



The Coronavirus Disease Pandemic: Assessment of Perceived Barriers and Threats among Undergraduate University Students in Saudi Arabia

Awad Mohammed Al-Qahtani^{1*} , Wafaa T. Elgzar^{2,3}, Heba A. Ibrahim^{2,4}, Nahid K. Elfeki⁵, Ibrahim Ahmed Shaikh⁶ , Mohammed Ashique K. Shaikh⁷, Ashjan T. Al Kayyadi⁸, Maali I. Alyami⁸, Nalah Y. Al Mani⁸, Haneen A. Kuzman⁸, Rabab M. Alherz⁸ and Sarah J. Sabihah⁸

¹Department of Family and Community Medicine, College of Medicine, Najran University, Najran, Saudi Arabia.

²Department of Maternity and Childhood Nursing, College of Nursing, Najran University, Najran, Saudi Arabia.

³Department of Obstetrics and Gynecologic Nursing, Damanhour University, Damanhour, Egypt.

⁴Department of Obstetrics and Women's Health Nursing, Benha University, Benha, Egypt.

⁵Department of Community and Mental Health Nursing, College of Nursing, Najran University, Najran, Saudi Arabia.

⁶Department of Pharmacology, College of Pharmacy, Najran University, Najran, Saudi Arabia.

⁷Pharmacy Services Division, Najran University Hospital, Najran, Saudi Arabia.

⁸Internship Student, College of Medicine, Najran University, Najran, Saudi Arabia.

*Correspondence: awadresearch17@gmail.com; +966 530540450

(Received: December 22, 2020; accepted: January 14, 2021)

Citation: Al-Qahtani AM, Elgzar WT, Ibrahim HA, et al. The Coronavirus Disease Pandemic: Assessment of Perceived Barriers and Threats among Undergraduate University Students in Saudi Arabia. *J Pure Appl Microbiol.* 2021;15(1):155-163. doi:10.22207/JPAM.15.1.10

© The Author(s) 2021. **Open Access.** This article is distributed under the terms of the [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/) which permits unrestricted use, sharing, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made.

Abstract

Communities play an important and active role in preventing and controlling the spread of coronavirus disease (COVID-19). Reduction of COVID-19-related barriers and threats perceived by the public should be the top priority in promoting positive preventive behaviors among people. This cross-sectional study aimed at identifying the barriers and threats perceived by public university students in the southwestern part of Saudi Arabia during the COVID-19 pandemic. The students were recruited through a snowball sampling technique, and data were collected using a web-based questionnaire. Data on socio-demographic aspects, perceived barriers, and perceived threats were collected. Perceived barriers were estimated using the Health Belief Model (HBM) questionnaire, and perceived threats were estimated using the patient threat perceptions in the emergency department scale. This study was conducted between March and June 2020. Approximately 50% of the study participants had a high level of perceived barriers and a moderate level of total perceived threats. Notable factors associated with participants' perceived barriers and threats were age, college type, and monthly income. Perceived barriers, participants' residence location, and sex were also significantly related to each other. Moreover, perceived barriers were significantly correlated with perceived threats. COVID-19-related perceived barriers and threats ranged from a moderate level to a high level among most of the participating students. Perceived barriers were associated with some of the demographic variables. The findings from this study may help the government in formulating strategies for planning interventions to reduce COVID-19 pandemic propagation.

Keywords: COVID-19, barriers, threats, students, Saudi Arabia

INTRODUCTION

The coronavirus disease (COVID-19) is an ongoing infectious disease that has posed a threat to people's health globally. It has been declared as a public health emergency of international concern. The COVID-19 pandemic is unique in many ways, when compared to other previous pandemics¹. The first case of infection with severe acute respiratory syndrome coronavirus 2 (SARS-COV) was reported in 2003,² following which a global outbreak of the disease occurred, named COVID-19. The outbreak was reported for the first time in late December 2019, when groups of pneumonia cases associated with epidemiological exposure to the seafood market and unlisted exposure were reported in Wuhan, China. Owing to the spread of the disease to other regions globally, COVID-19 was declared a pandemic³.

