

## SPECIFICS OF THE WORKLOAD-DEPENDENT DYNAMICS OF PSYCHO-EMOTIONAL EXHAUSTION AMONG MEDICAL STAFF OF A COVID HOSPITAL

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In the beginning of 2020 there appeared an urgent need for substantial advancement of the medical and psychological support for medical personnel involved in medical care provided to patients with the new coronavirus infection (COVID-19) in hospital settings. This need originated from the necessity to diagnose the risks of doctors developing mental states that adversely affect their professional performance and, subsequently, lead to disorders. In addition, there are under-researched matters of dependence of the prevalence of destructive mental states on the intensity of workload experienced by doctors in the "red zones", where the risk of patient fatalities is high. This study aimed to investigate the workload-dependent dynamics of psycho-emotional exhaustion among the medical staff of a COVID hospital. We analyzed the psychological tests (MBI, Maslach Burnout Inventory) that 121 people completed during a four-week assignment in the "infectious" zone and two weeks in the observation department. Seventy-nine doctors comprised the heavy workload group and 42 were in the moderate workload group. The study showed that healthcare workers experiencing heavier workloads exhibit high values of the psycho-emotional exhaustion indicators more often. We registered significant differences ( $p \leq 0.05$ ) by the Emotional Exhaustion scale at the third and fifth weeks of the study. By the fifth week, i.e., when the assignment in the "infectious zone" was over, heavy workload group had the median of 25 (23.5; 27), while in the moderate workload group it was 14 (14; 15), which is 56% lower.

**Keywords:** healthcare workers, COVID-19, psycho-emotional state, professional burnout, psychological testing, psycho-emotional exhaustion, emotional exhaustion, depersonalization, professional degradation

**Author contributions:** VI Sedin — study planning, data analysis and interpretation; SE Nazaryan — literature analysis, data collection, processing of the results; AS Samoilov — study planning.

**Compliance with the ethical standards:** the study was approved by the Ethical Committee of A.I. Burnasyan Federal Medical Biophysical Center (minutes #34 of April 7, 2020). All participants signed the informed consent form agreeing to psychological examination and rehabilitation program activities.

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## ОСОБЕННОСТИ ДИНАМИКИ ПСИХОЭМОЦИОНАЛЬНОГО ИСТОЩЕНИЯ У МЕДИЦИНСКОГО ПЕРСОНАЛА COVID-ГОСПИТАЛЯ С РАЗЛИЧНОЙ ИНТЕНСИВНОСТЬЮ ТРУДОВОЙ НАГРУЗКИ

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С начала 2020 г. появилась острая потребность в развитии медико-психологического обеспечения медицинского персонала, задействованного в оказании медицинской помощи пациентам с новой коронавирусной инфекцией (COVID-19) в стационарных условиях. Она продиктована необходимостью диагностики рисков развития у врачей психических состояний, приводящих к снижению эффективности профессиональной деятельности и, в итоге, к заболеваниям. Кроме того, недостаточно изучены вопросы влияния на распространенность деструктивных психических состояний у медиков интенсивности нагрузки при работе непосредственно в «красной зоне» в отделениях с повышенным риском смертности у пациентов. Целью работы было изучить динамику психоэмоционального истощения у медперсонала COVID-госпиталя с различной интенсивностью трудовой нагрузки. Проанализированы результаты психологического обследования 121 человека с использованием «Опросника профессионального выгорания Маслаха» (MBI) в течение четырехнедельной работы в «заразной» зоне и двухнедельного пребывания в обсервации. В группу с высокой интенсивностью нагрузки вошло 79 медиков, в группу со средней интенсивностью — 42. Показано, что у медперсонала, чей труд был связан с большей интенсивностью, чаще встречается высокий уровень показателей психоэмоционального истощения. Так, по шкале «Эмоциональное истощение» достоверные различия ( $p \leq 0,05$ ) получены на третьей и пятой неделях исследования. На пятой неделе исследования, т. е. после окончания работы в «заразной зоне», в группе с высокой интенсивностью нагрузки медиана составила 25 (23,5; 27), в то время как в группе со средней интенсивностью она была на 56% ниже и составила 14 (14; 15).

