

RESILIENCE INDEX AND MENTAL STRESS OF NURSING STAFF WORKING IN INTENSIVE CARE UNITS DURING THE SARS-COV-2 PANDEMIC

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A – study design, B – data collection, C – statistical analysis, D – interpretation of data, E – manuscript preparation, F – literature review, G – sourcing of funding

ABSTRACT

Background: Resilience, or mental toughness, is the ability to effectively cope in challenging circumstances. High resilience levels allow for faster adaptation in extreme situations.

Aim of the study: An assessment of resilience, mental stress, and self-reported work environment among nursing staff in intensive care units (ICUs) during the SARS-CoV-2 pandemic.

Material and methods: The study involved 102 nursing staff working in ICUs. Data collection used the Resilience Coping Scale (RCS-25), Meister's psychological strain scale, and an original work environment self-assessment scale.

Results: The overall mean score of the respondents on the resilience scale was 74.11 points out of a possible 100, while they scored an average of 24.36 points out of 50 on the mental stress scale. Staff working in hospitals converted into infectious disease sites ($p=0.000$) or in infectious hospitals with a third level of referral ($p=0.012$) assessed their working environment significantly better in the context of the coronavirus disease 19 (COVID-19) pandemic. Medical staff who worked longer at their current workplace, those with longer seniority in the profession, and those who were older scored higher in the resilience areas. The younger the respondent, the more mentally stressed they were in general ($\rho=-0.200$), in non-specific areas ($\rho=-0.217$), and in monotony ($\rho=-0.211$). Those who did not feel well equipped with personal protective equipment showed lower resilience.

Conclusions. Respondents were characterized by average resilience and second-level mental stress, while those with higher resilience suffered lower mental stress. We recommend organizing training to strengthen mental toughness, the identification of resilience factors, and the assessment of mental stress in the work environment in the context of the ongoing pandemic. The data obtained could be used to adjust working conditions during the next pandemic.

KEYWORDS: nurse, intensive care unit, resilience, mental stress, mental strain, COVID-19

BACKGROUND

Resilience, or mental resilience, is the ability to effectively deal with challenging situations and is also defined as effectively withstanding adversity

and responding to changing circumstances, including stress, conflict, or threat [1]. High resilience allows for faster adaptation in extreme situations. Mealer et al. define resilience as the ability of intensive care unit (ICU) nurses to cope with their work setting

and maintain healthy and stable mental well-being despite exposure to extreme stressors [2]. Labrague et al. found that individuals with higher resilience coped better with the new challenges associated with the outbreak of the coronavirus disease 19 (COVID-19) pandemic [3]. Since these personality traits can be worked on and reinforced, organizational and psychological support and learning strategies promoting resilience are critical. Persistence and determination, a sense of humor and openness to new experiences, coping-supporting personal competencies, and accepting negative emotions are resilience factors that determine life satisfaction. The prevalence of low immunity among healthcare professionals during the pandemic was estimated to be 23% (26% from January to March 2020), which was significantly lower compared to the general population [4,5]. Frontline COVID-19 healthcare workers had a higher prevalence of low immunity (93.6%) compared to other healthcare workers (6.2%) [4].

Mealer et al. showed that ICU nurses with high resilience scores were 18-50% less likely to develop post-traumatic stress disorder (PTSD) than those with low resilience scores [6]. A lower degree of psychological resilience demonstrated by nurses working in the ICU during the COVID-19 pandemic was associated with higher levels of depression and burnout [7]. Moreover, nurses with higher psychological resilience showed a lower turnover intention during the pandemic [8]. Data confirm a significant negative association between overall resilience and psychological distress among healthcare professionals during the COVID-19 pandemic [9]. Mental strain is closely related to working conditions, routine, effort, and psychological fatigue and is a subjective response of an employee to mental overload (rushing, problems, conflicts, and responsibility), monotony (wearisome work and a low level of satisfaction), and non-specific strain (work repletion, reduced productivity at work over time, nervousness, and fatigue) [10]. Excessive tasks and duties accompanied by time deficits lead to overload and chronic fatigue, which negatively affects efficiency and correctness when performing duties. Furthermore, work is associated with great responsibility, and long-term stress is mentally exhausting, which leads to medical errors [11].

