

ASSOCIATION BETWEEN PREVENTIVE BEHAVIOUR AND ANXIETY AT THE START OF THE COVID-19 PANDEMIC IN SLOVENIA

PREVENTIVNO VEDENJE IN NJEGOVA POVEZANOST Z ANKSIOZNOSTJO V ZAČETNI FAZI EPIDEMIJE SARS-CoV-2 V SLOVENIJI

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ABSTRACT

Keywords:

SARS-CoV-2 epidemic, public health, preventive measures, preventive behaviour, anxiety, perceived infectability

Introduction: The first large outbreak of SARS-CoV-2 in Europe occurred in Northern Italy in February 2020. The relatively fast spread of the infection to Slovenia was expected, and preventive measures for its suppression were widely discussed.

Methods: An online questionnaire was designed to evaluate adherence to preventive measures and the extent to which the taking of preventive measures was associated with people's anxiety level, psychological burden, their perceived vulnerability to disease, germ aversion and a number of demographic characteristics in the early stage of Covid-19 spread. The survey was active for 24 hours (13-14 March 2020). There were 12,307 responses and 7,764 questionnaires were completed in full.

Results: Higher preventive behaviour was found in individuals who experienced greater psychological distress, were more anxious, and expressed greater perceived infectability and germ aversion. Greater compliance with preventive behaviour was found among women, those sharing a household with people aged over 65, the elderly and those who knew somebody who had been infected. These groups also showed higher anxiety levels, which appeared to be significantly increased in general as a result of the specific situation. Quarantine was evaluated as the most efficient preventive measure, and was respected relatively strictly even before it became an officially announced protective measure.

Conclusion: This research reveals a strong association between preventive behaviour and anxiety. Anxiety, together with social distancing, may affect physical and psychological health in the population in the long term. Other aspects of public health might therefore be influenced by the measures currently being enforced to prevent the spread of SARS-CoV-2.

IZVLEČEK

Ključne besede:

epidemija SARS-CoV-2, javno zdravje, preventivno vedenje, anksioznost, percepcija dovzetnosti za okužbo

Uvod: Prvi večji izbruh koronavirusa SARS-CoV-2 v Evropi se je zgodil februarja 2020 na severu Italije. Ker sta Slovenija in Italija sosednji državi z relativno visoko stopnjo prehajanja meje, ki je še izrazitejša v času zimske turistične sezone, je bilo pričakovati razmeroma hitro širjenje okužbe v Slovenijo. V strokovni in laični javnosti se je razvila široka razprava o preventivnih ukrepih za omejevanje širjenja okužbe. Namen raziskave je bil v splošni javnosti oceniti izvajanje preventivnih ukrepov ter povezanost upoštevanja preventivnih ukrepov z doživljanjem situacije in nekaterimi demografskimi značilnostmi v zgodnji fazi širjenja covid-19 v Sloveniji.

Metode: Anketni vprašalnik je vseboval sklope vprašanj o upoštevanju preventivnih ukrepov, mnenju o učinkovitosti preventivnih ukrepov, vprašalnik za oceno anksioznosti, samooceno psihološke obremenitve, vprašalnik za oceno dojemljanja dovzetnosti za okužbo in averzije do potencialno kužnih predmetov ter demografske značilnosti respondentov. Spletni vprašalnik je bil razširjen preko elektronskih medijev z metodo snežene kepe. Raziskava je bila aktivna 24 ur (13. in 14. marca 2020). Odzvalo se je 12.307 respondentov, v celoti je bilo izpolnjenih 7.764 vprašalnikov.

Rezultati: Posamezniki, ki doživljajo večjo psihično stisko, so bolj zaskrbljeni, se počutijo bolj dovzetne za okužbo in izražajo večjo averzijo do potencialno kužnih predmetov, v večji meri izvajajo preventivne ukrepe za preprečevanje širjenja okužb. O večjem upoštevanju preventivnih ukrepov so poročale ženske, osebe, ki živijo v skupnem gospodinjstvu s starejšimi od 65 let, starejši in tisti, ki poznajo koga, ki je okužen s SARS-CoV-2. Te skupine ljudi kažejo tudi višje stopnje anksioznosti, ki je bila v dani situaciji tudi na splošno znatno povečana. Karantena je bila ocenjena kot najučinkovitejši preventivni ukrep in respondenti so jo izvajali v velikem deležu, še preden je bila socialna izolacija uradno določena kot preventivni ukrep.

