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Research Article

Assessing the Psychological Well-being of Healthcare Workers During the COVID-19 Pandemic

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Abstract

During the COVID-19 pandemic, working in any medical organization is associated with the risk of coronavirus infection. This applies first and foremost to specialized medical organizations dealing with the treatment of patients infected with coronavirus. Medical workers experiencing increased psychological stress are at an increased risk of infection with the SARS-CoV-2 virus while providing medical care. Therefore, studying the psychological states of medical workers – doctors, nurses, orderlies - is of particular importance and relevance. Our research goal is to investigate the psychological responses of medical professionals amid the COVID-19 pandemic. The research focused on the Aktobe Medical Center (AMC), which hosts the regional pulmonology center for COVID-19 patients and the Regional Clinical Infectious Diseases Hospital (RCIDH). The study is a selective, single-stage cross-sectional analysis. To assess the psychological reactions of medical workers, standardized questionnaires are used, including the PSM-25, GAD-7, and MFI-20. Statistical analysis of the data is conducted using the STATISTICA 10.0 software package from StatSoft, Inc., USA. An analysis of the research results indicates that medical personnel, nurses, and administrative staff in medical organizations associated with the risk of coronavirus infection are susceptible to adverse psychophysiological disorders. The study revealed that stress levels, anxiety, and asthenia in doctors and nursing staff are significantly higher compared to those in nurses and administrative personnel. Medical workers at risk of COVID-19 clearly require support measures, as the potential for occupational infection has been definitively established. Additionally, the psychological risk is largely influenced by the nature of their work and their direct contact with the population and patients infected with the coronavirus. Senior and mid-level medical workers at the forefront of combating coronavirus infection is at a high risk of experiencing psycho-emotional and psychophysiological health issues. Doctors and nurses have been found to exhibit high levels of physical and mental asthenia, anxiety, and moderate-to-high levels of stress. Evaluating potential risk factors for psychophysiological disorders among healthcare workers not only provides an objective assessment of their health status, but also aids in the effective and rational organization of their work.

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1. Introduction

The COVID-19 pandemic presents numerous challenges that significantly affect the population, particularly medical professionals. Stressors such as enforced restrictions, fear of infection, prolonged periods of isolation, economic uncertainty, perceived discrimination, and social stigma pose significant threats to mental well-being, especially for medical workers who are at a heightened risk.

In March 2020, the World Health Organization (WHO) declared this outbreak a global pandemic, making it an unprecedented international public health emergency, and leading to various medical and psychological problems among the general population, including healthcare workers [1, 2]. The global healthcare system confronts a critical challenge in safeguarding the psychological welfare and effectiveness of frontline doctors and nurses combating the transmission of SARS-CoV-2 [3-5]. Close interaction with the virus in their work environment exposes doctors to traumatic experiences, including loss and the burden of making challenging decisions, heightening the risk of stress reactions [6].

Some studies have proven that COVID-19 has not only posed numerous challenges to the public health system, but also leads to numerous forms of psychological disorders, including anxiety, stress, depression, and emotional burnout [7-10]. According to the literature, the most common mental disorders over the course of coronavirus infection include post-COVID syndrome, including the development of asthenia, cognitive impairment, anxiety, depression, insomnia and stress disorders, which when combined form a special clinical astheno-neurotic syndrome [11, 12, 13-15].

During the initial phases of the pandemic, healthcare workers encountered inadequate training in infection control, a scarcity of personal protective equipment (PPE), and overwhelming workloads [16, 17]. In addition, direct contact with patients with the coronavirus infection increased their risk of infection, and the fear of passing the virus to their families made them susceptible to mental disorders [18]. Research derived from comprehensive investigations into COVID-19 has unveiled fresh evidence of adverse psychological impacts on healthcare workers across various nations [19-22]. A meta-analysis encompassing a survey of 108,931 medical professionals from 69 published articles across four nations (China, Iran, Italy, and Turkey) revealed that amid the COVID-19 pandemic, the collective prevalence rates of anxiety, depression, and insomnia stood at 37%, 34%, and 39%, respectively [23]. Another meta-analysis [24], incorporating 401 studies with 458,754 participants from 58 countries, revealed depression prevalence at 28.5%, anxiety at 28.7%, post-traumatic stress disorder at 25.5%, and insomnia at 24.4%. In a separate analysis [25] of 13 studies with 33,062 participants, the combined prevalence rates of anxiety, depression, and insomnia were 23.2%, 22.8%, and 38.9%, respectively. Additionally, a cross-sectional study in Egypt and Saudi Arabia found depression rates of 69%, anxiety at 58.9%, stress at 55.9%, and insomnia at 37.3% among medical workers [26]. A survey in Qatar indicated that 71.4% of doctors and 74.4% of intensive care unit nurses reported moderate to severe perceived stress, with symptoms of post-traumatic stress disorder prevalent among those directly caring for COVID-19 patients [27, 28].

