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RESEARCH ARTICLE

Determinants of Intention and COVID-19 Preventive Behaviors among the Urban Population: The use of the Theory of Planned Behavior (TPB)

Sima Ghorbanzadeh¹, Mina Maheri¹, Hamid Reza Khalkhali² and Alireza Didarloo^{3,*}

¹Department of Public Health, School of Health, Urmia University of Medical Sciences, Urmia, Iran

²Department of Biostatistics and Epidemiology, School of Medicine, Patient Safety Research Center, Clinical Research Institute, Urmia University of Medical Sciences, Urmia, Iran

³Department of Public Health, School of Health, Social Determinants of Health Research Center, Clinical Research Institute, Urmia University of Medical Sciences, Urmia, Iran

Abstract:

Background and Purpose:

COVID-19 is a new viral disease that has led to a pandemic due to its high infectivity. Since many people do not have access to available vaccines, preventive behavior is the only way to fight the disease. Despite the great emphasis on preventive behaviors, many people do not follow them so the etiology of this issue seems necessary; hence, the present study aimed to determine the predictors of intention and COVID-19 preventive behaviors using the theory of planned behavior.

Materials and Methods:

The present study was descriptive-analytical and was conducted among individuals over 18 years of age living in Urmia. Samples were selected by snowball and convenience sampling. Data were collected using a valid and reliable electronic researcher-made questionnaire consisting of 4 sections (demographic characteristics, questions about knowledge, questions about constructs of the theory of planned behavior, and questions about COVID-19 preventive behaviors), and they were analyzed by descriptive and inferential statistical methods.

Results:

The results indicated a positive and statistically significant correlation between the COVID-19 preventive behaviors and constructs, namely the attitude ($p < 0.001$, $r = 0.65$), subjective norms ($p < 0.001$, $r = 0.67$), perceived behavioral control ($p < 0.001$, $r = 0.72$), and behavioral intention ($p < 0.001$, $r = 0.76$). Based on regression analyses, the constructs of the theory of planned behavior predicted a total of 65% of the variance of COVID-19 preventive behaviors and 73% of the variance of behavioral intention. Among the constructs, behavioral intention ($p < 0.001$, $\beta = 0.393$) was the strongest predictor of behavior, and perceived behavioral control ($p < 0.001$, $\beta = 0.546$) was the strongest predictor of behavioral intention.

Conclusion:

The research results indicated the efficiency of the theory of planned behavior in predicting COVID-19 preventive behaviors; hence, the theory and its effective constructs, especially behavioral intention, can be utilized in the development of educational programs and interventions to change the citizens' behavior towards COVID-19.

Keywords: Theory of Planned Behavior (TPB), COVID-19, Respiratory disease, Preventive behavior, Viral disease, Pandemic.

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1. INTRODUCTION

COVID-19 is a zoonotic respiratory disease caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) [1]. According to the World Health Organization

(WHO), about 238022598 people worldwide will have been infected with this disease and about 4857795 people will have died until October 9, 2021. About 5683980 cases of disease and about 122197 deaths have been reported in Iran [2]. Many people with COVID-19 have mild to moderate symptoms and recover without special treatment. Common symptoms include fever, dry cough, shortness of breath, and respiratory problems. Many people may also experience non-respiratory symptoms

* Address correspondende to this author at the Department of Public Health, School of Health, Social Determinants of Health Research Center, Clinical Research Institute, Urmia University of Medical Sciences, Urmia, Iran; Tel: 0098 44-3275-2300; Fax: 0098 44-3277-0047; E-mail: didarloo_a@umsu.ac.ir

such as nausea, vomiting, and diarrhea. In more severe cases, the infection can lead to pneumonia, cardiovascular diseases, liver, kidney, gastrointestinal, and neurological diseases, and eventually death. The disease can be transmitted through coughing, sneezing, contact with an infected person, touching infected surfaces, and then touching the mouth, nose, and eyes with infected hands [3].

Several COVID-19 vaccines have been approved for human use, but vaccination alone is not enough to achieve global control of COVID-19 [4], and factors such as fierce competition of rich countries, limited production, and weak financial resources of various countries also make it difficult to access the COVID-19 vaccine [5]. Iran like other countries had suitable access to the COVID-19 vaccine, but the vaccine acceptance rate in the Iranian population is 70% [6]. Based on previous experience in the management of SARS and MERS infections, the World Health Organization has recommended public health measures to reduce the risk of COVID-19 transmission [7]. These measures include two key sets of preventative behaviors.

