


Perception of negative emotions and sleeping difficulties among adults in Poland during the COVID-19 pandemic

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ABSTRACT

Introduction: The restrictions introduced during the COVID-19 pandemic were supposed to prevent the spread of infections, but they may have contributed to increased negative emotions. The aim of the study was to assess the prevalence of negative emotions and sleeping difficulties and their determinants in the adult Polish population.

Material and methods: A survey was conducted among 323 adult Poles using an Internet surveying technique, CAWI (computer-assisted web interview). Some of the questions came from standardized forms applied in surveys conducted by the Public Opinion Research Centre (CBOS). The relationship between socio-demographic characteristics and perceived emotions was investigated. The chi-square test was used to assess the relationships between nominal variables ($p < 0.05$). One-dimensional logistic regression was used to determine the effect of demographic variables on perception of negative emotions. Unadjusted models (crude odds ratios) with one dependent variable were used: gender, age, place of residence, marital status, occupational activity, having children, and economic situation due to the pandemic.

Results: Most frequently the respondents experienced lowered mood (51.5%), anger, irritation (41.2%), boredom (41.8%), and feelings of loneliness (39.3%). Almost one in four respondents experienced sleeping disorders. This was lower in the group of people who did not experience financial problems due to the pandemic (OR = 0.5; 95% CI: 0.2-0.8). A protective effect of having children on feelings of loneliness (OR = 0.5; 95% CI: 0.3-0.9) and boredom (OR = 0.5; 95% CI: 0.3-0.8) was observed. Being professionally active reduced the risk of feeling angry (OR = 0.4; 95% CI: 0.2-0.7). An increased risk of feeling lonely was associated with female gender (OR = 2.8; 95% CI: 1.5-5.2).

Conclusions: Most of the respondents experienced negative emotions during the pandemic. Having children and being professionally active had a protective effect against the occurrence of loneliness, boredom or anger. The lack of impact of the COVID-19 pandemic on the economic situation was a protective factor against the occurrence of sleep difficulties.

KEY WORDS: negative emotions, sleep difficulties, mental health, COVID-19, pandemic.

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INTRODUCTION

COVID-19 is an acute infectious disease of the respiratory system caused by the SARS-CoV-2 coronavirus. The first cases of the disease appeared in November 2019 in the Hubei Province in the interior of China. In Europe

the virus was identified for the first time at the end of January 2020, and on March the 11th 2020 the World Health Organization (WHO) announced the COVID-19 pandemic. Symptoms of COVID-19 are diverse and dependent on the variant of the virus. The most frequent

symptoms include: headache, fever, cough, dyspnoea, fatigue, diarrhoea, and loss of smell or taste. In the most severe cases the disease causes acute respiratory failure, necessity of hospitalization, oxygen therapy or connection to a respirator. However, it should be kept in mind that apart from the physical consequences, the COVID-19 pandemic has a negative impact on mental health too [1-3].

The new disease with the world-wide spread forced the government of each country to take adequate measures to prevent further spread of the SARS-CoV2 virus. Massive lockdown, mobility restrictions and necessity of being subjected to quarantine or isolation, alterations in work and teaching methods became for many people a necessary change in the daily routine. Requirements for limitation of social interactions, including remote work and teaching, constituted a measure of infection prevention, but on the other hand contributed to an increase in negative emotions and deterioration of mental status [1-3]. Scientific studies and the WHO data confirm that imposed isolation and social distance may lead to intensification of negative emotions, such as boredom, anger, loneliness, and fear, but also increase the risk of chronic stress [4]. Chronic stress may cause more serious disorders of mental health, such as depression or even PTSD (post-traumatic stress disorder) [5-7]. The results of a survey of residents of long-term care institutions in Poland showed that the risk of depression increased with the duration of the pandemic [8]. This was associated with factors such as isolation, feelings of insecurity, stress, pessimistic thoughts and a general lowering of mood. In addition, stress affects the quality of sleep, which is a key element of mental health [9]. Many studies have indicated that the pandemic-related stress results not only from fear of the infection, but is also related to other emotions, such as feelings of boredom, frustration and anger [10]. Factors of social life resulting from the forced isolation and necessity of limitation of previous activities to home space may also have a stress-inducing effect, contributing to more frequent family conflicts or experience of boredom which stems from daily routine [11]. Negative emotions may also be related to economic uncertainty [12]. The COVID-19 pandemic is also a form of social trauma, because it is a sudden and unexpected change which affects every aspect of human life. It frequently causes uncertainty and unpredictability with respect to individual economic status. Loss of employment or even a change in the character of work may evoke feelings of helplessness, fear or apathy. In some cases it results in a lack of adaptation to the new situation and social disorders [13, 14].

