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REVIEW ARTICLE

Occupational safety of healthcare workers in the terms of the COVID-19 pandemic as the public health aspect

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ABSTRACT

Aim: To assess the level of occupational safety, health and hygiene of healthcare workers in the terms of the COVID-19 pandemic.

Materials and Methods: bibliosemantic, bibliographic, analytical, statistical methods as well as a systemic approach have been used in the research. The data of the Cabinet of Ministers of Ukraine, the Ministry of Health of Ukraine, the State Labour Service and the scientific research findings from open sources have been analyzed.

Conclusions: The safety of healthcare workers with regard to infection is essential for a secure hospital environment. From an infection prevention perspective, PPE and sanitary requirements are fundamental to ensuring a safe environment for healthcare workers. The analysis revealed inadequate provision of PPE for healthcare workers during the pandemic, with levels ranging from 61,25% to 63,63%. The risk of contracting the novel coronavirus among healthcare personnel during the pandemic was 12 times higher than in the general population. The risk of developing an occupational disease among those who treated patients infected with SARS-CoV-2 was 58,1 times higher.

The analysis revealed that the provision of personal protective equipment (PPE) to healthcare workers during the study period was only two-thirds of the required amount, which consequently elevated the risk and incidence of morbidity among healthcare workers.

KEY WORDS: safety of medical personnel, COVID-19, provision of personal protective equipment (PPE), public health

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INTRODUCTION

The problem of safety of healthcare personnel while providing medical care has many aspects. By the nature, challenges can be divided into external criminal, organisational (lack of standards in work), physical and internal psycho-emotional exertion, work with chemicals, infectious agents, etc. The infection safety of healthcare workers is a significant element in the organisation of a safe hospital environment. The infection safety of medical staff means a system of measures taken to protect the health of employees and fight against pathogens of various diseases [1]. From the perspective of infection prevention, following sanitary requirements is essential to provide safe environment for medical personnel. However, flexibility and ability to provide material resources for both healthcare personnel safety equipment and vaccines are equally important. The time dimension of organising a safe hospital environment becomes crucial, as it is necessary to create immunity to infections among medical staff. Current challenges involving the occurrence of new infections and their dramatic spread worldwide enhance a focus concerning the rapid response to the threat.

AIM

The aim of the study was the assessment of the level of safety, health and occupational health of healthcare workers in the terms of the COVID-19 pandemic.

MATERIALS AND METHODS

Bibliosemantic, bibliographic, analytical, statistical methods as well as a systemic approach have been used in the research. The data of the Cabinet of Ministers of Ukraine, the Ministry of Health of Ukraine, the State Labour Service and the scientific research findings from open sources have been analyzed.

REVIEW

Medical staff is primarily at the most likely risk of catching some infections, becoming disabled or dead while working with patients who are the carriers of an infectious pathogen or are ill with some infectious diseases [14]. Consequently, at the initial stage of quarantine restrictions dated from 12 March 2020 to 8 May 2020, healthcare workers in Ukraine faced the risk of COVID-19 infection 12 times more frequently

Table 1. Dynamics of registration of the number of SARS-CoV-2 in April 2020

№ S/N	INDICATORS	ABSOLUTE QUANTITY				NUMERICAL VALUE OF THE INDICATOR			
		14.04.	17.04	24.04	01.05.	14.04.	17.04	24.04	01.05.
1	Total number of SARS-CoV-2 infections	3372 people	4662 people	7648 people	10861 people	8,028 per 100 thousand people	11,13 per 100 thousand people	18,26 per 100 thousand people	25,93 per 100 thousand people
2	Number of healthcare workers involved in providing inpatient care to patients with COVID-19	1059 of them 242 in healthcare facilities	4092 of which 242 in healthcare facilities	4602 of which 398 in healthcare facilities	4866 (240+69 reserve healthcare facilities)	Staffing levels 75,6%	Staffing levels 76,76%	Staffing levels 76,41%	Staffing levels 76,46%
3	Number of healthcare workers infected with SARS-CoV-2	350 people	879 people	1458 people	2154 people	10,4 % of all the infected people	18,85 % of all the infected people	19,06 % of all the infected people	19,83 % of all the infected people
4	Number of reports of acute occupational disease caused by SARS-CoV-2 (COVID-19)	98 people	152 people	354 people	612 people	28,0% of all the infected healthcare workers	17,3% of all the infected healthcare workers	24,23% of all the infected healthcare workers	28,41% of all the infected healthcare workers

compared to patients among general population [2]. According to statistics (Table 1), April 2020, 10,4 % of all the infected people in the country were healthcare workers. From the 14.04.2020 to 17.04.2020 the number of infected healthcare workers more than doubled in three days – 879 workers versus 350, while the number of infected patients increased by only one quarter – 4662 people versus 3373 with the unchanged rate of personal protective equipment (PPE) provision for Ukrainian healthcare workers in the pandemic.