Zaključek: Raziskava je pokazala statistično pomembno povezavo med preventivnim vedenjem in anksioznostjo ter drugimi vidiki doživljanja ob širjenju okužbe SARS-CoV-2. Anksioznost lahko skupaj s socialno izolacijo in pomanjkanjem socialnih interakcij dolgoročno vpliva na fizično in psihično zdravje, zato bo treba ukrepe za preprečevanje širjenja SARS-CoV-2, ki so bili uveljavljeni med epidemijo, obravnavati tudi v širšem kontekstu učinkov na javno zdravje.

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1 INTRODUCTION

After the coronavirus outbreak at the end of December 2019 in China, the first cases of infection in Europe appeared after 24 January 2020, with the first large outbreak occurring in Northern Italy (1). As a neighbouring country of Italy with a high rate of population mobility, the relatively fast spread of the infection to Slovenia was expected. The Slovenian National Institute of Public Health published recommendations to prevent the spread of infection, including hand disinfection (2) and social distancing. However, the isolation of people who had been to Italy, but who had not been in direct contact with infected persons and were asymptomatic, was not recommended. As awareness of the infectiousness of the virus grew, citizens and institutions took a range of preventive activities to limit social contact even before these were officially recommended. The first case of infection in Slovenia was reported on 4 March. On 13 March, when this survey began, the Slovenian government declared an epidemic. With a prevalence of 67.8 cases/million population, Slovenia was ranked 11th on that day (3). On 14 March, the country reported its first coronavirus death. The government adopted confinement measures, including the temporary closure of nursery schools and schools, and the temporary prohibition of public gatherings.

Preventive measures such as mask wearing, hand hygiene practices, social distancing, case detection, contact tracing, and quarantine were proposed to reduce infection transmission (4, 5) according to the available data on virus infectivity (6), its persistence, and the efficacy of chemical (7) or heat disinfection (8, 9). The elderly and those with certain underlying medical conditions, which required more attention and care (6, 10), especially in clinical environments (11), were the most vulnerable population. Potential drugs are still being tested in clinical trials. Infected persons therefore mainly receive symptomatic treatment and supportive care (4, 6).

Preventive behaviour can be explained by the evolutionary disease-avoidance model that proposes a behavioural immune system as a proactive mechanism that protects us against the infection, working in tandem with the physiological immune system (12-15). The behavioural immune system is a motivational system that helps minimise infection risk by changing cognition (e.g. vulnerability beliefs, group stereotypes), affect (e.g. disgust, fear, worry, anger) and behaviour (e.g. illness avoidance) in ways that promote pathogen avoidance. It is marked by both contextual sensitivity and biases that aid adaptive response (16).

In the context of disease-avoidance mechanisms, fear is associated significantly with specific attitudes and reactions (17). Anxiety appears to have a highly degree of impact on preventive behaviour. People with high levels

of anxiety are likely to develop maladaptive behaviours, such as excessive avoidance and the persistent, repetitive and unnecessary seeking of medical reassurance, which is an added burden on an already overtaxed healthcare system during a pandemic. On the other hand, it is important to note that health anxiety, defined as an enduring tendency or trait, varies along a continuum. People with very low health anxiety may fail to engage in basic hygiene or other recommended health measures because they do not perceive their health to be at risk. In times of a pandemic, such people are liable to spread infections. In the context of planning preventive measures to reduce the scope of an epidemic, such psychological elements are often overlooked when considered within the context of medical diseases (18).

The purpose of this study, performed in the early stage of the spread of Covid-19 in Slovenia, was to evaluate respondents' opinions on the efficacy and use of preventive measures, and to assess how these opinions were associated with their anxiety level, perceived vulnerability to disease, germ aversion and a number of demographic characteristics.

2 METHODS

2.1 Design

The research was based on a survey in which data was obtained through the voluntary participation of anonymous participants. A questionnaire exploring knowledge and perception of different aspects of the epidemic in Slovenia was used to identify the factors influencing the taking of preventive measures in the early phase of coronavirus spread. The study protocol was reviewed and approved by the Ethics Committee of the Faculty of Health Sciences, University of Novo mesto (approval no FZV-98/2020128).

2.2 Data collection

The online survey was distributed using snowball sampling, which is in line with similar previous studies (19-21). The initial group of respondents was contacted via project members' professional (healthcare professionals) and personal contacts (general population), and the link to the survey was disseminated further via the Facebook social network. The participants were asked to complete a structured, self-administered electronic questionnaire. The online survey began on 13 March at 2.20 pm and was active for 24 hours.

