

Factors affecting the incidence of fatigue among nursing staff caring for patients infected with SARS-CoV-2

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Summary Background. Nursing is a profession burdened by many biological, physical and psychosocial factors that contribute to fatigue and have a negative impact on the health of staff. An additional challenge was posed by the outbreak of the COVID-19 pandemic, which led to many changes, an increase in the intensity of work and thus the fatigue that nurses had to face.

Objectives. The aim of this study was to assess the factors affecting the incidence of fatigue among nursing staff caring for patients infected with SARS-CoV-2.

Material and methods. A diagnostic survey method and the questionnaire technique were used in the study. Standardised research tools such as the Self-Concept Evaluation Questionnaire (CIS-20R), Condition Emotional Control Scale (CECS) worksheet, Perceived Stress Scale (PSS-10) worksheet, Multidimensional Inventory for the Measurement of Coping with Stress (Mini-COPE) worksheet and the author's survey questionnaire were used.

Results. The most common strategy for coping with stress was active action (M = 2.16) and planning (M = 2.14). The overall index of emotion control was 51.05 on average, and the overall index of anxiety and emotion control shows a correlation with concentration deterioration within chronic fatigue. Anger and depression had no effect on the overall index of chronic fatigue. Age, gender, education and marital status did not affect the prevalence of fatigue among the subjects.

Conclusions. In view of the correlations found between the incidence of chronic fatigue and its components and the intensity of stress, as well as selected coping strategies and emotion control, remedial measures should be introduced to provide support in the difficult situations faced by nursing staff.

Key words: fatigue, coronavirus, patient care.

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Background

In the modern world, nursing is a profession with many occupational functions. These include holistic care and cooperation with the patient in both sickness and health, participation in therapies, education, preventive health care or cooperation in an interdisciplinary team. The orientation of this profession to be constantly present among patients, in any health situation, is a source of increasing mental and physical burdens for the employee, which in turn initiate the emergence of deficits in health and in one's personal and social life [1].

The nursing profession is highly stressful due to high responsibility and inadequate pay, working under time pressure, shift work, the need to provide constant attention and the sight of human suffering. Working with severely ill patients, over time, arouses indifference and inner remoteness in the staff, which is a reaction to a feeling of powerlessness and helplessness in the face of a given situation. The onset of stress, fatigue and even professional burnout can be a result of individual characteristics and predispositions, such as the inability to control emotions and deal with difficult situations, setting unrealistic goals and excessive demands [2].

The risk of fatigue in the work of a nurse can be associated with the following factors: anxiety of losing a job, failure to cope with the development of technology, lack of or inability to

ceive a promotion and reduced mental and physical fitness. Factors that are related to the structure and organisation of work include, for example, a sense of low control over work, lack of or little participation in decision-making, inadequate communication and a lack of a sense of belonging. Situations involving conflicting demands in family life and the work environment can also contribute to the onset of fatigue [2].

In the last two years, an additional stress factor for medical personnel includes working with COVID-19 patients and being aware of constant exposure to the disease, which necessitates the use of additional personal protective equipment. Contact with the patient can also contribute to anxiety and even depression. Time-pressured decisions and changes due to the new situation create uncertainty and a sense of instability. Accompanying the pandemic, it is not uncommon to experience the death of another human being in an unpredictable scenario, which can be an additional burden and also translates into increased fatigue [3, 4].

Objectives

The aim of this study was to assess factors influencing the incidence of fatigue among nursing staff caring for patients infected with SARS-CoV-2.



Material and methods

The study included a total of 100 people working with patients infected with SARS-CoV-2 which were hospitalised (Department of Cardiology, Rheumatology, Rehabilitation) in one of Cracow's hospitals.

A diagnostic survey method and questionnaire technique were used in the study. To assess the level of chronic fatigue, the Checklist Individual Strength (CIS-20R) by T. Makowiec-Dąbrowska and W. Koszada-Włodarczy was used, which consists of 20 statements relating to the last 14 days, verified on a 7-point Likert scale. The score obtained determines the overall level of chronic fatigue. However, the total score corresponds to the following 4 aspects of fatigue: subjective feeling of fatigue, decreased motivation, decreased activity and decreased concentration [5].