Therefore, the undertaken measures of social distance have an impact on mental health of the population [15, 16]. It was found that during the COVID pandemic the prevalence of depression and anxiety disorders increased by 27.6% and 25.6%, respectively [17]. Taking

into account the above aspects, the present study aimed to assess the prevalence of negative emotions and sleeping difficulties and their causal factors in the population of adult Poles.

MATERIAL AND METHODS

STUDY DESIGN

Between March and June 2021 a cross-sectional epidemiological study was conducted in which convictions and perceived emotions related to the COVID-19 pandemic were analysed in a group of adult Poles. The study was carried out using an original questionnaire which was distributed using the Internet surveying technique CAWI (computer-assisted web interview). Inclusion criteria constituted consent of the respondent for filling out the questionnaire and age above 18. The upper age limit was not defined. Nonprobability sampling technique where existing study subjects recruit future subjects from among their acquaintances (snowball sampling) was applied. During the study 326 filled out questionnaires were collected. Three questionnaires were excluded from the analysis due to lack of completeness and failure to meet the subjects' age criterion. Finally, the group of respondents included 323 persons, including 251 women (77.7%).

QUESTIONNAIRE

Respondents filled out the anonymous questionnaire in which some of the questions came from standardized forms applied in surveys conducted by the Public Opinion Research Centre (CBOS). A few questions concerned demographic characteristics of respondents, while the main part of the survey was related to the influence of the COVID-19 pandemic on the occupational and economic situation of the subjects and perceived feelings related to these aspects. This study was focused only on negative emotions and reactions. Fact of perceiving fear, boredom, feeling of loneliness and isolation, anger and irritation due to limitations and occurrence of sleep disorders were defined based on the positive response of respondents to questions concerning occurrence of such emotions and symptoms. Respondents answered the following question: "Which of the following experiences of the introduced restrictions apply to you personally?", by indicating yes or no next to each answer:

- fear,
- boredom resulting from household routine,
- feelings of loneliness, isolation,
- anger and irritation due to limitations,
- sleep disorders.

The question was derived from the CBOS survey from 2020 titled "Everyday life in times of plague" [18].

For the analysis of dependence between the demographic variables and the perceived emotions the following three categories of marital status were defined: married, single, and divorced/widowed (as a single category). Due

to the low number of respondents who selected divorced/widowed, both these groups were merged. The following three categories of occupational activity were defined: employed (persons who at the time of the survey were occupationally active and had a job), students, and unemployed (respondents who at the time of the survey were not occupationally active and were not students).

STUDY GROUP

A half of the respondents were at the age of 18-35. The majority of respondents lived in cities. Almost half of the respondents had children. Almost three quarters of the respondents had higher education. Detailed characteristics of the respondents are given in Table 1.

STATISTICAL ANALYSIS

For assessment of relationships among the nominal variables the χ^2 test was used with the criterion of statistical significance $p < 0.05$. Using a univariate logistic regression approach the influence of demographic variables on perception of negative emotions was determined. Unadjusted models (crude odds ratio) with one dependent variable – gender, age, place of residence, marital status, occupational activity, having children, and economic situation caused by the pandemic – were applied. In the logistic regression model, only those emotions and variables were analysed for which, in simple dependency analyses, a statistically significant relationship was observed. The statistical analyses were performed using the program Statistica 13.0.

ETHICAL ISSUES

The study did not require consideration by the Bioethics Committee. Completion of the questionnaire implied consent to participate in the study and, in addition, all responses were anonymous, and the instruments used and the way the study was conducted did not allow for identification of the respondent. Furthermore, only adults participated in the study.