The first set includes personal protective behaviors that are performed to protect people from themselves and those around them and is often based on their beliefs, such as hand hygiene (washing hands with soap and water, or disinfecting hands with 70% alcohol solution), and wearing a mask. The second set includes behaviors that are performed to ensure the physical distance between people in society and are often performed by legal policies such as social distancing [8, 9]. Evidence suggests that adopting such behaviors can help prevent the spread of the disease effectively [10]. Therefore, it is necessary to follow preventive behaviors, and it depends on factors such as knowledge, belief, attitude, perception of people about the risk of COVID-19, and preventive measures [11 - 13]. The findings of a study in Indonesia indicated that adherence to social distancing behavior was high in people with great knowledge about this behavior [14]. Findings of a study by Honarvar *et al.* in Iran to examine the knowledge, attitude, and practice of people in the field of COVID-19 also indicated that only educated women had followed the preventive guidelines [15]. Therefore, it seems necessary to diagnose and eliminate social-cognitive causes of COVID-19 due to the reduction in individuals' adherence to its health guidelines [16].

Meanwhile, models and theories of health education and promotion can help researchers determine the causes of non-adherence or low adherence to COVID-19 preventive behaviors [12]. The Theory of Planned Behavior (TPB) is about promoting healthy and disease-preventing behaviors, and it was introduced by Icek Ajzen and Martin Fishbein in 1988. This theory considers individual intention as the most important determinant of behavior. The individual's intention is also affected by three constructs, namely attitude, subjective norms, and perceived behavioral control [12, 17]. According to this model, people intend to perform a preventive behavior (COVID-19) if, firstly they consider it a useful behavior (attitude), and secondly, people feel pressured by family members, medical staff, and the government to do it through social factors (subjective norms). Third, they feel that there are factors that play a role in inhibiting COVID-19 preventive

behaviors, but despite these factors, they can perform the behavior (perceived behavioral control) [18]. Due to the costs imposed by the disease on Iran's health system, serious complications of the disease, and few similar studies in Iran, the present study aimed to determine the predictors of intention and preventive behaviors of COVID-19 using the TPB in the urban population of Urmia.

2. MATERIALS AND METHODS

The present research was a descriptive-analytical cross-sectional study that was conducted in Urmia from April to June 2021. Inclusion criteria were as follows: age over 18 years, access to cyberspace, ability to complete the questionnaire physically and mentally, and having consent to participate in the study. Incomplete filling of the questionnaire was an exclusion criterion. The sample size was equal to 432 based on estimating the mean of COVID-19 preventive behavior, and according to the results of a study by Khazaei *et al.* [19] who found the mean score of total COVID-19 preventive behaviors to be 4.19 ± 2.65 at a 95% confidence level, and the measurement accuracy of 0.25, and 500 participants were included in the study according to a 20% drop. Samples were selected by snowball and convenience sampling. Therefore, the questionnaire was sent *via* a link to participants, and they completed it online through WhatsApp channels. At the beginning of the questionnaire, sufficient explanations were given about the purpose and inclusion criteria, and the individuals were assured that their participation in the study would be voluntary, that they could leave the study if they wished, and their information would be confidential.

The data collection tool included a researcher-made questionnaire consisting of four sections: The first section included demographic information (age, gender, marital status, education level, employment status, number of family members, and history of COVID-19). The second section included knowledge questions consisting of 14 questions with a score range of 0-14, which were given 1 point for correct answers, and 0 points for wrong answers. The third section included questions about the constructs of the theory of planned behavior as follows: The attitude dimension included 5 questions with a score range of 5 - 25. Attitude questions were scored based on a 5-point Likert scale ranging from 1 to 5 (useless, less useful, neither useful nor useless, useful, and very useful). Subjective norms, perceived behavioral control, and behavioral intention each included 5 questions with a score range of 5 - 25. The scoring of the questions was based on a 5-point Likert scale (strongly disagree, disagree, natural, agree, and strongly agree) ranging from 1 to 5. The fourth section included 5 questions about preventive behaviors such as social distancing, mask use, hand hygiene (washing hands with soap and water, or hand disinfection with 70% alcohol solution), and disinfecting surfaces with a score range of 5 - 25. Five options (never, rarely, sometimes, often, and always) were assigned to answer these questions, and each answer was given a score of 1 to 5, respectively.