COVID-19 is highly contagious that it has rapidly spread to almost all people worldwide. Based on the rate of spread as well as with the use of mathematical models, it is predicted that 50%-60% of the world's population will be affected by COVID-19⁴. According to the World Health Organization (WHO), as of December 7, 2020, more than 65.8 million cases of COVID-19 and

more than 1.5 million related deaths have been reported since the start of the pandemic; of all countries, the United States of America and India have the highest incidence rates⁵.

In light of the severe consequences of the current pandemic, the WHO has formulated several guidelines related to COVID-19. The WHO has started online sessions and training programs with an intent to increase awareness of COVID-19 and achieve prevention and control of the disease spread among healthcare workers and the general population⁶. Prevention and control of infection require not only the application of knowledge and experience. but also a high level of self-efficacy and a low level of perceived barriers. A perceived threat is a coin that has two faces. If it is moderately perceived, then it can foster positive preventive behaviors. Contrarily, if it is highly perceived, then it may lead to panic behaviors and compromised immunity⁷. Furthermore, when self-efficacy is increased, it can decrease barriers to improving preventive practices.

Community members are stakeholders who play a very important role in limiting the spread of COVID-19 by blocking the infection chain and eradicating the disease. This occurs

with an increase in people's awareness about the disease and the benefits of preventive measures and a reduction in perceived barriers they might have toward adopting preventive behaviors. A perceived barrier is defined as an individual's estimation of the degree of challenge due to social, personal, environmental, and economic obstacles that hinder an action or the goal of an action. Perceived barriers and threats are essential parts of many healthy behavior theories⁸. The Health Belief Model (HBM) is one of the first models that were developed to determine and understand health-related behaviors and identify key health beliefs. In HBM, perceived barriers and benefits may precipitate the potential for recommended action, as well as any other component such as perceived threat⁹. Moreover, according to the protection motivation theory, the general population's intention to take preventive measures is greatly influenced by high levels of perceived threats. The theory assumes that public awareness of the severity and vulnerability to a specific health risk determines their perceived threats to the disease¹⁰. Therefore, during a new epidemic, obtaining information about the disease from several sources such as health teams and mass media can increase personal awareness of the associated dangers, thereby enhancing the implementation of preventive measures against the epidemic¹¹.

METHODS

Study objectives

This study aimed to identify perceived barriers and perceived threats among Najran University students during the COVID-19 pandemic. Study design: This cross-sectional study was conducted at Najran University Campus, Najran City, using a non-probability sampling technique (snowball sampling). The study was conducted from the beginning of March to the end of June 2020; data were collected using a web-based questionnaire. An online link to the questionnaire was sent to the participants through their personal e-mail address and social media applications such as WhatsApp, Facebook, and Twitter. Confidentiality of the data obtained was assured and maintained.

Inclusion criterion

All Saudi students with valid e-mail IDs, active social media users, and those who consented to participate in the study were included.

Sample size

The sample size was calculated using the Epi Info 7 program, where the sample size for frequency in a population size was 16809, corresponding to a 99% confidence level; the anticipated frequency was 50%, and the design effect was 1%. The sample size was 761 students.