The Emotional Control Scale (CECS) is composed of 3 subscales. Each contains 7 statements relating to how anxiety, depression and anger are revealed on a 4-point scale. The summation of the total score is preceded by a change in the scores of statements relating to the disclosure of emotions. The higher the final score, the greater the suppression of negative emotions and the greater the subjective sense of ability to control emotions in difficult situations [6].

The Perceived Stress Scale (PSS-10) worksheet, which consists of 10 questions and is used to assess the intensity of stress over the past month, was used to assess stress. The questions refer to subjective feelings related to personal problems, events, behaviour and coping. The results are interpreted as an indicator of stress intensity. High values suggest increased stress intensity. Scores obtained on the PSS-10 scale range from 0 to 40 points. Values from 0 to 13 points are considered low stress intensity, the range of 14 to 26 points are interpreted as moderate stress intensity, while scores from 27 to 40 points indicate a high level of stress [7].

The Multidimensional Inventory for the Measurement of Coping with Stress (Mini-COPE) consists of 28 statements that are included in the 14 components of coping with stress. This paper assigns each strategy to 4 areas as follows: The first area includes avoidance behaviour (humour, preoccupation with something else, denial, discharge), the second area is distraction-helplessness (use of psychoactive drugs, cessation of activities, blaming oneself), the third area is based on active coping (planning, positive re-evaluation, acceptance), and the fourth area involves activities including seeking both emotional and instrumental support and turning to religion [7].

Statistical analysis

The results obtained were subjected to statistical analysis using the statistical package STATISTICA 10 version PL and MS Office's Excel spreadsheet. The collected data was summarised using descriptive statistics (mean, median, standard deviation, minimum and maximum). Pearson's correlation coefficient was used to analyse the relationship between the study variables. For comparison between two groups, Mann-Whitney U-test

was used. On the other hand, for comparisons between more groups, the Kruskal-Wallis rank ANOVA test was used. In all analyses, effects for which the p-likelihood level was less than the accepted significance level $\alpha = 0.05$ ($p < 0.05$) were taken as significant.

Results

A total of 100 subjects participated in the survey, of which 95% ($n = 95$) were women, and only 5% ($n = 5$) were men. The average age of those surveyed was 37 years. Personnel with higher education (master's degree in nursing) – 47% ($n = 47$) and higher education (bachelor's degree in nursing) – 34% ($n = 34$) were predominant. The largest group of respondents in terms of marital status was unmarried, 44% ($n = 44$), and married, 40% ($n = 40$). The average professional experience was 14 years. The largest group consisted of individuals with up to 5 years of work experience, 41% ($n = 41$), while the least numerous were those with seniority of more than 35 years, 5% ($n = 5$).

The overall fatigue index obtained based on the standardised tool (CIS-20R) was divided into 3 subgroups: values from 1 to 3 sten were defined as low (22–39 points), from 4 to 6 sten as medium (40–83 points) and from 7 to 10 sten as high (84–over 128 points). Taking into account the above interpretation criteria, the highest values were obtained in the area – subjective assessment of chronic fatigue (4.37), which is the same as average fatigue intensity. In contrast, the lowest values were obtained in the area of concentration deterioration (3.73) (Table 1).

Analysis of the relationship of chronic fatigue prevalence with selected sociodemographic data

Assessment of the overall fatigue index and individual areas according to the CIS-20R scale showed no statistically significant differences with respect to the age of subjects (Table 2). Gender, education and marital status of the subjects did not indicate statistically significant correlations in the area of overall fatigue (Table 3).

Assessment of stress levels and coping strategies among the respondents

The results obtained on the PSS-10 scale reflect the subjective assessment of the respondents' life situation considered in terms of stressful, unpredictable and excessively stressful. Analysis of the results showed that stress at the medium level was predominant among the respondents ($n = 82$). However, comparable values were obtained in the other two dimensions: high ($n = 8$) and low ($n = 10$). Within the coping strategies associated with the severity of stress, the predominant strategies were active measures ($M = 2.16$), planning ($M = 2.14$), acceptance ($M = 1.94$), distraction ($M = 1.9$) and seeking emotional support ($M = 1.89$). The following were included among the least selected stress coping strategies: use of alcohol ($M = 0.565$), cessation of actions ($M = 0.785$) and denial ($M = 0.835$) (Table 4).