2.3 Participants

The survey was accessed by 18,760 individuals: 12,305 responded with 8,023 responses appropriate for further analysis, and 7,764 completed the questionnaire in full. There were 79% female and 21% male respondents. Their ages ranged from 13 to 83 years (mean 40.5 years, SD

13.2; male participants: mean age 41.2 years, SD 13.63; female participants: mean age 40.36 years, SD 13.16), and 4.8% were aged 65 years or over. Forty-five per cent of respondents had secondary school education, 41% had an undergraduate degree, and 15% a postgraduate degree. Fourteen per cent of respondents worked in the healthcare sector. One quarter of respondents reported having household member(s) over 65 years old, 52% reported having children in the household and 14% reported having both. Among the respondents, 17 had had a coronavirus infection, 1% had been in contact with an infected person and 10% knew somebody that had been infected (but had not had direct contact with that person).

2.4 Research instrument

The opinions on preventive measures were obtained using a cluster of ten preventive measures (listed in Table 2) that were assessed from 1 (absolutely inefficient) to 5 (absolutely efficient) (Cronbach's $\alpha=0.7$).

For the assessment of the preventive behaviour, respondents evaluated their level of agreement with ten statements (listed in Table 2) from 1 (absolutely not) to 5 (absolutely yes). For further analysis, the sum was calculated to obtain the preventive behaviour score (Cronbach's $\alpha=0.75$).

The Thermometer for Mental Health was used to assess the psychological burden, i.e. one's own experience of physical, emotional, psychosocial burden, and the burden of everyday life during the preceding seven days (22). Respondents had to assess these on a continuous visual scale from 0 (no burden) to 10 (extremely strong burden). To assess anxiety, the seven-item, GAD-7 Generalized Anxiety Disorder (23) was used. GAD-7 consists of seven questions based in part on the DSM-IV (Diagnostic and Statistical Manual of Mental Disorders, 4th edition) criteria for GAD (generalised anxiety disorder), and reflects the frequency of symptoms during the preceding two-week period. For each symptom queried, it provides the following response options: "not at all," "several days," "over half the days" and "nearly every day", and these are scored 0, 1, 2 or 3 respectively (Cronbach's $\alpha=0.92$).

The Perceived Vulnerability to Disease Questionnaire (PVDQ), developed by Duncan et al. (24), a 15-item self-report using a seven-point scale response (with endpoints labelled as "strongly disagree" and "strongly agree") was used. It measures two factors: perceived infectability (assesses beliefs in one's own susceptibility to infectious diseases, e.g. "If an illness is going around, I will get it"; seven items, Cronbach's $\alpha=0.68$) and Germ Aversion (assesses emotional discomfort in contexts where disease-causing germs might be transmitted, e.g. "It really bothers me when people sneeze without covering their mouth"; eight items, Cronbach's $\alpha=0.56$). The first translation from English to Slovenian was done by a group of Slovenian

psychologists, with a backward translation provided by an English reader, as recommended by the guidelines on the translation of tests. One item from Germ Aversion was changed from "I avoid using public telephones because of the risk that I may catch something from a previous user" into "I avoid using public transport or other objects for public use because of the risk...", to be more reflective of current reality, as in recent research in China (25).

2.5 Data analysis

To assess an association between numerical variables, a Pearson correlation was performed, and ANOVA was used to assess the differences between the groups in terms of their demographic characteristics. For ranking analysis, a Friedman non-parametric ANOVA was computed. IBM SPSS Statistics for Windows, Version 25.0 was used for all analyses. A p-value of <0.05 was considered statistically significant.

3 RESULTS

3.1 Opinions on the efficacy of different measures for the prevention of coronavirus infection

Non-parametric ANOVA (Friedman's test) showed statistically significant different opinions on the efficacy of preventive measures ($p<0.001$). Quarantine ranked the highest, followed by hand disinfection (and hand washing). The least efficient were seasonal flu vaccination, herbal infusions and essential oils.

Table 1. Ranking of opinions on the efficacy of different preventive measures against coronavirus infection.