Table 1. Percentage distribution of the study participants according to their perceived barrier scores (n=761)

No.	Perceived barrier	Strongly disagree		Disagree		Neutral		Agree		Strongly agree	
		n	%	n	%	n	%	n	%	n	%
1.	For me, preventing COVID-19 infection requires a lot of difficult procedures	47	6.2	133	17.5	136	17.9	222	29.2	223	29.3
2.	My economic and social conditions do not enable me to adhere to COVID-19 preventive measures	112	14.7	253	33.2	146	19.2	120	15.8	130	17.1
3.	I cannot easily change my unhealthy habits	68	8.9	176	23.1	150	19.7	214	28.1	153	20.1
4.	Being committed to health quarantine is difficult for me	132	17.3	205	26.9	133	17.5	156	20.5	135	17.7
5.	Adherence to preventive measures restricts my freedom	115	15.1	205	26.9	145	19.1	161	21.2	135	17.7

Table 2. Percent distribution of the study participants according to their perceived threat scores (n=761)

No.	Perceived threats	True to a great extent		True		I don't know		Not true at all	
		n	%	n	%	n	%	n	%
1.	My body-build is weak and will not be able to fight infection	142	18.7	82	10.8	209	27.5	328	43.1
2.	I am concerned that I cannot control the epidemic	212	27.9	170	22.3	196	25.8	183	24.0
3.	I am concerned about death if I become infected	178	23.4	92	12.1	180	23.7	311	40.9
4.	I have a great fear of COVID-19 infection	193	25.4	138	18.1	206	27.1	224	29.4
5.	I think that COVID-19 will have a negative impact on my life	156	20.5	126	16.6	188	24.7	291	38.2
6.	I am worried about my family	444	58.3	165	21.7	88	11.6	64	8.4

Study tools**Tool I**

A self-administered questionnaire was developed by the researchers after consulting relevant literature. It consists of two parts: demographic variables and perceived barriers. The demographic variables included sex, age, college, residence, marital status, family income, and medical history, while the questionnaire on perceived barriers was based on the HBM. It consisted of five statements for the evaluation of perceived barriers to seeking health care during COVID-19. It was rated on a 5-point Likert scale. The overall scale scores ranged from 5 to 25.

Tool II

Patient Threat Perceptions in the Emergency Department Scale (PTPEDS).

The scale developed by Cornelius et al. (2018) consisted of 12 items rated on a 4-point Likert scale.¹² The scale was adapted to the

COVID-19 outbreak containing 6 items. The total score ranged from 6 to 24.

Instrument validity and reliability

The tools were tested for face, content, and construct validity by a jury of five experts from the fields of nursing and medicine. Instrument reliability was assessed using the Cronbach's alpha coefficient test.

A pilot study was conducted among 10% of the participants who were excluded from the main study. This pilot study aimed to ascertain the clarity and validity of the instrument.

Data collection and analysis

Data were collected during the study period using a web-based questionnaire. The data collected were analyzed using SPSS software, version 23. Categorical variables were presented as frequency (n) and percentage, while continuous variables were presented as mean \pm standard deviation (SD). Relationships and correlations

Table 3. Percent distribution of the study participants according to their total perceived barriers and threats score (n=761)

Total perceived barriers and threats score	Low		Moderate		High	
	n	%	n	%	n	%
Total perceived barriers	122	16.0	272	35.7	367	48.2
Total perceived threats	174	22.9	367	48.2	220	28.9

Table 3 shows that about half (48.2%) of the study participants had high perceived barriers. Besides, the same percentage of the study participants had moderate total perceived threats.

Table 4. Relationship between subject total perceived barriers and their demographic characteristics (n=761)