Table 1. Categories of chronic fatigue on the Checklist Individual Strength (CIS-20R)

Components of chronic fatigue	<i>n</i>	M	Me	Min	Max	SD
Overall chronic fatigue index	100	4.372	4.375	2.000	6.750	0.961
Subjective feeling of fatigue	100	3.610	4	1	5	0.764
Decreased motivation	100	3.975	4.000	2.250	6.250	0.943
Decreased activity	100	4.053	4.167	1.333	6.000	0.952
Decreased concentration	100	3.730	3.600	1.800	5.800	0.944

n – number of respondents; M – mean; Me – median; Min–Max – minimum–maximum; SD – standard deviation.

Table 2. Results of statistical analysis between age and the general level of fatigue and its components in the study group according to the Checklist Individual Strength (CIS-20R)

Categories of chronic fatigue according to the Checklist Individual Strength (CIS-20R)	Age	
	Z	p
Overall index	0.479	0.632
Subjective feeling of fatigue	H	p
	4.559	0.102
Decreased motivation	Z	p
	1.277	0.201
Decreased activity	Z	p
	0.341	0.733
Decreased concentration	Z	p
	0.086	0.931

Z – Mann-Whitney U-test; H – ANOVA rang Kruskal-Wallis; p – statistical value; $p \leq 0.05$.

Table 3. Results of statistical analysis between the subjects' sociodemographic data and the general level of fatigue in the study group according to the Checklist Individual Strength (CIS-20R)

	Chi-squared	df	p
Overall chronic fatigue index			
Gender	0.210	1	0.646
Marital status	2.890	4	0.576
Education	4.717	2	0.094

df – degree of freedom; Pearson correlation; p – statistical value; $p \leq 0.05$.

Table 4. Evaluated components of coping with stress in the study group according to the Multidimensional Inventory for the Measurement of Coping with Stress (Mini-COPE)

Stress coping strategies	n	M	Me	Min	Max	SD
Active measures	100	2.160	2	1	3	0.607
Planning	100	2.140	2	0.50	3	0.537
Seeking instrumental support	100	1.875	2	0	3	0.701
Seeking emotional support	100	1.890	2	0	3	0.812
Blaming myself	100	1.245	1	0	3	0.744
Turn to religion	100	1.375	1.50	0	3	0.903
Positive revaluation	100	1.735	2	1	3	0.529
Discharge	100	1.605	1.50	0	3	0.617
Acceptance	100	1.945	2	0	3	0.559
Denial	100	0.835	1	0	3	0.711
Distraction	100	1.895	2	1	3	0.538
Cessation of actions	100	0.785	1	0	3	0.617
Use of alcohol	100	0.565	0	0	3	0.688
Sense of humour	100	0.935	1	0	3	0.669

n – number of respondents; M – mean; Me – median; Min–Max – minimum–maximum; SD – standard deviation.

Analysis of the relationship of chronic fatigue prevalence with stress intensity among the respondents

There was a statistically significant correlation between the overall stress level and the chronic fatigue index ($p < 0.001$) among the subjects, indicating that overall fatigue intensifies as the stress level increases. The detailed results indicate that regardless of the severity of chronic fatigue, most of the subjects had an average stress score. In the group of individuals with a high level of the overall chronic fatigue index, about 16% of respondents experienced stress intensity at a high level. Within the components of chronic fatigue, there was a statistically significant correlation between subjective feelings of fatigue and stress intensity ($p < 0.001$), which with the increase in stress intensity contributed to lower motivation among nursing staff. No significant statistical association was found between chronic fatigue and reduced activity ($p = 0.061$) and deterioration of concentration ($p = 0.023$). Detailed analysis indicates

that respondents who experienced high levels of subjective chronic fatigue scored high on stress intensity. The component of chronic fatigue related to reduced motivation was dominated by the group of respondents reporting stress intensity at an average level ($n = 59$). Only 8 respondents showed a significant reduction in motivation while experiencing stress at a high level (Table 5).