A recent systematic review found that 54% of nurses experience a high mental workload, which is higher among ICU nurses than among those in other hospital wards. The analysis demonstrated that the mental workload of frontline nurses increased significantly during the COVID-19 pandemic [12]. Moreover, nurses caring for COVID-19 patients experienced a higher workload, lower quality of work life, significantly higher average working hours, and more overtime compared to nurses caring for patients in non-COVID-19 wards [13]. Overall mental workload

scores indicate that ICU nurses have a heavy workload [14].

Poor working conditions, responsibility for human life, stress, the mental strain associated with the death of patients, shift work, time pressures, and urgent decision-making, on which human life depends, are the sources of psychological strain among nurses. Excessive duties accelerate fatigue, physical exhaustion, and occupational burnout, leading to a deterioration in performance [15]. Intensification of negative factors such as stress, fatigue, and time pressure causes physical overload, which may lead to health deterioration or occupational disease. Shen et al. showed that the psychological stress among ICU nurses working during the COVID-19 pandemic was associated with the following problems: significant work overload and fatigue, anxiety about possible infection, unknown work environment and work processes, lack of experience in infectious diseases, depression related to treatment failures, and concerns about one's own family [16].

Chronic mental stress occurs when the work is highly burdensome, monotonous, and performed under challenging conditions, often leading to burnout. As such, understanding the risk factors and alleviating them to prevent the consequences of mental strain is worthwhile [17]. The study can help to understand the effective predictors of resilience and mental strain. An analysis of the working environment may point to the needs of employees that could improve working comfort, efficiency, and well-being.

AIM OF THE STUDY

To assess resilience, mental strain, and self-reported work environment among nursing staff in ICUs during the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic.

MATERIAL AND METHODS

Study design

Cross-sectional study.

Participants

A total of 102 nurses participated in the study. Current professional activity and ICU employment of more than three months were the inclusion criteria.

Setting

This online cross-sectional survey was conducted between March and May 2020 during the COVID-

19 pandemic in Poland. The survey provided information about the purpose of the study, as well as the voluntary participation and anonymity of the participants. Due to the challenging epidemiological situation caused by a considerable increase in coronavirus-infected patients in ICUs and the inability to distribute pen-and-pencil surveys (due to the lockdown), the questionnaire was made available on Facebook in two private groups for nurses working in anesthesia and ICUs, with a total of 9,027 members. As the questionnaire was completed and returned anonymously, it was impossible to link the responses to specific individuals or groups within which they were completed. The epidemiological situation and workload of ICU personnel during this period of the pandemic may have been a significant factor limiting interest in survey participation.

According to current legal acts, questionnaires and non-invasive research do not require the approval of the university bioethics committee.

Measurement

The Polish version of the resilience assessment scale (SPP-25) developed by Ogińska-Bulik and Juczyński was used to measure mental resilience [18]. SPP-25 contains 25 statements on various personality traits that make up resilience, which also equates to mental toughness. The assessment is scored on a five-point Likert scale, with responses to the statements interpreted as 0 – definitely not, 1 – rather not, 2 – hard to say, 3 – rather yes, or 4 – definitely yes. The tool measures overall resilience level, considered a personality trait, and its five factors: 1) perseverance and determination, 2) openness to new experiences and sense of humor, 3) competencies and tolerance of negative emotions, 4) tolerance of failures and treating life as a challenge, and 5) optimism and the ability to mobilize in difficult situations. The overall SPP-25 result is the sum of five factors, including five items. The higher the score, the higher the level of resilience. The Cronbach's alpha for the questionnaire was $\alpha=0.89$.

The Polish version of Meister's questionnaire, developed by Dębska, was used to assess mental stress [10]. The questionnaire measures mental strain associated with work based on the subjective assessment by an employee. It consists of ten items divided into three subscales in the following categories: mental overload (rushing, high responsibility, problems, and conflicts), monotony overload (monotony, weariness with work, and low level of satisfaction), and non-specific stress (nervousness, work overload, fatigue, and lower productivity at work). The degree of mental stress was assessed using the tool key. A scale consisting of ten questions corresponding to the following components of the statements was used to assess the level of mental stress. Each question is assigned

to a specific element: overload, monotony, and non-specific factors.