Working in any medical organization during the COVID-19 pandemic carries a risk of coronavirus infection, particularly in facilities treating infected patients. Medical personnel providing care face an elevated risk of contracting SARS-CoV-2. Therefore, it is crucial and highly relevant to study the psychological and psychophysiological condition of medical workers, including doctors, nurses, and orderlies. The existing literature lacks targeted studies on the psychological state of medical and nursing staff in the Republic of Kazakhstan during the COVID-19 pandemic, underscoring the importance of research in this area. Research goal is to investigate the psychological responses of medical professionals amid the COVID-19 pandemic.

2. Materials and Methods

2.1. Study design

This selective, cross-sectional, randomized study utilizes a qualitative approach to obtain more in-depth data on the psychological state of medical workers.

2.2. Study object

The research was conducted at the Aktobe Medical Center (AMC), which provides outpatient and inpatient care across 16 specialties for both children and adults in the region. A total of 498 employees participated, including 177 doctors and 321 nurses, in having their psychological state and corresponding psychophysiological reactions assessed. The second research site was the Regional Clinical Infectious Diseases Hospital (RCIDH), which offers high-quality medical care for children and adults with infectious diseases. At RCIDH, 34 doctors, 56 nurses, and 57 orderlies were interviewed. These facilities were chosen because, during the COVID-19 pandemic, medical personnel at all levels had the most direct contact with coronavirus patients, and the regional pulmonological center was located within AMC.

2.3. Inclusion criteria

Medical and secondary medical staff, including nurses, administrative, and technical personnel; ages 18 to 70 years; informed consent to participate in the study.

2.4. Exclusion criteria

Refusal to participate in the study; age over 70 years; presence of acute somatic and neurological diseases; use of sedation.

2.5. Sample size

The sample size for studying psychological reactions among medical and technical personnel was determined based on the specific staffing levels of medical and secondary medical positions at AMC and RCIDH. The sample is comprehensive. Additionally, the required sample size was calculated using the RaoSoft online calculator (http://www.raosoft.com/), with an assessment accuracy level of 5% and a confidence interval of 95%.

Health workers were surveyed using the PSM-25, GAD-7, and MFI-20 questionnaires. The survey was available in both Kazakh and Russian.

All participants were informed about the study's goals and objectives and provided their informed consent to participate. Each medical and technical worker was surveyed at the time of inclusion in the study, with responses recorded on a paper form that included their surname, first name, patronymic, age, gender, and the structural unit of their medical institution.

The Lemur-Tessier-Fillion PSM-25 scale is designed to measure the phenomenological structure of stress experiences. The frequency of these experiences is rated on a scale from 1 to 8, where 1 means "never," 2 "extremely rare," 3 "very rare," 4 "rare," 5 "sometimes," 6 "often," 7 "very often," and 8 "constantly (daily)." The sum of all responses provides an integral indicator of mental tension (PPN). A higher PPN indicates a higher level of psychological stress. Specifically, a PPN greater than 155 points signifies a high stress level, a PPN between 100 and 154 points indicates a moderate stress level, and a PPN below 100 points reflects a low stress level.

The Generalized Anxiety Disorder (GAD-7) questionnaire, which consists of seven questions, was employed. This scale asks respondents to assess the severity of the following manifestations over the past two weeks: anxiety, nervousness, feeling "on the verge of a breakdown"; inability to cope with or control anxiety; severe anxiety for various reasons; difficulty relaxing; restlessness; irritability and intemperance; and anxious premonitions of negative events. The total score is categorized as follows: 0-4 points indicate minimal anxiety, 5-9 points indicate moderate anxiety, 10-14 points indicate average anxiety, and 15-21 points indicate high anxiety.

To determine the severity of asthenia, the subjective asthenia assessment scale MFI-20 (The Multidimensional Fatigue Inventory) was utilized. This tool is designed to provide a subjective quantitative assessment of the overall severity of asthenia and its various aspects. The scale contains 20 statements, each reflecting indicators of asthenia: general asthenia, physical asthenia, decreased activity, decreased motivation, and mental asthenia. Developed by Dutch scientists E. Smets, B. Garssen, B. Bonke, and J. Haes, the scale is formulated to minimize the influence of subjective factors on responses. The highest scores indicate the greatest severity of asthenia. A total score above 12 on any of the subscales may preliminarily indicate the presence of "asthenic syndrome."