RESULTS

Experience of the SARS-COVID infection was reported by 42 respondents. Four persons out of this group (9.5%) were hospitalized. The respondents were asked whether the COVID pandemic had influenced their occupational life and economic situation. Lack of such influence was reported by 111 respondents, whereas 212 respondents were affected by the negative influence of the COVID pandemic.

Only 13.6% of the respondents indicated that they did not experience any pandemic-related negative emotions. Various reactions to the pandemic and negative emotions which were reported by the respondents are included in Table 2.

Most frequently the respondents reported a decline in mood, anger, irritation due to the pandemic-related

TABLE 1. Sociodemographic characteristics of the analysed group

Variables	n (%)
Gender	
Female	251 (77.7)
Male	72 (22.3)
Age (years) (mean age 36.9 ± 13.7)	
18-35	162 (50.1)
36-50	117 (36.2)
> 50	44 (13.6)
Place of residence	
City	280 (86.7)
Village	43 (13.3)
Educational level	
Elementary or vocational	3 (0.9)
Middle	82 (25.4)
Higher education	238 (73.7)
Marital status	
Married	148 (46.3)
Single (never married)	153 (47.8)
Divorced/widowed	19 (5.9)
Professional activity	
Employed	203 (63.6)
Student	76 (23.8)
Professionally inactive	40 (12.5)

restrictions, feeling of loneliness, and boredom resulting from the daily routine. Almost 25% of the respondents reported sleep disorders. The sleep disorders, fear, uneasiness, apprehension, or irritation due to the restrictions were not related to whether they had experienced COVID infection (Figure 1).

It was also analysed whether the indicated emotions depend on selected demographic variables, having children, or the influence of the pandemic on the economic situation of the respondents (Table 3).

Anxiety and depressed mood are the only emotions in relation to which no statistically significant relationship was observed in relation to the analysed variables. Respondents at the age of 35 and younger, single (never married), and without children more frequently experienced loneliness and boredom and the difference was statistically significant. Anger at the imposed restrictions and sleep disorders were significantly more frequent among inhabitants of cities than villages. It was also observed that respondents who reported a negative impact of the COVID pandemic on their economic status significantly more frequently experienced sleep disorders when compared to those who did not report such a negative impact.

TABLE 2. Emotions and reactions related to the COVID-19 pandemic in the analysed populations

Emotions/reactions to the COVID-19 pandemic	n (%)
Boredom resulting from daily routine	145 (41.8)
Difficulty in reconciling remote work/learning with everyday household duties	52 (16.1)
Feeling of loneliness and isolation	127 (39.3)
Misunderstandings and conflicts with housemates	62 (19.2)
Sleep difficulties	80 (24.8)
Fear, uneasiness, apprehension	102 (31.6)
Decline in mood	165 (51.1)
Usage of sedatives and tranquilizers	19 (5.9)
Anger, irritation evoked by pandemic-related restrictions	133 (41.2)

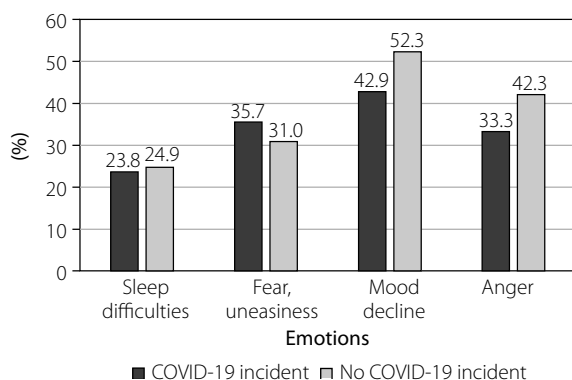


FIGURE 1. Prevalence of experiencing selected emotions among respondents depending on the experience of COVID-19

Regression analysis (Table 4) indicated that residence in cities was associated with a higher risk of anger due to the imposed restrictions (OR = 4.5; 95% CI: 1.9-10.8), and sleep disorders (OR = 2.9; 95% CI: 1.1-7.8). The risk of sleep disorders was lower in the group of respondents who did not experience financial difficulties related to the pandemic (OR = 0.5; 95% CI: 0.2-0.8). A preventive influence of having children on feeling of loneliness (OR = 0.5; 95% CI: 0.3-0.9) and boredom (OR = 0.5; 95% CI: 0.3-0.8) was observed. Occupational activity decreased the risk of feeling of anger due to the imposed restrictions (OR = 0.4; 95% CI: 0.2-0.7). Feeling of loneliness was more frequently observed among women (OR = 2.8; 95% CI: 1.5-5.2).