Analysis of the relationship between chronic fatigue prevalence and methods of coping with stress among the respondents

There was a statistically significant difference in methods of coping with stress focused on avoidance conditioned by the overall level of chronic fatigue. To the remaining variables, the level of significance p takes values above 0.05. Analysis of the results in terms of stress coping strategies indicates that there is no statistically significant difference in coping methods and subjective feelings of fatigue, except for the relationship with

Table 5. Results of statistical analysis between the general level of fatigue and its components and the intensity of stress among the respondents

Categories of chronic fatigue according to the Checklist Individual Strength (CIS-20R)	Intensity of stress according to the Perceived Stress Scale (PSS-10)					
	Low level (0–13 pkt.) <i>n</i> (%)	Medium level (14–26 pkt.) <i>n</i> (%)	High level (27–40 pkt.) <i>n</i> (%)	Chi-squared	<i>df</i>	<i>p</i>
Overall index				14.994	2	< 0.001
Low level (22–39 points)	–	–	–			
Medium level (40–83 points)	8 (16%)	42 (84%)	–			
High level (84 – over 128 points)	2 (4%)	40 (80%)	8 (16%)			
Subjective feeling of fatigue				22.925	4	< 0.001
Low level (22–39 points)	–	2 (100%)	–			
Medium level (40–83 points)	9 (13.24%)	59 (86.76%)	–			
High level (84 – over 128 points)	1 (3.33%)	21 (70%)	8 (26.67%)			
Decreased motivation				13.326	2	0.001
Low level (22–39 points)	–	–	–			
Medium level (40–83 points)	7 (2.93%)	20 (74.07%)	–			
High level (84 – over 128 points)	3 (4.11%)	62 (84.93%)	8 (10.96%)			
Decreased activity				5.574	2	0.061
Low level (22–39 points)	–	–	–			
Medium level (40–83 points)	1 (4.55%)	21 (95.45%)	–			
High level (84 – over 128 points)	9 (11.54%)	61 (78.21%)	8 (10.26%)			
Decreased concentration				7.531	2	0.023
Low level (22–39 points)	–	–	–			
Medium level (40–83 points)	4 (11.11%)	32 (88.89%)	–			
High level (84 – over 128 points)	6 (9.38%)	50 (78.13%)	(12.50%)			

n – number of respondents; *p* – *p*-value for Pearson's chi-squared; *df* – degree of freedom; *p* – statistical significance coefficient.

Table 6. Results of statistical analysis between the general level of fatigue and its components and method of coping with stress among the respondents

Categories of chronic fatigue according to the Checklist Individual Strength (CIS-20R)		Method of coping with stress according to the Multidimensional Inventory for the Measurement of Coping with Stress (Mini-COPE)			
		Avoidance behaviour	Distraction-helplessness	Active coping	Seeking support
Overall index	<i>Z</i>	2.444	0.817	-1.489	0.910
	<i>p</i>	0.014	0.414	0.136	0.3628
Subjective feeling of fatigue	<i>H</i>	2.171	2.929	6.087	0.226
	<i>p</i>	0.338	0.231	0.048	0.893
Decreased motivation	<i>Z</i>	1.246	-1.227	-2.581	-0.377
	<i>p</i>	0.213	0.220	0.001	0.706
Decreased activity	<i>Z</i>	0.511	-0.037	-1.664	0.911
	<i>p</i>	0.609	0.970	0.096	0.362
Decreased concentration	<i>Z</i>	2.643	1.702	-0.912	1.239
	<i>p</i>	0.008	0.089	0.368	0.215

Z – Mann-Whitney U-test; *H* – ANOVA rang Kruskal-Wallis; *p* – statistical value; *p* ≤ 0.05.

the method of coping with stress focused on working on the problem – active measures (*p* = 0.047). Statistical comparison of the results within an area related to reduced motivation showed a statistically significant difference with the stress coping method focused on active coping (*p* = 0.001). No statistically significant difference was found in all methods of coping with stress with reduced activity in the aspect of chronic fatigue. Another comparison of results regarding methods of coping with stress with the fatigue category concerning deterioration of concentration allowed us to show a statistically significant difference only in the method in which avoidance behaviour was dominant (*p* = 0.001) (Table 6).