3. Results

In evaluating our research results, we intentionally grouped doctors and nurses from various departments based on their infection risk. This grouping was driven by administrative requirements to integrate employees across departments, the professional responsibilities involved in delivering specific medical care stages, and considerations of stigmatization and the emotional and personal characteristics of healthcare staff during a pandemic. Additionally, literature reports indicate that 60.2% of medical workers contracted coronavirus infection while on duty [29].

During the height of the COVID-19 pandemic when we studied the psychological and psychophysiological state of medical, paramedical, and technical personnel, we found that infection rates among healthcare workers were significant. At AMC, 47% of doctors and 61% of nurses were affected. At OKIB, these numbers were higher with 58% of doctors, 67% of nurses, and 35% of technical staff contracting the coronavirus infection among the total number of employees.

3.1. Psychological reactions among medical and technical staff at the AMC

It was observed that doctors across various departments of the AMC exhibit moderate to high levels of stress. Specifically, doctors in the emergency room (ER), otorhinolaryngology department (OD), allergological and therapeutic departments (ATD) showed moderate stress levels in 51.5% of individuals and high stress levels in 30.3%. Similarly, doctors in the department of Pathology of Pregnant Women (DPPW), the Department of Anesthesiology, Intensive Care (DAIC), stroke center (SC), and Pathology of Newborns (PN) also demonstrated considerable levels of stress across low, moderate, and high categories. Doctors in the Department of Urology (DU), Neurotraumatic Surgery Department (NSD), emergency surgery (ES), elective surgery (ES), and vascular surgery department (VSD) exhibited considerable levels of stress across various categories. Conversely, the lowest levels of moderate and high stress were observed among doctors in the laboratory service (LabS), Department of Cardiology and Endocrinology (DCE), and Department of Functional Diagnostics (DFD). Notably, doctors in these departments reported the highest proportion of low stress levels (52.2%) (Figure **1**).

The nurses of the Aktobe Medical Center also had the highest stress levels in employees of ER, OD, ATD, DPPW, DAIC, SC, PN, DU, NSD,ES, ES,VS. The lowest stress levels were found in nurses employed in the following departments (LabS, DCE, DFD) (Figure **2**).

Examination of anxiety levels among medical staff at AMC revealed notable findings. The highest anxiety levels were observed among doctors from specific departments such as the Department of Pathology of Pregnant Women (DPPW), the Department of Anesthesiology and Intensive Care, the Stroke Center, and the pathology department of newborns, affecting 40.9% of participants. Additionally, a considerable level of anxiety was noted among doctors in departments like the emergency room,

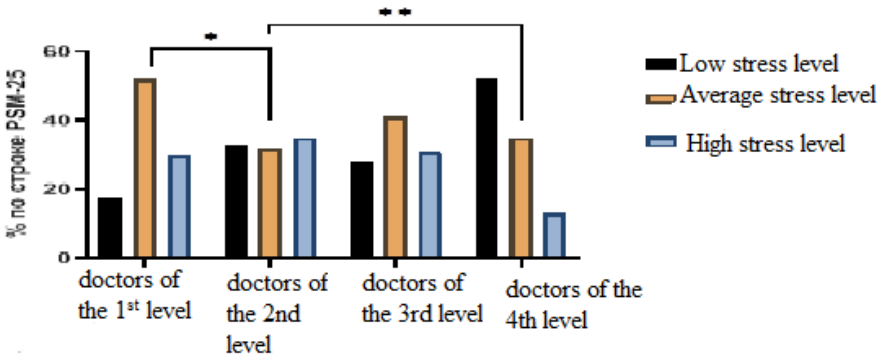

Figure 1: Psychological stress levels among AMC doctors (PSM-25, %). Note: * - p = 0,007 statistically significant differences in χ and Pearson square between 1st and 2nd category doctors ** - p = 0,025 statistically significant differences in χ and Pearson square between 2^{nd} and 4th category doctors.