DISCUSSION

This research was aimed at determining the prevalence of negative emotions which occurred during the COVID pandemic in the group of adults. Most frequently, the respondents indicated lowered mood, occurrence of anger and irritation due to the imposed restrictions, feeling of boredom and loneliness. Interestingly, the indicated emotions were experienced by all respondents, irrespective of whether they had experienced the COVID infection. Similar observations were also reported in earlier studies, in which it was found that

infectious disease epidemics had a negative influence on mental health, including that of persons who had not been infected [11]. Other studies indicated that the possibility of infection itself may increase the level of fear, depression, and stress in the general population [19]. Therefore, the pandemic may result not only in abnormalities including in function of the respiratory system of patients and the requirement of long convalescence, but also in emotional burden, which in extreme situations may lead to mental disorders.

At the time of outbreak of the COVID-19 pandemic all activities were mainly aimed at restriction of the spread of infection. The applied restrictions could contribute to flattening of the epidemic curve, but on the other hand could also negatively influence the mental health of populations. However, consideration of this aspect and planning of preventive actions came much later. It is understandable, as at the initial stage reduction of the number of infections and deaths was the priority. On the other hand, the pandemic-related emotions may have an impact on its course [20]. Fear of the disease may motivate people to undertake preventive actions and meticulous obedience of the applied restrictions, but may also result in enhancement of anxiety, and consequently, stigmatization of sick people. Moreover, fear is a typical reaction in populations experiencing swiftly spreading infectious diseases. However, a high level of fear may disturb logical and rational thinking [20]. In this study, over 30% of the respondents experienced pandemic-related fear, anxiety and apprehension. Nevertheless, these emotions were not found to be associated with the analysed social and economic factors. However, fear was more frequently reported by respondents aged 18-35 than by older respondents. These observations are in line with the results reported in many different countries, e.g. China or the United Kingdom, which indicated that these emotions are more frequently experienced by younger people [21-23]. Similar results were obtained in a study conducted in a population of adults from Poland and Germany. Levels of fear and threat of coronavirus were significantly higher in younger age groups than in older respondents [24]. In contrast,

TABLE 3. Negative emotions and reactions related to the COVID-19 pandemic depending on the selected variables.

Variables	Emotions/reactions related to COVID-19 pandemic, n (%)											
	Boredom	p-value	Loneliness	p-value	Sleep difficulties	p-value	Anxiety	p-value	Mood decline	p-value	Anger	p-value
Gender		0.4		< 0.001		0.7		0.3		0.1		
Female	108 (43.0)		111 (44.2)		64 (25.5)		78 (31.1)		132 (52.6)		109 (43.4)	
Male	27 (37.5)		16 (22.2)		16 (22.2)		24 (33.3)		33 (45.8)		24 (33.3)	
Age (years)		< 0.001		0.01		0.5		0.3		0.6		
18-35	86 (53.1)		76 (46.9)		41 (25.3)		56 (34.6)		90 (55.6)		71 (43.8)	
36-50	37 (31.6)		34 (29.1)		25 (21.4)		33 (28.2)		54 (46.1)		46 (39.3)	
> 50	12 (21.3)		17 (38.6)		14 (31.8)		13 (29.6)		21 (47.7)		16 (36.4)	
Place of residence		0.3		0.1		0.01*		0.6		< 0.001*		
City	120 (42.9)		115 (41.1)		75 (26.8)		90 (32.1)		146 (52.1)		125 (44.6)	
Village	15 (34.9)		12 (27.9)		5 (11.6)		12 (27.9)		19 (44.2)		8 (18.6)	
Marital status		0.02*		< 0.001*		0.8*		0.3*		0.4*		0.4
Single (never married)	79 (51.6)		79 (51.6)		40 (26.1)		54 (35.3)		70 (45.8)		69 (45.1)	
Married	50 (33.8)		39 (26.4)		35 (23.6)		44 (29.7)		78 (52.7)		55 (37.2)	
Divorced/widowed	5 (26.3)		9 (47.4)		4 (21.0)		4 (21.0)		8 (42.1)		8 (42.1)	
Having children		0.007		0.001		0.4		0.3		0.5		0.2
Yes	52 (34.0)		46 (30.1)		35 (22.9)		44 (28.8)		75 (49.0)		58 (37.9)	
No	83 (43.8)		81 (47.7)		45 (26.5)		58 (34.1)		90 (52.9)		75 (44.1)	
Professional activity		< 0.001		0.1		0.4		0.5		0.4		0.04
Employed	74 (36.5)		74 (36.5)		44 (22.7)		60 (29.6)		103 (50.7)		75 (36.9)	
Student	45 (60.0)		37 (49.3)		20 (26.7)		27 (36.0)		43 (57.3)		40 (53.3)	
Professionally inactive	13 (32.5)		15 (37.5)		13 (32.5)		14 (35.0)		18 (45.0)		17 (42.5)	
Impact of COVID-19 pandemic on economic situation		0.7		0.3		0.02		0.9		0.07		0.4
Yes	90 (42.5)		87 (41.0)		61 (28.8)		67 (31.6)		116 (54.7)		91 (42.9)	
No	45 (40.5)		40 (36.0)		19 (17.1)		35 (31.5)		49 (44.1)		42 (37.8)	