The originally developed scale for work environment self-assessment in the context of the SRAS-CoV-2 pandemic consisted of seven questions assessed on a Likert-type scale with the following interpretation: 1 – definitely not, 2 – rather not, 3 – hard to say, 4 – rather yes, 5 – definitely yes. Higher values corresponded to a better work environment rating.

Statistical analysis

The Mann-Whitney U rank test was used to verify significant differences between two independent groups, and the Kruskal Wallis (H) test was employed for comparisons between more than two groups. Spearman's rho correlation index was used to investigate correlations between the variables. Statistical inference was performed at a standard significance level of $p<0.05$.

RESULTS

Study group characteristics

A total of 102 nurses, with women accounting for the majority of respondents (95.1%), participated in the study. The mean age of the respondents was 34 ± 10.4 years, and the mean nursing seniority was 11 ± 11.24 years, while the mean length of employment in the current workplace was 8 ± 8.54 years. Most of the respondents were employed in tertiary hospitals (59.8%), in non-infectious wards (55.9%), and full-time (94.2%). On average, four to five nurses (30.4%) worked on wards during their last three shifts. The mean number of nurses working in a ward during the last three shifts was 8 ± 6.59 . A total of 35.3% and 32.4% of respondents had very frequent contact with patients suspected of being infected with SARS-CoV-2 or COVID-19 patients, respectively. Among those who had contact with patients suspected of being infected with coronavirus ($n=84$), the respondents declared providing care for an average of 4 ± 3.74 patients during the last three shifts. As for respondents who had contact with COVID-19 patients ($n=61$), they declared an average of 5 ± 5.2 patients with COVID-19 during their last three shifts.

Main results

Resilience

The mean overall score for the Resilience Scale was 74.11 out of 100. Among the five dimensions assessed, the lowest mean score of 13.43 was obtained

for optimism and the ability to mobilize in difficult situations (Table 1).

Table 1. Resiliency – descriptive statistics

Factors	Total			
	M	SD	Min	Max
Persistence and determination in action	15.15	2.47	8	20
Openness towards new experiences and a sense of humor	15.89	2.24	11	20
Personal skills to cope and tolerance to negative emotions	14.60	2.52	7	20
Tolerance to failure and view life as a challenge	15.04	2.12	8	20
An optimistic attitude towards life and the ability to self-mobilization in difficult situations	13.43	2.89	6	20
Resiliency Assessment Scale – total	74.11	9.94	50	97

Explanations: M – Mean difference; SD – Standard Deviation; Min – minimum; Max – maximum.

The analysis of resilience levels in the study group showed that nearly half of the respondents were characterized by average mental toughness (46.1%); low mental toughness was demonstrated in 21.6% of the respondents, while 32.4% demonstrated high mental toughness.

Perseverance and determination ($\rho=0.219$), competence, and tolerance of negative emotions

($\rho=0.237$) increased with respondent age. There were no significant differences between the respondents based on their education, either for mental resilience in general or for its dimensions ($p=0.539$). Those with children aged up to 18 were more tolerant of failure and more likely to treat life as a challenge than those with no children in this age range ($p=0.077$). Perseverance and determination increased with increasing employment time at their current workplace ($\rho=0.251$) and longer seniority in the profession ($\rho=0.245$). Significant correlations were also found between competence and tolerance of negative emotions and overall seniority.

The comparison of resilience scores based on the type of hospital in which the respondents worked and the type of ward (infectious or non-infectious) showed no significant differences ($p>0.05$). Also, the number of nurses working in a ward was not significantly associated with mental strain. The frequency of contact with patients suspected of being infected with SARS-CoV-2 and those with COVID-19 did not differentiate the respondents in terms of resilience ($p>0.05$). No significant correlation was found between the number of patients suspected of being infected with SARS-CoV-2 or suffering from COVID-19 resilience level ($p>0.05$).

In general, higher resilience was shown by respondents who positively rated personal protective equipment (PPE) and those who could not unequivocally rate PPE than those who rated such protection negatively ($p=0.068$) (Table 2).

