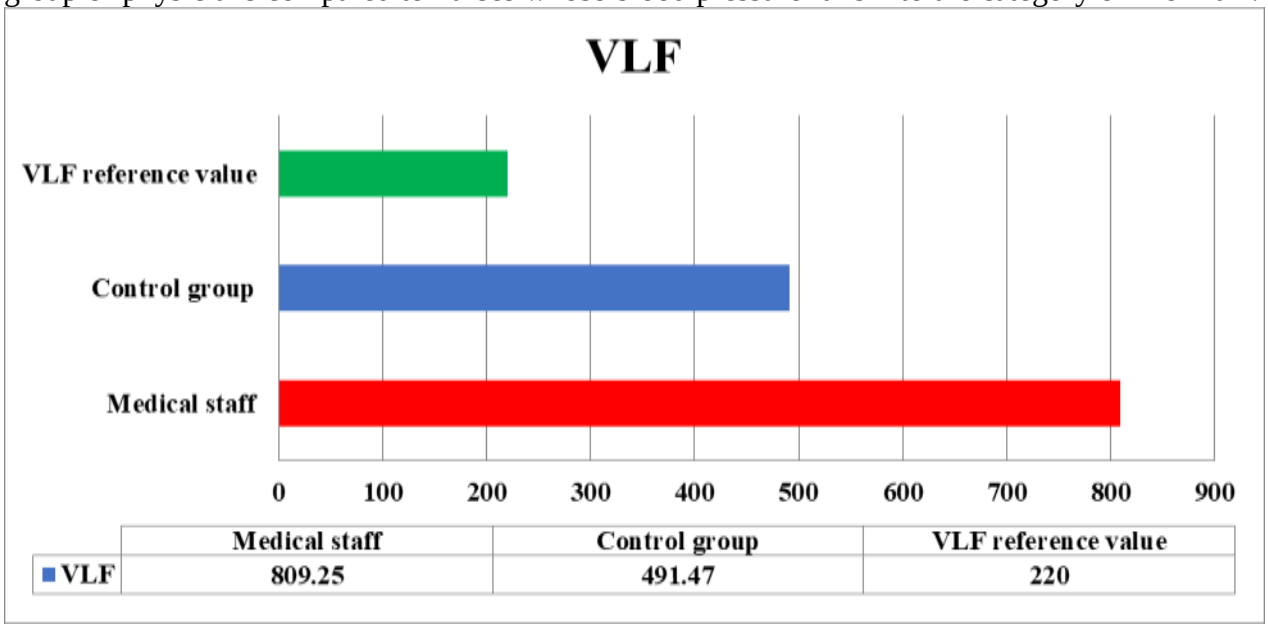


Fig. 1. Level of Very Low Frequency (VLF).

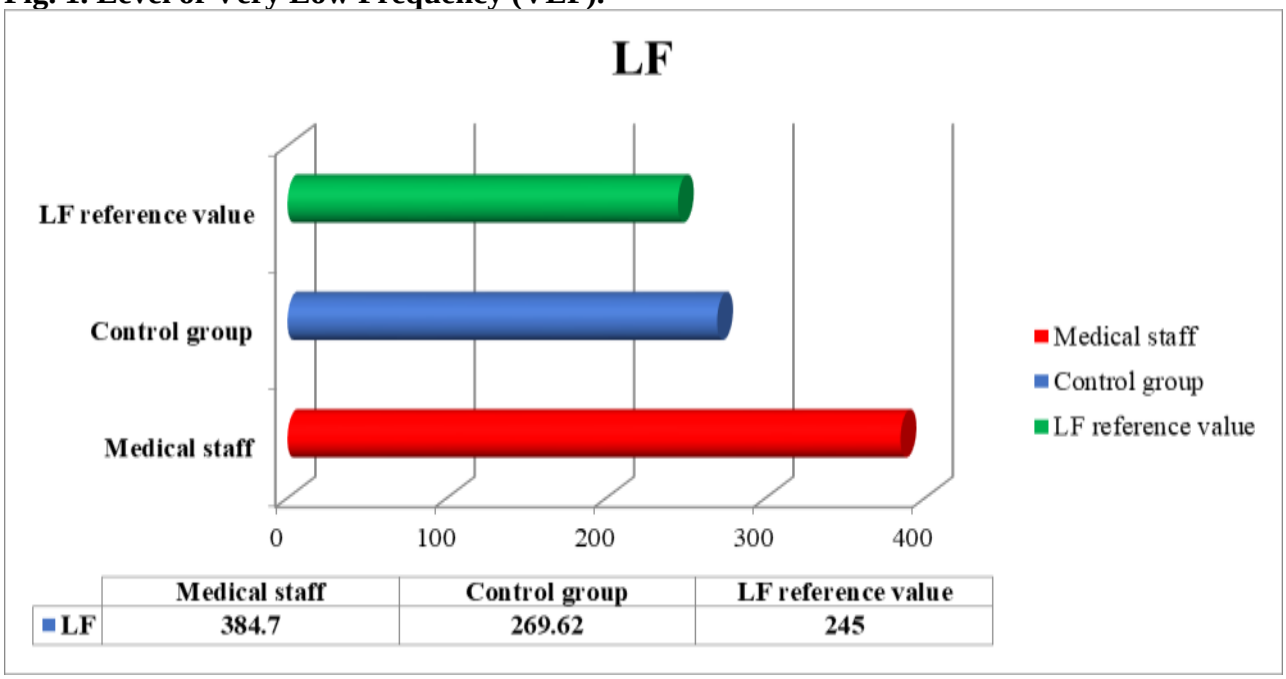
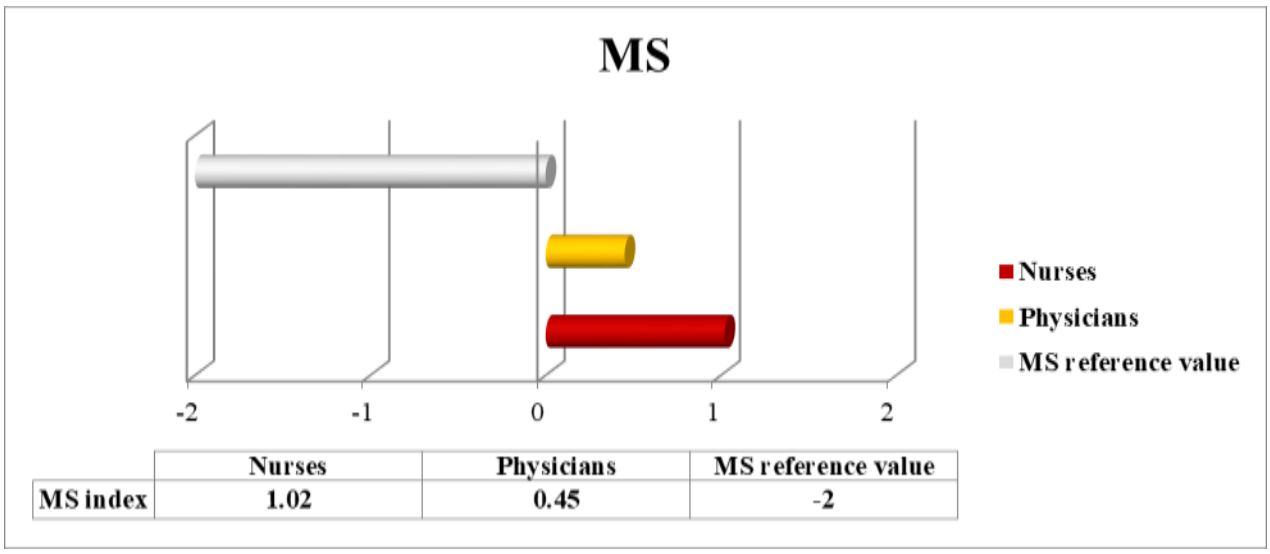


Fig. 2. Level of Low Frequency (LF).



	Nurses	Physicians	MS reference value
MS index	1.02	0.45	-2

Fig. 3. Level of Mental Stress (MS), physicians and nurses.

CONCLUSIONS

The results of our study revealed that the pandemic of COVID-19 is a major indicator of the level of mental stress among medical staff. COVID-19 appears to be a significant stress, causing disorder of the autonomic cardiovascular control. We have also defined significant psycho-social stressors that are aggravated by the COVID-19 pandemic. A work-related situation of high occupational stress is determined by a low degree of control and increased working demands. Nurses have lower social support from their immediate supervisor compared to physicians. In our study, chronic exposure to occupational psychosocial risk factors preceded the COVID-19 outbreak, but these same risk factors may contribute to exposure, susceptibility to infection, and disease severity during the pandemic. Cognitive strain from increased levels of occupational stress and working in a COVID-19 pandemic impairs CVS function and autonomic cardiovascular regulation in medical staff.

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CONSEQUENCES OF WORK-RELATED MUSCULOSKELETAL DISORDERS IN TAILORS

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ABSTRACT
Work-related musculoskeletal disorders affect not only the general health of many workers, but also have a negative economic impact.
Purpose: To study the consequences of work-related musculoskeletal disorders in tailors
Methods**:** The data was collected using a modified Nordic Musculoskeletal Questionnaire.
Results: In this study, 54.5% of tailors with work-related musculoskeletal disorders reported an increase in pain while working, which is a major reason for experiencing significant discomfort during work (47.1%), substantial difficulties in daily life (36.1%), and sleep disturbances (44.4%). A large proportion of tailors with work-related musculoskeletal disorders have undergone hospitalizations, surgical interventions, or taken medications to relieve pain. Many have taken sick leave or changed the type of work and workplace.
Conclusion: The study revealed that musculoskeletal disorders have a significant impact on the health, workability, and quality of life ofor tailors

Keywords: Musculoskeletal Disorders, Work-related Musculoskeletal Disorders, Sewing Machine Operators, Tailors

INTRODUCTION
The work-related musculoskeletal disorders (WMSDs) are musculoskeletal disorders (MSDs) that involve conditions causing physical discomfort due to the impact on bones, muscles, ligaments, and nerves, triggered or worsened by work and the circumstances surrounding it. WMSDs affect many workers across different professions, posing a significant problem for the overall healthcare system [1, 2].
Reports indicate that 60% of all work-related illnesses are MSDs. Although there was a reported decrease of 62% in some types between 2013 and 2021 in the EU, other conditions like synovitis and tenosynovitis have increased by 13%. About 44% of workers in the EU report pain or discomfort related to WMSDs [3, 4]. They not only affect the overall health of many workers but also have a negative economic impact on businesses, driving up financial and social costs for European countries.

THE PURPOSE of the study is to explore some consequences of WMSDs in tailors.

MATERIALS AND METHODS
This cross-sectional study is part of a larger study, the data of which were collected using the Nordic Musculoskeletal Questionnaire (NMQ) modified by Y. P. Prodanova and T. G. Kundurzhiev. The original questionnaire is available from the article by Kuorinka et al. [5].
The modified questionnaire contains 2 sections.
Section 1: a general question to identify areas of the body with musculoskeletal problems. The completion was assisted by a body map to indicate twenty-seven areas of possible problems. Respondents answered whether they had experienced musculoskeletal problems in the past 12 months. This question was mandatory. Participants had to answer “yes” or “no” to the screening question, and those who answered “yes” were asked to mark one or more pain sites.
Section 2: with four questions, to be completed in case of musculoskeletal problems in the past 12 months. It includes a question specifying the presence of difficulties that prevented normal activity (at work, at home) due to problems in the last 12 months, 4 weeks and the last 7 days, as well as 15 additional questions concerning the consequences of MSD.