Total perceived barriers/ Demographic characteristics		low		Moderate		High		Total	FET	P
		n	%	n	%	n	%			
Age	≥19 years	12	18.8	36	54	18	27.2	66	32.50	0.000 ^a
	20-24 years	75	13.1	191	33.5	303	53.4	569		
	25 years and more	35	27.7	45	35.7	46	36.6	126		
Location of residence	Urban	99	17.2	208	36.2	267	46.6	574	15.20	0.003 ^a
	Semi-urban	16	13.3	51	42.5	53	44.2	120		
	Rural	7	10.6	13	19.7	46	69.7	66		
College	Health sciences	59	19.6	120	39.8	122	40.6	301	12.47	0.002 ^a
	Non-health sciences	63	13.7	152	33.1	245	53.7	460		
Gender	Male	34	13.7	72	29.1	141	57.2	247	11.47	0.003 ^a
	Female	88	17.1	200	38.9	226	44	514		
Marital status	Married	18	15.9	50	43.1	48	41.4	116	3.38	0.187
	Unmarried	104	17.1	222	34.4	319	49.5	645		
Monthly income	<5000SAR/month	93	15.4	194	33.2	298	50.9	585	11.38	0.021 ^a
	5000-10,000 SAR/ month	19	15.7	44	39.6	48	43.2	111		
	>10,000SAR/month	10	16.1	34	52.3	21	32.3	65		
Chronic illness	Yes	13	15.9	27	43.1	43	41.4	83	0.507	0.772
	No	109	17.1	245	34.4	324	49.5	678		

^aP<0.05. FET = Fisher Exact test.

Table 4 shows statistically significant associations between participants' total perceived barriers and age, place of residence, college, gender, and monthly income(p<0.05). In contrast, there was no relationship between the participants' perceived barriers and marital status or chronic illness.

among variables were analyzed using Fisher's exact test. Values of p <0.05 were considered as indicating statistical significance.

RESULTS

Demographic data

Mean age of the participants was 20.27±4.39 years. Moreover, 75.5% of the study participants were urban residents, and 67.5% were females. Less than two-thirds (60.4%) of the participants were affiliated with non-health science colleges, and 84.8% were single. Furthermore, more than three-fourths (76.9%) of the participants had a monthly family income of less than 5000 SAR. Only 10.9% of the participants had a history of chronic disease.

DISCUSSION

According to Khosravi (2020), primary emotional concerns and public confidence are crucial factors that mitigate perceived threats and decrease perceived barriers associated with a pandemic, thereby enhancing public acceptance of protective measures¹³. Therefore, specialists

can develop and use behavior models to decrease perceived barriers as an effective response to a pandemic, and in the face of new threats.

The present study found that half of the study participants had a high level of perceived barriers to the prevention of COVID-19. These study participants had a moderate level of total perceived threats regarding COVID-19. The study findings also demonstrate that the most common source of threat was emotional concern toward their families. These findings are in agreement with those reported earlier by at least four other studies. In a study on the effect of HBM-based education on nursing student's health beliefs and knowledge about COVID-19, Elgzar et al. (2020) reported that the mean scores for perceived barrier in the intervention and control groups were 11.37±2.03 and 11.21±2.22, respectively, on a 15-point scale before intervention. Therefore, the participants were considered to have moderate perceived barriers to COVID-19, which were significantly decreased after the intervention. The study emphasized the importance of knowledge in decreasing perceived barriers among the students.

Table 5. Relationship between total perceived threats and their demographic characteristics (n=761)

Total perceived threats Demographic characteristics		Low		Moderate		High		Total n	FET	P
		n	%	n	%	n	%			
Age	≥19 years	13	19.7	47	71.2	6	9.1	66	20.99	0.000 ^a
	20-24 years	128	22.5	261	45.9	180	31.6	569		
	25 years and more	33	26.2	59	46.8	34	27.0	126		
Location of residence	Urban	135	23.5	276	48.1	163	28.4	574	5.70	0.222
	Semi-urban	23	19.2	66	55.0	31	25.8	120		
	Rural	16	24.2	25	37.9	25	37.9	66		
Type of college	Health sciences	95	31.6	153	50.8	53	17.6	301	40.10	0.000 ^a
	Non-health sciences	79	17.2	214	46.5	167	36.3	460		
Gender	Male	61	24.7	122	49.4	64	25.9	247	1.77	0.409
	Female	113	22.0	245	47.7	156	30.4	514		
Marital status	Married	26	22.4	53	45.7	37	31.9	116	0.64	0.732
	Unmarried	148	22.9	314	48.7	183	28.4	645		
Monthly income	<5000SAR/month	125	21.4	300	51.3	160	27.4	585	15.10	0.006 ^a
	5000-10,000 SAR/ month	26	23.4	49	44.1	36	32.4	111		
	>10,000SAR/month	23	35.4	18	27.7	24	36.9	65		
Chronic illness	Yes	11	13.3	44	53.0	28	33.7	83	5.25	0.07
	No	163	24.0	323	47.6	192	28.3	678		

aP<0.05. FET = Fisher Exact test.

