Journal of Basic Research in Medical Sciences
Ilam University of Medical Sciences
Homepage: https://jbrms.medilam.ac.ir
Online ISSN: 2383-0972
Print ISSN: 2383-0506

Anxiety, Knowledge, and Preventive Behaviors among COVID-19 Survivors: A Cross-Sectional Survey on Coronavirus Concerns

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Article Info

Article type:
Original article

Article History:
Received: Dec. 13, 2023
Revised: Mar. 01, 2024
Accepted: May. 06, 2024
Published Online: Jun. 24, 2024

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A B S T R A C T

Introduction: This study aims to examine the interplay between COVID-19-related knowledge, anxiety, and preventive behaviors among individuals who have survived COVID-19.

Material & Methods: A descriptive cross-sectional design recruited 230 participants from three public hospitals through simple randomization. Participants completed a questionnaire via email and phone, comprising sections on personal information, the Corona Disease Anxiety Scale (CDAS), and COVID-19 knowledge and preventive behaviors. Data analysis utilized T-tests, ANOVA, and regression models.

Results: Out of 230 individuals, 200 responded (an 87% response rate). Education level significantly correlated with COVID-19 knowledge and preventive behaviors. Job status also showed a significant association with participants' understanding and actions regarding COVID-19. Regression analyses revealed that higher levels of knowledge (β=0.5, p=0.001) and anxiety (β=0.182, p=0.001) were linked to increased engagement in preventive behaviors.

Conclusion: This study focused on COVID-19 survivors, finding that anxiety may serve as a motivating factor for engaging in preventive behaviors. These findings hold implications for policymakers in promoting effective preventive measures.

Keywords: COVID-19, Health Knowledge, Preventive Behavior, Anxiety

➢ **How to cite this paper**
Fallah B, Fathi F, Adham M, Moradi M, Nasiriani Kh, Jambarsang S and et al. Anxiety, Knowledge, and Preventive Behaviors among COVID-19 Survivors: A Cross-Sectional Survey on Coronavirus Concerns. J Bas Res Med Sci. 2024; 11(3):1-9.

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Introduction

Severe acute respiratory coronavirus 2 (SARS-CoV-2) was initially identified in Wuhan, China. This is the seventh human coronavirus and has been responsible for the ongoing pandemic of pneumonia since January 2020 (1). The spread of the coronavirus and its societal health ramifications represent significant events in the 21st century (2). Clinical manifestations of this disease encompass fever, cough, shortness of breath, fatigue, and gastrointestinal symptoms (3). Typically, symptoms manifest around 5 days post-exposure to the virus (4). Generally, the coronavirus predominantly impacts individuals with compromised immune systems, underlying medical conditions, and the elderly (5). Moreover, predisposing factors for respiratory failure include smoking, diabetes, hypertension, and cancer (6).

Since the onset of the outbreak, preventive measures have been implemented to mitigate the disease burden (7). These measures can be broadly categorized into two levels: preventive behaviors and preventive measures. Preventive behaviors entail actions taken by individuals to minimize pathogen transmission, such as mask-wearing, practicing hand hygiene, using sanitizers, and adhering to social distancing guidelines. Meanwhile, many preventive measures have been enforced by governments in response to the COVID-19 pandemic, including home quarantine, lockdowns, travel bans, curfews, and movement restrictions (8).

WHO (2021) underscores the significance of COVID-19 knowledge in slowing the transmission of the virus within communities (9). This knowledge encompasses understanding the virus, its symptoms, transmission pathways, and the necessary preventive measures to curb its spread (10). Studies indicate that awareness of COVID-19's nature correlates with the adoption of effective preventive behaviors (11). However, certain personal and psychosocial factors may influence these behaviors. Gender and age serve as examples of personal factors. Research suggests that while COVID-19 knowledge is associated with increased preventive behaviors, adulthood may have a detrimental impact on health behaviors. It appears that knowledge alone may not suffice in driving behavior change, necessitating an understanding of other mediating factors (12).

The perceived threat of contracting COVID-19 in daily life, coupled with the abrupt changes resulting from implemented preventive measures, can trigger anxiety (13). Certain demographic groups, including women and young adults, are particularly susceptible to experiencing adverse mental health outcomes. Consequently, contracting COVID-19 can be viewed as a traumatic event (1). Numerous complications, such as acute respiratory distress syndrome (ARDS), ICU hospitalization, and the loss of loved ones, further contribute to the stress associated with this evolving disease. Some researchers posit that the sudden upheavals brought about by COVID-19 will impact both the physical and mental well-being of society not only in the present but also over the next 2–5 years (14).