Preventive measure	Estimated efficacy - respondents' opinion	Share of respondents considering preventive measure to be efficient or very efficient (N=7875)
	Mean rank*	%
Isolation (quarantine)	8.59	92.4
Hand disinfection	7.68	84.2
Hand washing	7.62	83.7
Disinfection of objects and surfaces	7.44	78.5
Mask wearing	5.27	33.0
Vitamin C	4.92	27.3
Antiviral drugs	3.84	14.3
Seasonal influenza vaccination	3.41	14.6
Herbs/tea	3.40	10.2
Essential oils	2.83	7.1

*a higher rank means a more efficient measure

3.2 Analysis of taking preventive measures

The non-parametric ANOVA (Friedman's test) shows a statistically significant difference in the preventive measures taken ($p < 0.001$). The respondents adhered strictly to hand and cough hygiene (>97%), avoided crowded places (93.5%) and people at risk of infection (89.6%), and two thirds preferred to stay at home. They regularly disinfected their hands (89.9%) and objects (70.8%), almost 60% prepared food supplies for at least two weeks, and one quarter used face masks.

Table 2. Ranking of preventive measures being taken on the day the epidemic was declared.

Preventive measure	Estimated efficacy (Friedman's test)	Share of respondents that agreed or absolutely agreed with the preventive measure statement (N=7934)
	Mean rank*	%
I wash my hands more often	7.37	97.0
I cough in a handkerchief or sleeve	7.32	97.3
I avoid crowded places	6.92	93.5
I avoid people who I think are at increased risk of infection	6.74	89.6
I regularly disinfect my hands	6.55	89.9
I stay home (I do not go to work)	5.41	67.8
I disinfect objects	5.00	70.8
I have food supply at home for at least 2 weeks	4.59	59.3
I use a face mask	2.82	24.9
I have bought face masks	2.26	19.9

*a higher rank means a more frequently used preventive measure

3.3 Taking preventive measures in relation to a respondent's perceived vulnerability to disease, psychological burden and anxiety

We computed the scores of the variables in the questionnaire concerning preventive behaviour and the scales used: PVDQ (for both factors: Perceived Infectability and Germ Aversion), Thermometer for Mental Health to assess psychological burden, and GAD-7. The scores were also analysed with regard to the respondents' different demographic characteristics (Table 3).

Preventive measures were taken more strictly by women and by respondents living in a household with elderly people aged over 65 (either with or without children), whereas the level of education or whether a respondent worked in the healthcare sector did not have any effect on the measure-taking score. We also found a strong ($p < 0.001$) positive correlation between age and the taking of preventive measures.

People who knew somebody who had been infected had higher perceived infectability, greater germ aversion, were more anxious, took more preventive measures, and felt greater psychological burden compared to those who had not undergone this experience. The same was also characteristic of those living in a shared household with people aged over 65 and those living with both elderly persons and children.

We found strong positive correlations between preventive behaviour and all tested scores. Greater preventive behaviour was found among individuals who experienced greater psychological distress, were more anxious, and expressed greater perceived infectability and greater germ aversion (Table 4).

Table 3. Descriptive statistics for analysed scores (preventive behaviour, perceived infectability, germ aversion, psychological burden and anxiety) and ANOVA between the analysed scores and demographic characteristics (results presented as mean score (SD); shading represents a statistically significant difference between the demographic categories with ANOVA - level of significance $p < 0.05$)