Table 5 shows statistically significant associations between total perceived threats and age, type of college, and monthly income. On the other hand, there was no relationship between perceived threats and location of residence, gender, marital status, and chronic illness.

Table 6. Correlation between participants' total perceived barriers and threats associated with COVID-19 pandemic

Perceived barriers and threats	Mean ±SD	r	P
Total threats	14.65±5.29	0.562	0.000 ^a
Total barriers	15.66±5.1		

^aP <0.05 (r =Pearson correlation coefficient).

Table 6 shows statistically significant correlation between total perceived barriers and threats (p<0.05).

It is worth mentioning that the Elgzar et al. (2020) study was conducted in Najran University, the same setting as that of the present study.¹⁴ This could be one of the possible justifications for the consistency in the results of the two studies. In a cross-sectional study conducted to evaluate COVID-19-associated risk perception among Iranian medical students, Taghrir et al. (2020) reported moderate risk perception scores among the study participants.¹⁵ Geana (2020) conducted a cross-sectional study on the risk perception related to COVID-19 among

Kansans during the pandemic. In that study, the majority of Kansans had moderate total risk of contracting COVID-19. It was further revealed that people's risk perception associated with any infection was dependent on the severity of the outbreak in their communities.¹⁶ In a research on the application of HBM for the identification of COVID-19 risk perception, Costa (2020) reported a moderate level of total perceived susceptibility, and moderate-to-high levels of perceived barrier scores among the study participants. The efficiency of HBM in assessing COVID-19 determinants was further emphasized.¹⁷ In contrast, Bashirian et al. (2020) applied the protection motivation theory to investigate factors associated with COVID-19 preventive behaviors among Iranian hospital staff and found a high threat among the participants, with paramedical staff having the highest threat score.¹⁸ The differences between the results of the present study and those of the Bashirian et al. (2020) study may be attributed to differences in the study settings. The study by Bashirian et al. (2020) was conducted at a hospital wherein the infection risk was expected to be very high.

Thus, the threat was also high. In contrast, the present study was conducted in a university setting where the participants had no direct contact with COVID-19 patients. The present study results indicated a significant relationship between students' perceived barriers and perceived threats to their family income. Low-income students had higher perceptions of barriers and threats toward COVID-19. These findings seem logical because low-income students could not afford to buy protective equipment, unlike high-income students. Consequently, they may find themselves at a higher risk of contracting COVID-19. In addition, they may feel insecure among their families because they cannot stay at home during health quarantine because they are low-income earners.

The results of this study indicate significant relationships among the total perceived threats, barriers, and age. An in-depth analysis of the relationship between perceived threats and age revealed that older students had higher perceived threats and perceived barriers than their younger counterparts. This may be attributed to the fact that older students, who more mature, can effectively evaluate the severity of the COVID-19 situation. De Zwart et al. (2009)¹⁹ obtained a similar result in a study on perceived threats, risk, and efficacy with regard to SARS. They reported a significant relationship between perceived threats and age: perceived threat levels increased as age increased.

The findings of Yildirim et al. (2020)²⁰ and de Zwart et al. (2009)¹⁹ show variance with the results obtained in the present study. They found that females had higher perceived threats and fear of COVID-19 than males. The difference between the findings of the current study and those of previous studies may be attributed to differences in the culture and age of the study populations. The study by Yildirim et al. was conducted among Turkish adults with a mean age of 30.33 years, while the current research was carried out among Saudi university student participants with a mean age of 20.27 years.