Within the period from 17.04.20 to 24.04.20, the number of healthcare workers infected with SARS-CoV-2 has increased by 579 people, though the personnel supply remained approximately at the same level. One more week later, by 01.05.2020, the number of SARS-CoV-2 infected healthcare workers increased yet by 696 employees. Thus, in just sixteen days, the number of infected medical workers increased 6,15 times.

One of the reasons for the high rate of infections among healthcare workers was low as of 14.04.2020 availability of PPE (Table 2), which is significant for organising a system of infectious diseases prevention. The overall supply rate from 14.04.2020 to 17.04.2020 remained with no changes, with estimated delivery of 61.25%. The number of specific PPE as at 17.04.2024 somehow changed and the planning for the provision was already calculated for 30 days. By 24.04.2020 the provision of PPE for healthcare workers remained almost unchanged. The provision of PPE to healthcare workers as at 01.05.2020 has slightly changed in accordance with some items to 63,63% in total.

At the beginning of April 2020, 242 healthcare facilities and 1411 medical staff members were involved in providing inpatient care to patients with COVID-19, that constituted 75,06% of the required medical personnel.

While estimating the risk of infection of healthcare workers with SARS-CoV-2 in April 2020, an average level was determined. Medical staff working in inpatient facilities is exposed to high risk of being infected.

It should be noted that due to the large number of patients requiring inpatient care, many inpatient units actually operated as infectious disease units, and therefore the risk to healthcare workers working in such units was too high. Taking into account a dramatic increase in the number of patients who contracted the disease and needed inpatient care, the amount of healthcare facilities was expanded to 270 within three days from 14.04.2020 to 17.04.2020, with 4092 medical workers providing medical care to the patients with COVID-19; at that time it constituted 76,76% of the need.

The risk of SARS-CoV-2 infection among healthcare workers who provided medical care to patients with COVID-19 in infectious diseases hospitals as of 17.04.2020 was 24,7 times higher than among other healthcare workers.

By 24.04.2020, the number of healthcare workers engaged in providing inpatient medical care to patients with COVID-19 increased to 4602, which constituted 76,41% of the estimated need. The number of healthcare facilities involved in the organisation of medical care for patients with COVID-19 increased to 398.

Table 2. COVID-19: Ensuring prevention in the workplace in April 2020

№ S/N	PROVISION OF PERSONAL PROTECTIVE EQUIPMENT (FOR 15 DAYS)	ESTIMATED NEEDS				INDICATOR (61,25% in total) (*with expected deliveries)			
		14.04.	17.04	24.04	01.05	14.04.	17.04	24.04	01.05 (63,63% in total)
1	Antiseptics	55,4 thousand litres	50 thousand litres	221 thousand litres	164 thousand litres	99,1 %	90,0 %	98,2 %	97,6 %
2	Protect. goggles/shields	80,7 thousand units	132,7 thousand units	159,5 thousand units	145,7 thousand units	73,1% (77,7 %*)	59,5 % (62,3 %*)	67,7 % (70,6 %*)	67,3 % (69,8%*)
3	FFP2 / FFP3 / N-95 respirators	726,0 thousand units	1,2 million units	1,3 million units	1,33 million units	40,5 % (84,5 %*)	31,4 % (62,3 %*)	34,4 % (65,9 %*)	40,40% (68,6 %*)
4	Reusable medical masks	171.0 thousand units	416 thousand units	419 thousand units	418 thousand units	92,8 %	60,1 %	59,4 %	57,6 %
5	Medical disposable masks	2,2 million units	6,1 million units	6,1 million units	6,1 million units	45,4 % (99,5 %*)	49,2 % (67,2 %*)	49,2 % (67,2 %*)	49,2 % (67,2 %*)
6	Disposable protective gloves	2,2 million units	5,8 million units	5,9 million units	5,9 million units	90,9 %	86,2 %	84,7 %	84,7 %
7	Disposable insulating gowns	211,5 thousand units	700 thousand units	706 thousand units	734.0 thousand units	16,1% (75,4 %*)	15,4 % (33,4 %*)	16,3 % (34,0 %*)	18,9 % (36,1%*)
8	Biological protection suits	316 thousand units	1,2 million units	1,2 million units	1,24 million units	14,2% (44,1 %*)	10,5% (18,6 %*)	13,2% (19,5 %*)	17,5 % (23,6%*)