Variables	N		Psychological burden	Germ aversion	Perceived infectability	Anxiety	Psychological burden
Score descriptive statistics		Score range Mean score (SD)	10-50 38.31 (5.56)	1-7 3.40 (0.97)	1-7 4.98 (1.03)	1-10 4.36 (2.50)	0-21 4.55 (5.01)
Gender	1,642 6,089	Male Female	36.0 (5.95) 38.9 (5.19)	4.68 (1.02) 5.06 (1.01)	3.33 (0.92) 3.41 (0.98)	3.12 (4.12) 4.94 (5.16)	3.65 (2.50) 4.56 (2.47)
ANOVA		p	<0.001	<0.001	0.001	<0.001	0.001
Education level	3,460 1,383 2,418 400	Undergraduate Bachelor's degree or equivalent Master's degree or equivalent Doctoral degree or equivalent	38.3 (5.70) 37.9 (5.21) 38.4 (5.35) 38.1 (5.31)	4.92 (1.04) 5.04 (1.00) 5.01 (1.03) 5.04 (0.97)	3.43 (0.95) 3.39 (1.00) 3.35 (0.99) 3.31 (0.94)	4.52 (5.12) 4.56 (4.90) 4.60 (4.96) 4.64 (4.93)	4.25 (2.52) 4.38 (2.50) 4.53 (2.48) 4.41 (2.56)
ANOVA		p	0.067	0.005	0.001	0.929	<0.001
Healthcare worker	857 6,316 517	Yes No Unemployed	38.7 (5.43) 38.2 (5.52) 38.8 (5.20)	4.97 (1.01) 4.97 (1.02) 4.99 (1.09)	3.45 (1.03) 3.38 (0.96) 3.47 (0.97)	4.59 (5.16) 4.53 (4.99) 4.80 (5.12)	4.66 (2.51) 4.34 (2.50) 4.16 (2.58)
ANOVA		p	0.057	0.956	0.025	0.502	0.001
Living arrangements	714 861 2,905 1,108 2,106	alone with older>65 with children with older>65 and children with partner or other	37.7 (5.98) 38.7 (5.84) 38.5 (5.26) 38.8 (5.65) 37.8 (5.34)	4.84 (1.05) 4.95 (1.00) 4.99 (1.00) 5.01 (1.03) 5.00 (1.06)	3.38 (1.03) 3.47 (0.93) 3.31 (0.94) 3.48 (1.00) 3.44 (0.98)	4.04 (4.74) 4.72 (5.47) 4.47 (4.89) 5.00 (5.34) 4.56 (4.90)	4.15 (2.56) 4.50 (2.53) 4.42 (2.52) 4.46 (2.47) 4.26 (2.48)
ANOVA		p	<0.001	0.003	<0.001	0.001	0.006
Knows an infected person	885 6,846	Yes No	39.0 (5.54) 38.2 (5.48)	5.07 (1.00) 4.96 (1.03)	3.51 (1.02) 3.38 (0.96)	5.66 (5.60) 4.41 (4.91)	4.77 (2.57) 4.31 (2.49)
ANOVA		p	<0.001	<0.001	0.006	<0.001	<0.001

Table 4. Correlation between preventive behaviour score and perceived infectability, germ aversion, psychological burden and anxiety scores.

Pearson correlation of preventive behaviour score with:	Pearson correlation	Sig. (2-tailed)
Perceived infectability	0.094	$p < 0.001$
Germ aversion	0.288	$p < 0.001$
Psychological burden	0.130	$p < 0.001$
Anxiety	0.128	$p < 0.001$

Statistical analyses also revealed a significant correlation between anxiety and psychological distress ($r=0.555$, $p < 0.001$), and more anxious individuals also expressed greater perceived infectability ($r=0.267$, $p < 0.001$) and germ aversion ($r=0.153$, $p < 0.001$).

4 DISCUSSION

The purpose of this study was to evaluate people's opinions on the efficacy of preventive measures and the extent to which taking preventive measures was associated with people's perception of the situation, their anxiety level, including perceived vulnerability to disease, and a number of demographic characteristics in the initial phase of the Covid-19 epidemic. Infection prevention and control was a widely highlighted topic in research publications in the initial stage of the spread of Covid-19 as reviewed by Adhikari et al. (4). However, there has been no study on how preventive measures are applied. Compliance with preventive measures is one of the most important factors that should be considered in epidemic modelling in order to cover all the aspects that could influence it (26).

Preventive measures that were ranked by the respondents as more efficient were those recommended in the current

pandemic situation (4, 5, 10, 27): quarantine, disinfection and washing of hands, disinfection of surfaces and objects, and mask wearing. The measures traditionally used in the treatment of respiratory infections, such as herbs (28) and vitamin C (29) were ranked lower; herbal teas and essential oils were ranked even lower than antiviral drugs, since there are none available against Covid-19, along with the influenza vaccine, which targets another virus.

The results of this study show a very strong association between taking preventive measures and levels of anxiety, the self-assessed level of psychological burden, perceived infectability and greater germ aversion. Greater preventive behaviour is found in individuals who experience greater psychological distress, are more anxious, and express greater perceived infectability and greater germ aversion. A higher anxiety level was associated with increased use of preventive measures against Covid-19, which has also been described by Wong et al (30).

Germ aversion and pathogen disgust sensitivity were also the two variables most consistently associated with Covid-19 concern and preventive health behaviour in a similar study by Schook et al. (31).

