The stress of the SARS-CoV-2 virus pandemic and pro-health behaviors among medical personnel – preliminary report

Karina Badura-Brzoza[1], Rafał Bułdak[2], Paweł Dębski[1],
Sławomir Kasperczyk[3], Elżbieta Woźniak-Grygiel[4], Adam Konka[5],
Ewa Gawrylak-Dryja[2], Renata Mond-Paszek[2], Marcin Markiel[6],
Daniel Gabryś[5], Zenon Brzoza[7]

[1] Department of Psychiatry, Faculty of Medical Sciences in Zabrze,
Medical University of Silesia in Katowice

[2] Department of Clinical Biochemistry and Laboratory Diagnostics,
Institute of Medical Sciences, University of Opole

[3] Department of Biochemistry, Faculty of Medical Sciences in Zabrze,
Medical University of Silesia in Katowice

[4] Department of Histology, Institute of Medical Sciences, University of Opole

[5] Silesian Park of Medical Technology Kardio-Med Silesia

[6] Regional Specialised Hospital No. 4 in Bytom

[7] Department of Internal Diseases, Institute of Medical Sciences, University of Opole

Summary

Aim. The aim of the study was to evaluate pro-health behaviors as protective measures against symptoms of anxiety and depression in a group of healthcare workers during the first wave of the SARS-CoV-2 virus pandemic.

Material. 114 people participated in the study, including 46 medical doctors aged 41.10 ± 11.89 and 68 nurses aged 48.16 ± 8.54 years.

Methods. The following scales were used for the research: the Health Behavior Inventory (HBI), the Beck Depression Inventory (BDI) and the State-Trait Anxiety Inventory (STAI).

Results. Taking into consideration health behaviors, an average score of 79.61 ± 13.08 points in the HBI was obtained. In the BDI questionnaire, the respondents obtained an average of 3.7 ± 4.65 points. In the STAI questionnaire, in the part related to state anxiety, the mean result in the study group was 38.08 ± 9.46 points, and for trait anxiety 38.35 ± 8.44 points. Taking into account the components of the HBI, only the results obtained in the subscales: positive mental attitude (PMA) and pro-health activities (PhA) correlated negatively with the

results obtained in the STAI and BDI scales. Moreover, the pro-health effect of PMA on the symptoms of anxiety and depression was observed.

Conclusions. No significant intensification of anxiety and depressive symptoms was observed among medical personnel during the first wave of the pandemic. Health-promoting behaviors, and especially positive mental attitudes, may play a protective role in relation to the symptoms of anxiety and depression in stressful situations.

Key words: pandemic, SARS-CoV-2, COVID-19, stress, medical personnel, pro-health behavior

Introduction

On March 11, 2020, the World Health Organization declared the SARS-CoV-2 virus a pandemic state. The changes that took place in connection with this fact were multifaceted and affected not only society as a whole, but above all, each person individually. In a very short period of time, almost every person had to reorganize their daily functioning, and the chaos in the public space resulted in the loss of everyday, routine activities. The very fact of the threat related to the danger of infection with an unknown and dangerous pathogen and a complete change in everyday functioning have undoubtedly become a source of stress. The fear of losing one's own and loved ones' health and life, the vision of potential living and economic problems, as well as periods of forced isolation negatively affected the well-being of most of us. It seems that the stress related to the new conditions of functioning could, to a large extent, affect people for whom daily work activity was a potential source of infection with an unknown virus. Working in health care in this specific period has become particularly difficult. Deficit of reliable information, lack of detailed procedures, limitations related to the shortage of protective measures, as well as, and perhaps above all, the initial diagnostic difficulties related to the lack of access to the possibility of performing tests confirming the presence of the virus and the long waiting period for its result caused tension, fatigue and a feeling of overload. These elements could result in the appearance of symptoms of anxiety, depression, sadness and insomnia. The chronicity of the pandemic period and its long-term negative impact on the mental state may also be associated with more long-term consequences, such as post-traumatic stress disorder [1].