Another significant relationship was found between college type and perceived barriers and perceived threats. Surprisingly, non-health science college students had higher levels of

perceived threats and perceived barriers than health sciences college students. The hospital training provided to students in health science colleges such as medicine, nursing, dentistry, and applied medical sciences may place them at risk for COVID-19. Usually, these college students receive more training on preventive and protective measures against infectious diseases than other college students. In addition, they attended infection control courses before starting the hospital training. Thus, they may have more self-confidence in COVID-19 control because of their medical background. Lack of knowledge about infection control and self-protection may be a major barrier for non-health science college students. There are no published studies on the relationship between perceived threats and college type.

A significant association was observed between perceived barriers and residence location, wherein 69.7% of the rural residents had high levels of perceived barriers. This result may be attributed to the lack of health facilities in rural areas, when compared to urban and suburban areas. Furthermore, rural dwellers may lack health orientation programs about preventive and protective practices for COVID-19. An association was found between sex and perceived barriers, with male students having higher levels of perceived barriers than female students. In Saudi culture, males have more freedom of movement than females. They can visit different recreational places with their peers. Consequently, they may find it more difficult to maintain social distancing than female students who usually spend most of their time at home.

To the best of our knowledge, this is the first study on the relationship between perceived barriers, perceived threats, and participants' demographic variables during the COVID-19 pandemic. The findings of the present study provide valuable information for decision-makers about factors that may affect a population's perceived barriers and perceived threats during the COVID-19 pandemic.

CONCLUSION

The results of this study indicate that approximately half of the study participants had

high levels of perceived barriers and moderate levels of total perceived threats toward COVID-19. There were significant associations between participants' total perceived barriers and threats, age, college type, and monthly income. Moreover, the present study demonstrated significant relationships between perceived barriers and participants' residence location and sex. In addition, perceived barriers were significantly correlated with perceived threats.

ACKNOWLEDGMENTS

The authors are grateful to the students who voluntarily took part in this study.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORS' CONTRIBUTION

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

FUNDING

None.

DATA AVAILABILITY

All datasets generated or analyzed during this study are included in the manuscript and/or the Supplementary Files.

ETHICS STATEMENT

The research was approved by the Deanship of Scientific Research and the Institutional Review Board of the College of Medicine, Najran University. Formal approval was obtained from the administration of each college. Informed consent was obtained from all the participants. All data obtained were kept confidential and used for research purpose only.