However, a recently published study by Wang et al. (32), which also investigates the association between the psychological impact of the outbreak and the taking of precautionary measures in China, showed opposite findings, i.e. greater adherence to preventive measures was linked to lower anxiety, stress and depression. In our study, perceived infectability (3.40) is comparable to the European average (3.48) (17, 24), whereas germ aversion is much higher (4.98) than the expected European average (3.55). This is likely influenced by the current situation and the real threat posed by Covid-19, which has been confirmed by Diaz Martinez et al., who state that the germ aversion score is more situationally conditioned (33). This can explain the higher scores on the Germ Aversion scale in those who know someone already infected with Covid-19 (5.07).

Women expressed significantly higher levels of preventive behaviour, but also higher levels of anxiety, perceived vulnerability and germ aversion compared to men, which accords with other studies that suggest the existence of gender-based differences in immune behaviour (24, 34, 35).

Those residing in a household together with family members aged over 65 and those who live with both children and elderly persons expressed the highest level of anxiety, together with higher perceived psychological burden and infectability, and the lowest opinion on the efficacy of preventive measures. It is certainly the case that the fact that the highest mortality rate is among the elderly and that children are often asymptomatic (but are nevertheless possible carriers of the virus) (6) can worsen distress in such households.

With SARS-CoV-2, the greatest risk is transmission to healthcare workers (5). The observation that medical workers are facing enormous pressure and severe challenges, which include a high risk of infection, has already been reported for Hubei, China (6). In our study, healthcare workers did not declare higher levels of preventive behaviour and germ aversion, nor did they express a higher level of anxiety compared to other respondents. However, they did admit to higher levels of psychological burden and perceived infectability.

More anxious individuals express greater mental distress, as well as greater belief in their own susceptibility to infectious diseases and much more emotional discomfort in contexts that connote an especially high potential for pathogen transmission. Higher anxiety and perceived vulnerability apparently lead to a higher level of preventive behaviour, which is desirable during an epidemic. However, in the case of very high anxiety, it can lead to excessive health anxiety that gives rise to various maladaptive behaviours (18).

Our results show that at the time the epidemic was declared, as many as 20.5% of respondents were anxious, far exceeding the expected prevalence of anxiety disorders, which is 10.4% (7-15.5%) in Euro/Anglo cultures (36). Increased anxiety during the Covid-19 epidemic has also been described by other authors (32, 34).

Mental distress is expected to continue to deepen as the epidemic continues, also as a result of social isolation and associated distress and, in many cases, increased loneliness.

Quarantine was evaluated as the most efficient preventive measure, and people took it relatively seriously even before it became an official measure. It is to be expected that while social distancing is required to slow the spread of the coronavirus, it may have detrimental effects on an individual's physical and psychological health in the long run, as social isolation increases the risk of coronary heart disease, stroke and mortality, and can have a negative impact on psychological health, leading to depressive symptoms (37).

We should acknowledge some of the limitations of the survey we used. These include the oversampling of a particular network due to the random snowball sampling method, e.g. 79% of participants were women. However, Ekman et al. (38) claim that the bias associated with collecting information using online questionnaires is no greater than that caused by paper questionnaires. Nevertheless, it should be pointed out that although this survey is not representative of the entire adult population in Slovenia, we did manage to cover all age groups and educational levels.

5 CONCLUSION

While prevention and control was a widely highlighted topic in research publications in the early stage of the spread of Covid-19, there has been no study on the extent to which preventive measures are applied. This study reveals that quarantine has been evaluated as the most efficient preventive measure and that people took it relatively seriously even before it became an official measure. Women, those living with elderly people over the age of 65 and those who knew an infected person took preventive measures more seriously.

This study also reveals a significant association between adherence to preventive measures and anxiety, perceived psychological burden, perceived vulnerability and germ aversion. These findings may have implications for the development of interventions intended to increase preventive health behaviours. A follow-up study of these phenomena in the next stages of the epidemic will show how attitude towards and compliance with preventive measures will change, and whether the changes occur interdependently with anxiety and other scores that reveal one's perception of the situation.

CONFLICTS OF INTEREST

The authors declare that no conflicts of interest exist.

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ETHICAL APPROVAL

The study protocol was reviewed and approved by the Ethics Committee of the Faculty of Health Sciences, University of Novo mesto (approval no FZV-98/2020128).