Despite the detrimental impacts of anxiety and fear related to COVID-19, they may also yield positive effects. Some studies have highlighted the link between psychosocial factors and the adoption of effective preventive behaviors (15). However, the precise nature of this association remains unclear. Previous literature has not definitively indicated whether anxiety regarding COVID-19 is positively or negatively associated with the adoption of healthy preventive behaviors (16). This relationship is particularly uncertain among COVID-19 survivors (17). Within the overarching theme of personal factors, (15) identified several psychological, cognitive, and self-regulation factors that facilitate adherence to preventive behaviors for COVID-19.

While a limited number of studies have delved into the relationship between COVID-19-induced anxiety, preventive behaviors, and knowledge, there remains a gap in research concerning these factors within the population with a history of COVID-19.

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Therefore, this study was devised and executed to elucidate the correlation between COVID-19-related knowledge, anxiety, and preventive behaviors among individuals who have survived COVID-19.

Materials and methods

Study design

A descriptive cross-sectional design was employed, utilizing a quantitative approach to investigate the relationship between knowledge, attitude, preventive behaviors, and anxiety towards the coronavirus among COVID-19 survivors. In this study, the term "preventive behaviors" encompasses both knowledge and attitude, while "history of infection" specifically refers to past COVID-19 infection.

Participants

Three public hospitals, serving as care centers since the onset of the COVID-19 pandemic, were purposefully selected. All individuals who had been admitted to these hospitals with a history of COVID-19 infection and subsequently discharged after full recovery were eligible for initial participation. Participation was voluntary and not a component of formal clinical placement assignments. Recruitment of participants was conducted via email and phone. A comprehensive cover letter was provided to potential participants, detailing the study's objectives, confidentiality measures, expectations, and rights to facilitate informed decision-making regarding participation.

All individuals eligible for inclusion in the study were those with a history of COVID-19 infection, devoid of cognitive and psychological disorders, aged 18 years and above, and possessed access to the internet and social media platforms such as WhatsApp. Those with obsessive-compulsive disorder and chronic diseases (self-reported) were excluded from participation. A total of 230 individuals were recruited for the study using simple randomization.

This study obtained ethical approval from the institutional review board of Shahid Sadoughi University of Medical Sciences, Yazd, Iran (approval code: IR.SSU.REC.1400.017). Questionnaire responses were entirely anonymous to safeguard individuals' confidentiality. All prospective participants received comprehensive study information and a consent form. The results of the study were made accessible to participants upon request, conveyed through text messages or phone calls. Data were structured in a manner that precluded tracing back to individuals.

Study survey

The study questionnaire comprised three sections. The first section encompassed a general personal questionnaire, while the second part featured the Corona Disease Anxiety Scale (CDAS). The third section addressed knowledge and preventive behaviors concerning COVID-19. The demographic questionnaire collected data on age, sex, education, marital status, employment status, and history of comorbidities.

The CDAS, developed and psychometrically validated by Alipour et al., was utilized to assess anxiety induced by the COVID-19 pandemic in Iran (1). The final version of the CDAS included two dimensions and 18 items: physical symptoms (items 1 to 9) and mental symptoms (items 10 to 18). Responses were recorded on a 4-point Likert scale (never = 0, sometimes = 1, most of the time = 2, and always = 3). A higher total score indicates a greater level of anxiety.

The third section of the questionnaire was developed and psychometrically tested by (18) in Iran. This section comprised 20 items assessing knowledge regarding COVID-19, covering signs, preventive measures, and transmission pathways. Additionally, it included 13 items addressing preventive behaviors. Responses were recorded on a 5-point Likert scale ranging from "completely agree" to "disagree".

Data collection

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The data collection period spanned from June 2021 to August 2021. Participants' preferences were taken into account, and the questionnaire was disseminated via a link on social media platform WhatsApp. To enhance the response rate, weekly reminder messages were sent out.

Data analysis

The data were analyzed utilizing descriptive statistics, with proportions and percentages employed for Likert-style questions. Mean scores and standard deviations were reported for continuous and categorical variables. Relationships were examined using T-tests, ANOVAs, and regression models. Data were meticulously reviewed question-by-question to identify and exclude any missing data. The significance level (α) was set at 0.05. All analyses were conducted using the IBM SPSS for Windows, Version 22.0 statistical software package.

Results

A total of 200 individuals responded to the questionnaires (87% response rate). They were mainly in the age groups of 30–40 (30.6%) and 40–50 (31.7%). The majority of the respondents were female (57.5%), married (76.5%), employed (34%), and held at least a diploma degree. The detailed characteristics of the individuals are presented in Table 1. Regarding the history of infection by the COVID-19 virus, 24% of the responses were positive.