**Ключевые слова:** медицинский персонал, COVID-19, психоэмоциональное состояние, профессиональное выгорание, психологическое обследование, психоэмоциональное истощение, эмоциональное истощение, деперсонализация, редукция профессиональных достижений

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Healthcare professionals, especially those working in COVID hospitals where the conditions are excessively stressful, run the risk of development of psycho-emotional exhaustion and other negative mental conditions, like persistently bad mood, deteriorating health, sleep disorders, asthenia, emotional exhaustion, professional burnout [1–4]. These problems call for

solutions, which, in turn, necessitate development of a program and implementation of preventive psycho-corrective measures designed to counter progression of negative mental states and, ultimately, deterioration of professional effectiveness [5]. Many researchers note that extreme conditions of work peculiar to activities of many medical professionals translate into high risks

of development of negative mental conditions, e.g., persistently bad mood, deteriorating health, sleep disorders, asthenia, emotional exhaustion, professional burnout etc [1, 6, 7].

Previously, researchers have confirmed the leading role of psycho-emotional stress in the development of negative states when working conditions are extreme [8, 9]. For healthcare professionals, work inside quarantine, so-called "infectious" zones, in direct contact with COVID-19 patients, is the leading factor driving development of the aforementioned mental health disorders [10, 11]. A good example is the study that involved over 2000 Italian healthcare workers at the peak of the COVID-19 pandemic. The researchers found that medical professionals manning intensive care units and helping infected patients first-hand exhibited symptoms of post-traumatic stress disorder (66%), high level of anxiety (64%) and severe depression (42%). The findings included the conclusion that healthcare personnel of the departments where patients run high risk of death are more susceptible to mental health disorders [12]. Similar studies were conducted in the Russian Federation [2, 4, 13, 14]. One of them involved 248 people, its objective was to investigate professional burnout and emotional maladjustment among medical workers. According to the results of this study, over 60% of medical professionals experience emotional burnout, 23% suffer manifestations of symptoms of depression and 25% have high level of anxiety [13]. Authors of the study state that the frequency of identification of these symptoms in healthcare personnel working directly with COVID-19 patients is higher than in those who do not work with them. When the same sample of medical professionals was re-examined 4 months later, the occurrence of burnout symptoms decreased to 35%, depression symptoms — to 8.3%, but the frequency of high anxiety cases has grown to 29.3%.

It is well-known that distribution of workload among healthcare workers in COVID hospitals is not uniform. This fact is confirmed by the regulatory documents [15, 16] describing specifics of work of medical and nursing staff. Management of COVID hospitals, which sets the pay rates for various departments thereof, is also well aware of the non-uniform distribution of workload.

This study aimed to investigate the specifics of workload-dependent dynamics of psycho-emotional exhaustion among medical staff of a COVID hospital.

## METHODS

Criteria for inclusion of medical workers in the study: permanent stay in a COVID-hospital; work in "infectious" zone and observation department; provision of medical care (as part of professional duties) in direct contact with infected patients of the COVID hospital. The exclusion criteria were refusal to participate in the study, violation of the study plan.

The study sample included 121 people, 87 female and 34 male. Forty-two of them were medical doctors, 79 — nursing staff. Twenty-six doctors and 53 nurses made up the heavy workload group: they discharged their professional duties in the "infectious" zone of the COVID hospital, in departments where the risks of patient mortality and medical personnel infection were high (intensive care units, emergency room and departments for patients with severe disease). The moderate workload group included 20 doctors and 22 nurses working in the COVID hospital departments where the risk of mortality among patients was low (two aftercare departments).

The level of workload was assessed by experts; the assessment factored in the intensity of work in the departments of the COVID hospital, the likelihood of patient deaths infection

of the staff with coronavirus. The experts ( $n = 12$ ) were medical doctors with at least 10 years of experience in intensive care units and managers of the clinical departments of the Center the study was conducted at. The participating healthcare professionals were distributed into heavy and moderate workload groups. Experts found no doctors nor nurses whose workload could be qualified as "light."