The ability to respond to stress in a healthy way plays a key role in counteracting the effects of traumatic events. It may depend on many factors: personality traits, defense mechanisms, and pro-health behaviors, which may become an important protective factor in relation to the effects of chronic stress. Health-promoting behaviors are defined as activities aimed at maintaining or returning to health. These behaviors include: behaviors aimed at maintaining well-being, behaviors that protect health and behaviors that reduce the risk of losing health [2].

The aim of the study was to evaluate pro-health behaviors as protective measures against symptoms of anxiety and depression in a group of healthcare workers during the first wave of the SARS-CoV-2 virus pandemic.

Material

The study began in July-August 2020 in three health care facilities: Regional Specialised Hospital No. 4 in Bytom, University Hospital in Opole and EKO-PROF-MED Medical Center in Miasteczko Śląskie. The project was carried out in parallel with the project assessing the presence of antibodies indicative of past infection with SARS-CoV-2 virus. A group of 199 healthcare workers qualified for the laboratory study was simultaneously asked to complete psychological questionnaires. Among the respondents there were: 89 nurses, 59 medical doctors, 18 laboratory diagnosticians, 11 paramedics and 22 other medical workers. After analyzing the collected material (only complete questionnaires were taken into account) and in order to unify the research group, a group of 68 nurses and 46 medical doctors were finally separated. The results of those two groups were analyzed statistically. The criteria for inclusion in the study were: no symptoms of current SARS-CoV-2 infection and no previous psychiatric treatment in the history. All respondents agreed to participate in the project.

Methods

The following psychometric questionnaires were used to assess the tested parameters:

1. Proprietary demographic data questionnaire.
2. Health Behavior Inventory (HBI) by Z. Juczyński [2]. This test is a tool for measuring health behavior. It allows to determine the general intensity of pro-health behaviors and its four subscales – proper eating habits (PEH), preventive actions (PA), pro-health activities (PhA) and a positive mental attitude (PMA). This tool consists of 24 statements, to which the respondent refers to a five-point scale, where 1 means "almost never" and 5 "almost always". The possible overall score is in the range of 24 – 120 points. The higher the result, the greater the intensity of the declared pro-health behaviors. This indicator, after conversion into standardized units, is subject to interpretation on the sten scale.
3. Beck Depression Inventory (BDI) [3]. This tool is used to assess the severity of depressive symptoms. The following scale for assessing the severity of depression was adopted: 0-11 points – no depression, 12-26 points – mild depression, 27-49 points – moderate depression, 50-60 points – severe depression.
4. State-Trait Anxiety Inventory (STAI) by Spielberger et al., in the Polish adaptation of Spielberger, Strelau, Tysarczyk and Wrześniewski [4]. The inventory contains 40 statements, half of which assess anxiety as a relatively constant personality trait, and the remaining ones assess anxiety as a situationally conditioned state. The obtained results can be normalized using the sten scale.

Standard statistical procedures were used in the analyses performed.

The Mann-Whitney U test was used to assess the significance of differences between the studied groups. Spearman's rank correlation coefficient was used to evaluate the relationships between the data. The evaluation of the influence of variables was

analyzed using backward multiple stepwise regression. The significance level p < 0.05 was adopted as statistically significant. The calculations were made in Statistica version 13.3.

The Bioethics Committee of the Medical University of Silesia granted approval to conduct the research (PCN/0022/KB1/50/20).

Results

A total of 114 people participated in the study, including 46 medical doctors (30 women and 16 men) aged 41.10 ± 11.89 years and 68 nurses (54 women and 12 men) aged 48.16 ± 8.54 years. Taking into account the relatively small group of subjects, the obtained results were subjected to a preliminary overall analysis, which was then extended to include analyses conducted with the division into two groups, adopting the profession performed as a criterion for the division.

1.   Health behaviors

When analyzing the results obtained in the study group, in the Health Behavior Inventory (HBI) an average score of 79.61 ± 13.08 points was achieved (Table 1). After dividing the respondents into groups of medical doctors and nurses, statistically significant differences were noted between the groups in terms of the overall result of the HBI questionnaire and in the subscale of positive mental attitude (PMA) and preventive actions (PA). In both cases, a better result was obtained in the group of nurses (Table 2).