Table 3. Assessment of occupational risks of SARS-CoV-2 infection in the healthcare sector in April 2020

№ S/N	INDICATORS	QUANTITY			RISK ASSESSMENT		
		14.04	17.04	24.04	14.04	17.04	24.04
1	Number of employees in the healthcare sector	546,0 thousand people (State Statistics Service of Ukraine, 2020)	546,0 thousand people (State Statistics Service of Ukraine, 2020)	546,0 thousand people (State Statistics Service of Ukraine, 2020)	$6,4*10^{-4}$ («average» for industry workers)	8,5*10-3 («medium» for industry workers)	2,7 *10-3 («average» for industry workers)
2	Number of employees involved in providing inpatient medical care to patients with COVID-19:	1059 people (Ministry of Health of Ukraine, 2020)	4092 people (Ministry of Health of Ukraine, 2020)	4602 people (Ministry of Health of Ukraine, 2020)	$3,3*10^{-1}$ («high» for employees of infectious diseases hospitals)	$1 * 10^{-1}$ («high» for employees of infectious diseases hospitals)	$3,2*10^{-1}$ («high» for employees of infectious diseases hospitals)
3	Number of people infected with SARS-CoV-2	350 people (Ministry of Health of Ukraine, 2020)	879 people (Ministry of Health of Ukraine, 2020)	1458 people (Ministry of Health of Ukraine, 2020)	standardized incidence ratio = 515,62	standardized incidence ratio = 24,7	standardized incidence ratio = 118,52

DISCUSSION

Public health status is an indicator of the socio-economic development of any country worldwide and is thought to be a universal value. This indicator is an extremely important priority in the healthcare and public health system. In addition, health plays a crucial role in the lives of each person, family and society overall. The responsibility for maintaining and improving the health of the population is relied upon the government [11].

As indicated in the Accounting Chamber's 2021 report [13], the Cabinet of Ministers earmarked UAH 691,4 million, representing a 17,4% reduction from the planned allocation, to guarantee the public health system's preparedness and responsiveness to the emergence of novel coronavirus (Covid-19) outbreaks.

According to the data of Ministry of Health of Ukraine, by 01.05.2024, the total number of people infected with SARS-CoV-2 constituted 10861. By 8 May 2020, 14195 cases of COVID-19 had already been recorded, according to the Ministry of Health of Ukraine and the State Labour Service of Ukraine. Among them 361 people died and 2706 recovered. The total cumulative incidence rate was 33,89 per 100 thousand people. As of 01.05.2020, the number of healthcare workers infected with SARS-CoV-2 was 2154; 612 of whom were ill with acute occupational disease COVID-19. As of 08.05.2020, 1049 reports of acute occupational disease COVID-19 were recorded. This is only 38,03% of the total number of confirmed cases of SARS-CoV-2 infection among healthcare workers, with the total number of healthcare workers who contracted COVID-19 constituted 2758. However, the average growth rate of new cases of SARS-CoV-2 infection in terms of persons/day (i.e., the number of people infected per day) with the SARS-CoV-2 pathogen exceeded the growth rate of infection of healthcare workers during the observation period by an average of 3,5 times. As of 2 October 2020, the cumulative number of deaths among the country's population due to COVID-19 was 4359 (mortality rate – 2%), and among healthcare workers – 131 (mortality rate -0,8%) [2]. At the initial stage of quarantine restrictions, healthcare workers faced 12 times higher risk of COVID-19 infection than general population. The most vulnerable segments were nurses, junior nurses, anesthetists, general practitioners and therapists. Nurses were 5,5 times more likely to be infected with the virus, and nurses were 3,8 times more likely to be infected than anesthetists, who have the highest risk of infection among physicians (Fig. 1). Junior medical personnel were frequently included in the emergency medical team, which did not adhere to the stipulations set forth in paragraphs 6 and 7 of the Model Regulations on the Emergency Medical Team, approved by the Cabinet of Ministers of Ukraine on November 21, 2012, under the designation No. 1114 [15]. According to the data of the Ministry of Health of Ukraine, as of 14 July 2023, the number of COVID-19 cases in Ukraine was 5557995, respectively, 112418 (2%) of them were fatal.