REFERENCES

1. Wang C, Horby PW, Hayden FG, Gao GF. A novel coronavirus outbreak of global health concern. *Lancet*. 2020;395(10223):470-473. doi: 10.1016/S0140-6736(20)30185-9
2. Hawryluck L, Gold WL, Robinson S, Pogorski S, Galea S, Styrar R. SARS Control and Psychological Effects of Quarantine, Toronto, Canada. *Emerg Infect Dis*. 2004;10(7):1206-1212. doi: 10.3201/eid1007.030703
3. Nishiura H, Jung S, Linton NM, et al. The Extent of Transmission of Novel Coronavirus in Wuhan, China, 2020. *J Clin Med*. 2020;9(2):330. doi: 10.3390/jcm9020330
4. Flahault A. Has China faced only a herald wave of SARS-CoV-2? *Lancet*. 2020;395(10228):947. doi: 10.1016/S0140-6736(20)30521-3
5. World Health Organization. Weekly epidemiological update-8 December 2020. Available at: <https://www.who.int/publications/m/item/weekly-epidemiological-update-8-december-2020> (Accessed on 11/12/2020).
6. Bhagavathula AS, Aldhaleei WA, Rahmani J, Mahabadi MA, Bandari DK. Novel Coronavirus (COVID-19) Knowledge and Perceptions: A Survey of Healthcare Workers. *MedRxiv*. 2020. doi: 10.1101/2020.03.09.20033381
7. Hui DS, Azhar EI, Madani TA, et al. The continuing 2019-nCoV epidemic threat of novel coronaviruses to global health - the latest 2019 novel corona virus outbreak in Wuhan, China. *Int J Infect Dis*. 2020;91:264-266. doi: 10.1016/j.ijid.2020.01.009
8. Glasgow RE. Perceived Barriers to Self-Management and Preventive Behaviors. Constructs and Measures for Health Behavior. National Cancer Institute. 2008. Available at: <https://cancercontrol.cancer.gov/brp/research/constructs/barriers.html>
9. Becker MH, Maiman LA, Kirscht JP, Haefner DP, Drachman RH, Taylor DW. Patient perceptions and compliance: Recent studies of the health belief model. In Haynes R, Taylor D, Sackett D, editors. *Compliance in health care*. Baltimore: Johns Hopkins University Press; 1979.
10. Rogers RW. A Protection Motivation Theory of Fear Appeals and Attitude Change. *J Psychol*. 1975;91(1):93-114. doi: 10.1080/00223980.1975.9915803.
11. van der Weerd W, Timmermans DR, Beaujean DJ, Oudhoff J, van Steenberghe JE. Monitoring the level of government trust, risk perception and intention of the general public to adopt protective measures during the influenza A (H1N1) pandemic in The Netherlands. *BMC Public Health*. 2011;11:575. doi: 10.1186/1471-2458-11-575
12. Cornelius T, Agarwal S, Garcia O, Chaplin W, Edmondson D, Chang BP. Development and Validation of a Measure to Assess Patients' Threat Perceptions in the Emergency Department. *Acad Emerg Med*. 2018;25(10):1098-1106. doi: 10.1111/acem.13513
13. Khosravi M. Perceived Risk of COVID-19 Pandemic: The Role of Public Worry and Trust. *Electron J Gen Med*. 2020;17(4):em203. <https://doi.org/10.29333/ejgm/7856>
14. Elgzar WT, Al-Qahtani AM, Elfeki NK, and Ibrahim HA. COVID-19 Outbreak: Effect of an Educational Intervention Based on Health Belief Model on Nursing Students' Awareness and Health Beliefs at Najran University, Kingdom of Saudi Arabia. *Afr J Reprod Health*. 2020;24(2):78-86.
15. Taghrir MH, Borazjani R, Shiraly R. COVID-19 and Iranian Medical Students; A Survey on Their Related-Knowledge, Preventive Behaviors and Risk Perception. *Arch Iran Med*. 2020;23(4):249-254. doi:10.34172/

- aim.2020.06
16. Geana MV. Kansans in the Middle of the Pandemic: Risk Perception, Knowledge, Compliance with Preventive Measures, and Primary Sources of Information about COVID-19. *Kans J Med.* 2020;13:160-164. doi: 10.17161/kjm.v13i.13821
17. Costa MF. Health belief model for coronavirus infection risk determinants. *Rev Saude Publica.* 2020;54:47. doi: 10.11606/s1518-8787.2020054002494
18. Bashirian S, Jenabi E, Khazaei S, et al. Factors associated with preventive behaviours of COVID-19 among hospital staff in Iran in 2020: an application of the Protection Motivation Theory. *J Hosp Infect.* 2020;105(3):430-433. doi: 10.1016/j.jhin.2020.04.035
19. de Zwart O, Veldhuijzen IK, Elam G, et al. Perceived Threat, Risk Perception, and Efficacy Beliefs Related to SARS and Other (Emerging) Infectious Diseases: Results of an International Survey. *Int J Behav Med.* 2009;16(1):30-40. doi:10.1007/s12529-008-9008-2
20. Yildirim M, Gecer E, Akgul O. The impacts of vulnerability, perceived risk, and fear on preventive behaviours against COVID-19. *Psychol Health Med.* 2020;26(1):35-43. doi:10.1080/13548506.2020.1776891