Respondents who could not unequivocally state whether the hospital they work in organized train-

Table 2. Resilience and feeling of being equipped with personal protective equipment at work

Factors	The feeling of being equipped with PPE						H	p
	No (N=36)		Not sure (N=17)		Yes (N=49)			
	M	SD	M	SD	M	SD		
Persistence and determination in action	14.31	2.72	15.24	2.44	15.73	2.14	7.471	0.024
Openness towards new experiences and a sense of humor	15.22	2.26	16.41	2.27	16.20	2.15	5.264	0.072
Personal skills to cope and tolerance to negative emotions	14.08	2.64	15.29	2.17	14.73	2.51	3.567	0.168
Tolerance to failure and view life as a challenge	14.75	1.96	15.24	2.46	15.18	2.12	1.470	0.480
An optimistic attitude towards life and the ability to self-mobilization in difficult situations	12.58	3.03	14.00	3.10	13.86	2.61	3.870	0.144
Resiliency Assessment Scale – total	70.94	10.05	76.18	10.94	75.71	9.09	5.365	0.068

Explanations: M – mean difference; SD – standard deviation; H – Kruskal-Wallis test; p – statistical significance.

ing courses on how to deal with a patient suspected of having SARS-CoV-2 infection showed significantly lower resilience in general (65.56) and for two

out of five resilience factors compared to those who gave a positive or a negative answer to this question (Table 3).

Table 3. Resilience and assessment of the organization of training concerning the care of patients suspected of being infected with coronavirus

Factors	Organisation of training						H	p
	No (N=50)		Not sure (N=9)		Yes (N=43)			
	M	SD	M	SD	M	SD		
Persistence and determination in action	15.04	2.24	13.78	2.99	15.56	2.56	3.988	0.136
Openness towards new experiences and a sense of humor	15.84	2.08	14.33	2.12	16.28	2.34	5.294	0.071
Personal skills to cope and tolerance to negative emotions	14.66	2.18	12.56	3.05	14.95	2.64	5.596	0.061
Tolerance to failure and view life as a challenge	15.10	2.02	13.44	1.81	15.30	2.18	6.664	0.036
An optimistic attitude towards life and the ability to self-mobilization in difficult situations	13.44	2.96	11.44	2.30	13.84	2.80	5.867	0.053
Resiliency Assessment Scale – total	74.08	9.25	65.56	8.95	75.93	10.17	7.411	0.025

Explanations: M – mean difference; SD – standard deviation; H – Kruskal-Wallis test; p – statistical significance.

The overall level of resilience and its components did not differ significantly among the respondents depending on how they assessed the possibility of attending a hospital-arranged consultation with a psychologist if needed ($p > 0.05$).

Mental strain

In the study group, grade 1 mental strain was shown in 47.1%, grade 2 in 36.3%, and grade 3 in 16.7% of nurses. The respondents showed the most severe mental strain in dimensions such as time pressure (3.74) and high responsibility (3.73) (Figure 1).

Overall, the respondents had a mean score of 24.36 out of 50 on the mental strain scale (Table 4).

The analyses showed that the younger the respondents, the more mentally burdened they were in terms of work monotony ($\rho = -0.211$), non-

Table 4. Descriptive statistics of answers to questions included in the Meister questionnaire

Factors	Total			
	M	SD	Min	Max
Overload	9.75	2.60	4	15
Monotony	4.93	1.52	3	9
Nonspecific load	9.69	3.56	4	20
Total	24.36	6.28	12	42

Explanations: M – mean difference; SD – standard deviation; Min – minimum; Max – maximum.

specific ($\rho = -0.217$), and general mental strain ($\rho = -0.200$). No differences were found in the severity of mental strain based on education ($p = 0.757$) or having children up to 18 years of age ($p = 0.127$). Seniority in the current workplace, and in general, did not significantly differentiate the respondents ($p > 0.05$). Those employed in hospitals with different