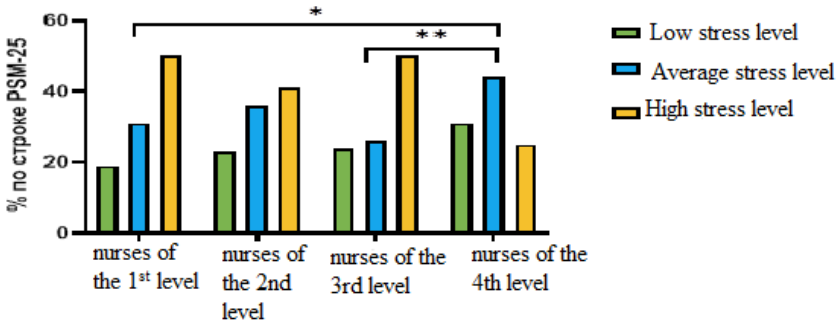

Figure 2: Indicators of psychological stress in AMC nurses (PSM-25, %). Note: * - p = 0,011 statistically significant differences in χ and Pearson square between 1st and 4th category nurses. ** - p = 0,009 statistically significant differences in χ and Pearson square between 3rd and 4th category nurses.

otolaryngology, allergy, and therapy (affecting 30.3% of participants). Conversely, doctors from divisions such as LabS, DCE, and DFD displayed lower levels of medium and high anxiety (Figure **3**).

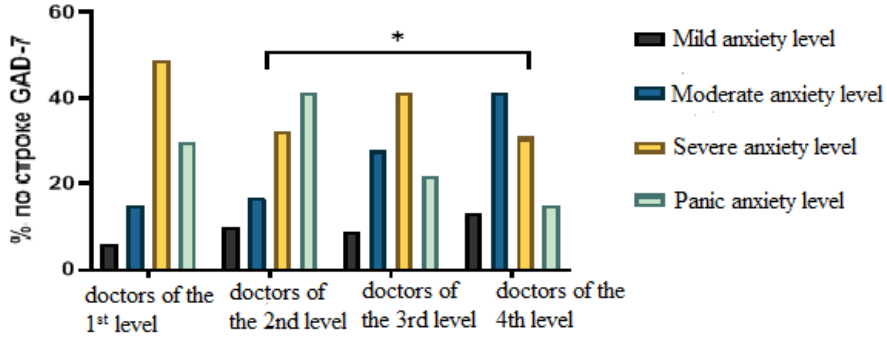

Figure 3: Indicators of anxiety among AMC doctors (GAD-7, %). Note: * - p = 0,003 statistically significant differences in χ and Pearson square between 2nd and 4th category doctors .

The nurses at Aktobe Medical Center exhibited elevated anxiety levels, particularly those working in departments such as ER, OD, ATD, DPPW, DAIC, SC, PN, DU, NSD, ES, and VS. Conversely, nurses in departments like LabS, DCE, and DFD demonstrated comparatively lower levels of anxiety (Figure **4**).

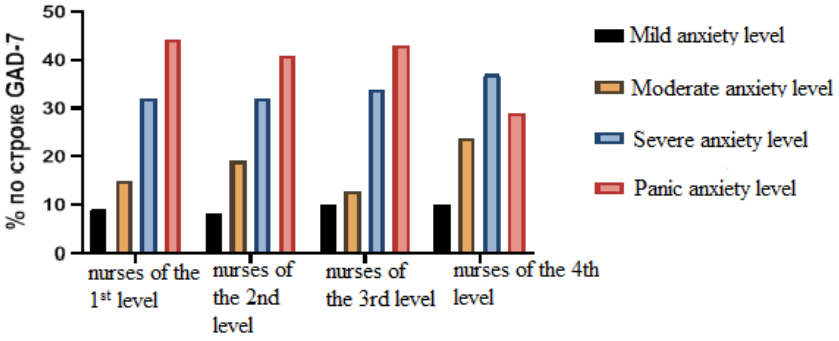

Figure 4: Indicators of anxiety among AMC nurses (GAD-7, %).

Table 1 presents the indicators of asthenia among doctors at AMC. Departments such as ER, OD, and ATD showed the highest levels of general asthenia, decreased activity, decreased motivation, as well as physical and mental asthenia. Additionally, compared to other AMC departments, these groups exhibited the highest rates of general and physical asthenia. Similarly, doctors in DU, NSD, ESD, and VSD departments demonstrated elevated levels of general asthenia, physical and mental asthenia, along with notable decreases in activity and motivation. Notably, this group also displayed the highest rates of mental asthenia. Conversely, medical staff in departments like LabS, DCE, and DFD exhibited the lowest rates of general asthenia, decreased activity, decreased motivation, and physical asthenia.

The nursing staff of Aktobe Medical Center was also exposed to high rates of asthenia during the COVID-19 pandemic (Table 2). The parameters of general asthenia, physical asthenia, and mental asthenia were most significant in such departments as ER, OD, ATD. In the same group of subjects, high rates of decreased activity and decreased motivation were also revealed. The nurses employed in the departments of DPPW, DAIC, SC, PN also had fairly high rates of asthenia. At the same time, its lowest levels were found in the departments of LabS, DCE, DFD. Approximately the same dynamics in the main parameters of asthenia was revealed in nurses employed in the departments of DU, NSD, ESD, VSD.