This article presents the data from these additional questions related to the duration of the musculoskeletal disease, seeking medical care, treatment, hospitalization, incl. with surgical resolution of the health problem, temporary incapacity for work, some temporal characteristics of pain as a result of MSD, as well as the degree of inconvenience from it, its impact on work capacity and sleep. Only the responses of individuals with musculoskeletal disorders (N=44) are included.
Descriptive statistics were used to examine the frequencies, percentages, means and standard deviations of variables, including the demographic characteristics of the tailors.
The statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) version 20.

RESULTS

This study is part of a larger study [6, 7], in which 86.3% of respondents reported the presence of musculoskeletal disorders. Namely, these individuals (N=44) are the subject of our study.
The distribution of tailors with MSD shows a higher relative share of women (84.1%), mean age 55.47 (±8.4) years, secondary education, married urban residents with an average total work experience of 32.34 (±10.2) years and special work experience – an average of 19.87 (±14.5) years. Underweight (BMI below 18.5) is 22.7%. The relative share of individuals with normal weight (BMI 18.5-24.9) is 65.9%, and those with overweight (BMI 25-29.9) – 11.4%. There are no obese tailors (BMI above 30).
The majority of people with MSD (72.7%) do not engage in sports or other activities characterized by moderate to intense physical activity in their free time.
At the time of the study, only 13.6% of respondents assessed their physical activity as high. People with moderate (70.5%) activity prevailed, and 2.3% noted a lack of such.
Only 11.4% of tailors with MSD have complaints in two areas of the body. The rest (88.6%) indicated pain and discomfort in three or more parts of their body.
As for the moment of the initial appearance of the problem on the part of the musculoskeletal system, the respondents indicated an age between 17 and 57 years old. The group that experienced pain for the first time at the age of 40 had the highest relative proportion.
The indisposition from pain and discomfort in the body is high for 47.1% of the tailors with MSD and moderate for 41.2%. The group with the smallest relative proportion (11.8%) is the group of individuals experiencing mild discomfort.
Pain and discomfort resulting from MSD cause slight inconvenience at work for 44.4%. They are a significant obstacle to performing work duties for 41.7% of individuals with MSD, and for 13.9% – they are not a cause of reduced work capacity at all and do not interfere with the ability to work by seamstresses.
In daily activities outside of work, slight inconvenience caused by MSD is experienced by 52.8% of affected individuals. A lower relative share (36.1%) are individuals experiencing significant difficulties in their daily lives as a result of musculoskeletal problems.
Pain and discomfort from MSD are the cause of significant (44.4%) and slight (41.7%) sleep disturbance in seamstresses.
During work, 54.5% of individuals experience increased pain/discomfort, while the rest claim that they are not affected by work.
After the end of the workday, pain decreased in 24.3% of seamstresses with MSD, increased in 18.2%, and was unaffected in 54.5%.
The picture is not the same when taking a break from work for a longer period – in more than half of the respondents with MSD (59.9%), the pain decreases, and in 35.1% it is not affected.
Due to a problem/s of the musculoskeletal system, 46.5% have taken medication in the last 12 months, and 68.3% have been on sick leave.
During their working life, 83.7% have been hospitalized due to a problem/s of the musculoskeletal system, 73.8% have practiced physical exercises to prevent these problems, and 76.7% have undergone surgical intervention/procedures to correct musculoskeletal disorders.

Prior to practicing the current tailoring profession, 81% had some disease/exacerbation related to musculoskeletal pain, and only 19% reported no MSD disease. A change of job or duty (even temporarily) due to MSD was necessary for 87.5% of tailors.

CONCLUSIONS

The study revealed that musculoskeletal disorders have a significant impact on the health status, work capacity and quality of life of tailors.

The peak of initial symptom onset is around the age of 40, highlighting the need for early prevention and intervention. More severe stages of MSD are associated with higher pain intensity and greater discomfort, and physical activity is reduced. The pain and discomfort characteristic of advanced stages of MSD are not only a significant obstacle to performing work duties, but also seriously disrupt sleep and leisure activities of affected individuals. Although short breaks provide temporary relief, sustained recovery remains a key factor in reducing symptoms.

The consequences of MSD are significant – a large proportion of of tailors have undergone hospitalizations, surgical interventions or pain medication, and many have used sick leave or changed their jobs and professional duties.

The data clearly show – the progression of MSD leads to a deterioration in the quality of life, including the quality of working life, to economic losses for the state, employers and workers, as well as a burden on the health system.

Investing in improving working conditions and early diagnosis of MSD can lead to better health of workers, increased productivity and long-term sustainability of the textile industry

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DETERMINATION OF CERVICAL SPINE MUSKULOSKELETAL DISORDERS IN MEDICAL PROFESSIONALS

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ABSTRACT
Healthcare workers are at increased risk of developing work-related musculoskeletal disorders. The consequences of neck pain in this population can lead to limitations in daily activities, sleep disruption, and prolonged temporary disability. **Aim**: Determination of MSD in the cervical spine as a result of application of the Vernon, H. & Mior, S. questionnaire in medical professionals as a result of occupational exposure. **Methods:** The Neck Injury Index Questionnaire, developed by: Vernon, H. & Mior, S. (1991), was used to determine specific cervical spine injuries administered to 251 healthcare professionals. **Results:** The results of our study indicate that NII is a valid tool for measuring pain in the cervical spine. We found that the distribution of the degree of damage to the cervical spine is as follows: (0-8%) without impairment - 40.2%, (10 - 28%) mild disability - 47%, (30-48%) moderate disability - 10.8%, (50-64%) severe disability - 2.0%.

Keywords: Neck Injury Index Questionnaire, Musculoskeletal Disorders, medical professionals; spinal cord; occupational activity

INTRODUCTION
Musculoskeletal disorders are one of the most common adverse occupational health problems among healthcare providers [1,2,3,4]. A systematic review of work-related musculoskeletal disorders found that 35–45% of physicians, nurses, and midwives suffer from neck, shoulder, and upper back pain [5]. The consequences of neck pain in this population can lead to limitations in daily activities, sleep disruption, and absenteeism [6]. Various studies have shown that healthcare workers are at higher risk of developing work-related musculoskeletal disorders [7,8] and have revealed that risk factors for neck pain include female gender, associated chronic diseases, working more than eight hours per day, and upper spine strain [9].

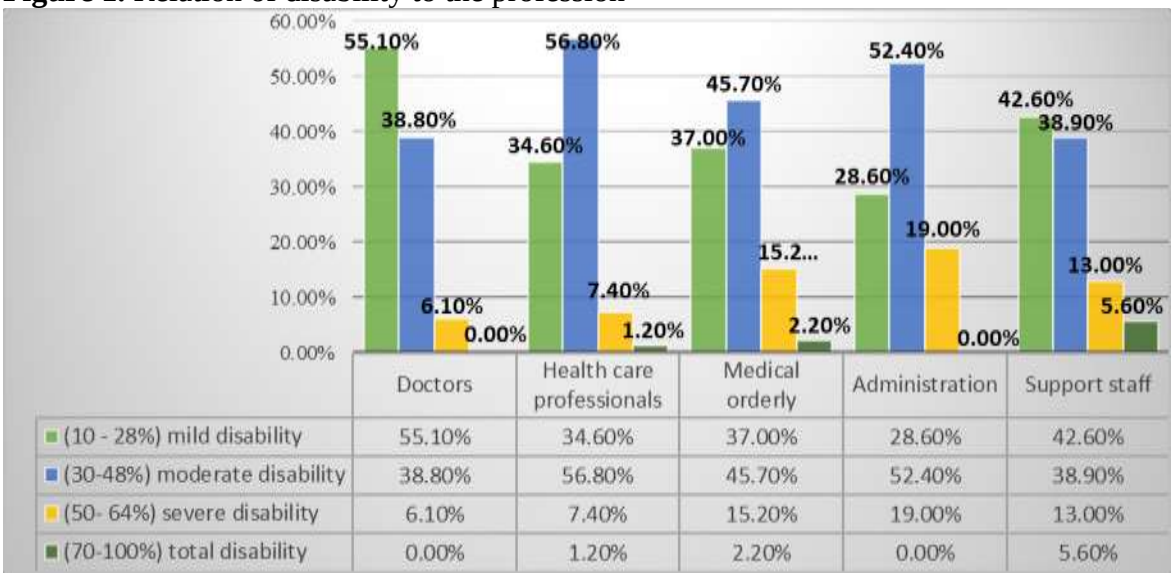
AIM
Determination of MSD in the cervical spine as a result of application of the Vernon, H. & Mior, S. questionnaire in medical professionals as a result of occupational exposure

MATERIALS AND METHODS
The Neck Injury Index (NBI) questionnaire, developed by: Vernon, H. & Mior, S. (1991), was used to determine specific cervical spine injuries, administered to 251 workers in a public hospital in Bulgaria. With its specificity and reliability, the questionnaire assesses the degree of disability caused by neck pain and/or limited neck movement in daily activities (self-care, lifting, reading, headache occurrence, concentration, driving, sleeping, work and other activities) [10].

RESULTS
To assess neck injuries related to activities of daily living of healthcare workers, we used a neck injury index questionnaire. The survey included 212 women and 39 men from a multidisciplinary hospital for active treatment in Bulgaria, with the largest proportion of respondents from the group of healthcare professionals - 32.3%, followed by physicians - 19.5% and support staff - 21.5%. The average age of the participating physicians in the study was 42.48 years, and of the healthcare professionals - 49.84 years, respectively, the total work experience - 17.14 years for physicians and 26.91 years for nurses, midwives and physician assistants.

The results of our study indicate that NII is a valid tool for measuring pain in the cervical spine. We found that the distribution of the degree of damage to the cervical spine is as follows: (0-8%) without impairment - 40.2%, (10 - 28%) mild disability - 47%, (30-48%) moderate disability - 10.8%, (50-64%) severe disability - 2.0%. We found a significant relationship between the degree of impairment and gender (p = 0.008). Women are more likely to be disabled. There was no significant relationship between the position held and the impairment (p = 0.154).

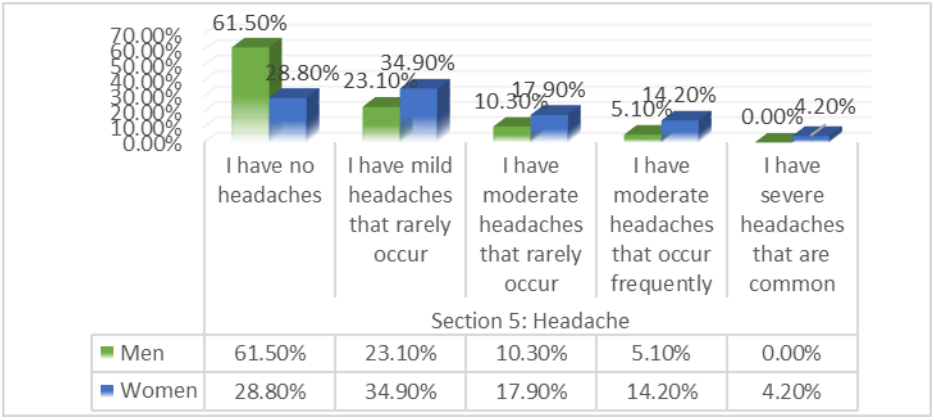
Figure 1. Relation of disability to the profession



	Doctors	Health care professionals	Medical orderly	Administration	Support staff
(10 - 28%) mild disability	55.10%	34.60%	37.00%	28.60%	42.60%
(30-48%) moderate disability	38.80%	56.80%	45.70%	52.40%	38.90%
(50- 64%) severe disability	6.10%	7.40%	15.20%	19.00%	13.00%
(70-100%) total disability	0.00%	1.20%	2.20%	0.00%	5.60%

Of the 10 questions, we found a significant relationship between gender and the topic (questions): headache, driving, sleeping. To the question "I do not have any or rarely a slight headache" men answered - 74.6%, and women - 63.7%. On the next question "driving a car I have no pain or too light to drive long enough" again the men are leading - 92.3% and the lower share of women - 56.1%.