Table 1. **Descriptive statistics of variables (all medical personnel)**

n=114	Mean	SD	Median	Min.	Max.	CI – 95%	CI +95%
HBI	79.611	13.087	79.500	41.000	118.000	11.415	15.338
PEH	3.383	0.693	3.333	1.667	5.000	0.604	0.812
PA	3.276	0.808	3.333	1.167	5.000	0.705	0.948
PMA	3.502	0.607	3.500	1.833	5.000	0.529	0.711
PhA	3.107	0.643	3.167	1.333	5.000	0.561	0.754
STAI I	38.089	9.464	38.000	21.000	64.000	8.255	11.092
STAI II	38.356	8.443	38.500	20.000	62.000	7.364	9.896
BDI	3.711	4.655	2.000	0.000	24.000	4.060	5.456
HBI – health behaviors in general, PEH – proper eating habits, PA – preventive actions, PMA – positive mental attitudes, PhA – pro-health activities, STAI I – state anxiety, STAI II – trait anxiety, BDI – depression, SD – standard deviation, CI – confidence interval							

Table 2. **Differences between professional groups of medical doctors and nurses**

	Medical doctors (n=46)			Nurses (n=68)			Mann-Whitney U	
	Mean	SD	Median	Mean	SD	Median	Z	p
HBI	74.964	12.914	76.500	81.710	12.716	81.000	2.023	0.043*
PEH	3.375	0.692	3.333	3.387	0.699	3.333	0.044	0.965
PA	2.917	0.761	2.917	3.438	0.782	3.417	2.704	0.007*
PMA	3.262	0.718	3.333	3.610	0.520	3.667	2.286	0.022*
PhA	2.940	0.616	3.167	3.183	0.646	3.167	1.366	0.172
STAI I	40.071	11.649	38.500	37.194	8.246	38.000	-0.842	0.400
STAI II	38.857	10.295	36.500	38.129	7.546	39.000	0.000	1.000
BDI	3.571	4.255	2.000	3.774	4.857	2.000	0.436	0.663

HBI – health behaviors in general, PEH – proper eating habits, PA – preventive actions, PMA – positive mental attitudes, PhA – pro-health activities, STAI I – state anxiety, STAI II – trait anxiety, BDI – depression, SD – standard deviation

2. Depressive tendencies

In the assessment of depression symptoms using the Beck Depression Inventory (BDI), the respondents obtained results in the range of 0-24 points, with an average score of 3.7 ± 4.65 (Table 1). After the division of the respondents into professional groups, no statistically significant differences were found (Table 2).

3. Anxiety tendencies

In the study group, the average result was 38.08 ± 9.46 points in the state anxiety questionnaire, and 38.35 ± 8.44 points in the trait anxiety questionnaire (Table 1). After the division of the respondents into groups of medical doctors and nurses, no statistically significant differences were found between occupational groups (Table 2).

4. Analysis of the relationships between the tested parameters

There were significant negative correlations between the results obtained in HBI and the results obtained in questionnaires assessing anxiety as a trait and anxiety as a state. Taking into account the components of health behaviors, the results obtained in the subscales of positive mental attitude (PMA) and pro-health activities (PhA) negatively correlated with the results obtained on the scales measuring the severity of anxiety symptoms and with the results of the scale assessing the presence of depressive symptoms (Table 3). Moreover, by assessing the influence of pro-health behavior parameters on unfavorable psychopathological tendencies, a pro-health effect of PMA on the symptoms of anxiety and depression was demonstrated (Table 4).

Table 3. **Relationships between health behaviors, anxiety and depression**

n=114	HBI	PEH	PA	PMA	PhA	STAI I	STAI II	BDI
HBI	1.000	0.730***	0.829***	0.758***	0.708***	-0.315**	-0.226*	-0.159
PEH		1.000	0.511***	0.367***	0.380***	-0.021	0.045	0.088
PA			1.000	0.560***	0.395***	-0.187	-0.122	-0.057
PMA				1.000	0.542***	-0.509***	-0.435***	-0.366***
PhA					1.000	-0.321**	-0.264*	-0.287**
STAI I						1.000	0.772***	0.565***
STAI II							1.000	0.588***
BDI								1.000
HBI – health behaviors in general, PEH – proper eating habits, PA – preventive actions, PMA – positive mental attitudes, PhA – pro-health activities, STAI I – state anxiety, STAI II – trait anxiety, BDI – depression, * p<0.05, ** p<0.01, *** p<0.001								