3.2. Psychological reactions among medical and technical personnel at RIDH

Figure **5** illustrates the levels of psychological stress and anxiety experienced by staff at the Regional Infectious Diseases Hospital. Doctors and nurses working in key departments of the hospital exhibit predominantly high and moderate levels of stress. Specifically, doctors reported the highest stress level at 47.1% of respondents. Additionally, between 80% and 90% of senior and secondary medical personnel experienced moderate to high levels of stress, with only 11.8% to 12.5% reporting low stress levels. In contrast, nurses at this institution showed a different distribution: 5.3% reported high stress levels, 31.6%

Table 1: Indicators of asthenia among AMC doctors.

Parameters	Staff				P*
	Level 1 Doctors - 33 (ER, OD, ATD)	Level 2 Doctors - 66 (DPPW, DAIC, SC, PN)	Level 3 Doctors - 32 (DU, NSD, ESD, ESD, VSD)	Level 4 Doctors - 46 (LabS, DCE, DFD, Others	
	n (%)	n (%)	n (%)	n (%)	
MFI-20 general asthenia					< 0.001
GA>=12	25 (75.7)	17 (25.6)	17 (53.1)	19 (41.3)	
GA<12	8 (24.3)	49 (74.4)	15 (46.9)	27 (58.7)	
MFI-20 reduced activity					< 0.001
RA>=12	21 (63.6)	11 (16.7)	19 (59.4)	13 (28.3)	
RA<12	12 (36.4)	55 (83.3)	13 (40.6)	33 (71.7)	
MFI-20 reduced motivation					< 0.001
RM>=12	18 (54.5)	25 (37.9)	25 (78.1)	9 (19.6)	
RM<12	15 (45.5)	41 (62.1)	7 (21.9)	37 (80.4)	
MFI-20 Physical asthenia					< 0.001
PA>=12	29 (87.9)	21 (31.8)	20 (62.5)	19 (41.3)	
PA<12	4 (12.1)	45 (68.2)	12 (37.5)	27 (58.7)	
MFI-20 Mental asthenia					< 0.001
MA>=12	11 (33.3)	13 (19.7)	22 (68.7)	27 (58.7)	
MA<12	22 (66.7)	53 (80.3)	11 (31.3)	19 (41.3)	

Note: * - Presented for the χ^2 – Pearson criterion

moderate stress levels, and 63.2% low stress levels. Similar trends in stress levels were observed among administrative and managerial staff, mirroring those of the nursing personnel.

Figure **6** highlights the anxiety levels among medical staff at the infectious diseases' hospital, revealing the significant psychological burden faced by healthcare workers amidst the COVID-19 pandemic. Both doctors and nurses at this facility show prevalent high and moderate levels of anxiety. A minority, approximately 15-17% of respondents, indicate minimal to moderate anxiety levels. In contrast, levels of high and moderate anxiety among nurses and administrative personnel are notably lower compared to doctors and nursing staff, consistent with the trends observed in stress indicators.

In addition to assessing the impact of stress from coronavirus infection on medical personnel, we explored key indicators of asthenia to evaluate anxiety parameters. Our findings indicate that doctors at the infectious diseases hospital display heightened levels of general asthenia, reduced activity, and notably elevated levels of mental asthenia. Similarly, nurses exhibit increased levels of general asthenia, reduced activity, physical asthenia, and mental asthenia. Mental asthenia, reduced activity, and diminished

Table 2: Indicators of asthenia among AMC nurses.

Parameters	Staff				P*
	Level 1 Nurses - 54 (ER, OD, ATD)	Level 2 Nurses - 119 (DPPW, DAIC, SC, PN)	Level 3 Nurses - 61 (DU, NSD, ESD, ESD, VSD)	Level 4 Nurses - 87 (LabS, DCE, DFD, Others)	
	n (%)	n (%)	n (%)	n (%)	
MFI-20 general asthenia					0.0092
GA>=12	34 (63)	54 (45.4)	21 (34.4)	33 (38)	
GA<12	20 (37)	65 (54.6)	40 (65.6)	54 (62)	
MFI-20 reduced activity					0.0077
RA>=12	31 (57.4)	41 (34.4)	19 (31.1)	41 (47.1)	
RA<12	23 (42.6)	78 (65.6)	42 (68.9)	46 (52.9)	
MFI-20 reduced motivation					< 0.001
RM>=12	39 (72.2)	63 (53)	27 (44.3)	27 (31)	
RM<12	15 (27.8)	56 (47)	34 (55.7)	60 (69)	
MFI-20 Physical asthenia					0.0547
PA>=12	19 (35.2)	47 (39.5)	18 (29.5)	19 (21.8)	
PA<12	35 (64.8)	72 (60.5)	43 (70.5)	68 (78.2)	
MFI-20 Mental asthenia					0.1406
MA>=12	22 (40.7)	39 (32.8)	13 (21.3)	25 (28.7)	
MA<12	32 (59.3)	80 (67.2)	48 (78.7)	62 (71.3)	