Table 1. Demographic Characteristics of Individuals and Their Relationship with COVID-19 Knowledge, Preventive Behaviors, and Anxiety.

Characteristics	Categories	Frequency (%)	COVID-19 knowledge			COVID-19 preventive behaviors			COVID-19 anxiety		
			Mean	SD	p-value	Mean	SD	p-value	Mean	SD	p-value
Age	<30	44 (22.1)	32.89	5.31	0.3	52.73	8.19	0.1			0.74
	30-40	61 (30.6)	33.93	4.98		52.52	7.92				
	40-50	63 (31.7)	32.21	5.54		50.76	8.64				
	>50	31 (15.6)	32.71	4.02		48.71	6.56				
Gender	Male	85 (42.5)	32.29	5.42	0.1	48.78	8.02	0.841	14.32	11.67	0.72
	Female	115 (57.5)	33.5	4.83		53.37	7.57		13.8	9.05	
Marital status	Single	47 (23.5)	32.17	6.7	0.2	51.21	9.17	0.84	12.57	9.31	0.82
	Married	153 (76.5)	33.24	4.5		51.48	7.74		14.46	10.47	
Education	High school	13 (6.5)	28.92	8.5	0.001	44.31	8.44	0.001	17.46	10.04	0.38
	Diploma	74 (37)	32.71	4.87		49.18	7.92		14.91	10.5	
	Bachelor	76 (38)	32.74	4.87		52.45	7.55		13.13	10.27	
	Postgraduate	37 (18.5)	35.49	3.30		56.30	5.93		12.86	10.44	
Occupation	No work	16 (8)	32.19	3.56	0.001	46.94	8.56	0.001	13.69	10.86	0.001

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	Student	27 (13.5)	33.67	3.83		54.33	5.63		15.04	8.084	
	Household	47 (23.5)	33.4	4.35		52.36	7.76		15.34	9.87	
	Employed workforce	68 (34)	34.13	4.87		54.22	7.08		13.43	11.24	
	Unemployed workforce	9 (4.5)	23.56	9.73		44.11	12.87		19.11	13.5	
	Business	33 (16.5)	32.42	3.89		46.09	5.72		11.30	8.05	
COVID-19 Infection Experience	Yes	48 (24)	32.35	5.55	0.32	49.65	8.86	0.08	18.44	11.9	0.001
	No	152 (76)	33.18	4.97		51.98	7.75		12.63	9.24	

Analysis showed no significant relationship between the age, gender, and marital status of individuals and their knowledge about COVID-19, preventive behaviors, and anxiety. However, the individuals' knowledge and preventive behaviors were significantly related to their educational level. The results of the ANOVA analysis showed that participants' job status was highly related to their knowledge and preventive behaviors about COVID-19. Two variables, including job status and history of COVID-19 infection, had a significant relationship with the COVID-19 anxiety score.

Table 2 displays the findings of the linear regression analyses. The results of the model revealed that, after adjusting for other variables, preventive performance was significantly better in the female gender compared to the male gender. Additionally, at older ages, the improvement in preventive performance was significantly less. According to this analysis, individuals' knowledge (β=0.5, p=0.001) and anxiety levels (β=0.182, p=0.001) were correlated with preventive behaviors and performance. In essence, higher scores in knowledge and anxiety were linked to increased preventive practices against the COVID-19 virus among participants.

Table 2. Association Between Linear Regression and Preventive Performance.

Factors	β	SE	Wald	*df*	95% CI	P-value
Intercept	6.93	4.64	2.22	1	-2.17-16.04	0.136
Gender	-3.19	0.84	14.27	1	-4.85- (-1.53)	0.001
Age	-0.112	0.039	8.24	1	-0.188- (-0.036)	0.04
Knowledge	0.5	0.97	26.41	1	0.310-0.691	0.001
Anxiety	0.182	0.040	19.99	1	0.102-0.262	0.001

Discussion

This study explored the correlation between COVID-19-related knowledge, anxiety, and preventive behaviors among individuals who had experienced a previous infection with COVID-19. Overall, nearly a quarter of the participants had a history of COVID-19. The research revealed that factors such as age, gender, marital status, and level of education did not influence anxiety levels regarding COVID-19.

However, concerning occupation, the study identified a significant association with all variables under investigation, including knowledge of COVID-19, preventive behaviors, and anxiety. This finding may be attributed to the widespread economic impact of the COVID-19 pandemic, affecting various industries and occupations. Many individuals experienced adverse effects on their employment

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status, leading to challenging work conditions or job loss.