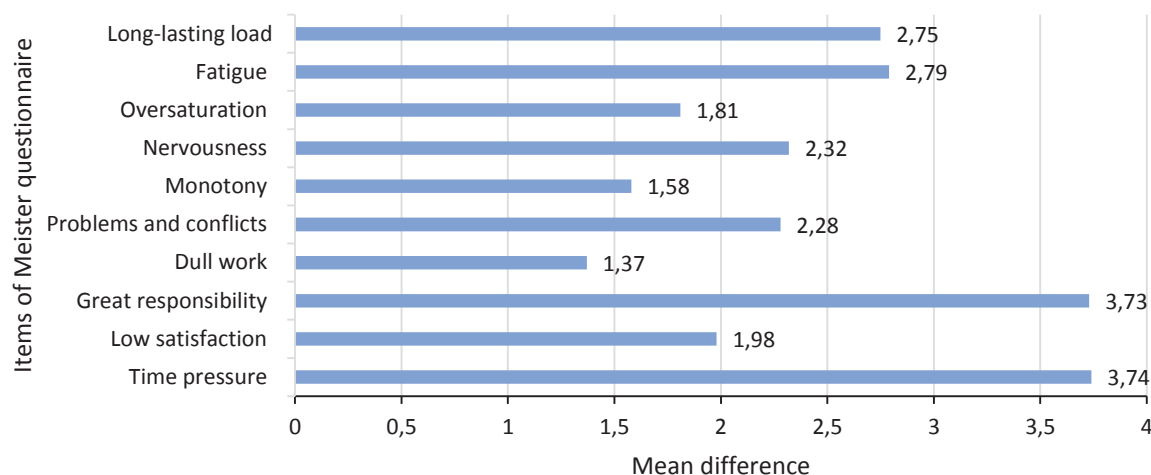


Figure 1. Components of Meister questionnaire statements – mean difference

reference levels did not differ in their severity of mental stress ($p=0.386$). Also, the type of ward did not significantly differentiate mental stress ($p=0.938$). Meanwhile, the severity of mental stress increased for the monotony factor with an increasing number of nurses in a given ward ($p<0.05$).

There were no significant differences in mental strain based on the frequency of contact with patients suspected of being infected with SARS-CoV-2 ($p=0.196$). Also, mental strain did not differ significantly ($p=0.612$) depending on the frequency of contact with COVID-19 patients. There were no significant correlations between mental strain and the number of patients suspected of being infected with SARS-CoV-2 or those with COVID-19 ($p>0.05$).

Mental strain did not differ among respondents based on their assessment of the sense of protection using PPE at work ($p=0.238$). Those who found it difficult to state whether their hospital organized training courses on how to deal with patients suspected of having SARS-CoV-2 infection showed

higher overall mental strain ($p=0.046$). The respondents did not differ ($p=0.989$) in the severity of mental stress based on whether or not the hospital they worked in provided consultations with a psychologist.

Self-reported work environment in the context of the SARS-CoV-2 pandemic

Among all of the questions included in this scale, the attitude to the fight against the coronavirus was rated the highest ($M=3.72$). A sense of good protection from using PPE at work ranked second ($M=3.09$). The organization of training courses by the hospital on how to deal with patients suspected of having SARS-CoV-2 infection came third ($M=2.86$). Meanwhile, the possibility of having a coronavirus test performed in the hospital was rated worst ($M=2.69$). The average score for self-reported work environment was 20.78 out of 35 (Table 5).

Table 5. Self-assessment of the working environment – descriptive statistics

Statements	M	SD	Min	Max
Do you have a positive attitude towards the fight against coronavirus?	3.72	0.98	1	5
Do you work beyond your capabilities?	2.83	1.19	1	5
Do you feel well equipped with personal protective equipment at work?	3.09	1.40	1	5
Has the hospital where you work provided training concerning the care of patients suspected of being infected with SARS-CoV-2?	2.86	1.55	1	5
If necessary, can you count on a talk with a psychologist initiated by the hospital?	2.85	1.44	1	5
Does the hospital give you the opportunity to test yourself for coronavirus?	2.69	1.42	1	5
When you are off duty, do you worry that you may already be infected? (and that you should not put your family at risk when coming back home)	2.75	1.35	1	5
Self-assessment of working environment	20.78	5.11	9	30

Explanations: M – mean difference; SD – standard deviation; Min – minimum; Max – maximum.

There were no significant correlations between the self-rating of the work environment and the age of the respondents. The respondents did not differ in their assessment of their work environment ($p=0.410$) based on their education level. Those who did not have children aged under 18 years assessed their work environment significantly higher than those with children under 18 years.

Nurses employed in tertiary hospitals gave significantly higher rates to their work environment in the context of the SARS-CoV-2 pandemic ($p=0.012$) than those working in first and second-reference-level hospitals. Respondents working in hospitals transformed into infectious units or infectious disease hospitals rated their work environment significantly higher ($p=0.000$) than those employed in non-infectious hospitals. The self-assessment of the work environment did not significantly correlate with the number of nurses working in the ward.