Figure 2. Section 5: Headache



	I have no headaches	I have mild headaches that rarely occur	I have moderate headaches that rarely occur	I have moderate headaches that occur frequently	I have severe headaches that are common
	Section 5: Headache				
Men	61.50%	23.10%	10.30%	5.10%	0.00%
Women	28.80%	34.90%	17.90%	14.20%	4.20%

94.9% of men and 68.9% of women surveyed are without sleep disturbances. This distribution clearly indicates that in women the impact of the medical profession is more significant when examining the specific relationship between the cervical spinal cord disability index and the occupational functions related to ergonomics, medical organization, shifting and absence of regulated breaks or their non-compliance.

Figure 2. Section 9: Sleeping

CONCLUSION

There is an urgent need to conduct thorough studies, diagnostics, and implement prevention for MSD among medical professionals due to the significant strain in their profession and the resulting injuries to the spine.

Our next goal and task will be to determine the localization of pain in the cervical region as well as in different segments of the spinal cord after applying various methods for diagnosing MSDs during work activities.

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TRIGGERING ROLE OF OCCUPATIONAL STRESS IN THE ETIOPATHOGENESIS OF CARDIOVASCULAR DISEASES IN NURSES

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ABSTRACT

The etiopathogenesis of CVD can be clarified by studying psychosocial and functional indicators of occupational stress. The purpose of the present study is to identify psychosocial and functional risk factors contributing to the elucidation of the etiopathogenesis of CVD in nurses. The NIOSH methodology for studying professional stress and functional state of the Cardiovascular System were investigated using a computer diagnostic method and Heart Rate Variability Analysis (HRVA) in 54 nurses and 30 controls. Our results revealed reduced level of control over the working process, an increased level of workload and a reduced degree of social support and increased level of Mental Stress indicating the formation of a high level of professional stress. The results of our study reveal the triggering role of occupational stress in clarifying the etiopathogenesis of CVD in nurses.

INTRODUCTION

The identification of Cardiovascular Disease (CVD) risk in healthy working individuals due to stress-induced autonomic cardiovascular control is determined and potentiated by chronically acting psychosocial and occupational stressogenic risk factors. Psychosocial risks at work are identified as new significant risks, stressors and hazards, and occupational risks further intensify the stress response (1,2). Occupational stress is one of the leading causes of CVD initiation (3) and it is possible that occupational groups with a high level of psycho-social stressogenicity such as nurses to be at increased risk of CVD. It is necessary to conduct in-depth studies to investigate the functional role and significance of psychosocial and physiological risk factors as indicators of predisposition to the risk of developing CVD and to clarify their role in the etiology of CVD.
The purpose of the present study is to identify psychosocial and functional risk factors contributing to the elucidation of the etiopathogenesis of CVD in nurses.

MATERIAL AND METHOD

Material: Two groups of individuals were included and examined in the study: nurses and controls. The nursing group consisted of 54 individuals, females (mean age/SD, 44.89/10.97 years; mean job tenure/SD, 23.85/1.00 years). The control group of individuals consisted of 30 individuals (mean age/SD, 39.47/10.68 years; mean job tenure/SD, 17.47/10.76 years), of which 18 were male and 12 female.

Methodological design

1. NIOSH Methodology for Assessment of Psychosocial Stress (4)

This methodology analyzes and evaluates those factors in the individual's work environment that are subjectively perceived and experienced as stressful. The tool includes the following six groups of scales: stressors at work; factors outside of work; individual factors; buffer factors; short-term psychological, physiological and behavioral reactions; long-term psychological, physiological and behavioral reactions. In order to ensure the precise, operational and rapid work of the experiment conducted in field conditions, the following scales were selected from the methodology: From the stressors at work scale: control over the working process; workload; cognitive abilities. From the individual factors scale: self-esteem in relation to work. From the buffer factors scale: social support from the immediate supervisor, colleagues and family. From

the long-term psychological, physiological and behavioral reactions scale: psychosomatic complaints.

Investigation of the functional state of the Cardiovascular System (CVS) by means of a computer diagnostic method and a system for the Analysis of Heart Rate Variability.

To study the functional state of the CVS and the autonomic cardiovascular control, a computer diagnostic method and a system for the HRVA have been applied (5-7). The methodological system consists of a PC-IBM, specialized hardware and software that allow the following functional tests to be performed: Cardiotachogram, Histogram, Scattergram, Spectral Analysis of Heart Rate Variability, Mental Stress and Health Risk. HRVA indicators are determined from 10-minute ECG recordings between 9-11 a.m. in a sitting position of the body after a one-hour rest period.

In order to achieve the aim of the study, the following is applied:

Index of HRVA: Mental Stress (MS) (arb. un.).

Data analysis. A t-test of two independent samples was used for data analysis.

RESULTS:

Psycho-Social Stress Analysis

The results of the detailed study of psychosocial factors, through the Bulgarian version of the NIOSH questionnaire for assessing work stress in nurses and controls, are presented in Table 1.

Table 1. Mean values (X±SD) and level of significance (p) of psychosocial factors in nurses and controls.

Indices	**Nurses 1 (N=54) Mean (SD)**	**Controls 2 (N=30) Mean (SD)**	**Level of significance P 1-2**
Control	3.89±0.51	4.45±0.28	0.001
Social Support Supervisor	4.01±0.52	4.34±0.18	0.027
Social Support Colleagues	4.11±0.57	4.50±0.16	0.005
Social Support Family	4.38±0.77	4.94±0.1	0.000
Workload	4.47±0.23	3.90±0.28	<0.001
Cognitive Skills	4.37±0.25	3.73±0.59	<0.001
Self-Esteem	4.46±0.27	3.28±0.42	<0.001
Psycho-Somatic Complaints	2.48±0.71	0.69±0.23	<0.001

Table 1 presents the mean values and the level of significance of the psychosocial factors. The behavior of the three most important dimensions of stress at work is as follows: control over the work process and social support from the immediate supervisor, colleagues and family are significantly reduced in nurses compared to controls, while the level of workload is significantly increased in nurses compared to controls. Cognitive demands and self-esteem in relation to the work process are also significantly increased in nurses compared to controls. Chronic exposure to psychosocial stress and low levels of social support significantly increase psychosomatic complaints in the group of nurses compared to controls.

Indices of the functional state of the CVS studied by HRVA:

Index of HRVA - MS:

Table 1. Mean values (X±SD) and level of significance (p) of MS in nurses and controls

Indices	**Nurses 1 (N=54) Mean (SD)**	**Controls 2 (N=30) Mean (SD)**	**Level of significance P 1-2**

MS (arb. un.)	0.31±0.11	-0.37±0.07	0.018

Table 1 presents the mean values of the HRVA – Mental Stress index for nurses and controls. A significant increase in the level of Mental Stress was observed in the nurses compared to the controls.

DISCUSSION:

Our results, established in nurses with a reduced level of control over the working process, an increased level of workload and a reduced degree of social support indicate the formation of a high level of occupational stress. We also established an increased degree of mental stress in nurses, which is registered through the integral functional indicator - MS. Our results on increased levels of occupational stress resulting from low levels of control and high job demands coincide with the results of Karasek 1997 (8), and the low level of social support combined with low control and high workload correspond with the results of Johnson J.& Hall E. 1988 (9). The results in nurses, established by us, confirm the model of high occupational stress that is involved in the etiopathogenesis of CVD.

CONCLUSION

The results of our study reveal the triggering role of occupational stress in clarifying the etiopathogenesis of CVD in nurses.

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HEALTH RISKS MANAGEMENT WHILE WORKING AT HEIGHT

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ABSTRACT
Effective management of health risks associated with working at height not only safeguards workers' lives and health but also helps increase productivity and reduce costs related to accidents. Risk management in this context includes: identifying, assessing, and controlling risks; training and raising awareness among workers; monitoring and reviewing procedures in light of newly emerging risks or changes in regulations. The aim of this study is to analyze approaches to managing health risks while working at height through the implementation of collective and personal protective equipment (PPE) and organizational measures. Statistical methods using SPSS were employed for analyzing and evaluating data, facts, and results. The study's outcomes form the basis for establishing good practices for the safe use of collective and personal protective measures in work at height.

Keywords: health risk management, working at height, good practices, training

INTRODUCTION
In Bulgaria, health risk management for work at height is regulated by the Law on Healthy and Safe Working Conditions (LHSWC) and related secondary legislative acts [1, 2, 3]. Employers are required to take all necessary measures to prevent accident risks and ensure a safe working environment. Falls from height remain one of the primary causes of fatal occupational accidents, particularly in the construction industry, where Europe reports about 1,300 fatalities annually [4]. Over 60% of workplace fatalities from height involve falls from ladders, scaffolds, work platforms, and roofs.
Health risk management for work at height is a process aimed at ensuring workers' safety in high-risk environments. This includes:

- **Risk identification**: Identifying potential hazards such as falls, structural collapses, or adverse weather conditions.
- **Risk assessment**: Analyzing the likelihood and severity of potential incidents, including reviewing equipment, worker qualifications, and the specifics of the work environment.
- **Risk control**: Providing adequate safety equipment such as safety harnesses and ropes, installing barriers or nets, and drafting evacuation and emergency plans.
- **Training and awareness**: Conducting safety training sessions, instructing proper use of PPE, and fostering a culture of safety among workers.
- **Monitoring and reviewing**: Regularly monitoring safety measures and updating procedures based on new risks or regulatory changes.

To examine workers' awareness across various economic sectors regarding the use of collective and personal protective measures while working at height.

MATERIALS AND METHODS

From October 2019 to March 2021, over 200 employers and workers nationwide participated in this study. Methods employed for collecting primary health data included:

- **Sociological method**: Individual direct surveys using a custom-developed questionnaire.
- **Documentary method**: Analysis of official health information from institutions such as NSSI, NSI, MLSP, and the Ministry of Health.

- **Legislative review**: Examination of regulations related to the provision and application of PPE.

For data processing and analysis, statistical methods using SPSS included:

- **Alternative analysis**: Intensity and structural indicators.
- **Variational analysis**: Averages and comparisons.
- **Non-parametric analysis**: Chi-square method for categorical survey data.
- **Pearson coefficient**: Measuring linear relationships between variables.
- **Reliability tests**: Fisher's exact test with significance level < 0.05.
- **Graphical and tabular analysis**: Sorting and presenting data in comprehensive tables and diagrams.