Both face and content validity methods were used in both quantitative and qualitative ways to evaluate the validity of the scale. To determine the face validity by the qualitative method,

the questionnaire was given to about 10 experts of disciplines related to the research topic and instrumentation (4 health education and health promotion specialists, 2 infectious disease specialists, 2 nurses, 1 psychologist, and 1 instrumentation expert), and they were asked to examine the questions in terms of the desirability of terms and clarity. To receive the opinions of the target group, an interview was conducted with 20 of them, and their opinions were applied to the questionnaire. In the quantitative method, the impact score was measured for each question by multiplying the percentage of the number of people, who gave the question a score of 4 and 5, by the mean score obtained for each question [20]. If the question impact score was greater than 1.5, the item was retained, otherwise deleted. To determine the content validity in a qualitative way, the questionnaire was given to about 10 experts to apply their corrective views in writing. Finally, their opinions were included in the questionnaire. The content validity ratio using the criterion of necessity, and the content validity index using the criteria of relevance, clarity, and simplicity were used to determine the content validity by the quantitative method. In this method, the questionnaire was given to about 10 experts to rate each question in terms of necessity, relevance, clarity, and simplicity. The first case was calculated using the content validity ratio (CVR), and the second case was calculated by the

content validity index (CVI). Questions in which values of CVR were equal with or above 0.62 and values of CVI were above 0.79, were retained, and the rest were removed. For reliability, a pilot study was conducted on 30 individuals, and Cronbach's alpha coefficients were calculated for attitude (0.84), subjective norms (0.89), perceived behavioral control (0.9), behavioral intention (0.88), behavior (0.83), and knowledge (0.9). The reliability of the tool was confirmed since Cronbach's alpha values were greater than 0.7 for all constructs. Data analysis was performed using frequency, mean, standard deviation, Pearson correlation coefficient, and linear regression in SPSS 16 at a significant level of 0.05.

3. RESULTS

In the present study, a total of 34 out of 500 questionnaires were excluded due to the non-completion of information, and finally, the data of 466 individuals were analyzed (93.2% response rate). The mean age of participants was 38.13 ± 11.82 years. Many people were in the age group of 25 - 44 years (51.7%). Most of the participants were female (77%), married (76.6%), with a bachelor's degree (32.6%), housewives (38.2%), and without a history of COVID-19 (73.4%) (Table 1).

Table 1. Frequency distribution of demographic characteristics in the participants (n=466).

Variable	Classification	Number (Percentage)
Age (Years)	18-24	80 (17.2)
	25 - 44	241 (51.7)
	45 - 64	135 (29)
	65 and over	10 (2.1)
Number of Family Members	1-3	131 (28.1)
	4-6	330(70.8)
	>6	5(1.1)
Gender	Male	107(23)
	Female	359(77)
Marital Status	Single	109 (23.4)
	Married	357(76.6)
Education Level	Primary school	35 (7.5)
	Secondary school	40 (8.6)
	High school	37 (7.9)
	High school diploma	111 (23.8)
	Associate degree	30 (6.4)
	Bachelor	152 (32.6)
	Master	53 (11.4)
Ph.D.	8 (1.7)	
Employment Status	Housewife	178 (38.2)
	Unemployed	37 (7.9)
	University student	39 (8.4)
	Government employees	117 (25.1)
	Private employees	64 (13.7)
	Retired	31 (6.7)
History of COVID-19	Yes	124 (26.6)
	No	342 (73.4)

Table 2. Mean, standard deviation, and correlation matrix of constructs of the theory of planned behavior(n=466).