* χ^2 NW test

TABLE 4. Crude odds ratios (OR) and 95% confidence intervals related to determinants of observed negative emotions

Perceived emotions	Determinants *Reference group	OR (95% CI)	p-value
Feeling of loneliness	Having children (Y*/N)	0.5 (0.3-0.9)	0.03
	Age group 18-35 36-50* > 50	0.5 (0.3-0.8)	0.003
	Gender (F*/M)	2.8 (1.5-5.2)	0.001
	Marital status Married* Single (never married) Divorced/widowed	0.4 (0.1-1.0)	0.06
Boredom resulting from the home routine	Age group 18-35 36-50* > 50	1.3 (0.5-3.3)	0.6
	Having children (Y*/N)	0.5 (0.3-0.8)	0.007
	Professional activity Employed* Student Professionally inactive	0.7 (0.4-1.4)	0.3
	Marital status Married Single (never married)* Divorced/widowed	3.0 (1.02-8.7)	0.004
Sleep difficulties	Place of residence City* Village	2.9 (1.1-7.8)	0.03
	COVID-19 pandemic impact on economic situation (Y/N*)	0.5 (0.2-0.8)	0.01
Anger due to imposed restrictions	Place of residence City* Village	4.5 (1.9-10.8)	< 0.001
	Professional activity Employed* Student Professionally inactive	0.4 (0.2-0.7)	0.005

no relationship between age and severity of anxiety was observed by the authors of another study conducted in Poland [25]. However, it was observed that anxiety affected more than half of the subjects, but the severity of anxiety based on the Liebowitz Social Anxiety Scale was within normal limits. In the study group, however, mildly severe social phobia was found. Anxiety can furthermore contribute to chronic stress and thus affect mental health. Analysis of Ministry of Health data in Poland showed an increase in sickness absence due to a depressive episode, and there was an increase in suicide attempts compared to 2017 [26].

Isolation, sudden change in daily activities, and limitation of social contacts and physical activity can be sig-

nificant source of stress, and thus also affect the quality of sleep in the population [21]. Poor-quality sleep may also be the result of increased exposure to blue light during the COVID-19 pandemic, which disturbs the secretion of melatonin and is emitted by devices such as smartphones, tablets, and laptops [9, 27]. In this study, 25% of the respondents experienced sleep disorders. It is a disquieting result, as poor sleep quality may debilitate the immune system, and consequently increase the risk of infection [9, 11]. In addition, poor-quality sleep may contribute to the development of more serious mental disorders, such as depression or PTSD [21, 28]. Meta-analyses indicated that during the COVID-19 pandemic as many as one-third of the respondents

experienced sleep disorders [29-30]. It should be mentioned that in this meta-analysis the COVID-19 patients were taken into account, which might have influenced the above observations. However, the results of one systematic review indicated that insomnia was also reported in the general population [31].