REFERENCES

- Spiteri G, Fielding J, Diercke M, Campese C, Enouf V, Gaymard A, et al. First cases of coronavirus disease 2019 (COVID-19) in the WHO European Region, 24 January to 21 February 2020. *Euro Surveill.* 2020;25(9). doi: 10.2807/1560-7917.ES.2020.25.9.2000178.
- Slovenian National Institute of Public Health. koronavirus-sars-cov-2-gradiva @ www.nijz.si. Accessed May 24th, 2020 at: <https://www.nijz.si/sl/koronavirus-sars-cov-2-gradiva>.
- Www.worldometers.info.4e4f86f66dc170efebb43978c569264aea8dfa64 @ www.worldometers.info. Accessed March 13, 2020 at: <https://www.worldometers.info/coronavirus/>.
- Adhikari SP, Meng S, Wu Y-J, Mao Y-P, Ye R-X, Wang Q-Z, et al. Epidemiology, causes, clinical manifestation and diagnosis, prevention and control of coronavirus disease (COVID-19) during the early outbreak period: a scoping review. *Infect Dis Poverty.* 2020;9(1):29. doi: 10.1186/s40249-020-00646-x.
- Singhal T. A review of coronavirus disease-2019 (COVID-19). *Indian J Pediatr.* 2020;87(4):281-6. doi: 10.1007/s12098-020-03263-6.
- Guo Y-R, Cao Q-D, Hong Z-S, Tan Y-Y, Chen S-D, Jin H-J, et al. The origin, transmission and clinical therapies on coronavirus disease 2019 (COVID-19) outbreak - an update on the status. *Mil Med Res.* 2020;7(1):11. doi: 10.1186/s40779-020-00240-0.
- Kampf G, Todt D, Pfaender S, Steinmann E. Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents. *J Hosp Infect.* 2020;104(3):246-51. doi: 10.1016/j.jhin.2020.01.022.
- Leclercq I, Batéjat C, Burguière AM, Manuguerra JC. Heat inactivation of the middle east respiratory syndrome coronavirus. *Influenza Other Respir Viruses.* 2014;8(5):585-6. doi: 10.1111/irv.12261.
- WHO. Alert and response operations Diseases Biorisk reduction Disease outbreak news First data on stability and resistance of SARS coronavirus compiled by members of WHO laboratory network. Accessed Apr 5th, 2020 at: https://www.who.int/csr/sars/survival_2003_05_04/en/.
- Li Q, Guan X, Wu P, Wang X, Zhou L, Tong Y, et al. Early transmission dynamics in Wuhan, China, of novel Coronavirus-infected pneumonia. *N Engl J Med.* 2020;382(13):1199-207. doi: 10.1056/NEJMoa2001316.
- Lake MA. What we know so far: COVID-19 current clinical knowledge and research. *Clin Med.* 2020;20(2):124-7. doi: 10.7861/clinmed.2019-coron.
- Segerstrom SC. Stress, energy, and immunity: an ecological view. *Curr Dir Psychol Sci.* 2007;16(6):326-30. doi: 10.1111/j.1467-8721.2007.00522.x.
- Park JH, Faulkner J, Schaller M. Evolved disease-avoidance processes and contemporary anti-social behavior: prejudicial attitudes and avoidance of people with physical disabilities. *J Nonverbal Behav.* 2003;27(2):65-87. doi: 10.1023/A:1023910408854.
- Schaller M, Park JH. The behavioral immune system (and why it matters). *Curr Dir Psychol Sci.* 2011;20(2):99-103. doi: 10.1177/0963721411402596.
- Schaller M. The behavioural immune system and the psychology of human sociality. *Philos Trans R Soc B Biol Sci.* 2011;366(1583):3418-26. doi: 10.1098/rstb.2011.0029.
- Ackerman JM, Hill SE, Murray DR. The behavioral immune system: current concerns and future directions. *Soc Personal Psychol Compass.* 2018;12(2):57-70. doi: 10.1111/spc3.12371.
- Faulkner J, Schaller M, Park JH, Duncan LA. Evolved disease-avoidance mechanisms and contemporary xenophobic attitudes. *Gr Process Intergr Relations.* 2004;7(4):333-53. doi: 10.1177/1368430204046142.
- Taylor S. The psychology of pandemics: preparing for the next global outbreak of infectious disease. 1st ed. Newcastle: Cambridge Scholars Publishing, 2019.
- Dawson DL, Golijani-Moghaddam N. COVID-19: psychological flexibility, coping, mental health, and wellbeing in the UK during the pandemic. *J Contextual Behav Sci.* 2020;17:126-34. doi: 10.1016/j.jcbs.2020.07.010.
- Kameridou I, Stavrianea A, Liava C. Achieving a Covid-19 free country: citizens preventive measures and communication pathways. *Int J Environ Res Public Health.* 2020;17(13):4633. doi: 10.3390/ijerph17134633.
- Rodrigues-Ray R, Garrido-Hernansaiz H, Collado S. Psychological impact and associated factors during the initial stage of the coronavirus (COVID-19) pandemic among the general population in Spain. *Front Psychol.* 2020;11:1540. doi: 10.3389/fpsyg.2020.01540.
- Chauvin JJ, Insel TR. Building the thermometer for mental health. *Cerebrum.* 2018;2018:cer-14-18.
- Spitzer RL, Kroenke K, Williams JBW, Löwe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med.* 2006;166(10):1092-7. doi: 10.1001/archinte.166.10.1092.
- Duncan LA, Schaller M, Park JH. Perceived vulnerability to disease: development and validation of a 15-item self-report instrument. *Pers Individ Dif.* 2009;47(6):541-6. doi: 10.1016/j.paid.2009.05.001.
- Goh J. Perceived vulnerability to disease predicts restrictive policy supports in response to the 2019-nCoV ("Wuhan virus") outbreak. *PsyArXiv.* 2020. Accessed May 10th, 2020 at: <https://psyarxiv.com/52bw4>