Note: * - Presented for the χ^2 – Pearson criterion

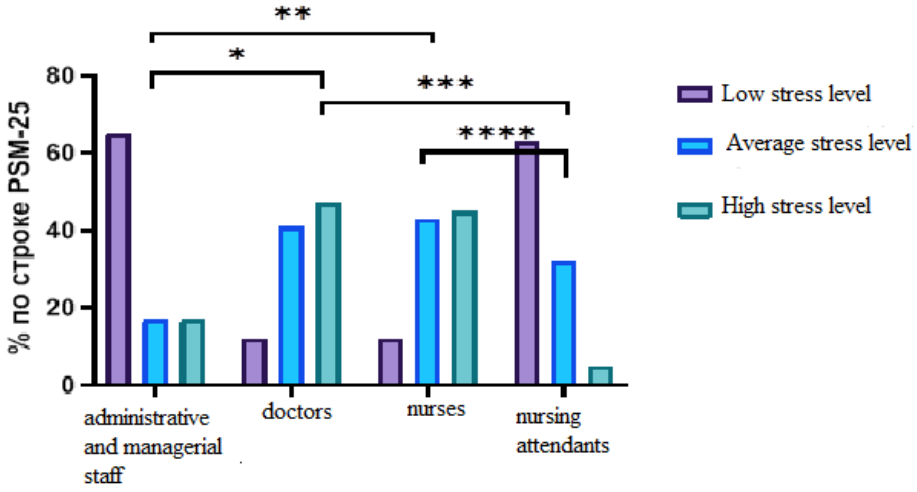

Figure 5: Indicators of psychological stress in medical staff of the RIDH (PSM-25, %). Note: * - p < 0, statistically significant differences in χ and Pearson square between administrative and managerial staff and doctors. ** - p < 0,001 atistically significant differences in χ and Pearson square between administrative and managerial staff and nurses. *** - p = p < 0,001 atistically significant differences in χ and Pearson square between doctors and nursing attendants **** - p < 0,001 statistically significant differences in χ and Pearson square between nurses and nursing attendants.

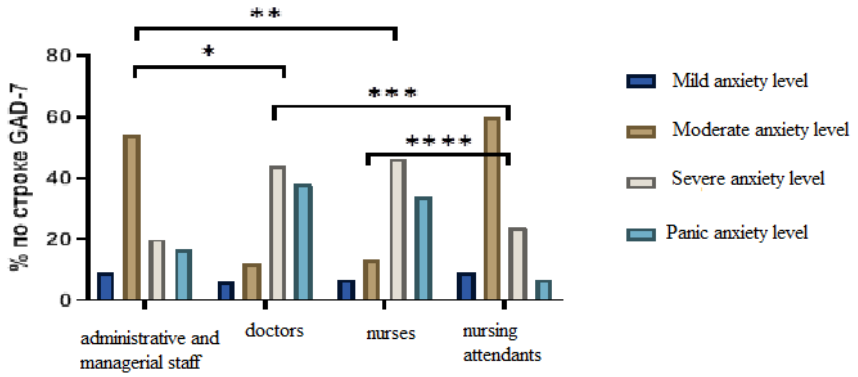

Figure 6: Indicators of anxiety among nurses of the RIDH (GAD-7, %). Note: * - p = 0,002 statistically significant differences in χ and Pearson square between administrative and managerial staff and doctors. ** - p = 0,001 statistically significant differences in χ and Pearson square between administrative and managerial staff and nurses. *** - p = p < 0,001 statistically significant differences in χ and Pearson square between doctors and nursing attendants. **** - p < 0,001 statistically significant differences in χ and Pearson square between nurses and nursing attendants.

motivation showed the highest rates among nurses. Additionally, administrative and managerial staff demonstrated significant indicators of general and physical asthenia, as detailed in Table 3.