Additional methods:

- **Epidemiological methods**: Descriptive and analytical epidemiology.
- **Statistical analysis**: Indicators of workplace injuries.
- **Systematic-historical approach**: Review and synthesis of literature on regulatory developments regarding PPE.
- **Expert analysis**: Evaluating existing practices through a "regulatory pyramid" framework.

RESULTS

Survey data revealed that most participants were men aged 40-50, with approximately 20 years of work experience (10 years at their current job). Of the respondents, 80% were workers, and 12% were employers or health and safety inspectors. Workers were engaged in height-related tasks as follows: 36% up to 5 meters, 26% between 5 and 15 meters, and 16% over 15 meters.

Key findings:

- **Awareness**: Over 90% of respondents acknowledged the high risk of working at height and reported being informed and trained to use PPE.
- **Gaps in safety practices**: 26% considered training sessions formal, lacking practical safety guarantees.
- **Inspection and compliance**: Over 70% reported annual inspections by safety officers, but 62% felt unsafe due to colleagues' unsafe practices.
- **Training and equipment**: 40% indicated inadequate provision of or training for using safety equipment, while 37% lacked sufficient experience.

CONCLUSIONS

- The survey highlighted a significant proportion of workers perceiving heightened risk due to inadequate experience, training, or organizational and protective measures.
- Training on health and safety regulations and good practices is essential for effective health risk management while working at height.

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TRENDS IN THE PREVALENCE OF CANCER DISEASES IN BULGARIA OVER AN 11-YEAR PERIOD (2013 TO 2023)

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ABSTRACT
Purpose. The data on morbidity and mortality from Cancer diseases (CD) from 2013 to 2023 were analyzed.
Material and Methods Data from the National Statistical Institute and the National Center for Public Health and Analysis were analyzed.
Results. The morbidity of CD does not show a definite trend (contrary to our preliminary hypothesis of a permanent increase of these diseases among the population). The highest incidence of CD was in 2013 – 461.9 per 100,000, decreasing to 434.9 per 100,000 in 2019. The lowest values were in 2020 and 2021, the period of the Covid-19 pandemic, during which the reporting for oncological diseases is difficult and health indicators - incomparable with other years. The trends in the distribution by location were also examined, the most common of which are prostate, breast, lung, and colon cancer. Mortality of cancer diseases varied over the studied period, with highest rates in 2019 and 2020, lowest in 2016-2018 and average rates for other years.
Conclusion. The analyzed data show high levels of cancer incidence, but no trend for a constant increase on an annual basis. Health and hygiene problems are related to a wide spread of harmful habits, obesity, as well as a polluted environment, insufficient prevention, undiagnosed cases or late diagnosis, lack of habits among the population for regular preventive examinations.

Key words: morbidity, mortality, cancer diseases

INTRODUCTION
The wide distribution and social significance of cancers place them among the priorities in the field of health care. Of interest is the dynamics of their frequency and the impact of the Covid-19 pandemic on their spread in Bulgaria.

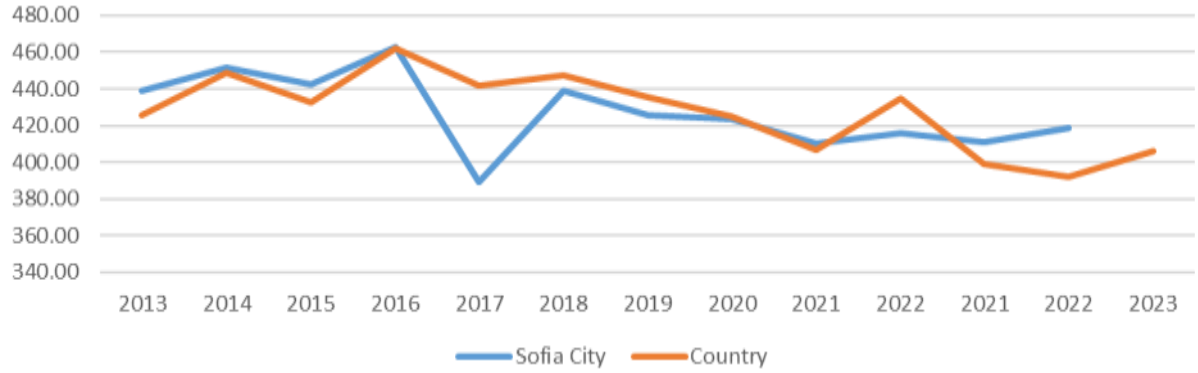
MATERIALS AND METHODS
A retrospective analysis of data on morbidity and mortality from Cancer diseases (CD) from 2013 to 2023 were analyzed using a documentary method, with a comparative analysis in a dynamic plan. Official statistical data from state institutions [1-5] were used. IBM SPSS Software version 21 (New York, USA statistical package. Variation analysis were used. A p-value $P<0.5$ (<0.001) was considered statistically significant.

RESULTS
The morbidity of Cancer diseases is presented in Table 1 and Figure 1.

Table 1 Incidence (registered new cases) of cancer diseases per 100,000 inhabitants in Sofia and (in) the country, by years

	2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Sofia	463.0	389.2	438.8	425.4	423.4	410.4	415.5	411.0	418.3	427.1	423.2
Country	***461.9***	***442.0***	***447.2***	***435.5***	***424.8***	***406.7***	***434.9***	***399.3***	***392.2***	***405.8***	***406,5***

Figure 1 Dynamics of cancer incidence per 100,000 inhabitants in Sofia and the country, by years



The incidence of cancer by localization and year is presented in Table 2.

Table 2 Incidence (registered new cases) of malignant diseases per 100,000 inhabitants in the country, by location and year (2013 – 2023)

Localization of cancer/year	***2013***	***2014***	***2015***	***2016***	***2017***	***2018***	***2019***	***2020***	***2021***	***2022***	***2023***
Total	***461.9***	***442.0***	***447.2***	***435.5***	***424.8***	***406.7***	***434.9***	***399.3***	***392.2***	***405.8***	***406.5***
Lips, oral cavity and pharynx	11.7	11.0	10.7	10.8	9.9	10.3	10.8	9.8	10.5	10.7	9.9
Digestive organs	103.3	103.5	100.7	98.1	98.1	89.5	100.1	94.6	91.7	90.2	87.9
Including: stomach	18.8	18.5	17.2	17.6	16.3	14.8	16.7	15.3	14.8	13.7	12.6
Colon	32.3	33.9	34.0	31.9	33.1	30.0	33.6	31.2	31.2	31.3	31.7
Respiratory organs and chest	59.7	53.8	53.5	51.5	47.8	44.6	51.6	47.6	44.0	41.4	39.6
Bones and articular cartilage	0.9	0.6	0.7	0.5	0.5	0.5	0.7	0.6	0.6	0.5	0.5
Melanoma and other Skin neoplasms	63.9	64.0	64.1	63.0	64.5	66.8	66.6	54.2	57.0	67.7	69.2
Mammary gland (female)	101.5	93.6	103.5	96.2	92.1	89.5	90.8	84.6	87.2	92.2	92.2
Female genital organs	86.6	81.3	84.1	82.7	79.5	74.4	77.2	74.9	73.2	73.3	75.4
Including: cervix	28.4	27.4	26.7	27.2	24.9	23.5	24.8	23.6	22.5	22.3	22.8
Male genital organs	82.5	70.2	74.8	80.0	80.0	78.9	83.4	76.0	70.3	81.4	91.8
including: prostate	74.8	63.2	68.3	73.2	74.0	72.3	77.0	70.8	64.2	75.8	86.8

Urinary system	32.2	32.9	32.9	34.2	33.1	31.9	34.0	32.7	31.9	32.8	33.2
including: bladder	21.5	22.1	22.7	23.4	21.9	21.6	22.8	22.4	21.8	22.2	22.8
Eye, brain and other parts of the CNS	8.4	8.4	7.8	7.8	7.1	6.1	7.4	7.1	6.6	5.6	5.2
Thyroid and other endocrine glands	4.1	4.1	4.8	4.4	3.9	4.5	4.6	3.4	3.9	4.1	4.3

In dynamic terms, a general decrease in newly diagnosed cancers is reported more pronounced in cancers of the respiratory organs ($p<0.001$) and digestive organs ($p<0.05$), a slight decrease in breast cancer ($p>0.05$) and female genital organs ($p>0.05$), including cervical cancer. There was an increase in new cases of skin cancer ($p>0.05$) and prostate cancer, without statistical significance.

CD in Bulgaria have significantly lower levels than the European Union (for 2020 it is 458/100,000 for Bulgaria and 569/100,000 for the EU [6].

Mortality from oncological diseases in Bulgaria is presented in table 3.

Table 3 Mortality from cancer diseases in Bulgaria, by year

Region /year	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**
Number of deaths	18274	18110	18020	17294	17429	17462	18298	18527	17221	16301	16683
Per 100,000 inhabitants	***251.5***	250.7	251.0	242.6	246.3	248.6	262.3	267.2	250.4	252.1	258.3
% of total mortality	***17,5***	***16,6***	***16,4***	***16,1***	***15,9***	***16,1***	***16,9***	***14,9***	***11,6***	***13,7***	***16,5***

IARC (International Agency for Research on Cancer) reports that cancer mortality in Bulgaria is slightly below the EU average, but there has been a trend of increasing cancer mortality over the last 10 years [6].

DISCUSSION:

The morbidity of CD does not show a definite trend, contrary to our preliminary hypothesis of a permanent increase of these diseases among the population, there is even a decline in newly registered diseases and lower levels than the EU average. At the same time, high and premature cancer mortality is the reason for the significant disease burden of oncological diseases in Bulgaria [7]. The Covid 19 pandemic negatively affects the reporting of cancer diseases (likelihood of missed cases), impact on the prevention, diagnosis and treatment of CD associated with the closure of hospitals or departments, failure to perform preventive examinations, possibly undiagnosed and/or untreated diseases.

It is difficult to analyze the multifactorial nature of the development of RD, the endogenous and stress factors of the modern lifestyle, but some leading exogenous (external) factors that influence the development of oncological morbidity in our country can be summarized and can be associated with:

- *High percentage of smokers among the population* – about 29%, with an EU average of 18% [6]

- *Alcohol consumption* – about 11 liters of pure alcohol per capita, higher than the EU average (9.8 l) [6].
- *Overweight and obesity* – unhealthy diet and low physical activity among the Bulgarian population are unfavorable factors, the cause of many diseases, including neoplasms.
- *Environmental pollution* – air pollution in some regions of Bulgaria is higher than health standards (and than the EU average [8].
- *Vaccination against HPV (human papillomavirus*) - access to vaccination is limited to girls aged 10 to 14, vaccination coverage is only 3% compared to 90% in Europe, and there is anti-vaccination sentiment among the population. However, the implemented national programs for primary prevention of cervical cancer [9] can be compared with the established reduction in the incidence of this type of cancer during the period under review.
- *Population aging in Bulgaria* - people over 60 years of age are more at risk of cancer.
- *Low levels and low coverage of CD screening* - there are no national programs for screening for lung cancer and prostate cancer, and one third of the target groups undergo breast cancer screening.

CONCLUSION

The analyzed data show high levels of cancer incidence, but no trend for a constant increase on an annual basis is established. Incidence rates are often lower than the European Union average, but the mortality rate from CD is higher than the EU average. Reducing risk factors and strict prevention for early detection of cancer are of utmost importance.