Theory of Planned Behavior	Mean ± Standard Deviation	Preventive Behaviors	Knowledge	Attitude	Subjective Norms	Perceived Behavioral Control	Behavioral Intention
Preventive behaviors	22.37 ± 3.22	1	-	-	-	-	-
Knowledge	11.93 ± 2.11	r = 0.30 p < 0.001	1	-	-	-	-
Attitude	21.53 ± 3.45	r = 0.65 p < 0.001	r = 0.31 p < 0.001	1	-	-	-
Subjective norms	21.36 ± 3.48	r = 0.67 p < 0.001	r = 0.26 p < 0.001	r = 0.69 p < 0.001	1	-	-
Perceived behavioral control	21.52 ± 3.32	r = 0.72 p < 0.001	r = 0.25 p < 0.001	r = 0.65 p < 0.001	r = 0.74 p < 0.001	1	-
Behavioral intention	21.53 ± 3.67	r = 0.76 p < 0.001	r = 0.32 p < 0.001	r = 0.68 p < 0.001	r = 0.73 p < 0.001	r = 0.81 p < 0.001	1

Table 3. Coefficients, standard deviation, and the value of the correlation index of the research variables(n=466).

Predictors of COVID-19 Preventive Behavior Intention						
Independent Variables	β	Standard Deviation (sd)	Standard Beta	T	P	R ²
Constant	-1.738	0.733	-	3.282	0.018	0.727
Perceived behavioral control	0.604	0.042	0.546	14.295	0.001	
Attitude	0.162	0.038	0.153	4.230	0.001	
Subjective norms	0.210	0.042	0.199	4.969	0.001	
Education level	0.148	0.050	0.074	2.965	0.003	
Knowledge	0.134	0.046	0.077	2.956	0.003	
Predictors of COVID-19 Preventive Behavior						
Independent Variables	β	Standard Deviation (sd)	Standard Beta	T	P	R ²
Constant	4.062	0.708	-	5.734	0.001	0.646
Behavioral intention	0.345	0.046	0.393	7.572	0.001	
Perceived behavioral control	0.215	0.051	0.222	4.260	0.001	
Attitude	0.144	0.039	0.154	3.717	0.001	
Number of family members	0.238	0.087	0.076	2.731	0.007	
Subjective norms	0.104	0.043	0.112	2.404	0.017	

Table 2 presents the mean, standard deviation, and correlation matrix of the constructs of the theory of planned behavior. The mean scores of behavior (22.37 ± 3.22), and then attitude (21.53 ± 3.45), and behavioral intention (21.53 ± 3.67) were higher than other constructs. Analysis of data obtained from the correlation coefficient table indicated a significant correlation between preventive behaviors with attitude (p < 0.001, r = 0.65), subjective norms (p < 0.001, r = 0.67), perceived behavioral control (p < 0.001, r = 0.72), and behavioral intention (p < 0.001, r = 0.76). The strongest correlation was observed between behavioral intention and preventive behaviors in terms of behavior, and between behavioral intention and perceived behavioral control in terms of constructs (Table 2).

In regression analysis by the forward method, the variables, namely attitude, subjective norms, perceived behavioral control, knowledge, and education level remained as predictors of COVID-19 preventive behaviors in the final model. Based on the findings of the regression analysis table, the variables could predict 72.7% of the variance of preventive behaviors intention. Among them, the perceived behavioral control construct (p < 0.001, β = 0.546) was the strongest

predictor (Table 3). Furthermore, the attitude, subjective norms, perceived behavioral control, behavioral intention, and the number of family members remained as predictors of COVID-19 preventive behaviors in the final model. Based on the findings of the regression analysis table, the variables could predict 64.6% of the variance of preventive behaviors. Among them, the behavioral intention construct (p < 0.001, β = 0.393) was the strongest predictor (Table 3).

4. DISCUSSION

The present study aimed to determine the predictors of intention and COVID-19 preventive behaviors using the theory of planned behavior in the urban population of Urmia. The results indicated that the mean score of preventive behaviors was high, and it was consistent with the results of other studies [19, 21, 22]. For instance, Khazaee reported desired mean scores of COVID-19 preventive behaviors among people in Mazandaran province [19]. Delshad reported high mean scores of the behaviors [21], and finally, Fallahi reported high mean scores of COVID-19 preventive behaviors among the residents of Sabzevar [22]. High levels of preventive behavior in the population were probably due to the high prevalence of

COVID-19 in the world, Iran, and especially Urmia, and the high number of hospitalizations and deaths in a short time. The mean scores of knowledge in the participants indicated moderate and increasing knowledge in the majority of individuals, and the result was consistent with the results of other studies so that more than half of people had a high perceived knowledge [19, 22]. Extensive media coverage and the creation of various campaigns to raise knowledge, and the sensitization of people to take preventive behaviors seem to play important roles.