26. Eržen I, Kamenšek T, Fošnarič M, Žibert J. Key challenges in modelling an epidemic-what have we learned from the COVID-19 epidemic so far. *Zdr Varst.* 2020;59(3):117-9. doi: 10.2478/sjph-2020-0015.
27. Sjödin H, Wilder-Smith A, Osman S, Farooq Z, Rocklöv J. Only strict quarantine measures can curb the coronavirus disease (COVID-19) outbreak in Italy, 2020. *Euro Surveill.* 2020;25(13):1-6. doi: 10.2807/1560-7917.ES.2020.25.13.2000280.
28. Liu Q, Zhou YH, Yang ZQ. The cytokine storm of severe influenza and development of immunomodulatory therapy. *Cell Mol Immunol.* 2016;13(1):3-10. doi: 10.1038/cmi.2015.74.
29. Hemilä H. Vitamin C and infections. *Nutrients.* 2017;9(4):339. doi: 10.3390/nu9040339.
30. Wong LP, Hung CC, Alias H, Lee TSH. Anxiety symptoms and preventive measures during the COVID-19 outbreak in Taiwan. *BMC Psychiatry.* 2020;20(1):376. doi: 10.1186/s12888-020-02786-8.
31. Shook NJ, Sevi B, Lee J, Oosterhoff B, Fitzgerald HN. Disease avoidance in the time of COVID-19: the behavioral immune system is associated with concern and preventative health behaviors. *PLoS One.* 2020;15(8):e0238015. doi: 10.1371/journal.pone.0238015.
32. Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS, et al. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *Int J Environ Res Public Health.* 2020;17(5):1729. doi: 10.3390/ijerph17051729.
33. Díaz Martínez A, Pastor J, Beleña Á. Perceived vulnerability to disease questionnaire: factor structure, psychometric properties and gender differences. *Pers Individ Dif.* 2016;101:42-9. doi: 10.1016/j.paid.2016.05.036.
34. Liu X, Luo WT, Li Y, Li CN, Hong ZS, Chen HL, et al. Psychological status and behavior changes of the public during the COVID-19 epidemic in China. *Infect Dis Poverty.* 2020;9(1):58. doi: 10.1186/s40249-020-00678-3.
35. Olaimat AN, Aolymat I, Elsayhori N, Shahbaz HM, Holley RA. Attitudes, anxiety, and behavioral practices regarding COVID-19 among university students in Jordan: a cross-sectional study. *Am J Trop Med Hyg.* 2020;103(3):1177-83. doi: 10.4269/ajtmh.20-0418.
36. Baxter A, Scott K, Vos T, Whiteford H. Global prevalence of anxiety disorders: a systematic review and meta-regression. *Psychol Med.* 2013;43(5):897-910. doi: 10.1017/S003329171200147X.
37. Elmer T, Stadtfeld C. Depressive symptoms are associated with social isolation in face-to-face interaction networks. *Sci Rep.* 2020;10(1):1444. doi: 10.1038/s41598-020-58297-9.
38. Ekman A, Dickman PW, Klint A, Weiderpass E, Litton J-E. Feasibility of using web-based questionnaires in large population-based epidemiological studies. *Eur J Epidemiol.* 2006;21(2):103-11. doi: 10.1007/s10654-005-6030-4.