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FUNCTIONAL OUTCOMES FROM THE EARLY POSTOPERATIVE PERIOD IN PATIENTS UNDERGOING 3D PREOPERATIVELY PLANNED AND COMPUTER-NAVIGATED TOTAL KNEE ARTHROPLASTY

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ABSTRACT

The aim of this article is to compare the functional outcomes during the early postoperative recovery period in patients undergoing 3D preoperatively planned and computer-navigated knee arthroplasty. **Material and methods:** In our study, we present a group of 10 patients who underwent 3D preoperatively planned knee arthroplasty and a group of 10 patients who underwent computer-navigated knee arthroplasty, all of whom underwent specialized physiotherapy protocols and postoperative therapy and treatment. To assess the results, we utilized the Visual Analogue Scale (VAS) and the Oxford knee score, as well as methods for measuring and recording the range of motion in the knee joint. **Results:** After analyzing the obtained results, patients in the computer-assisted knee arthroplasty group demonstrate better indicators during the early postoperative period. **Conclusion:** By utilizing the most modern techniques in arthroplasty and a specialized approach in early recovery through physiotherapy methods and resources, better results are achieved in the early postoperative period for patients who opt for the computer-assisted method.

Key words: total knee arthroplasty, kinesitherapy, computer assisted surgery

INTRODUCTION

The preparation for such a major surgical intervention involves preoperative planning, which allows for the selection of the appropriate surgical technique and the proper alignment of the lower limb for the patient [1, 2]. However, this approach leads to a more standardized approach to prosthetics, predisposes to greater soft tissue trauma, requires reaming of the intramedullary canals, and increases the risk of iatrogenic injury. Planning can be carried out in two ways:

1. **2D Preoperative Planning** is relatively easy to perform as it requires inexpensive, yet specialized imaging (Long leg standing X-ray) [3]. This method provides good information about the deviation of the lower limb in the coronal plane, but assessing the bone structures, especially in the sagittal plane, is difficult, leading to relatively low precision of the results [4, 5].
2. **3D Preoperative Planning** is more difficult to perform due to the need for a CT scan of the lower limb following a specific protocol that covers either the entire limb or three sectors of it—namely the hip joint, knee joint, and ankle. Additionally, it requires expensive specialized medical software and trained personnel. The advantages of 3D planning include high precision in results due to the ability to assess the bone structures and implant positioning in all planes, as well as the 3D reconstruction [6, 7].

Computer navigation enables intraoperative planning, allowing for a personalized approach for each patient and significantly reducing soft tissue trauma [8, 9]. It eliminates the need for reaming of the intramedullary canals, thereby reducing the thromboembolic risk and providing

the ability to assess ligamentous balance before making the bone cuts [10, 11]. The surgical procedure is performed with the aid of costly specialized equipment, which increases the cost for the patient and requires training of surgeons to use it, potentially leading to a relatively longer surgical time during the training period.

MATERIALS AND METHODS

The study was conducted between January 2023 and November 2023, with the aim of examining, comparing, and analyzing the functional outcomes in the early postoperative period in a total of 20 patients, divided into two equally sized groups. Group 1 consisted of 10 patients who chose the 3D preoperatively planned prosthesis method, while Group 2 included 10 patients who preferred the computer navigation method. The surgical intervention, physiotherapeutic treatment process, and study were carried out at the Orthopedics and Traumatology Clinic of the University Hospital "Saint Marina" – Varna.

The therapeutic program applied to all patients involved in the study consisted of the following components [12, 13, 14]:

1. General development exercises
2. Passive kinesitherapy using arthromod
3. Active exercises
4. Isometric exercises for postural musculature
5. Pulleys and suspension therapy
6. Positional therapy combined with cryotherapy

The functional tests and assessments used to monitor the patients' progress included the well-known SFTR method for measuring joint range of motion, the visual analogue scale (VAS) for pain, and a 12-question survey aimed at assessing the functionality of the knee.

RESULTS AND DISCUSSION

At the average values of flexion and extension in the knee joint at the start and end of the study period, we found significantly better knee flexion at the beginning of treatment in patients with computer-navigated knee replacement compared to those with 3D preoperative planning.

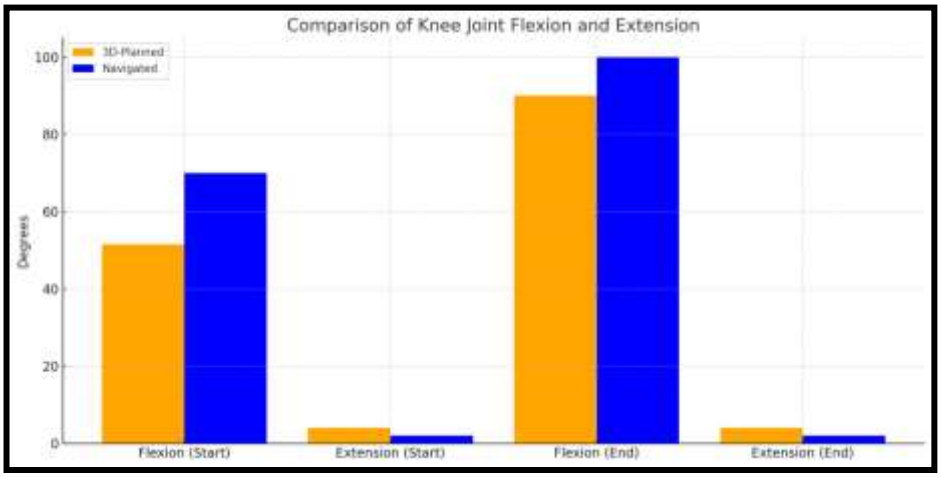

Fig.1. Range of motion of the two groups

The difference was about 20 degrees – 51.5 degrees for 3D-planned and 70 degrees for navigated surgery. Regarding extension, the difference between the two groups was small, with an average

of 4 degrees for 3D planning and 2 degrees for navigation. At the end of the early postoperative period, the flexion difference remained, but was halved – 90 degrees for the 3D group and 100 degrees for the navigated group (**Fig.1**).

Regarding pain symptoms, patients with 3D preoperative knee replacement planning report moderate to severe pain (average score of 4.5), while patients with navigated knee replacements describe it as tolerable, with a lower average score of 2.6. The Oxford Knee Score results show a difference of about 4 points between the groups. Group 1 (3D-planned knee replacement) has an average of 36 points, while Group 2 (navigated knee) scores 40 points. Both groups show good results, but Group 2 demonstrates better functional outcomes (**Fig.2**).

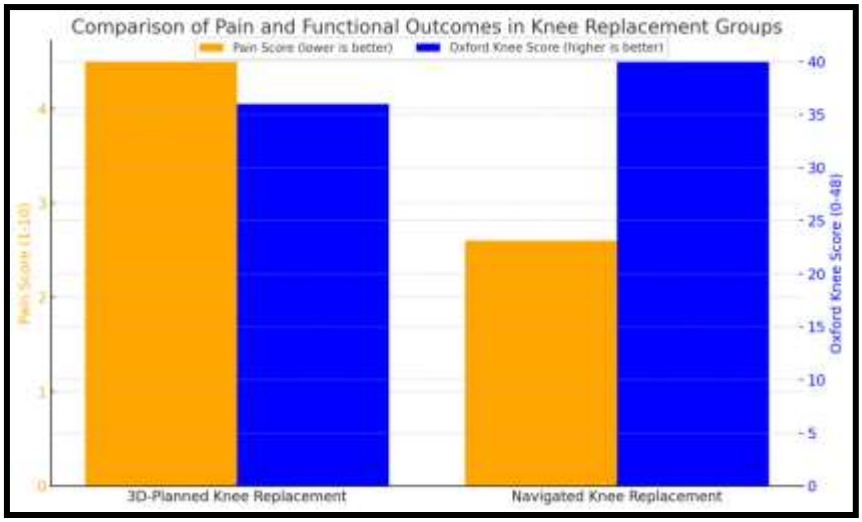

Fig.2. VAS Score & Oxford Knee Score

CONCLUSION

In conclusion, patients undergoing total knee replacement with computer navigation achieved better functional outcomes in the early postoperative period compared to those treated with the standard method. Greater range of motion and reduced pain in the computer-assisted group enable more effective physiotherapy, potentially shortening the overall recovery process. Additionally, the precision of the surgery and reduced postoperative trauma result in earlier limb loading, decreased reliance on assistive devices, and faster, more complete recovery.

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STRATEGIES FOR IMPROVING ERGONOMIC FACTORS OF THE ADMINISTRATIVE DEPARTMENT IN TRADE SECTOR

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ABSTRACT

Musculoskeletal disorders are one of the most common causes of occupational injuries. The aim of this study was to investigate the prevalence of musculoskeletal disorders and ergonomic risk factors in the administrative department in trade sector.

Obejectives: Study of ergonomic factors in the administrative department of organization in the trade sector.

Materials and methods: The study was conducted among 144 employees working in administration department of an organization in Commerce sector in the city. The sociological method used was survey method and the results of the study were presented using descriptive, descriptive statistics and Chi - Square test.

Results: Participants of female gender were 56.03%, of male gender - 43.26% and one person - 0.71% preferred not to share their gender. To the question, "Have you suffered from musculoskeletal disorders /pain in the neck, shoulders, lower back, arms, hands, legs or feet/?" 57% answer Yes, 11% No, rather not and rather yes 16%. Next, " Have you ever had swelling, pain or stiffness in your joints?" 36% answer Yes, 37% No, Rather No 19%, 12% Rather yes. 47% of the employees experienced eye problems such as flashes, black spots, eye pain or blurred vision and 31% experienced a feeling of numbness in their hands or feet.

Conclusion: Due to the lack of knowledge of some managers and employees about the importance of ergonomics, it is better to provide the workers with the necessary training in this field in addition to creating a work environment by the principles of ergonomics.

INTRODUCTION

Musculoskeletal disorders are one of the most common causes of occupational injuries. The aim of this study was to investigate the prevalence of musculoskeletal disorders and ergonomic risk factors in the administrative department in trade sector. The work of administration workers is varied. This is determined by the diversity of functions, the different characteristics of the work process and professional environment. [1]

Another feature of administration work is that in the system involves the basic elements of the labour process - prevention in its two directions: promotion and prevention. The work of administration sector is defined as mental, with elements and is characterized by high nervous tension resulting from the great responsibility [2] Similar is the nature of the work of other administration staff -the labour process of these workers is organizational - executive elements prevail, with more motor activity, with lower nervous-psychic tension and nervous-sensory tension. [3]

There is a need to optimize workflow among workers. The aim is the long-term preservation of health, safety and performance among workers and an active working life among older workers. [4] In this regard, we propose to optimize the work process by making adjustments to the physiological work and rest regime among workers in the Administration sector. Work breaks are known for positively influencing employees' psychologically and physiologically. [5] Thus far, only limited research regarding the importance of precise work-break activities has been conducted, which becomes crucial to an employer when deciding on investing in additional work-break activities.

Therefore, in this study, we investigate whether performance effects induced by work breaks differ for different work-break interventions. [6]

Three physiological breaks at work are recommended as part of the working day:

- First break - 2-2 and a half hours after the start of the working day - 10 minutes

- Second break - 1½ hours after the meal break - 10 minutes
- Third break - 3 hours and a half after the meal break - 10 minutes.