In many areas and communities, such as Iran, many businesses were closed for several weeks due to reduced income. For example, Fatahi et al. (2020) reported in their systematic review that during the COVID-19 pandemic, people's income levels and economic conditions (especially the low-income class) were affected. In other words, according to this study, economic problems caused by the impact of people's jobs may negatively affect people's response to the COVID-19 pandemic (15, 19, 20). Previous studies suggested that the COVID-19 pandemic caused economic anxiety which results in mental and physical health problems (21).

Regarding the history of COVID-19 infection, it was highly related to COVID-19 anxiety among individuals. Studies reported a higher prevalence of anxiety, stress, and depression during the COVID-19 pandemic (22, 23). In line with this study, (17) reported that 55% of COVID-19 survivors were diagnosed with at least one mental disorder, such as post-traumatic stress disorder, depression, or anxiety. Regarding the level of anxiety about COVID-19, Khaleghparat et al. (2022) reported higher levels of anxiety in families with COVID-19 patients (24). Borges and Byrne (2022) also suggested that individuals with a COVID-19 history in themselves or their families adopted significantly more preventive behaviors (25).

The present study confirmed the positive relationship between individuals' knowledge and anxiety and their preventive behaviors. Consistent with previous research, it was reported that knowledge, education level, and training in preventive skills are positively related to compliance with preventive behaviors (15, 18). Fattahi et al. (2020) suggested that to improve Covid-19-related preventive behaviors, it is essential to focus on the logical reasoning for the importance of changing behavior (15). Borges and Byrne (2022), from the results of their predictive model, emphasized the significance of knowledge of preventive behaviors (25). They reported that this knowledge may even influence individuals' compliance with vaccination behaviors. However, some literature suggests that COVID-19 knowledge may not necessarily result in a change in individuals' preventive behaviors (26). Another study, consistent with our findings, reported that the more participants experience anxiety about COVID-19, the more likely they are to adopt preventive behaviors (16).

The regression model suggests higher levels of preventive behaviors for females compared to males. This finding is consistent with similar studies (14, 25). Borges and Byrne (2022) believed that this interpretation may be influenced by the lower number of male participants compared to females, with males comprising a quarter more than females (25). However, in this study, males and females were relatively equal in number, and the participant count is less likely to impact this finding.

The study also identified that with increasing age, adherence to preventive behaviors decreases. Conversely, another study (16) suggested that older people are more likely to engage in preventive behaviors. However, Borges and Byrne (2022) reported that age is not correlated with following preventive behavior among young adults. This discrepancy between the findings of studies might be related to different categorizations of age groups during data analysis and interpretation.

Conclusion

This study presents a valuable contribution to our understanding of the association between anxiety, COVID-19, and the adoption of preventive behaviors. Some previous research has highlighted the positive aspects of stress and anxiety in promoting preventive behaviors. Our study specifically focused on the COVID-19 survivor population, and we can conclude that anxiety can positively enhance engagement in preventive behaviors for COVID-19. Authorities and policymakers can utilize these

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findings to guide individuals' preventive behaviors. These behaviors could be enhanced by providing accurate knowledge and preventive skills through various approaches during non-peak COVID-19 periods.

Limitations

The study has several limitations. Firstly, it is a cross-sectional study, which restricts the ability to infer causality (27). Secondly, we utilized an online survey with a self-report nature study questionnaire. Since we surveyed preventive behaviors, it is probable that more self-regulated individuals participated in answering online questionnaires. This potential bias may impact the interpretation of data regarding preventive behaviors (25). Additionally, self-reported questionnaires increase the likelihood of social desirability bias, which could influence the number of participants exhibiting higher preventive approaches (28). However, as a positive aspect, we designed the questionnaires in a user-friendly manner and shared the questionnaire links via popular social media platforms. This facilitated questionnaire completion for participants at their convenience.

Acknowledgements

This article was derived from the research project approved by the Clinical Research Development Office of Shahid Rahnamoun Hospital, Yazd, Iran. The authors extend their gratitude to the patients, the vice president of research at Yazd University of Medical Sciences, and the staff of Shahid Rahnamoun Hospital for their invaluable support and collaboration in this research.

Financial support

This work received financial support from the Research Center of Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

Conflict of interest

The authors declare no competing or conflicting interests regarding this study.

Authors' contributions

BF, FF, and SJ contributed to the study design. FB, BF, and KN participated in sequence alignment, drafting, and revising the manuscript. MA, MM, and FF were involved in data acquisition. FB and BF contributed to critical review. All authors have read and approved the final manuscript.

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