In this study, sleep difficulties were significantly more frequent among respondents inhabiting cities than villages, and among those who reported economic problems which were caused by the pandemic. The regression analysis confirmed the significance of the economic aspect with respect to sleep disorders. Thus, it should not be excluded that in the analysed group sleep disorders had an emotional basis which resulted from other burdens caused by the change in the economic situation. Research by de Miquel *et al.* showed that loss of income during a pandemic was associated with a higher risk of suffering from depression and panic attacks [32]. A study conducted in Italy found that more than half of respondents reported poor sleep quality [9]. Among the factors responsible for this condition, the authors cite emotional causes: having a loved one who died of COVID-19, high levels of stress, anxiety and depression.

The regression analysis also indicated a mitigating impact of having children on feeling of loneliness, and boredom caused by the everyday routine. Moreover, middle age (35-50) and male gender were associated with less frequent feelings of loneliness, and professional activity and work activity were associated with less frequently reported feelings of anger. In conclusion, it may be inferred that any kind of activity (professional or resulting from household duties, in this case having children) was associated with respondents reporting negative feelings less frequently. On the other hand, this observation may be too general and not appropriate to draw unequivocal conclusions. It results from the character of the conducted analysis (a cross-sectional study) which does not validate drawing conclusions about the existence of cause-effect dependence. On one hand, the regression analysis indicated statistically significant dependencies; however, on the basis of the cross-sectional study they may have the character of secondary association. Thus, it is necessary to conduct a long-term analysis to determine the analysed relations between variables with greater reliability. However, the above-mentioned limitation of this research does not influence its quality or substantive value. The observed correlations between variables were also confirmed by studies conducted by other researchers and may provide an important suggestion for preventive actions.

Moreover, many other factors, not only social and economic, may influence the emotions. These factors include type of personality, level of sociability, and existence of mental disorders. These factors were not analysed in this study. However, their potential impact on the observed results should be taken into account.

The results of the present study, although consistent with other such analyses, should be interpreted with caution. Due to the study model used (cross-sectional study), there is a risk of reverse causality. For example, it cannot be explicitly ruled out that the less frequent reporting of negative emotions among working people is not also due to the healthy worker effect: people in better health are more likely to be able to be fully active at work.

The results of the regression analysis also require an additional comment. In the case of some demographic variables a statistically significant dependence in regard to occurrence of selected emotions was observed. Moreover, the OR values indicate that they may be a risk or protective factor. It is so in the case of city dwellers, who are more susceptible to occurrence of anger than inhabitants of villages (OR = 4.5; 95% CI: 1.9-10.8), singles, who are 3 times more susceptible to feeling of boredom (OR = 3.0; 95% CI: 1.02-8.7), and women, who experienced higher risk of feeling of loneliness (OR = 2.8; 95% CI: 1.5-5.2). However, these results should be interpreted with caution, due to the relatively broad confidence intervals. Observations with narrower confidence intervals are more disturbing and prompting to reflection. On the basis of these results, the conclusions of this study were drawn.

The applied method of data collection also requires comment, due to the lack of representativeness of the group. Thus, the results and the conclusions based on them relate only to the group studied. There is no possibility of generalizing the obtained results to the entire population (country or region). However, both the results and the conclusions of the study can be treated as signal information, providing a basis for conducting similar studies in larger groups. This is because they point to a significant mental health problem that seems to have been trivialised and treated marginally during the pandemic and the proposed solutions to combat COVID-19.

CONCLUSIONS

During the COVID19 pandemic the majority of respondents experienced negative emotions which were associated with the pandemic.

Factors responsible for any kind of activity (having children, professional activity) were associated with less frequent reporting of feeling of loneliness, boredom, or anxiety caused by the imposed restrictions.

One-fourth of respondents experienced sleep difficulties, and the lack of impact of the COVID-19 pandemic on the economic situation of the respondents was a protective factor against the occurrence of sleep difficulties.

During potential preventive actions, aimed at limiting the spread of SARS-CoV-2 or other types of infections, effects of the pandemic and the undertaken measures on mental health should also be taken into account.

DISCLOSURE

The authors report no conflict of interest.

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AUTHORS' CONTRIBUTIONS

AWS prepared research concept and design of the publication. AGG collected data. AWS analysed and interpreted the data. AWS, AGG wrote the article. AGG critically revised it.