The respondents who had very frequent contact with COVID-19 patients rated their work environment significantly better than those who rarely had contact with such patients. The rating of the work environment increased with an increasing number of COVID-19 patients cared for during the last three shifts ($\rho=0.397$).

Mental strain and resilience, and self-rated work environment

Overall, negative correlations were found between the resilience score and mental stress ($\rho=-0.463$). The higher the score on the resilience scale obtained by the respondents, the lower their mental strain (Table 6).

The data show that the greater the overload of respondents, the lower their level of competence

Table 6. Correlations between the mental stress scale, the resilience scale, and the working environment self-assessment scale

Resilience/Self-assessment of the working environment	Mental stress			
	Overload	Monotony	Nonspecific load	Total
Persistence and determination in action	0.023	-0.393**	-0.348**	-0.270**
Openness towards new experiences and a sense of humor	-0.180	-0.393**	-0.363**	-0.373**
Personal skills to cope and tolerance to negative emotions	-0.230*	-0.321**	-0.434**	-0.410**
Tolerance of failure and viewing life as a challenge	-0.195*	-0.471**	-0.471**	-0.457**
An optimistic attitude towards life and the ability to self-mobilization in difficult situations	-0.309**	-0.345**	-0.409**	-0.439**
Resiliency Assessment Scale -total	-0.216*	-0.439**	-0.481**	-0.463**
Self-assessment of working environment - total	-0.160	-0.169	-0.353**	-0.303**

* $p < 0.05$; ** $p < 0.01$ correlations were statistically significant.

($\rho = -0.230$) and tolerance of negative emotions, tolerance to failure, and treating life as a challenge ($\rho = -0.195$), as well as their ability to mobilize in challenging situations, and vice versa ($\rho = -0.309$). A negative correlation was also found between the self-rating of the work environment and non-specific stress ($\rho = -0.353$), as well as the overall result on the mental stress scale ($\rho = -0.303$). All correlations were negative, except for statistically insignificant overload and persistence and determination ($\rho = 0.023$).

DISCUSSION

Determining whether resilience can be responsible for coping with extreme stress such as the SARS-CoV-2 pandemic and the analysis of the indicators of mental stress and environmental self-rating during this pandemic seems critical for planning interventions to improve working conditions and reinforce mental resilience among nurses. The study was conducted from March to May 2020, in the initial period of the SARS-CoV-2 pandemic, when the number of new cases of coronavirus infection in Poland was low. As of March 31, 2020, 2311 cases of coronavirus infection and 33 deaths were recorded, and as of May 25, 2020, there were 21,631 infected persons and 1007 deaths [19]. No significant correlations were found between the number of patients suspected of being infected with coronavirus or suffering from COVID-19 who were cared for and the level of resilience in the study group. This could be due to the relatively low number of COVID-19 patients during the first wave of the pandemic in Poland.

In general, the respondents presented with average resilience (a score of 74.11), which is higher than the findings reported by other authors for groups of medical personnel during the coronavirus pandemic. Studies using CPP-25 found mean scores (range

0–100) ranging from 59 to 73 [20]. Lower resilience was characteristic of nurses working in hospitals in Iran (a score of 61.18) [21]. In Great Britain, 18.9% of nurses working with patients with respiratory diseases (including COVID-19) showed a low or very low level of resilience during the pandemic [22].

Resilience helps to effectively cope with COVID-19-related stress [23]. We showed that the dimensions of mental resilience, such as perseverance and determination, as well as competencies and tolerance of negative emotions, increased with increasing seniority and the age of respondents. Similar findings were reported by Afshari et al., who indicated age, professional experience, and education as predictors of nurse resilience [21]. Roberts et al. also observed a higher level of anxiety and lower resilience among less experienced junior nurses in a study assessing work experiences during the COVID-19 pandemic [22]. Sull et al. also showed that resilience increased with age [24].

Our study confirms that the younger the respondents, the higher the mental strain in terms of work monotony, non-specific stress, and overall mental stress. Dębska et al. also demonstrated this by showing that longer seniority and seniority in a specific position reduced the level of monotony, though it contributed slightly to overload. Furthermore, the length of seniority in a given workplace increases overload, and it can be assumed that it is a substantial risk factor for occupational burnout [17].