Assessment of emotional incidence control (anger, anxiety, depression) among the respondents

The overall emotional control index was *M* = 51.05 in the study group, which translated into values ranging from 21–84 points, representing a result at a moderate level. It is noteworthy that the higher the score, the more intense the suppression of negative emotions. The arithmetic mean of the depression control index was *M* = 17.59, which was the highest in comparison with anxiety (*M* = 16.83) and anger (*M* = 16.63) control index values (Table 7). The results may indicate that this is among

Table 7. Emotional control according to the Emotional Control Scale (CECS)

Assessment categories	n	M	Me	Min	Max	SD
Overall index	100	51.05	51.00	27.00	79.00	10.087
Depression control index	100	17.59	17.50	7.00	27.00	4.139
Anger control index	100	16.63	16.00	7.00	28.00	4.681
Anxiety control index	100	16.83	17.00	8.00	13.00	4.216

n – number of respondents; M – mean; Me – median; Min–Max – minimum-maximum; SD – standard deviation.

Table 8. Results of statistical analysis between the general level of fatigue and its components and emotional control among the respondents

Categories of chronic fatigue according to the Checklist Individual Strength (CIS-20R)	Components of emotional control according to the Emotional Control Scale (CECS)							
	Overall index		Anger control index		Depression control index		Anxiety control index	
Overall index	Z	p	Z	p	Z	p	Z	p
	-0.813	0.416	-1.837	0.066	0.493	0.622	0.283	0.777
Subjective feeling of fatigue	H	p	H	p	H	p	H	p
	3.839	0.147	2.030	0.362	3.705	0.157	2.801	0.246
Decreased motivation	Z	p	Z	p	Z	p	Z	p
	-0.252	0.801	-0.543	0.587	1.176	0.239	-0.380	0.704
Decreased activity	Z	p	Z	p	Z	p	Z	p
	0.391	0.696	0.516	0.606	-0.383	0.702	1.236	0.216
Decreased concentration	Z	p	Z	p	Z	p	Z	p
	-3.020	0.002	-1.224	0.221	-1.790	0.073	-3.060	0.001

Z – Mann-Whitney U-test; H – ANOVA rang Kruskal-Wallis; p – statistical value; $p \leq 0.05$.

the subjective control of emotions – depression represents a value that signifies a lack of ability to control responses when experiencing negative emotions.

Analysis of the relationship between chronic fatigue and control of perceived emotions among the respondents

There was no statistically significant difference in the area of emotional control when compared with the overall fatigue index, subjective feeling of fatigue, reduced motivation and reduced activity. A statistically significant difference existed in the area of chronic fatigue in terms of impaired concentration and the overall emotion index ($p = 0.001$) and anxiety control ($p = 0.001$). For the other variables studied, the significance level p takes values higher than 0.05 (Table 8).

Discussion

A nurse's work is burdened with factors that negatively affect mental and physical health, as well as contribute to diseases, including occupational diseases. Therefore, in recent years, the phenomenon of fatigue has become a subject of discussion and targeted diagnosis, which is often confused with occupational burnout that prevails in nursing staff [8, 9].

By subjecting the level of chronic fatigue among nurses in their work with coronavirus-infected patients to analysis, it was shown that the subjective feeling of chronic fatigue was rated at a medium level, the same as the domain relating to reduced motivation. Meanwhile, two areas were placed at a high level: decreased activity and decreased concentration.

An analysis conducted by Galanis et al. indicates that during the COVID-19 pandemic, 34.1% of nurses experienced fatigue at a high level, which was higher compared to nurses working in other work environments [10].

Different results were obtained in a study by Bellanti et al., in which nursing staff working on covid wards obtained lower

levels of fatigue, and its severity was reported in a group of staff not involved in the care of patients with COVID-19 [11].

The work of a nurse is undoubtedly related to stress. This was indicated in a study conducted by Piernikowska and Podsiadly, which showed that a group of nurses surveyed from behavioural and surgical wards experienced work-related stress (74.3%), including 25.7% of those at a moderate level [12].