Based on the findings of the present study, the attitude had a positive, direct, and significant effect on the adoption of preventive behaviors of COVID-19. Attitude is assessed as a belief about the outcome of health-related behavior that is weighted based on the value of the results. The more people believe in the usefulness and wisdom of preventive behaviors, the more they will be inclined to follow such advice. This indicates the importance of understanding the usefulness and effectiveness of preventive behaviors in combating COVID-19. The more people are aware of the benefits of preventive measures, the better prepared they are to perform these activities, and the more likely they are to adopt the behaviors. People usually do not have a positive attitude towards activity and do not change their behavior until they receive an advantage from doing an activity. In other words, if people believe that observing social distancing and other COVID-19 preventative behaviors can reduce the risk of getting sick, or have social benefits such as lower treatment and country costs, and preventing the epidemic of this disease, they will have a positive attitude towards this behavior, and they will probably do it more. This finding is consistent with the results of research by Yazdanpanah, Hartley, Haung, Jacob, and Irfan [23 - 27]. For instance, in Yazdanpanah's study to analyze preventive behaviors against coronavirus in rural areas of Dashtestan city, there was a positive and significant correlation between attitude and preventive behaviors [23]. In a study by Irfan to assess the tendency of the general population to use masks during the COVID-19 epidemic in China, the attitude had a positive effect on individuals' willingness to wear masks, and people who were fully familiar with COVID-19 were more inclined to wear masks [27].

In addition to attitude, the subjective norm also had a positive, direct, and significant effect on the adoption of COVID-19 preventive behaviors. The subjective norm refers to the social pressures perceived by individuals, and the expectations of important people in life such as relatives, family, and friends. The higher the expectations of these people about performing preventive behaviors by other people, or the more they approve of preventive behaviors, the more their willingness to follow the recommendations will increase. This finding is consistent with the results of research by Aschwanden, Hagger, Yazdanpanah, Sun, Gabriel, and Gerend [12, 13, 23, 28 - 30]. In Sun's study to predict the intention of masking behavior using the theory of planned behavior in China, subjective norms had a significant relationship with masking behavior among students [28]. In Aschwanden's study to investigate preventive behaviors in the COVID-19 epidemic in the United States, subjective norms had a significant relationship with preventive behaviors [12]. The finding was

also inconsistent with studies by Jacob and Trifiletti who found that subjective norms did not affect individuals' intention to take preventive measures [26, 31]. The inconsistency could be due to the completion of the questionnaire at two stages, and as a result, the loss of a large part of the sample size during the process, and also the study of a low number of preventive behaviors. Since learning from friends and relatives, the mass media, social networks, and health officials and experts about COVID-19 and ways to combat it positively predict preventative behavior, the policies and programs of the Ministry of Health encouraging people to engage in preventative behaviors can include education through mass media, social media, posters, and banners. Furthermore, if such programs are maintained and increased at regular intervals, the individuals will become emotional due to the constant exposure to the announcement or reminders of these programs, and thus preventive behavior will increase.

Results of the present study indicated that perceived behavioral control had a positive, direct, and significant effect on COVID-19 preventive behavior. The more people feel motivated, capable, and hoping to succeed in fighting COVID-19, the more they show individual health behaviors and vice versa. The simpler and more feasible people consider preventative behaviors, the more likely they are to perform these behaviors. This finding is consistent with the results of studies by Aschwanden and Sun [12, 28]. In Aschwanden's study, the perceived behavioral control construct had a significant relationship with preventive behaviors [12]. The results of Sun's study indicated that perceived behavioral control had a positive effect on the intention of masking behavior [28].

Based on the results, the individuals' intentions also had a positive, direct, and significant effect on behavior. The more people like to follow health advice or plan for it, the more the occurrence of preventive behaviors will increase. The results of a study by Yazdanpanah *et al.* indicated that the intention construct had a positive effect on behavior [23]. The finding was also consistent with the results of Jacob's study [26].