To identify signs of emotional burnout, the state of the medical personnel of the COVID hospital was monitored remotely with the help of a the questionnaire (Google Form) the link to which was sent to the participants via WhatsApp messenger. In this work, we used the Maslach Burnout Inventory (MBI) adapted by N. E. Vodopyanova [17]. The results of the testing were analyzed by the three scales of the methodology: Emotional Exhaustion, Depersonalization and Professional Degradation. The study lasted six weeks: four weeks of work in the "infectious" zone and two weeks in the observation department. The participants were tested before starting their work in the "infectious" zone, thus giving the baseline data. After that, the testing was done every week, online.

We checked distribution of the data with the Kolmogorov-Smirnov test. Since it was not normal for most of the data, the subsequent statistical analysis was performed with nonparametric data analysis method: Mann-Whitney U test (pairwise comparison of the two groups at each time point). The differences were considered significant when the level of significance was  $p \leq 0.05$ .

## RESULTS

In order to obtain the baseline values of Emotional Exhaustion, Depersonalization and Professional Degradation indicators under the Professional Burnout Questionnaire methodology, we tested the participants (psychological examination) before they started working in the "infectious" zone (Table 1).

The baseline values learned through the initial examination were compared with the reference values [17]; there were no negative deviations identified, which indicates the participants did not have signs of professional burnout before starting work in the "infectious" zone.

Table 2 presents the analysis of results of psychological examination of healthcare workers that had different levels of workload while working in the "infectious" zone and the observation department.

Figure 1 shows dynamics of the Emotional Exhaustion indicator depending on the level of workload throughout the study.

In the first week, neither the participants working in the departments where the risk of patient mortality was high nor those discharging duties in the rehabilitation treatment departments exhibited noticeable signs of emotional exhaustion. In the first group, the values of this indicator were in the range of  $15.65 \pm 4.89$ , the range for the second group was  $16.21 \pm 4.29$ .

In the heavy workload group, the highest values of the Emotional Exhaustion indicator (outside the normal range) were registered on the fifth week of the study:  $25.08 \pm 2.36$ . By the end of the study, the values went down to the upper limit of the range of low level of emotional exhaustion and equaled  $15.08 \pm 2.63$ .

In the moderate workload group, the highest values of the Emotional Exhaustion indicator, which lay within the average level range, were recorded on the fourth week of the study:  $22.93 \pm 2.83$ . Further, by the fifth week, the values decreased and equaled  $14.21 \pm 1.05$ , and by the end of the study, they returned to the normal range ( $15.43 \pm 2.58$ ).

**Table 1.** Mean professional burnout values, initial examination, by gender

Indicators (scales) of the methods	Men (n = 34)	Women (n = 87)	Reference values
Emotional exhaustion	16,65 ± 4,25	15,53 ± 4,81	16,0–24,0
Depersonalization	3,21 ± 1,47	2,78 ± 1,37	6,0–10,0
Deterioration of personal achievements	37,85 ± 1,88	36,79 ± 2,34	31,0–36,0

The differences registered on the third and fifth weeks were significant.

Figure 2 shows the dynamics of the Depersonalization indicator. The initial examination revealed no signs of depersonalization in either of the groups. The values of this indicator recorded in the heavy workload group were  $2.85 \pm 1.41$ , in the moderate workload group —  $3.00 \pm 1.43$ .

In the first group, by the end of the second week of the study the values of this indicator started climbing ( $5.28 \pm 2.01$ ) and peaked in the third week, reaching  $7.30 \pm 1.16$ . After that, the trend is downward:  $6.24 \pm 1.28$  from the fourth week and  $4.76 \pm 1.33$  by the end of the study.

The second group shows similar dynamics. The values of this indicator grow up from the second week ( $5.76 \pm 2.24$ ) and reach their maximum levels ( $7.57 \pm 1.21$ ) in the third week of the study. By the end of the fourth week the values equaled  $6.67 \pm 1.59$ , they were going down and reached the level of  $3.81 \pm 1.21$  by the end of the sixth week.

The differences registered on the fifth and sixth weeks were significant.