Our research findings highlight that medical organizations facing the risk of coronavirus infection expose medical personnel, nurses, and administrative staff to significant psychophysiological challenges. We observed that doctors and nursing staff experience markedly higher levels of COVID-19-related stress, anxiety, and asthenia compared to nurses and administrative personnel. Given the proven occupational infection risk, it is crucial to implement supportive measures for medical workers. The psychological impact is notably influenced by job roles and direct contact conditions with the population and COVID-19 patients.

4. Discussion

A cross-sectional study conducted by researchers in China, involving 1,257 medical personnel, highlighted a considerable prevalence of mental health symptoms among healthcare workers involved in treating COVID-19 patients. The study found high rates of depression (50.4%), anxiety (44.6%), insomnia (34.0%), and distress (71.5%) among participants [30]. Similarly, another multicenter cross-sectional online survey, spanning 48 countries, identified significant changes in psychological responses among medical professionals [31]. The findings indicate that 360 out of 730 respondents (49.3%) reported severe or extremely severe levels of stress, anxiety, and depression. Moreover, the analysis revealed that healthcare workers in facilities treating COVID-19 patients exhibited significantly more pronounced symptoms of severe stress, anxiety, depression, and a higher level of emotional burnout compared to their counterparts in other fields.

Table 3: Indicators of asthenia in the medical staff of the RIDH.

Parameters	Medical Staff				P*
	Doctors (34)	Nurses (56)	Nursing attendants (57)	administrative and managerial staff (35)	
	n (%)	n (%)	n (%)	n (%)	
MFI-20 general asthenia					< 0.001
GA>=12	23 (67.6)	31 (55.3)	19 (33.3)	11 (31.4)	
GA<12	11 (32.3)	25 (44.7)	38 (66.7)	24 (68.6)	
MFI-20 Reduced activity					< 0.001
RA>=12	14 (41.2)	17 (30.3)	27 (47.4)	7 (20)	
RA<12	20 (58.8)	39 (69.7)	30 (52.6)	28 (80)	
MFI-20 reduced motivation (RM)					< 0.001
RM>=12	3 (8.8)	15 (26.8)	26 (45.6)	6 (17.1)	
RM<12	31 (91.2)	41 (73.2)	31 (54.4)	29 (82.9)	
MFI-20 Физическая астения					< 0.001
ФА>=12	6 (17.6)	20 (35.7)	18 (31.6)	16 (45.7)	
ФА<12	28 (82.4)	36 (64.3)	39 (68.4)	19 (54.3)	
MFI-20 Mental asthenis					< 0.001
MA>=12	29 (85.3)	34 (60.7)	38 (66.7)	10 (28.6)	
MA<12	5 (14.7)	22 (39.3)	19 (33.3)	25 (71.4)	

Note: * - Presented for the χ^2 – Pearson criterion

During the peak of the COVID-19 pandemic, a cross-sectional study involving 367 nurses from Dr. Soliman Fakih Hospital was conducted [32]. Utilizing the Depression, Anxiety, and Stress Scale 21 (DASS-21) through an online survey, findings revealed that 67.7% of the respondents experienced moderate to severe psychological issues. Specifically, 46.1% reported symptoms of moderate to severe depression, 48.0% exhibited symptoms of moderate to severe anxiety, and 48.4% experienced stress levels ranging from moderate to severe. In a separate study involving 2,182 subjects in China, healthcare workers demonstrated a higher prevalence of insomnia, anxiety, and depression compared to non-medical workers. Notably, nurses in Wuhan Province, particularly those working with infected patients, reported more severe symptoms of depression, anxiety, insomnia, and distress compared to doctors [33].

In a comparative study of various staff categories within a medical institution, it was revealed that medical workers exhibit higher levels of fear, anxiety, and depression compared to administrative staff. Particularly, advanced medical personnel working in departments such as respiratory, emergency, intensive care, and infectious diseases are twice as likely to experience anxiety and depression compared to non-clinical medical personnel [34].

In our study, doctors across almost all departments of the AMC exhibited medium to high levels of stress. Specifically, 51.5% of doctors in the ER, OD, ATD showed average stress levels, with 30.3% experiencing high stress levels. Among nurses, 50% reported high stress levels. Conversely, doctors in the laboratory service (LabS), Department of Cardiology and Endocrinology (DCE), and Department of Functional Diagnostics (DFD) showed the lowest stress levels, with 52.2% reporting low stress levels. Additionally, the highest levels of anxiety were observed among doctors in the DPPW, DAIC, SC, PN, with 40.9% of respondents experiencing anxiety. Similarly, doctors in the ER, OD, ATD reported a fairly high level of anxiety, with 30.3% of respondents affected.