Similar findings were obtained by Siemianowska et al. among nursing staff working in medical treatment wards [13].

In the case of own research, nursing staff declared feeling stress at a moderate level of 82% when assessed using the PSS-10 scale.

The results obtained from a study by Grzelak and Szwarc among nurses working with COVID-19 patients indicated that the intensity of stress was at a moderate level (58.5%) in the dominant group of respondents [4].

Similar results were obtained from a study conducted by Grochowska et al. among paediatric nurses – where the intensity of stress was determined at a moderate level (39.7%) [14].

When analysing the results of our own study, conclusions were drawn indicating that an increase in the level of stress contributes to an increase in the overall level of fatigue and to a deterioration in concentration and motivation.

Similar conclusions were presented by Wojciechowska et al., stating that high levels of stress increase feelings of fatigue, which may subsequently contribute to the onset of occupational burnout [15].

A study conducted by Sygit-Kowalkowska among psychiatric nurses confirmed the above report that the greater the severity of chronic fatigue, the greater the decrease in motivation, concentration and, what's more, the decrease in activity [16].

In addition, a study by Borgosz et al. gave confirmation to earlier findings that chronic fatigue further exacerbates lack of motivation, increases dissatisfaction and increased tension and discouragement [17].

An analysis of stress coping methods based on the Mini-COPE scale in this study showed that the most frequently cho-

sen method of coping with stress was active stress management and planning, while the least frequently chosen method was “escape” into alcohol consumption. The avoidance method was more frequently used in the group of nurses with high levels of chronic fatigue. Meanwhile, the method based on working on the problem was mainly used in the situation of respondents with low levels of subjective feelings of fatigue and depended on the motivation level.

Piernikowska and Podsiadły confirmed the correlation in terms of selected remedial methods used by nurses of medical treatment and surgical wards [12]. In a study conducted by Siemianowska et al., the same results can be confirmed among nurses of medical treatments [13].

Analysing demographic data, such as age, gender, marital status, education and seniority of nursing staff, it was shown that these do not affect the incidence of fatigue and the increase in its intensity in terms of its individual components.

A different conclusion was drawn by a meta-analysis conducted by Galanis et al., according to which gender, age and education influenced nurses' fatigue during the coronavirus pandemic. In the case of gender, it showed that women tended to feel fatigue more than men. Here, men experienced an increase in depersonalisation and discomfort related to lack of achievement. In addition, it was shown that women of younger age with higher education tended to feel more fatigue compared to older people [10].

A study conducted by Bellanti et al. during the coronavirus pandemic indicated that the rate of fatigue was higher in women than in men, especially among those with longer work experience compared to respondents who declared shorter work experience [11].

On the other hand, in a study by Andruszkiewicz et al., it was found that it is not gender but age that has a significant impact on the level of fatigue and overall health, while also affecting the intensity of anxiety [9].

Studies conducted show that the COVID-19 pandemic and contact with infected patients exacerbated fear, nervousness and depression among medical personnel with direct contact.

Knowledge of the subject of nurse fatigue is important in daily practice, as it translates into the quality of care provided by staff, and thus patient safety. Despite the fact that the research was limited to one facility and was conducted on a small group of respondents, it can be seen that the problem of fatigue is quite common. In this regard, an important direction for future research is an in-depth analysis of the factors that significantly affect the intensity of fatigue among nursing staff, as well as enabling the introduction of remedial measures in daily work.

Conclusions

According to the study, as the level of stress increases, the overall level of fatigue and subjective feelings of fatigue increase, as well as motivation and concentration among nursing staff decreases.

There is a correlation between the stress management method focused on avoidance and the overall index of chronic fatigue levels and deterioration in concentration. A correlation exists between the method of coping with stress that is directly focused on the problem and the area of chronic fatigue relating to decreased motivation. No correlation was observed between the overall chronic fatigue index and other methods of coping with stress.

There is a correlation between chronic fatigue in the category – concentration deterioration and the overall index of emotional control and anxiety intensity. No relationship was shown between the presence of chronic fatigue and control in terms of perceived anger and depression.

No relationship was found between chronic fatigue and its components and sociodemographic data such as age, gender, marital status and education.

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