According to the results of regression analysis, the constructs of planned behavior theory could predict 65% of the variance of COVID-19 preventive behaviors, and 73% of the variance of COVID-19 preventive behaviors intention. Among the constructs, the behavioral intention was the strongest predictor of COVID-19 preventive behaviors and perceived behavioral control was the strongest predictor of COVID-19 preventive behaviors intention. The finding was consistent with the results of Hagger's study on the prediction of intention and social distance behavior, indicating that the intention construct was a potential predictor of social distancing [13]. In Aschwanden's study, perceived behavioral control was the strongest predictor of COVID-19 preventive behaviors intention [12], but the results of Sun's study indicated that the subjective norm was the strongest predictor of mask-wearing intention [28]. In Thoma's study on the predictors of COVID-19 preventive behavior, perceived behavioral control was the strongest predictor [16]. The inconsistency might be due to differences in measurement tools and demographic diversity.

The study of both sexual groups and all age groups in Urmia, a red city of West Azerbaijan province with a high prevalence of COVID-19, was a strength of the present study. The research limitations included the self-report nature and online completion of the questionnaire which affected the data reliability. To resolve the problem, an option was considered in designing the questionnaire to allow the user to complete the online form only once with an ID. Due to a large number of questions, the participants might answer the questions carelessly. To reduce this error, an option was enabled to record only the data of those who answered all the questions. Since only people with smartphones and the Internet could complete the forms, other people's chances of completion were lost. It is suggested that other theories of behavior change, such as the Precede-Proceed model, and the model of stages of change should be examined for COVID-19 preventive behaviors. Finally, the dimensions with the strongest predictive power should be combined, and a practical and comprehensive model should be designed and implemented for health planning and interventions to prevent COVID-19.

CONCLUSION

Considering the strong prediction of performing COVID-19 preventive behaviors based on the theory of planned behavior, this theory can be used in educational planning and intervention techniques with an emphasis on the behavioral intention construct to change attitudes, intentions, and behavior in citizens.

LIST OF ABBREVIATIONS

TPB	=	Theory of Planned Behavior
CVR	=	Content Validity Ratio
CVI	=	Content Validity Index

AUTHORS' CONTRIBUTIONS

All authors contributed in conceive and designing this study. AD, MM, SGh, and HKh contributed to the design and implementation of the research, the analysis of the results, and the writing of the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study protocol was reviewed and approved by the ethical committee of Urmia University of Medical Sciences (approved No = IR.UMSU.REC.1400.071). All methods were carried out in accordance with relevant guidelines and regulations.

HUMAN AND ANIMAL RIGHTS

No animals were used in this research. All procedures performed in studies involving human participants were according to the ethical standards of institutional and/or research committees and with the 1975 Declaration of Helsinki, as revised in 2013.

CONSENT FOR PUBLICATION

Informed consent was obtained from all participants and if participants are under 16, from a parent and/or legal guardian.

AVAILABILITY OF DATA AND MATERIALS

The datasets generated during and/or analyzed during the current study are not publicly available due to the confidentiality of data and subsequent research but are available from the corresponding author at reasonable request.

STANDARDS OF REPORTING

STROBE Guidelines were followed in this study.

FUNDING

None.

CONFLICT OF INTEREST

None of the authors have any conflict of interest financial or otherwise.