Nurses across nearly all departments of the AMC exhibited the highest levels of anxiety. Additionally, both doctors and nurses displayed elevated rates of general asthenia, decreased activity, decreased motivation, physical asthenia, and mental asthenia.

Doctors and nurses working in the key departments of the Regional Infectious Diseases Hospital exhibit elevated to medium levels of stress. Among doctors, the highest stress level was reported by 47.1% of respondents. However, only 5.3% of nurses reported high stress levels, with 31.6% experiencing average stress levels and 63.2% reporting low stress levels. Similar trends were observed among administrative and managerial staff. Additionally, both doctors and nurses in this medical institution predominantly experience high to medium levels of anxiety, with minimal to moderate anxiety levels observed in only 15-17% of respondents. Notably, the levels of high and medium anxiety among nurses and administrative staff were notably lower compared to doctors and paramedics. Furthermore, doctors and nurses at the hospital reported high rates of general asthenia, decreased activity, and elevated levels of mental asthenia.

Due to limited resources and time constraints, our study could not extensively analyze the risk factors contributing to hospital-acquired coronavirus infections among medical workers. It would be valuable to investigate the impact of factors such as duration of exposure to infected patients, inadequate provision of personal protective equipment, work overload, inadequate infection control measures, and concurrent chronic illnesses. Additionally, assessing the long-term consequences of COVID-19, including the heightened risk of acute and chronic occupational diseases among medical personnel, predicting occupational fitness, and determining disability levels, is crucial.

Our findings underscore the necessity of maintaining a dedicated psychological support service for medical staff. Furthermore, it highlights the urgent need to implement and activate psychological services and intervention programs during emergencies triggered by the COVID-19 pandemic.

5. Conclusion

Healthcare workers constitute a high-risk group for COVID-19 and require supportive measures, given the confirmed occupational infection risks that vary depending on their roles and direct patient contact conditions. Recent research emphasizes that COVID-19 should be recognized as an occupational hazard

for medical personnel [35, 36]. The risk group encompasses virtually all healthcare professionals involved in treating COVID-19 patients. Factors contributing to healthcare worker infections include department overcrowding, prolonged exposure to COVID-19 patients, inadequate isolation facilities, and environmental contamination [37]. The COVID-19 pandemic, exacerbated by shortcomings in healthcare infrastructure, resulted in extended work hours, heightened workloads for healthcare personnel, insufficient rest periods, and inadequate implementation of preventive measures by medical professionals [38].

Regional disparities in the progression of the COVID-19 epidemic must be considered, owing to the intricate interplay of various factors that shape a multi-level and multi-component system capable of either exacerbating or mitigating the epidemic's course. This complexity also influences the psychological responses of the general population, including healthcare professionals. Modifying factors such as anti-epidemic measures, socio-demographic characteristics, economic conditions, weather patterns, environmental pollution, healthcare system indicators, and lifestyle choices all play a role in shaping regional variations in the epidemic's trajectory [39, 40].

The World Health Organization has urged the global community to enhance the safety of healthcare workers amidst the COVID-19 pandemic. Published in Geneva on September 17, 2020, the Charter on the Safety of Health Workers delineates measures in this regard. It calls on governments to bolster coordination between strategies aimed at safeguarding the well-being of both healthcare workers and patients, establish national programs to safeguard the health of medical personnel, enhance psychological support, and fortify protection against "physical and biological hazards."

The literature and our own research findings clearly highlight that senior and mid-level medical professionals face significant psychophysiological challenges during the COVID-19 pandemic, including asthenia, anxiety, and stress. Protecting the mental well-being of healthcare workers is crucial to sustaining their effectiveness in patient care. Therefore, identifying predictors of psychological reactions and implementing organizational strategies for prevention and treatment appears essential.

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Statistical Analysis

Statistical data processing was performed using the STATISTICA 10.0 software package from StatSoft, Inc., USA.

The data were presented in both absolute values and percentages relative to the total number of doctors and nurses. Analysis of the association between qualitative variables was conducted using Pearson's chi-square test (χ^2). A significance level of $p \leq 0.05$ was applied across all statistical analyses. Additionally, statistically significant differences were confirmed by the achieved p-value of $p = 0.002$.

Conflict of Interest

All authors of this article were appointed by the university rector to participate in the temporary research team under the program-targeted funding of the project BR11065386, "scientific and technological justification of the response system to the spread of new respiratory infections, including coronavirus infection" (2021-2023). The authors declare no conflicts of interest.

Authors' Contribution

Bermagambetova S.K. (statistical processing, design of the article)

Shayakhmetova K.N. (collection of material, preparation of the database)

Karashova G.I. (collection of material, preparation of the database)

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