The analysis of median values revealed the greatest intergroup differences at the fifth week of the study. Then, this value for the heavy workload group was at the level of 6 (5; 7), and in the moderate workload group it was 4 (3; 4). In both groups, the values of the Depersonalization indicator were going up from the first to the third week, remained consistently high through the fourth week and started going down from the fifth week. The revealed dynamics was more pronounced in the heavy workload group, which is the result of the larger number of patients treated and significant emotional and physical stress.

Figure 3 visualizes the Professional Deterioration indicator dynamics throughout the study.

Initial examination revealed no signs of manifestation of the condition behind this indicator in either of the groups, with its values being  $37.00 \pm 2.32$  and  $37.26 \pm 2.19$ , respectively.

In the heavy workload group, the values of this indication decrease through the second week of the study ( $34.87 \pm 1.71$ )

and reach the minimum level on the third week ( $30.49 \pm 1.91$ ). From the end of the fourth week ( $34.11 \pm 1.33$ ), the trend becomes upward: on the fifth week, the values are in the range of  $36.58 \pm 2.20$ , and on the sixth —  $39.73 \pm 1.37$ . This fact signals of the signs of professional deterioration associated with peak loads (the second and third weeks).

A similar trend was noted in the moderate workload group. The values of the indicator decrease from the second to the third week of the study ( $35.24 \pm 1.82$  and  $30.29 \pm 1.99$ , respectively). After that, they start to go up, with the final examination revealing no signs of professional deterioration ( $39.88 \pm 1.19$ ).

The values of this indicator remained within the reference range throughout the study; no significant intergroup differences were found. The lack of such differences was further confirmed by the median values and the interquartile range of the data. In terms of this indicator, the comparison groups exhibited maximum heterogeneity at the fifth week of the study, but the values showing the level of Professional Deterioration were not significantly different: 37 (35; 38) and 36 (34; 38), respectively.

## DISCUSSION

Numerous studies conducted by scientists from different countries confirm that every second healthcare worker involved in the treatment of patients with the new coronavirus infection has psychological maladjustment disorders and shows symptoms of increasing fatigue, irritability, and aggression. According to the authors of these studies, it is the awareness of the high risk of contracting the potentially lethal disease, understanding the imperfection of drug therapy and the process of care provision to patients with severe complications that are most stressful for the healthcare professionals working in the quarantine zones [18–23].

The results obtained are consistent with the data reported by other researchers. The authors confirm that healthcare personnel of the departments where patients run high risk of death are more susceptible to mental health disorders [24, 25].

**Table 2.** Summary data on the dynamics of the workload-dependent professional burnout indicators (groups of participating healthcare workers)

Method	Group, workload level	Week of the study					
		1	2	3	4	5	6
		M ± SD	M ± SD	M ± SD	M ± SD	M ± SD	M ± SD
Emotional exhaustion	Group 1, heavy n = 79	15,65 ± 4,89	19,57 ± 2,93	19,76 ± 2,92	22,06 ± 2,91	25,08 ± 2,36	15,08 ± 2,63
	Group 2, moderate n = 42	16,21 ± 4,29	19,19 ± 2,87	12,67 ± 9,92*	22,93 ± 2,83	14,21 ± 1,05*	15,43 ± 2,58
Depersonalization	Group 1, heavy n = 79	2,85 ± 1,41	5,28 ± 2,01	7,30 ± 1,16	6,24 ± 1,28	5,82 ± 1,59	4,76 ± 1,33
	Group 2, moderate n = 42	3,00 ± 1,43	5,76 ± 2,24	7,57 ± 1,21	6,67 ± 1,59	3,36 ± 1,03*	3,81 ± 1,21*
Deterioration of personal achievements	Group 1, heavy n = 79	37,00 ± 2,32	34,87 ± 1,71	30,49 ± 1,91	34,11 ± 1,33	36,58 ± 2,20	39,73 ± 1,37
	Group 2, moderate n = 42	37,26 ± 2,19	35,24 ± 1,82	30,29 ± 1,99	34,12 ± 1,35	36,12 ± 2,48	39,88 ± 1,19