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REFERENCES

- [1] Fesseha H, Fesseha Y. Corona Virus Disease-2019 (COVID-19)-An Insight on Treatment Options and Prevention Protocol. *J Comm Med Pub Health Rep* 2020; 1 (1). [http://dx.doi.org/10.38207/JCMPUR20208.]
- [2] WHO. World health organization novel coronavirus (COVID-19) Information and Alerts-Worldometer. 2021. Available From: www.worldometers.info/coronavirus
- [3] Tavakoli A, Vahdat K, Keshavarz M. Novel coronavirus disease 2019 (COVID-19): An emerging infectious disease in the 21st century. *Iranian South Medical Journal* 2020; 22(6): 432-50. [http://dx.doi.org/10.29252/ismj.22.6.432]
- [4] Wouters OJ, Shadlen KC, Salcher-Konrad M, et al. Challenges in ensuring global access to COVID-19 vaccines: production, affordability, allocation, and deployment. *Lancet* 2021; 397(10278): 1023-34. [http://dx.doi.org/10.1016/S0140-6736(21)00306-8] [PMID: 33587887]
- [5] Gostin LO, Karim SA, Meier BM. Facilitating access to a COVID-19 vaccine through global health law. *J Law Med Ethics* 2020; 48(3): 622-6. [http://dx.doi.org/10.1177/1073110520958892] [PMID: 33021168]
- [6] Omidvar S, Firouzbakht M. Acceptance of COVID-19 vaccine and determinant factors in the Iranian population: A web-based study. *BMC Health Serv Res* 2022; 22(1): 652. [http://dx.doi.org/10.1186/s12913-022-07948-w] [PMID: 35578251]
- [7] Farnoosh G, Alishiri G, Hosseini Zijoud SR, Dorostkar R, Jalali Farahani A. Understanding the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease (COVID-19) based on available evidence-a narrative review. *J Mil Med* 2020; 22(1): 1-11.
- [8] Hamilton K, Smith SR, Keech JJ, Moyers SA, Hagger MS. Application of the health action process approach to social distancing behavior during COVID-19. *Appl Psychol Health Well-Being* 2020; 12(4): 1244-69. [http://dx.doi.org/10.1111/aphw.12231] [PMID: 33006814]
- [9] Chang KC, Strong C, Pakpour AH, Griffiths MD, Lin CY. Factors related to preventive COVID-19 infection behaviors among people with mental illness. *J Formos Med Assoc* 2020; 119(12): 1772-80. [http://dx.doi.org/10.1016/j.jfma.2020.07.032] [PMID: 32773260]
- [10] Niu Z, Wang T, Hu P, Mei J, Tang Z. Chinese public's engagement in preventive and intervening health behaviors during the early breakout of COVID-19: cross-sectional study. *J Med Internet Res* 2020; 22(8): e19995.

