

## RESEARCH ARTICLE

# The prevalence of preventive behaviors and associated factors during the early phase of the COVID-19 pandemic among Iranian People: Application of a Health Belief Model

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## Keywords

Coronavirus disease 2019 • Preventive behaviors • Health belief model • Cross-sectional • Iran

## Summary

**Introduction.** Coronavirus disease 2019 (COVID-19) has developed into a severe public health concern. The present study was aimed to evaluate the related preventive behaviors to COVID-19, and associated factors among Iranians based on the constructs of the Health Belief Model (HBM).

**Methods.** This cross-sectional study was conducted between March and April 2020 among Iranians. Data of 1,020 people were collected by a self-administered questionnaire based on the constructs of HBM and also a demographics questionnaire. Simple and multivariable linear regression models were used to determine the predictors of preventive behaviors concerning COVID-19. A P-value of less than 0.05 was considered significant.

**Results.** The mean score of preventive behaviors concerning COVID-19 was 4.27 (standard deviation = 0.60). 40.6% (95% CI: 38.6-43.7%), and 56.5% (95% CI: 53.4-59.5%) of the participants exhibited a high, and moderate level of preventive behaviors, respectively.

75.1% of the participants would always/often wear face masks out home or in crowded places. The most common preventive behaviors were using of personal belongings in the workplace or at home (96.1%) and staying at home except for very necessary or for work (92.9%). Results showed that all six HBM constructs, i.e., perceived susceptibility ( $B = 0.07, P < 0.001$ ), perceived severity ( $B = 0.08, P < 0.001$ ), perceived benefits ( $B = 0.25, P < 0.001$ ), perceived barriers ( $B = -0.12, P = 0.001$ ), cues to action ( $B = 0.07, P < 0.001$ ), and self-efficacy ( $B = 0.26, P < 0.001$ ) were significant predictors of related preventive behaviors to COVID-19. Female gender was another predictor of preventive behaviors ( $B = 0.18, P < 0.001$ ).

**Conclusions.** This study demonstrated the effectiveness of HBM constructs in predicting COVID-19 preventive behaviors. Therefore, the model as a framework for designing training programs for improving health behaviors among Iranians during the COVID-19 pandemic seems to be helpful.

## Introduction

Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) is a novel member of the Coronavirus family. It may affect humans by developing multiple symptoms such as pneumonia, fever, trouble breathing, and lung infection [1]. The virus was first observed in December 2019 in Wuhan, China, and has been officially named as coronavirus disease 2019 (COVID-19) by the World Health Organization (WHO) [2]. According to the WHO announcement, by 12 May 2020, more than 4 million positive cases had affected 215 countries, regions or regions, and 285,000 deaths were reported [3]. The possible ways for transmission of SARS-CoV-2 are droplets from the patient's mouth or nose, contact, contaminated surfaces (fomites), and the fecal-oral route [4, 5]. Currently, there is no vaccination or effective antiviral therapy for the COVID-19. Therefore, personal hygiene behaviors such as wearing face masks, hand hygiene, and social distancing, which is proven are

effective in infection control [6, 7], is the best way to minimize the risk of transmitting the disease.

Health education interventions that supported by theory-based research could be helpful during the COVID-19 pandemic to motivate people to engage in preventive behaviors. The health belief model (HBM) is a conceptual model that is widely applied to explain and predict preventive health behaviors [8]. According to this model, people need to feel a real risk (perceived susceptibility) and also to have an extensive perception of the risk depth and seriousness of it (perceived severity) to adopt preventive behaviors. Also, when they feel that trying to change their behavior has many benefits (perceived benefits) and can overcome barriers to healthy behaviors (perceived barriers), there is more possibility that they are inclined to admit them. Moreover, the confidence level of a person from his/her capacity to perform a behavior (self-efficacy) is an influencing factor that can lead one toward that. Cues to action, such as advice from others, are another stimulus to decide to admit a health recommendation [9].

Exploring the prevalence of preventive behaviors and associated factors during a pandemic can help officials promote public health measures that improve the health behaviors rate in the general population. This study was aimed to evaluate the related preventive behaviors to COVID-19 and associated factors among Iranians based on the constructs of HBM.

## Methods

### STUDY DESIGN, PARTICIPANTS, AND SAMPLING STRATEGY

This was a cross-sectional study that was conducted on Iranian people. Subjects were selected by convenience sampling between March and April 2020, by sending an invitation along with the web page link of the online questionnaires through social networks (such as WhatsApp and Telegram). The inclusion criteria were the willingness to participate in the study, living in Iran, and the age of 15 years old or older. The sample size was determined as 1,004 individuals assume a small effect size of 0.11, 90% power, and a 95% confidence interval (CI), and a possible loss rate of 10%.

### MEASURES

#### *Demographic*

The demographic questionnaire included several items about age, gender, educational level, marital status, income, underlying medical condition, physical exercise, and smoking.