Table 4. **The regression model of anxiety and depression in the light of positive mental attitude (PMA)**

	STAI I			STAI II			BDI		
	Beta	β SE	p	Beta	β SE	p	Beta	β SE	p
	-0.486	0.093	0.000	-0.444	0.096	0.000	-0.403	0.098	0.000
PMA	corr. R²=0.227; F(1.88)=27.174; error of estim.=8.319			corr. R²=0.188; F(1.88)=21.653; error of estim.=7.607			corr. R²=0.153; F(1.88)=17.066; error of estim.=4.284		
	PMA – positive mental attitudes, STAI I – state anxiety, STAI II – trait anxiety, BDI – depression, β SE – Beta standard error								

Discussion

The state of human health is conditioned by a number of factors more or less dependent on the individual capabilities of the person. Health-promoting behaviors are one of the elements that may influence health, including mental. They are shaped by many factors, such as conscious choices and lifestyle, as well as health habits formed in the process of socialization and modified and consolidated in adulthood. The elements connected with the possibilities and limitations resulting from the position of the individual in society, which may hinder or even prevent the taking of certain patterns of behavior, are also important. Pro-health behaviors may also become an important protective element in situations of chronic stress [2].

The year 2020 was a period of challenges caused by the surprising changes in social functioning that appeared with the announcement of the SARS-CoV-2 virus pandemic. During this period, a significant proportion of people struggled with symptoms of

tension, anxiety, and sleep disorders [5, 6]. Healthcare workers were those who were particularly affected by stress symptoms. According to scientific analyses, in this professional group, during the pandemic, mood and sleep disturbances were most often experienced [7, 8]. An online survey of 442 physicians conducted in Turkey in March 2020 showed that more than half of physicians experienced symptoms of anxiety and depression [9]. Similar results were obtained by Chinese researchers when they asked about the stress intensity of 200 people working in two hospitals in Wuhan. Almost 60% of respondents declared increased stress on the PSS scale [10, 11]. Also, Italian researchers showed that a significant proportion of health service employees experienced increased symptoms of anxiety and depression during this period [12]. In our analysis, the respondents achieved an average BDI score of 3.71 ± 4.65 points (only 12 people achieved a result allowing the assessment of mild or moderate severity of depressive symptoms). In the STAI I scale assessing the severity of situational anxiety, the respondents achieved a result of 38.08 ± 9.46 points. Both results indicate a slight intensification of anxiety and depression symptoms in the analyzed group. Nakhostin [13] obtained similar results; however, in this scientific report, a group of medical students was included in the analysis.

It should be remembered that this project was carried out in the months of July-August, i.e., in a period of some holiday relaxation of the general restrictions related to the pandemic, and at the same time in a period in which healthcare workers already had some experience of working in the new conditions. There was also greater knowledge based mainly on previous experiences in dealing with infections in other European countries, such as Italy or Spain [14]. Of great importance is the place of the research. It should be emphasized that none of the centers was a center dedicated to patients diagnosed with SARS-CoV-2 infection. In numerous studies of people working with patients with COVID-19 symptoms, it was shown that the stress load of these people was much greater compared to employees of "non-COVID" facilities [15, 16].

It is also probable that not all people confronted with the pandemic show post-traumatic psychiatric symptoms and need support or psychological help. It is possible that the health service employees, using their own resources to cope with difficult situations, will not react with the appearance of psychopathological symptoms [1]. Such resources may include pro-health behaviors. In our research, in the overall assessment of pro-health behaviors, an average score of 79.61 ± 13.8 points was obtained, which in terms of sten allows us to estimate the behaviors at an average level. This indicator was slightly lower than the normative one (81.82), obtained in a study on a population of 496 adults [2]. When analyzing the values obtained in HBI subscales, the respondents obtained the highest result on the positive mental attitudes scale (PMA). On the other hand, when comparing the groups of medical doctors and nurses, in the group of nurses, statistically significantly higher values were noted in terms of pro-health activities (PhA), and also in terms of positive mental attitudes, compared to the group of medical doctors. Perhaps, it is related to the fact that women probably show greater care for health in comparison to men, and the female gender was dominant among the nurses [17].