Semi-active breaks are recommended - walking, light exercise, as well as methods of active hygiene of the visual analyzer.

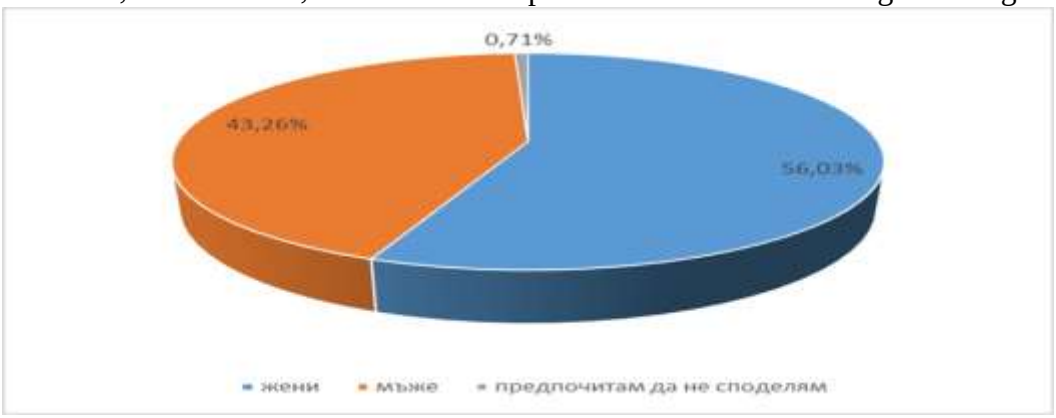
In order to investigate the different impacts of work-break interventions on performance, a theoretical introduction into the economics of the work break topic is first provided by discussing the theoretical connection between work breaks and performance. [7] Subsequently, the effectivity of different work breaks is empirically investigated by using three different incentivized work-break interventions - a relaxation system, boxing, and napping. [8]

MATERIALS & METHODS

The study was conducted among 144 employees working in administration department of an organization in Commerce sector in the city. The sociological method used was survey method and the results of the study were presented using descriptive, descriptive statistics and Chi - Square test.

RESULTS

Overall of 141 people from the administration department were surveyed among the employees of a trade sector. The gender distribution shows that the majority of the respondents were women - 56.03%, men were 43, 26% and 0.71% preferred not to share their gender /fig. 1/.



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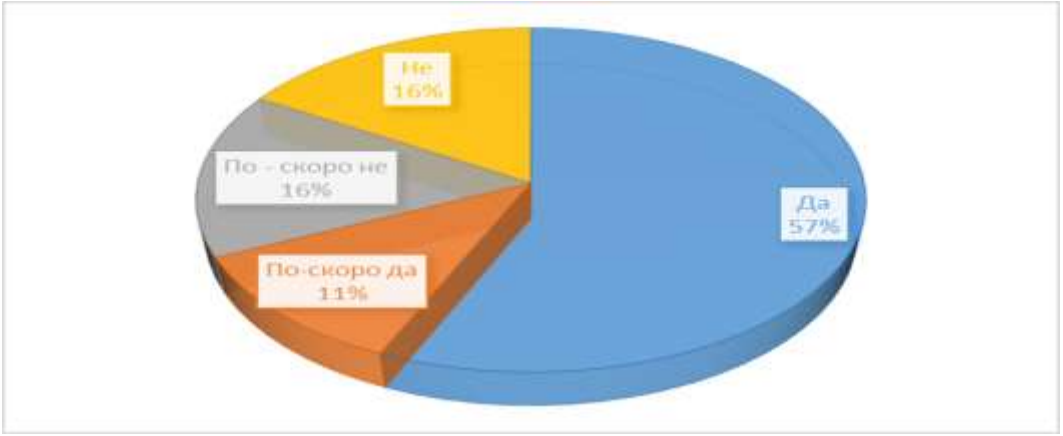

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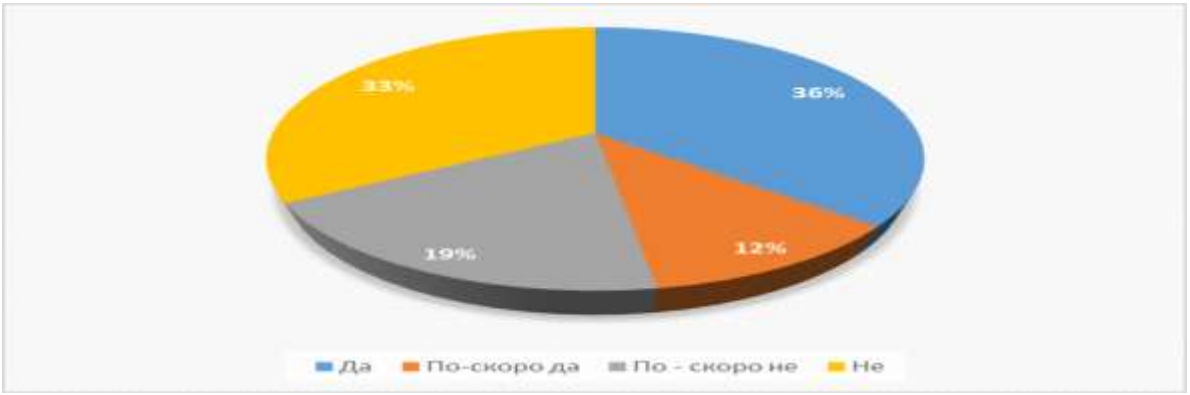

CONCLUSION

Due to the lack of knowledge of some managers and employees about the importance of ergonomics, it is better to provide the workers with the necessary training in this field in addition to creating a work environment by the principles of ergonomics. From all of the above, we can conclude that there is a need to optimize workflow among workers. The aim is the long-term preservation of health, safety and performance among workers and an active working life among older workers. In this connection, we propose to optimize the work process at LIDL Bulgaria Ltd. by making adjustments to the physiological work and rest regime among workers in the Administration sector.

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CHRONIC DISEASES AS A CAUSE OF DISABILITY AMONG SEAFARERS

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ABSTRACT
Introduction: disability is a phenomenon that has accompanied humanity since its very inception. Essential to the occurrence of disability are the disease, the social environment and the type of professional labour. Indisputably, the labour of seafarers differs from that of other professional groups in the populations by the specific conditions of maritime service. Loss of working capacity associated with the profession manifests with particular potency among seafarers, given the numerous risks they are exposed to.
Purpose: to study and present the chronic diseases leading to disability among seafarers.
Material and methods: this research examines the available scientific publications in world-renowned databases (PubMed, Web of Science, Scopus, Google Scholar, eLIBRARY) for 1973-2023. The search for scientific data was conducted through the keywords ″disability″, ″diseases″/″illnesses″, and ″seafarers″/″seamen″ in the Cyrillic and Latin alphabet. *Methods:* document and content analysis, Microsoft Excel.
Results: numerous scientific publications referring to chronic diseases leading to disability among seafarers were found during the studied 50-year period. They examine specific causes leading to disability, but none of them address disability as a general phenomenon. Cardiovascular diseases prevail among them, together with the risk factors leading to their onset.
Conclusion: the following scientific research regarding permanent incapacity among seafarers and the causes for its occurrence established a relatively small number of publications focused on general disability. This data cannot fully represent the importance of the problem due to the absence of a unified information database concerning the health status and disability that has occurred among seafarers.

Keywords: disability, seafarers, chronic disease

INTRODUCTION
Seafarers' labour activity is related to the impact of a broad spectrum of occupational hazards - noise, vibrations, electromagnetic fields, work at height, rotating shift regime and drastic climate changes. The work of seafarers in the conditions of a prolonged stay on board, isolation from society, incl. home and family, the monotony of the surrounding environment, the duration of the voyage, and the intensive professional workload of the rotation shift regime inevitably lead to health problems [1]. The professional activity of seafarers justifiably falls into the category of work performed in extreme conditions. At sea, the human organism is affected by a complex of the world's ocean biological phenomena and the technical characteristics of seafaring.
The particularities of the organisation of the labour process during the voyage period lead to an overstrain of the adaptation systems, and the unfavourable factors of the system ″sea-ship-man″, individually or in combination, affect the seafarer's organism and cause significant changes, incl. pathological. Most common at sea are traumas and injuries that can lead to a lethal end or disability [2]. Among the many scientific studies found in world-renowned databases by separate nosological entities (e.g., myocardial infarction, brain stroke, peptic ulcer disease, overweight, metabolic syndrome, etc.), only a few studies about disability among seafarers have been established [3]. *The purpose* of this research is to study and present the chronic diseases leading to disability among seafarers.

MATERIALS AND METHODS

This research examines the available scientific publications in world-renowned databases such as PubMed, Web of Science, Scopus, Google Scholar, and eLIBRARY for the period 1973-2023. The search for scientific data was conducted through the keywords ″disability″, ″diseases″/″illnesses″, and ″seafarers″/″seamen″ in the Cyrillic and Latin alphabet. The only scientific publications recruited into the study are concerning diseases, excluding injuries and accidents. These studies were initially analysed based on title and abstract and subsequently on full-text assessment. *Methods:* document and content analysis.

RESULTS AND DISCUSSION

An increase in scientific research is observed after 2003, with the 2013-2023 time interval doubling compared to 2003-2013. Cardiovascular diseases prevail among them, together with the risk factors leading to their onset - hyperlipidemia, smoking, and overweight. (table 1):

Table 1. Publications about diseases leading to disability among seafarers

Causes leading to disability	Author's collective	Causes leading to disability	Author's collective
Polymorbidity	Tomaszunas S et al. (1997) Ehara M et al. (2006) Kaerlev L et al. (2007) Carter T (2011) Walters D et al. (2013) Poulsen TB et al. (2014) Baygi F et al. (2017) Herttua K et al. (2019)	Cardiovascular diseases	Rosik E et al. (2006) Oldenburg M et al. (2007) Oldenburg M (2014) Hanzu-Pazara L et al. (2017) Papadakis M et al. (2020) Sagaro GG et al. (2021) Szafra-Dobrowolska J (2021) Li X et al. (2022) Sagaro GG et al. (2023)
Infectious diseases	Wickramatillake HD (1998) Pallotta G et al. (2019)	Musculoskeletal disorders	Kaerlev L et al. (2008)
Metabolic syndrome	Filikowski J et al. (2003)	Nervous system diseases	Litvinenko IV et al. (2018)

The first study on disability among seafarers was conducted by Tomaszunas S et al. in 1997, revealing that 176.8 per 1000 Polish seafarers cited polymorbidity as a cause of restricted working capacity [4]. In 2006, Ehara M et al. included 51,641 individuals with gastrointestinal, musculoskeletal, and cardiovascular diseases, urging the need to clarify seafarers' lifestyles [5], while Kaerlev L et al. in 2007 noted pulmonary and cardiovascular incidences along with conditions like diabetes and bronchitis [6]. Carter T's 2011 studies highlighted health promotion and prevention of injuries and diseases among seafarers [7], and Walters D et al. in 2013 examined hazardous working conditions affecting seafarers' health and capacity [8]. Poulsen TB et al. (2014) found differences in disease incidence between sexes among Danish seafarers, with various pathologies affecting each [9]. Baygi F et al. (2017) explored obesity's impact on cardiovascular disease and liver health among Iranian seafarers [10], while Herttua K et al. (2019) compared disease risks between seafarers and other occupational groups, confirming higher disease development among seafarers [11]. Wickramatillake HD (1998) focused on

infectious diseases and their complications affecting crew capacity [12], and Pallotta G et al. (2019) mentioned malaria as a disability cause due to inadequate medical support on vessels [13]. Filikowski J et al. (2003) studied metabolic syndrome risks, finding varying prevalence of risk factors [14], while Rosik E et al. (2006) identified acute cardiovascular conditions as leading causes of reduced capacity and disability [15]. Oldenburg M (2014) noting the risks and delays in emergency medical care [16]. Hanzu-Pazara L et al. (2017) discussed occupational cardiovascular risks among Romanian seafarers [17], and a study on Greek seafarers linked cardiovascular risk factors with low disease incidence [18]. Sagaro GG et al. (2021) addressed cardiovascular disease risk factors [19], while Szafra-Dobrowolska J (2021) identified cardiovascular diseases as leading causes of mortality in Poland [20]. An article by Li X et al. (2022) confirms the importance of cardiovascular diseases but also cites sexually transmitted diseases, fatigue, and stress as leading health problems among seafarers [21]. The authors collective Litvinenko IV et al. discuss the causes of neuropathy and degenerative-dystrophic processes and their influence on the working capacity of military and marine personnel [22].