We showed in our study that respondents with children younger than 18 were more tolerant of failure and more likely to treat life as a challenge than those who did not have children in this age range. Afshari et al. have shown an inverse correlation between having children and the overall resilience score among nurses [21]. This may be because living with family and concerns about bringing the virus home generated anxiety and stress during the COVID-19 pandemic [25].

The lack of adequate protection against the virus or incomplete PPE was the primary source of anxiety at work during the pandemic [26]. In this study, those who felt well protected by PPE showed significantly higher persistence and determination, greater openness to new experiences, a sense of humor, and overall greater resilience. Ahmad et al. assessed the impact of the availability of protection and training on the number of infections and the spread of the SARS-CoV-2 virus in Pakistan and showed that training in donning and doffing of PPE, social distancing, isolation, and quarantine effectively increased the protection of personnel [27]. Additionally, those trained in hand hygiene were less likely to contract the virus. The analysis of our findings showed that those uncertain whether the hospital they worked in organized training on the management of a patient suspected of being infected with SARS-CoV-2 showed significantly lower overall resilience. Huang et al. showed that the availability of appropriate protective measures was one of the independent factors influencing mental resistance [28].

Our study showed grade 2 mental stress in ICU nursing staff. Kaducakova and Lehotska, who assessed mental stress among nurses working in social welfare centers, also showed grade 2 mental stress and a tendency to overload [29]. This can affect the subjective condition and performance of nursing staff. The authors also found that the greatest mental stress was related to time pressure, high responsibility levels, fatigue, and chronic workload, which is so exhausting that it does not allow for work to be performed at a constant efficiency level. In this study, the mean level of mental strain in psychological overload in ICU nurses scored 9.75 out of 15.

The current study does not confirm that seniority in the profession in general or at the current workplace is significantly associated with mental stress. Dębska et al. showed that longer seniority is associated with higher levels of mental stress, overload, and monotony [17]. In a study by Labrague et al., over 90% of nurses from the Philippines reported that they were not sufficiently prepared to treat COVID-19 patients, and only 20.3% of the respondents expressed their willingness to care for infected patients [3]. In this study, 65.3% of nurses expressed a definitely positive or a rather positive attitude toward combating coronavirus.

Our study showed that those employees of tertiary hospitals rated the work environment in the context of the SARS-CoV-2 pandemic significantly higher than those working in first and second-reference-level hospitals. Employees of infectious disease hospitals or hospitals transformed into infectious disease units gave significantly higher ratings to their work environment than those working in non-infectious hospitals. This may have been because such work-

places received the highest financing and had better protective measures.

The surveyed nursing staff were characterized by higher resilience and lower mental stress. Huffman et al. pointed out that during the SARS-CoV-2 pandemic, medical personnel experienced higher levels of stress, which is coped with more effectively by those with higher mental toughness [30]. Higher resilience allows staff to deal more effectively with challenges, anxiety, fatigue, and sleep disturbances. Increased resilience can help nurses reduce emotional exhaustion and increase work engagement [31].

The conducted analyses may serve as a basis for planning further research in this area. However, the study had several limitations. It was conducted on a small group of respondents, which makes it impossible to generalize the results to the entire population of ICU nursing personnel. Another limitation was the collection of data for analysis using electronic questionnaires due to the pandemic, which could exclude older individuals from the study due to their lack of computer skills or difficulty accessing the questionnaires. In future research in this field, it would be interesting to assess resilience and mental stress over a longer time after the outbreak of the pandemic, with the participation of a representative group of nurses.

Study limitations

This study had several limitations. We used an electronic questionnaire for data collection due to the SARS-CoV-2 coronavirus pandemic, which made it impossible to conduct the study in hospital departments. Due to the small number of respondents participating in the study, the results should not be generalized to the entire population of ICU nursing personnel. This was a cross-sectional study that may not reflect the resilience and mental stress of the population over time. However, these phenomena change over time and with the evolving environment. Therefore, there is a need to present the psychological aspects of the COVID-19 pandemic over a longer and more perspective period.

CONCLUSIONS

The presented study allows for the following conclusions: the surveyed nursing staff were characterized by higher resilience and lower mental stress; nurses showing higher mental toughness have a sense of adequate protection with PPE; nurses assessing their work environment better in the context of the SARS-CoV-2 pandemic have higher resilience and lower mental stress.

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