According to the available scientific reports, medical groups do not perform best in assessments of pro-health behaviors. In the research conducted by Bąk-Sosnowska [18], as many as 1/3 of the examined doctors showed anti-health behaviors, and in the studies by Trojanowska et al. [19], a relatively low level of pro-health behaviors was found among pediatric nurses. In the analyzed relationships between the variables in our study, negative correlations were observed between the values obtained on the pro-health behavior assessment scales and the results obtained on the anxiety scales. Moreover, the values obtained in regression models involving positive mental attitudes (PMA) showed a statistically significant protective effect of PMA against the symptoms of anxiety and depression. Similar results were obtained by Nowak et al. [20], who emphasized in their research that depressed people show less care for their health. In our research, in the study group, no significant intensification of depression or anxiety was noted in conditions of increased stress, but what is worth emphasizing is the probability of a protective function of pro-health behaviors, especially a positive mental attitude against symptoms of anxiety and depression. Health behaviors are a very important element of human life activity. Knowledge about the types of health-promoting behaviors and ways of modifying them can largely contribute to improving the health of the society, as well as better functioning in periods of increased stress, such as the pandemic period [21-23].

A limitation of the study is certainly the small size of the group – for this reason, the initially planned analysis of the relationship between the studied parameters and socio-demographic factors was not possible. The next stage of the research will therefore be to increase the size of the study group and to analyze the above-mentioned variables in the context of such factors as age, sex, marital status or number of years of work, affecting the level of experience related to the profession. Moreover, since the study was conducted in different regions of the country, with significantly different incidence rates, as well as in various health care units – in hospitals and outpatient care – it seems that this factor would also be important in further analysis of the studied parameters. The authors treat the study as a preliminary report giving rise to further research.

Conclusions

1. During the first wave of the pandemic, no significant intensification of anxiety and depression symptoms was observed among the medical personnel surveyed.
2. Health-promoting behaviors, and especially positive mental attitudes, may play a protective role in relation to the symptoms of anxiety and depression in a stressful situation.

References

1. Heitzman J. *Impact of COVID-19 pandemic on mental health.* Psychiatr. Pol. 2020; 54(2): 187–198.

2. Juczyński Z. *Narzędzia pomiaru w promocji i psychologii zdrowia.* Warsaw: Pracownia Testów Psychologicznych PTP; 2009.

3. Parnowski T, Jernajczyk W. *Inwentarz depresji Becka w ocenie nastroju osób zdrowych i chorych na choroby afektywne.* Psychiatr. Pol. 1977; 11(4): 417–421.

4. Wrześniewski K, Sosnowski T, Jaworowska A, Fecenec D. *Inwentarz stanu i cechy lęku. Polska adaptacja STAI. Podręcznik.* Warsaw: Pracownia Testów Psychologicznych; 2006.

5. Torales J, O'Higgins M, Castaldelli-Maia JM, Ventriglio A. *The outbreak of COVID–19 coronavirus and its impact on global mental health.* Int. J. Soc. Psychiatry 2020; 66(4): 317–320.

6. Duszyński J, Afelt A, Ochab-Marcinek A, Owczuk R, Pyrć K, Rosińska M et al. *Zrozumieć COVID–19. Opracowanie zespołu ds. COVID–19 przy Prezesie Polskiej Akademii Nauk.* PAN; 2020.

7. Chew NWS, Lee GKH, Tan BYQ, Jing M, Goh Y, Ngiam NJH et al. *A multinational, multicentre study on the psychological outcomes and associated physical symptoms amongst healthcare workers during COVID–19 outbreak.* Brain Behav. Immun. 2020; 88: 559–565.

8. Pappa S, Ntella V, Giannakas T, Giannakoulis VG, Papoutsi E, Katsaounou P. *Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID–19 pandemic: A systematic review and meta-analysis.* Brain Behav. Immun. 2020; 88: 901–907.

9. Elbay RY, Kurtulmuş A, Arpacıoğlu S, Karadere E. *Depression, anxiety, stress levels of physicians and associated factors in COVID–19 pandemics.* Psychiatry Res. 2020; 290: 113130.