The research of disability as a general concept among seafarers in available scientific research over a fifty-year period (1973-2023) found numerous publications on cardiovascular diseases as the primary cause of permanent incapacity, followed by infectious diseases, metabolic syndrome, and nervous system diseases. The discovered publications containing three or more diseases (polymorbidity) considered diseases affecting the cardiovascular system, gastrointestinal tract, musculoskeletal, genitourinary and endocrine systems, as well as the presence of neoplasms. The necessity for preservation of the professional health of seafarers, prevention of general and occupationally determined diseases, as well as complex rehabilitation of seafarers, arises given the severe pathology found in seafarers and the unfavourable outcome for their health and working capacity.

The certification of seafarers for fitness of work is an important part of risk management at sea. The industry risks, the evaluation methods, and the evidence on which the whole process of marine risk management is based are extremely dynamic. Health risk management for seafarers depends on the preliminary and periodic assessment of the health status of workers to ensure that any health problems that may arise during a sea trip, as well as any complications of chronic conditions that might create further risk for the ship, the sailor himself or the other persons on board the vessel, is detected, treated and stabilised, and does not constitute a contraindication for seafaring. Diseases among the crew during a trip represent a serious threat to the individual, given the fact that there is a lack of full medical care.

CONCLUSION

The following scientific research regarding permanent incapacity among seafarers and the causes for its occurrence established a relatively small number of publications focused on general disability. Especially the first two decades of the period under review. This data cannot fully represent the importance of the problem due to the absence of a unified information database concerning the health status and disability that has occurred among seafarers. This is a problem that concerns all maritime nations regardless of their economic and other levels of development.

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ROLE OF SONICATION IN PJI

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ABSTRACT
Culture negative prosthetic joint infections (PJIs) remain a significant part of all PJIs. Isolating a pathogen, especially in low-grade infections, has been a problem or orthopedic surgeons worldwide and still remains one of the great challenges in treating these patients. Presumed aseptic loosening (i.e. with negative standard tissue cultures) have reported worse outcomes in many studies and the need for better diagnostics and treatment of these patients is obvious. **Purpose:** To compare results between standard tissue cultures (STC) and sonication fluid cultures (SFC) from extracted metal implants with low grade PJI. **Materials and methods:** This study uses the results from a group of 19 patients, who underwent revision surgery for PJI in "Saint Marina" Hospital, Varna, Bulgaria. Samples from standard tissue cultures, aspiration fluid and sonication fluid were tested in all patients. In 3 of the patients there was no isolated pathogen from any cultures and they were considered as confirmed aseptic loosening. **Results:** 93.75% of the sonication fluid cultures had an isolated pathogen compared to 50% from standard tissue cultures and 25% from aspiration fluid cultures. A 100% bacterial match was found in presence of growth in both standard tissue and sonication fluid cultures. **Conclusions:** Standard tissue cultures remain the gold standard for diagnosis of PJI but sonication has an added value in the diagnostic algorithm. In some patients with suspected low-grade infection, sonication could identify a possible causal microorganism despite the negative tissue and aspiration fluid cultures.
Keywords: prosthetic joint infection, sonication, standard tissue cultures, aspiration fluid, low-grade infection

INTRODUCTION
In the last 20 years there has been a great rise in primary arthroplasty, especially in total hip and knee replacement. With the increase of demand and cases per year prosthetic joint infections (PJIs) and their treatment started becoming a big problem for orthopedic surgeons. These patients have and increased burden for hospitals with their high mortality rates (5-8 times greater than in aseptic loosening), higher cost and lower functional results [1 ,2 ,3]. The risk factors for surgery in these cases are numerous and can be separated in 3 groups [4] as shown in Table 1.
Table 1. Risk factors for surgery.

Patient related	Surgery related	Other
Diabetes mellitus Obesity Rheumatoid arthritis Immunosuppressive therapy Other comorbidities: congestive heart failure, COPD, peripheral vascular disease, malignancy	Complexity and duration of procedure Wound complications (delayed healing, persistent dehiscence, hematoma, seroma, wet wound after being dry)	Urinary tract infection in the postoperative period

Diagnostics of PJIs is still uncertain and isolating a pathogen may not always be possible. This problem is mostly connected to the formation of bacterial biofilm over the metal implants used in these surgeries. In 2018 Parvizi et al. introduced a scale of criteria with a scoring system to help surgeons diagnose PJIs.

So far the most reliable method for isolating a pathogen in low-grade infections has shown to be sonication fluid cultures from extracted metal implants. Sonication is a process which includes a series of ultrasound application, vortexing and centrifugation, aiming tho break the slime of the biofilm on the metal surface of the implants. So far it has shown great sensitivity (avg. 83%) and specifity (avg. 91%) in many studies [5, 6].

The biggest challenge in treating these patients is isolating a pathogen. As reported 4-13% of patients with presumed aseptic loosening had unexpected infections [7], so a question should be asked and answered – Is aseptic loosening really aseptic?

PURPOSE

The purpose of this study is to compare results between standard tissue cultures and sonication fluid cultures from extracted metal implants with low grade PJI.

To compare results between standard tissue cultures and sonication fluid cultures from extracted metal implants with low grade PJI.

MATERIALS AND METHODS

This study includes a group of 19 patients, who underwent revision surgery for PJI in "Saint Marina" Hospital, Varna, Bulgaria in the period between 07.2023 and 08.2024. Samples from standard tissue cultures (3-5 periprosthetic samples), aspiration fluid and sonication fluid were tested in all patients. 3 of those patients were excluded because they had negative results from all tests and were considered as aseptic loosening. All of our results with the isolated microorganisms and elevated PMN levels from aspiration fluid are shown in Table 2.

Table 2. Results with the isolated microorganisms and elevated PMN levels from aspiration fluid.

Patient	Joint aspiration	TCS	SONICATION	Spacer sonication
THA ♀ 54y.o.	+Esch. colli	+/- Esch. colli	+Esch. colli	
THA ♀ 84y.o.		+Pseud. oryzihabitans	+Pseud. oryzihabitans	Staph. hominis
THA♀		-	+Staph. epidermidis	
TKA ♀ 78y.o.	+Staph. epidermidis	+Staph. epidermidis	+Staph. epidermidis	-
TKA ♀79y.o.	+PMN	+/-Esch. colli	+Esch. colli	
HOS ♀ 74y.o.		-	+Staph. hominis	-
THA ♀ 86y.o.		-	+Staph. epidermidis	
Humerus SA ♀81y.o.		-	+ Staph. aureus	
THA ♀ 82y.o.		+Enterococcus faecalis	+Enterococcus faecalis	-
THA ♀ 67y.o.		+Pseud. aeruginosa	+Pseud. aeruginosa	

		Acinet. Baumannii	**Acinet. Baumannii**	
TKA ♀ 69y.o.	**+PMN**	**+Enterobacter cloacae**	**+Enterobacter cloacae**	
THA ♀ 83y.o.	**-**		**+Staph. auerius**	
THA ♀ 77y.o.	**-**		**+Rhizobium radiobacter**	
THA ♀ 56y.o.	**+Staph. epidermidis**		**+Staph. epidermidis**	
TKA ♀ 26y.o.	**+Ser. marcescens**	**+Ser. marcescens**		**-**

RESULTS AND DISCUSSION

In 15/16 cases (93.75%) of the sonication fluid cultures had an isolated pathogen compared to 8/16 (50%) from standard tissue cultures and 4/16(25%) from aspiration fluid cultures. We would like to take note that the one case that had no isolated pathogen from sonication fluid culture was an extracted polyethylene inlay and not a metal implant. More importantly whenever there was an isolation in both standard tissue cultures and sonication fluid cultures there was a 100% match of the bacteria, proving the high specifity and sensitivity of the method. Moreso the SFC grew a lot richer bacterial collonies and faster – 3 to 5 days compared to the standard 14 days for the STC. Sonication fluid can also be tested with Multiplex PCR, which can give information about the type of microbial DNA (Gramm positive or negative) in the first 3 hours after surgery. This information was used to guide the empirical antibiotical therapy, while waiting for the final resulst from the antibiogram.

Results from our study confirm that sonication detects more bacteria than conventional methods as periproshtetic standard tissue cultures, and increases the sensitivity of microbiological investigations especially in patients with previous antibiotic therapy or late infections. This is also confirmed by two meta analysis from 2021 and 2023, with more than 3000 and 6000 patients respectivly, which show that sonication of extracted metal implants and antibiotic joint spacers has high specifity and sensitivity and that the evidence of SFC in PJI is more favorable, but not yet strong [8, 9].

CONCLUSIONS

A combination of laboratory tests, imaging studies, histopathology and microbiology is necessary for the most accurate diagnostics of PJI. Standard tissue cultures remain the gold standard but sonication has an added value in the diagnostics algorhythm. In some patients with suspition of low grade infection, sonication can identify a possible causal microorganism despite negative standard tissue cultures.

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INFLUENCE OF MEDICAL NUTRITION THERAPY ON A PATIENT WITH GASTRIC CANCER DETECTED AT AN EARLY STAGE

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ABSTRACT

Aim: To present a case of a 60-year-old female who was admitted for the first time to the Clinic of General and Abdominal Surgery at the University Specialized Hospital of Oncology in Sofia. She was diagnosed with histologically and instrumentally verified gastric carcinoma and was scheduled for surgical treatment along with post-operative nutritional support.