One of the most essential reasons of high risk of occupational infectious disease COVID-19 is the lack of PPE [8]. In addition, the inadequate use of PPE and its ineffectiveness is the cause of 18,9% of the occurrence of such disease in a healthcare worker. This factor is one of the leading ones along with increased working load, overtime work, physical fatigue, monotonous work, unstable work schedule, lack of time and lack of order, among those that negatively affect the possibility of contracting an infectious disease [9]. The mode of use of PPE by healthcare workers is significant, as long hours of work in PPE and the temperature rise, absence of ventilation in the premises, especially in summer (most

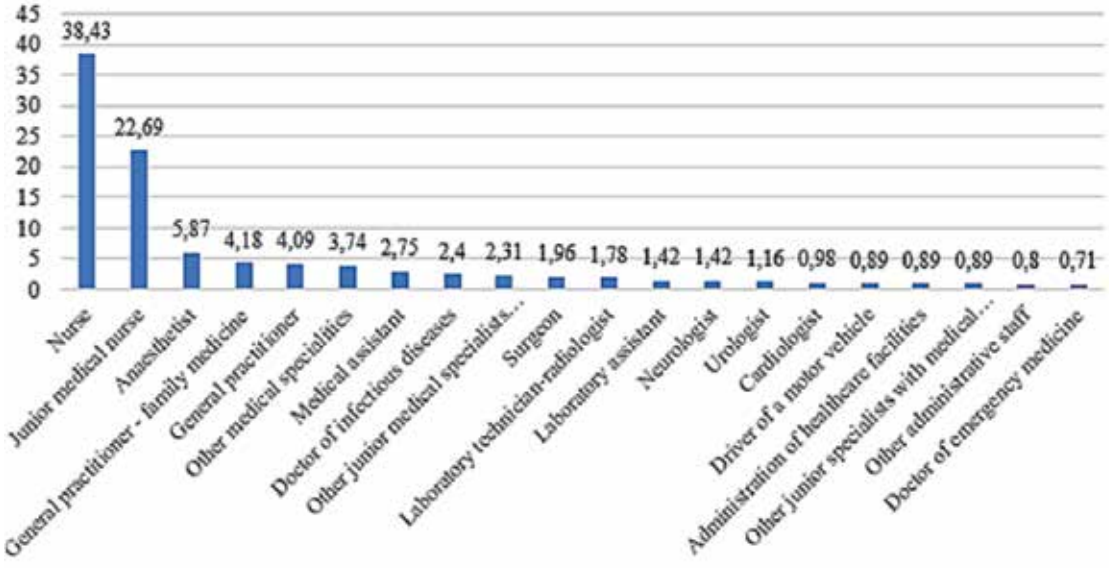


Fig. 1. Occupations diagnosed with acute occupational disease COVID-19, which were reported to the State Labour Service of Ukraine at the beginning of quarantine restrictions.

premises are not equipped with air conditioners) reduce the time of use [10], while the possibility of timely change of PPE is limited because of lack of 100% supply.

In Ukraine, according to the Law of Ukraine No. 2573 "On the Public Health System", a public health system is being created characterized by complexity; it should be integrated into European network in accordance with international standards. The specified system of public health has to promote health, prevent diseases, improve the quality and increase the life expectancy of Ukrainians. According to the Law, the priority function of the system of public health is the prevention of communicable and non-communicable diseases and access to immune-prophylactic services. The main task of the country's healthcare system on the background of current challenges is to provide the most effective medical care to the population with the available resources and to achieve the highest possible level of medical care and medical services [11]. Healthcare workers are part of society, so from the system of public health perspective, they should have all the conditions and support to prevent occupational diseases, as the SARS-CoV-2 virus is classified as a highly hazardous infectious agent and, according to the current Hygienic Labour Classification, work with such a pathogen is characterized by the highest hazard class – 4 [11]. When looking for solutions to numerous health-related problems, the global community emphasizes the need for a comprehensive approach that embraces cross-sectoral cooperation, strengthening of health systems, integration of various medical and non-medical services, strategic management, a nationwide approach, a participatory approach, a view to the future, innovation, evidence-based, inclusiveness, collective action, adaptability, evaluation and accountability [12].

CONCLUSIONS

The results of the analysis indicated:

1. The risk of infection with the novel coronavirus among healthcare workers was 12 times higher than in the general population.
2. The risk of occupational disease among healthcare workers who cared for patients with SARS-CoV-2 infection was 58,1 times higher.
3. The provision of PPE was 63,63%, which is 1/3 less than the required level.
4. The shortage of PPE had a negative impact on the incidence of SARS-CoV-2 infection among healthcare workers.

PROSPECTS FOR FURTHER RESEARCH

Occupational health and security organization of medical personnel remains a scientific problem that requires some additional research as far as the current challenges and the construction of the public health system in Ukraine introduce new aspects to the organisation of this work and identify new factors of impact.

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CONFLICT OF INTEREST
The Authors declare no conflict of interest

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