10. Du J, Dong L, Wang T, Yuan C, Fu R, Zhang L et al. *Psychological symptoms among frontline healthcare workers during COVID–19 outbreak in Wuhan.* Gen. Hosp. Psychiatry 2020; 67: 144–145.

11. Xing LQ, Xu ML, Sun J, Wang QX, Ge DD, Jiang MM et al. *Anxiety and depression in frontline health care workers during the outbreak of COVID–19.* Int. J. Soc. Psychiatry 2020: 20764020968119.

12. Rossi R, Socci V, Pacitti F, Di Lorenzo G, Di Marco A, Siracusano A et al. *Mental health outcomes among frontline and second-line health care workers during the coronavirus disease 2019 (COVID–19) pandemic in Italy.* JAMA Netw. Open 2020; 3(5): e2010185.

13. Nakhostin-Ansari A, Sherafati A, Aghajani F, Saeid Khonji M, Aghajani R, Shahmansouri N. *Depression and anxiety among Iranian medical students during COVID–19 pandemic.* Iran. J. Psychiatry 2020; 15(3): 228–235.

14. Rodríguez-Rey R, Garrido-Hernansaiz H, Bueno-Guerra N. *Working in the times of COVID–19. Psychological impact of the pandemic in frontline workers in Spain.* Int. J. Environ. Res. Public Health 2020; 17(21): 8149.

15. An Y, Yang Y, Wang A, Li Y, Zhang Q, Cheung T et al. *Prevalence of depression and its impact on quality of life among frontline nurses in emergency departments during the COVID–19 outbreak.* J. Affect. Disord. 2020; 276: 312–315.

16. Trumello C, Bramanti SM, Ballarotto G, Candelori C, Cerniglia L, Cimino S et al. *Psychological adjustment of healthcare workers in Italy during the COVID–19 pandemic: Differences in stress, anxiety, depression, burnout, secondary trauma, and compassion satisfaction between frontline and non-frontline professionals.* Int. J. Environ. Res. Public Health 2020; 17(22): 8358.

17. Babiarczyk B, Małutowska-Dudek B. *Ocena zachowań zdrowotnych podejmowanych pacjentów z nadciśnieniem tętniczym hospitalizowanych i leczonych.* Pol. Prz. Nauk Zdr. 2016; 1(46): 29–35.

18. Bąk-Sosnowska M, Kołodziej S, Gojdź K, Skrzypulec-Plinta V. *Podmiotowe czynniki ryzyka zachowań antyzdrowotnych w grupie lekarzy medycyny.* Medycyna Środowiskowa – Environmental Medicine. 2015; 18(3): 17–24.

19. Trojanowska A, Trojanowska P, Piasecka K, Sobolewska-Samorek A, Zarzycka D. *Zachowania zdrowotne pielęgniarek pediatrycznych.* Kwartalnik Naukowy Fides Et Ratio 2020; 43(3): 177–194.

20. Nowak G, Żelazko A, Rogalska A, Nowak D, Pawlas K. *Badanie zachowań zdrowotnych i osobowości typu D wśród studentek dietetyki.* Medycyna Ogólna i Nauki o Zdrowiu 2016; 22(2): 129–134.

21. Banaszkiewicz M, Andruszkiewicz A. *Zachowania zdrowotne.* In: Banaszkiewicz M, Andruszkiewicz A, eds. *Promocja zdrowia*, vol. 1. Lublin: Wydawnictwo Czelej; 2008.

22. Kulik A, Grądziel J, Smotrycka A. *Zachowania zdrowotne studentek – charakterystyka i znaczenie zmiennych socjodemograficznych.* Probl. Hig. Epidemiol. 2017; 98: 371–380.

23. Gruszczyńska M, Bąk-Sosnowska M, Plinta R. *Zachowania zdrowotne jako istotny element aktywności życiowej człowieka. Stosunek Polaków do własnego zdrowia.* Hygeia Public Health 2015; 50(4): 558–565.

Address: Karina Badura-Brzoza
Department of Psychiatry
Institute of Medical Sciences in Zabrze
Medical University of Silesia in Katowice
e-mail: kbbrzoza@sum.edu.pl