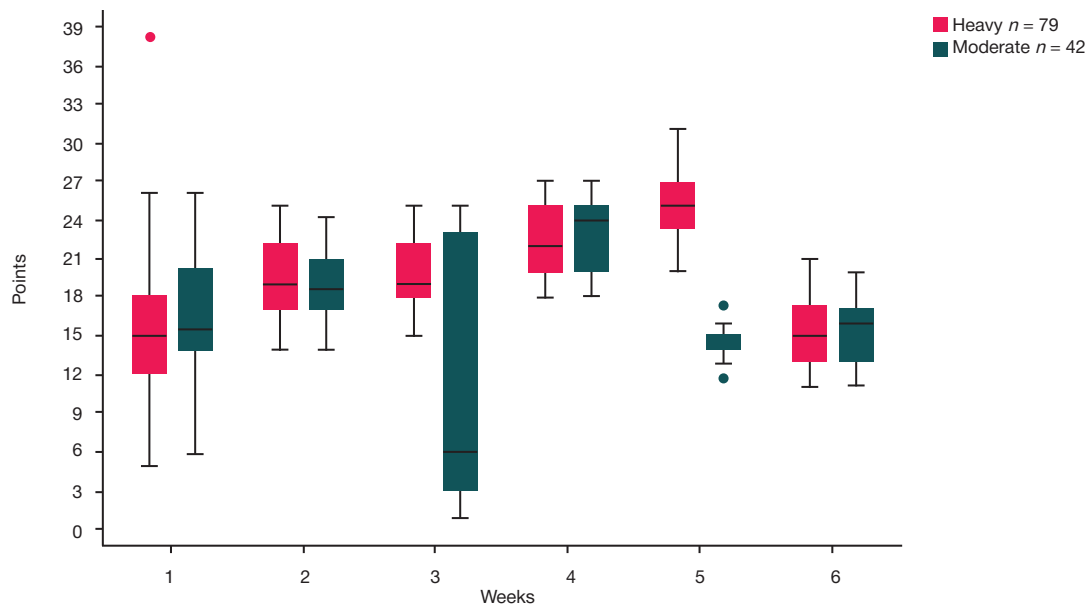


Fig. 1. Emotional Exhaustion indicator dynamics, groups with different level of workload (Me [Q<sub>1</sub>; Q<sub>3</sub>])

Summarizing the results of our study, we can trace the general dynamics of psycho-emotional states of healthcare professionals working under extreme conditions. The level of workload and the very character of work done by medical staff are associated with specific mental burden, which makes the person use various kinds of resources to cope.

The three scales of the Professional Burnout Questionnaire showed that in the second, third and fourth weeks of the study, the mental state of the participating healthcare professionals (both groups) was characterized by moderate manifestations of psychasthenia, apathy and emotional emptiness. Overall, the first week of the study was uneventful in terms of pronounced emotional shocks, which may indicate that the preliminary training of the medical personnel was high quality. At the second week, we registered manifestations of emotional exhaustion and depersonalization, which is the result of high saturation of the participants' work with emotions. The Emotional Exhaustion indicator values continue to grow through the third and fourth weeks of the study and finally go beyond the reference range. During the fifth and sixth weeks, the downward trend persists for the Emotional Exhaustion and Depersonalization indicator values, while the Professional Deterioration indicator shows growth, which can manifest in underestimation of one's competence, increased dissatisfaction with oneself,

underestimation of the value of work done (professional activities), negative self-perception in the professional sphere, appearance of the sense of failure, indifference to work.

## CONCLUSIONS

In terms of psycho-emotional disorders, the most difficult were the second, third and fourth weeks of work in the "infectious" zone. The Workload Level and the associated specifics of professional activity should be accounted for when evaluating the dynamics of the indicators studied. The component to be paid special attention to in the analysis of the data is the interquartile range, which was larger at the beginning and decreased by the end of work in the "infectious" zone, which means the values registered then reflect the state of the majority of study participants. Medical personnel working in heavy workload departments had to deal with severe cases and patient mortality more often; in this connection, the dynamics of their psychological state is peculiar in its low variability and high values of indicators of the psycho-emotional burnout. The peculiarities of the dynamics of development of negative psychological conditions in healthcare professionals working in difficult epidemiological conditions are important factors in the process of designing preventive and corrective psychological