- [11] [http://dx.doi.org/10.2196/19995] [PMID: 32716897]
Li J, Liu X, Zou Y, *et al.* Factors affecting COVID-19 preventive behaviors among university students in Beijing, China: An empirical study based on the extended theory of planned behavior. *Int J Environ Res Public Health* 2021; 18(13): 7009.
- [12] [http://dx.doi.org/10.3390/ijerph18137009] [PMID: 34209072]
Aschwanden D, Strickhouser JE, Sesker AA, *et al.* Preventive behaviors during the COVID-19 pandemic: Associations with perceived behavioral control, attitudes, and subjective norm. *Front Public Health* 2021; 9(492): 662835.
- [13] [http://dx.doi.org/10.3389/fpubh.2021.662835] [PMID: 34026716]
Hagger MS, Smith SR, Keech JJ, Moyers SA, Hamilton K. Predicting social distancing intention and behavior during the COVID-19 pandemic: An integrated social cognition model. *Ann Behav Med* 2020; 54(10): 713-27.
- [14] [http://dx.doi.org/10.1093/abm/kaa073] [PMID: 32914831]
Yanti B, Wahyudi E, Wahiduddin W, *et al.* Community knowledge, attitudes, and behavior towards social distancing policy as prevention transmission of COVID-19 in Indonesia. *J Admin Kesehatan Indonesia* 2020; 8(2): 4-14.
- [15] [http://dx.doi.org/10.20473/jaki.v8i2.2020.4-14]
Honarvar B, Lankarani KB, Kharmandar A, *et al.* Knowledge, attitudes, risk perceptions, and practices of adults toward COVID-19: A population and field-based study from Iran. *Int J Public Health* 2020; 65(6): 731-9.
- [16] [http://dx.doi.org/10.1007/s00038-020-01406-2] [PMID: 32583009]
Thoma V, Weiss-Cohen L, Filkuková P, Aytón P. Cognitive predictors of precautionary behavior during the COVID-19 pandemic. *Front Psychol* 2021; 12(325): 589800.
- [17] [http://dx.doi.org/10.3389/fpsyg.2021.589800] [PMID: 33732179]
Godbersen H, Hofmann LA, Ruiz-Fernández S. How people evaluate anti-corona measures for their social spheres: Attitude, subjective norm, and perceived behavioral control. *Front Psychol* 2020; 11(2851): 567405.
- [18] [http://dx.doi.org/10.3389/fpsyg.2020.567405] [PMID: 33281669]
Mehri A, Sedighi Somea Koochak Z. Application and comparison of the theories of health belief model and planned behavior in determining the predictive factors associated with seat belt use among drivers in Sabzevar. *Indian J Med Educ* 2012; 11(7): 806-18.
- [19] Khazae-Pool M, Shahrivand S, Naghibi SA. Predicting COVID-19 preventive behaviors based on health belief model: An internet-based study in Mazandaran province, Iran. *J Mazandaran Univ Med Sci* 2020; 30(190): 56-66.
- [20] Taghizadeh Z, Ebadi A, Montazeri A, Shahvari Z, Tavousi M, Bagherzadeh R. Psychometric properties of health related measures. Part 1: Translation, development, and content and face validity. *Payesh* 2017; 16(3): 343-57.
- [21] Delshad Noghabi A, Youshany N, Mohammadzadeh F, Javanbakht S. Predictors of COVID-19 Preventive Behaviors in Iranian Population over 15 Years Old: An Application of Health Belief Model. *J Mazandaran Univ Med Sci* 2020; 30(191): 13-21.
- [22] Fallahi A, Mahdaviifar N, Ghorbani A, Mehrdadian P, Mehri A, Joveini H, *et al.* Public knowledge, attitude and practice regarding home quarantine to prevent COVID-19 in Sabzevar city, Iran. *Journal Mil Med* 2020; 22(6): 580-8.
- [23] Yazdanpanah M TM, Zobeidi T. Analysis of preventive behavior against coronavirus: Rural areas of Dashtestan city. *Quarterly J Space Econ Rur Develop* 2020; 9(3): 2131-322.
- [24] Hartley EM, Hoch MC, Cramer RJ. Health belief model and theory of planned behavior: A theoretical approach for enhancing lower extremity injury prevention program participation. *Int J Athl Ther Train* 2018; 23(1): 16-20.
- [25] [http://dx.doi.org/10.1123/ijatt.2017-0016]
Huang X, Dai S, Xu H. Predicting tourists' health risk preventative behaviour and travelling satisfaction in Tibet: Combining the theory of planned behaviour and health belief model. *Tour Manag Perspect* 2020; 33: 100589.
- [26] [http://dx.doi.org/10.1016/j.tmp.2019.100589]
Jacob J, Valois P, Aenishaenslin C, *et al.* Factors leading municipal authorities to implement preventive interventions for Lyme disease. *Int J Environ Res Public Health* 2019; 16(9): 1547.
- [27] [http://dx.doi.org/10.3390/ijerph16091547] [PMID: 31052452]
Irfan M, Akhtar N, Ahmad M, *et al.* Assessing public willingness to wear face masks during the COVID-19 pandemic: Fresh insights from the theory of planned behavior. *Int J Environ Res Public Health* 2021; 18(9): 4577.
- [28] [http://dx.doi.org/10.3390/ijerph18094577] [PMID: 33925929]
Sun Y, Qin B, Hu Z, *et al.* Predicting mask-wearing behavior intention among international students during COVID-19 based on the theory of planned behavior. *Ann Palliat Med* 2021; 10(4): 3633-47.
- [29] [http://dx.doi.org/10.21037/apm-20-2242] [PMID: 33615807]
Gabriel EH, Hoch MC, Cramer RJ. Health Belief Model Scale and Theory of Planned Behavior Scale to assess attitudes and perceptions of injury prevention program participation: An exploratory factor analysis. *J Sci Med Sport* 2019; 22(5): 544-9.
- [30] [http://dx.doi.org/10.1016/j.jsams.2018.11.004] [PMID: 30501955]
Gerend MA, Shepherd JE. Predicting human papillomavirus vaccine uptake in young adult women: Comparing the health belief model and theory of planned behavior. *Ann Behav Med* 2012; 44(2): 171-80.
- [31] [http://dx.doi.org/10.1007/s12160-012-9366-5] [PMID: 22547155]
Trifiletti E, Shamloo SE, Faccini M, Zaka A. Psychological predictors of protective behaviours during the COVID-19 pandemic: Theory of planned behaviour and risk perception. *J Community Appl Soc Psychol* 2022; 32(3): 382-97. [PMID: 33967569]