Materials and methods: A formation was identified at the corpus/antrum-boundary along the greater curvature of the stomach, measuring approximately 3–4 cm in diameter. A partial gastrectomy applying anastomosis with jejunum was performed under general, endotracheal anesthesia.
Results: The procedure involved an upper-middle laparotomy. The stomach undergoes a subtotal resection en bloc, followed by the removal of lymph nodes in the D1 dissection volume. Roux gastroenterostomy was used to open up the passage again, and a small-lumen catheter in the form of a feeding enterostomy was placed into the efferent loop.
During the first 24 hours following the surgery, the patient was administered a pre-prepared liquid formula at a rate of 20 ml/hour with an energy carrier of 2 kcal/ml through the enterostomy. It was supplemented with parenteral nutrition to achieve the target caloric intake of 1400–1600 kcal/day. Per oral feeding was initiated after a period of 2 to 3 days, with a gradual increase in intake while simultaneously decreasing parenteral nutrition. Upon discharge, the patient received detailed instructions regarding the feeding stage.
Conclusion: A poorly differentiated adenocarcinoma, stage G3, located in the pylorus region of the stomach was excised completely. The patient was provided with proper nutritional support during the postoperative period and throughout the hospital stay, applying a combination of enteral, parenteral, and ultimately peroral nutrition.
Keywords: gastric cancer, therapy, nutritional support

INTRODUCTION

Gastric adenocarcinoma represents a considerable clinical problem, characterised by a rising prevalence and a poor long-term prognosis [1]. The surgeon's pursuit of optimal oncological radicality poses several challenges and problems that they must address in their everyday clinical practice. Treatment outcomes are influenced by various factors, including tumour location, stage, histological variant, degree of differentiation, potential for radical resection, and the patient's overall and nutritional status.

AIM: To report a case of a sixty-year-old female patient who was admitted to the Clinic of General and Abdominal Surgery at the University Specialized Hospital of Oncology in Sofia, Bulgaria. She was diagnosed with gastric carcinoma, confirmed through histological and instrumental methods, and was scheduled for surgical treatment along with post-operative nutritional support.

MATERIALS AND METHODS

A formation of approximately 3–4 cm in diameter was identified at the corpus/antrum boundary along the bigger curvature of the stomach, suggesting mobility and absence of infiltration into the gastric wall, with no enlarged perigastric lymph nodes observed. A partial gastrectomy with jejunal anastomosis was conducted under general endotracheal anaesthesia.

RESULTS

In the Clinic of General and Abdominal Surgery at the USHATO EAD, the construction of a feeding jejunostomy is routinely employed during gastric resections to facilitate enteral nutrition in the early postoperative period and to establish a secure feeding route when oral intake is restricted postoperatively. The procedure involves inserting the catheter into the long arm of the Roux-loop. When performing resections that involve a small intestinal conduit, it is necessary to lower the catheter tip below the level of the entero-entero anastomosis. Alternatively, in gastric conduit reconstructions, the catheter is placed suspended in the jejunum approximately 30 centimeters away from the Treitz line (**Fig. 1**).

Fig. 1 Placement of the catheter into the long arm of the Roux-loop

The catheters employed are either 8 CH or 10 CH in diameter and measure 50 cm in length. This choice of diameter has proven effective, considering that there have not been the leakage complications typically associated with the 18 CH diameter catheters previously used.

Feeding through the enteral catheter is typically initiated within 24 hours of surgery. This is achieved by administering a ready-to-use enteral formula of 2 kcal/ml at a continuous infusion rate of 20 ml/h, combined with a three-component parenteral formula of 1400 kcal and a glucose water-saline solution, resulting in a total energy intake of 2800 kcal during the initial postoperative period.

Following the restoration of the passage, the enteral intake dosage is gradually increased to 60–80 ml/h, bolus administered, and sustained in the initial days post-resumption of oral intake at a sufficient volume to maintain the requisite daily energy balance of 25–30 kcal/kg.

After discharge, the patient started with fluid to creamy-prepared food, 7 to 8 times per day. Two–three meals were fortified with 1–2 scoops of protein powder. Gradually, the food became denser, and the calorie intake was increased. The portions became bigger, and after 6 months, the number of portions became 4 to 5. The diet of the patient was supplemented with vitamins, minerals, and trace elements which were necessary for the recovery period.

DISCUSSION: Patients diagnosed with cancer face a significant risk of malnutrition, both from the disease itself and the treatments they undergo. Consequently, malnutrition contributes to mortality in 10–20% of such patients Sofia University ”St. Kl.Ohridski”; Medical faculty, Sofia, Bulgaria [2–5]. Medical professionals, along with patients and their families, often underestimate the problem of nutritional risk. A recent study indicated that 30–60% of hospitalized cancer patients identified as having increased nutritional risk did not receive appropriate nutrition therapy, whether per oral, parenteral, or enteral [6–7]. Malnutrition leads to several adverse outcomes in patients, including reduced immunological competence, heightened infection rates during the postoperative period, extended intensive care, and prolonged general hospital stay [8–10]. It is important to assess and adjust

nutritional deficiencies [11] both perioperatively and promptly in the postoperative stage by applying parenteral and enteral methods to reduce these consequences.

CONCLUSION: A poorly differentiated adenocarcinoma at stage G3, located in the pylorus of the stomach and extending through the full thickness of the muscularis propria, was excised completely. The patient received successful and complication-free nutritional support during her hospital stay, which is essential for a full recovery and adequate nutrition in the post-hospital period.

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NUTRITIONAL SUPPORT AND ENTERAL FEEDING IN OPERATIVE TREATMENT OF ABDOMINAL TUMOURS

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ABSTRACT

Patients after undergoing abdominal surgery for abdominal tumours tend to have a heightened risk of acute malnutrition and death. Therefore, the doctors and nutritionists highlight the importance of nutritional support. Such patients often have compromised gastrointestinal anatomy and physiological function, resulting in nutrient malabsorption. The lack of appetite, the feelings of fullness after eating a small amount of food, or gastro-oesophageal reflux are factors that contribute to a large reduction of food intake. They may report symptoms such as nausea, vomiting, abdominal pain and diarrhoea, and are even likely to have complaints of dysphagia.

Emotional distress and cancer-related inflammation further worsen food intake and protein waste, which in turn leads to poor outcomes. Nutritional support should be implemented in two stages: during the patient's hospitalization and following his/her discharge.

Nutritional support for patients with stomach cancer is a serious professional challenge for oncologists and nutritionists. In patients undergoing gastric cancer surgery, it enhances long-term postoperative nutritional status and reduces the length of hospital stay. Deficiencies in protein, zinc, potassium, calcium, vitamin B_{12} and iron frequently occur following gastrectomy and necessitate a proper therapy.

Conclusion: In cancer patients, the increased metabolic demands, inadequate nutrient intake, and nutrient loss exacerbate the risk of poor nutritional status and a prolonged hospital stay. Therefore, receiving proper and sufficient nutritional support training is essential for patients' recovery. A healthier diet not only improves the functional and nutritional status of patients, but it also enhances their quality of life.

Keywords: stomach cancer, malnutrition, nutritional management, deficiencies

INTRODUCTION

Worldwide, stomach cancer ranks as the fifth most common malignancy in both sexes [1]. Early stages of the disease can be asymptomatic or accompanied by non-specific symptoms, leading to a delay in diagnosis [2] and, in most cases, a poor prognosis [3]. It should be noted that weight loss depends on the type of cancer [4] and occurs at an advanced stage of the disease course [5]. Patients with advanced disease often exhibit anorexia and cachexia, characterised by reduced food intake, hypoalbuminaemia, weight loss, and muscle mass loss [6], leading to increased morbidity and mortality [7,8]. Symptoms such as nausea, vomiting, early satiety, and dysphagia are associated with the malnutrition after chemotherapy, radiotherapy, and surgery.

Nutrition and its significance

Malnutrition is sub acute or chronic state resulting a decreased or missing dietary intake which leads to irreversible changes of body composition, body functions - physical and mental, and poor clinical outcome. [9] Disease-related malnutrition is common in patients with cancer, as the prevalence range is between 50% and 80% depending on the tools used and the type of cancer - prevalence of digestive cancers. [10] Many studies have researched the relationship between cancer and malnutrition and demonstrated the benefits of early nutrition support on improving nutritional status in cancer patients. [11] Thus shows the necessity of early detection of malnutrition in those patients and strictly monitoring the main markers of assessment of nutritional status - anthropometric and biochemical indicators. [12] Special attention need the cancer patients following surgery, more precisely - abdominal surgery. [13]

Following surgery, it is advisable to administer liquid nutrition during the hospital stay. Due to the low density of these feeds, supplemental parenteral nutrition is required in the initial days. When adequate oral and/or enteral nutrition is substituted, the results immediately improve. The consistency of the food progressively becomes thick, it is fortified with protein powder. It is essential to calculate calorie intake considering basal metabolic rate (BMR), physical activity, and the degree of inflammation resulting from the underlying disease and surgery. Biomarkers, including electrolytes, short-lived proteins, blood sugar, vitamins, and trace elements must be regularly checked and supplemented if needed. Anthropometric measurements, such as measurements of weight, arm circumference, hand grip strength, and bioimpedance, must be conducted on a weekly basis.

Patients should have frequent, short meals and limit their intake of simple carbohydrates after a gastrectomy to prevent dumping syndrome [14,15]. Regular evaluation of the patient's nutritional status at intervals of 4–8 weeks is imperative [16]. After surgery, there is a noticeable reduction in hunger and food intake, however, this decreased appetite and food intake reappeared by the end of the first year [15]. The small intestine returns to its proper function within 6–12 hours after the surgery.

The malnourished patient receives an individual diet rich in proteins, electrolytes, and vitamins after discharge. After the first month, the food's consistency shifts from being creamy to having small to large particles with a higher caloric density. After 6 months, the 7–8 servings per day should be gradually reduced 4–5, ensuring each serving is larger and exceeds the energy needs. Biochemical and anthropometric indicators must be monitored once a month. Patients are advised to maintain a high-calorie diet for a minimum of one year, and this period may extend based on their nutritional status. [17]

Many patients suffer from compromised muscle status and low albumin levels, they don`t meet the recommended intake of 1,2 - 1,5g/kg/day protein according to the recent guidelines. [18] Intervention with amino acids, more exactly - branched chain aminoacids leucine, isoleucine and valine), also β-hydroxy β-methyl butyrate are a good solution for better gut function and prevent muscle wasting. [19] Recommendations for glutamine are controversial in cancer patients and there are no convincing evidence to include it in the nutritional therapy. [20] Long chain fatty acids and fish oil are recommended to decrease systemic inflammation and improve appetite, food intake and body weight. The American and European societies of cancer and nutrition (American Institute for Cancer Research, American Cancer Society and the European Society for Clinical Nutrition and Metabolism—ESPEN) recommend use of multivitamin and multi mineral supplements according to the daily dietary recommendations. They decisively advocate vitamin D supplementation in cancer patients for preventing muscle wasting. [14]

Anaemia may result from deficiencies in iron, vitamin B_{12}, or folate following gastrectomy [21]. Both blood loss at the anastomotic site and bacterial overgrowth in blind loops can cause iron deficiency . Reduced gastric acid production and duodenal bypass following surgery hinder the body's ability to absorb iron from dietary sources. This occurs due to the disruption in the conversion of non-heme iron (Fe^{3+}) to the more readily absorbable form of iron (Fe^{2+}).

Preparations in the form of ferrous sulphate or gluconate can effectively correct iron deficiency. Vitamin B_{12} deficiency can also occur one year after stomach bypass surgery, and the administration of vitamin B_{12} can be helpful either subcutaneously or orally. These treatment options are available.

CONCLUSION

Patients diagnosed with cancer affecting the stomach and other organs of the gastrointestinal tract must receive appropriate and timely nutritional support during the postoperative phase to facilitate a smoother transition into outpatient care. This approach notably enhances the anthropometric and functional indicators of patients, ultimately contributing to an improved quality of life.

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