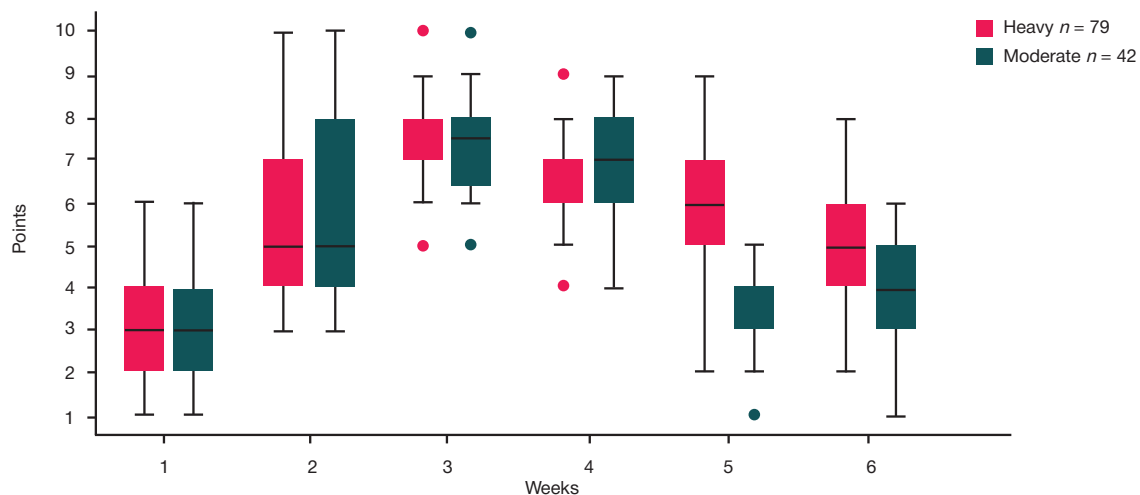


Fig. 2. Depersonalization indicator dynamics, groups with different level of workload (Me [Q<sub>1</sub>; Q<sub>3</sub>])

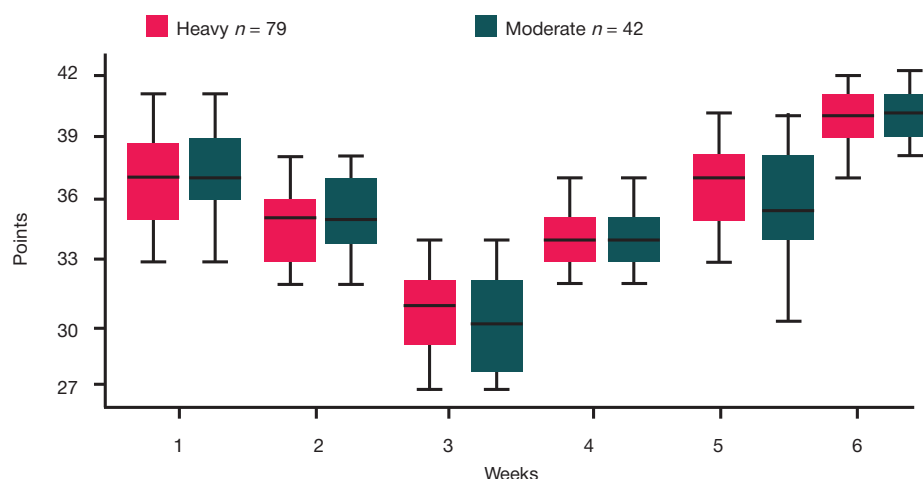


Fig. 3. Professional Deterioration indicator dynamics, groups with different level of workload (Me [Q<sub>1</sub>; Q<sub>3</sub>])

support and recovery programs for those who discharge their professional duties in extreme conditions with limited opportunities for direct contact in the context of psychological support rendered to them. In this case, the relevant methods are those of cognitive-behavioral therapy (reading or online

viewing of lectures containing sections about possible negative mental states and methods for their self-correction, methods for switching internal behavioral attitudes — psychophysical gymnastics) and art therapy, which can be applied without external assistance.

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