#### *The HBM-based scale*

The HBM scale was designed based on six constructs based on the Likert scale, including perceived susceptibility, perceived severity, perceived benefit, perceived barrier, cues to action, and self-efficacy [10, 11]. The mean score was obtained for all subscales of the HBM scale by summing the answers and then dividing by the number of items. The mean scores of each subscale were also categorized into none/very low, low, moderate, and high based on the quartiles of the distribution of the scores. Further details of the HBM subscales were as follows:

- Perceived susceptibility toward COVID-19. It was measured by six items (e.g., “There is a possibility that I will be infected with COVID-19” based on a 7-point Likert scale (1 = “strongly disagree”, 2 = “disagree”, 3 = “somewhat disagree”, 4 = “neither agree nor disagree”, 5 = “somewhat agree”, 6 = “agree”, 7 = “strongly agree”). Three negative items were rated in reverse. A higher total score would represent higher perceived susceptibility to COVID-19 by respondents.
- Perceived severity toward COVID-19. Eight items were designed to measure perceived severity toward COVID-19 (e.g., “COVID 19 may lead to me be hospitalized”) based on 7-point Likert scales (1 as “strongly disagree” to 7 as

“strongly agree”). Higher scores would represent that respondents perceive more severe adverse consequences of COVID-19.

- Perceived benefits of related preventive behaviors to COVID-19. Twelve items (e.g., “I could prevent COVID-19 by wearing facemasks in busy environments”) were designed to indicate the degree of agreement of the benefits of preventive behaviors in preventing contracting and spreading COVID-19 based on a 7-point Likert scale (1 as “strongly disagree” to 7 as “strongly agree”). Higher scores would indicate that respondents perceive more benefits in related preventive behaviors to COVID-19.
- Perceived barriers of related preventive behaviors to COVID-19. Respondents were asked to rate the degree of difficulties in performing relate the preventive behaviors to COVID-19 based on a 7-point Likert scale (1 as “strongly disagree” to 7 as “strongly agree”). To this purpose, twelve items (e.g., “Face mask use makes me feel suffocated”) were designed. Higher scores of these items indicate respondents perceive more barriers in performing related preventive behaviors to COVID-19.
- Cues to action in preventive behaviors to COVID-19. It was measured by five items (e.g., “I have watched programs about COVID-19 on various TV channels”) based on a 5-point Likert scale (1 as “strongly disagree” to 5 as “strongly agree”). A higher score would represent more cues to perform relate preventive behaviors to COVID-19.
- Perceived self-efficacy in performing related preventive behaviors to COVID-19. Twelve items (e.g., “I can prevent COVID-19 by following health principles”) were designed to indicate the degree of self-efficacy in performing related preventive behaviors to COVID-19 based on a 5-point Likert scale (1 as “strongly disagree” to 5 as “strongly agree”). Higher scores would suggest more self-efficacy.

#### *The scale of preventive behaviors concerning COVID-19*

Twelve items were designed to measure preventive behaviors related to COVID-19 (e.g., “I wear a face mask when I leave home or in crowded places”). These items rated based on a 5-point Likert scale (1 = “never”, 2 = “rarely”, 3 = “sometimes”, 4 = “often”, and 5 = “always”). The answers were then summed and divided by the numbers of items to obtain the mean score and then categorized into none/very low, low, moderate, and high level based on the quartiles of the response distribution. Higher scores would suggest more performing preventive behaviors concerning COVID-19.

#### *Validity and reliability of the scales*

The content validity of the scales was assessed using the content validity ratio (CVR), and content validity index (CVI) based on the opinions of a team of experts

consisting of seven health education and promotion specialists and three infectious disease specialists. The last version of the scales was completed by adding experts' suggestions. The reliability of the scales was measured using Chronbach's alpha coefficient based on a pilot sample of 30 participants. For the HBM model constructs the Chronbach's alpha were as follows: perceived susceptibility ( $\alpha = 0.66$ ); perceived severity ( $\alpha = 0.74$ ), perceived benefit ( $\alpha = 0.92$ ), perceived barrier ( $\alpha = 0.79$ ), cues to action ( $\alpha = 0.92$ ), and perceived self-efficacy ( $\alpha = 0.92$ ). Chronbach's alpha for the scale of preventive behavior concerning the COVID-19 was 0.89.

### ETHICAL CONSIDERATIONS

Study approval was obtained from the Ethics Committee of the Gonabad University of Medical Sciences (Ethical Code No: IR.GMU.REC.1399.002). The relevant descriptions of the research and its objectives were inserted at the outset of the online questionnaire. All participants completed the electronic questionnaires anonymously and with informed consent.

### STATISTICAL ANALYSIS

Statistical analyses in this study were conducted using SPSS 16.0 software. Descriptive statistics for individual characteristics, the HBM constructs, and the preventive behaviors of respondents were generated using frequency (percent) for qualitative variables and mean [standard deviation (SD)] for quantitative variables. Univariate analysis was conducted by simple linear regression and variables with  $P < 0.15$  were entered into a multivariable linear regression. We considered this selection criterion to avoid missing the variables that are not quite significant in the univariable model but may gain significance in a multivariable model by taking into account other variables [12, 13]. The multivariable linear regression model was used to investigate the efficacy of HBM in predicting related preventive behaviors to COVID-19 by controlling the effects of individuals' characteristics. A  $P < 0.05$  was considered significant in the multivariable linear regression.

## Results

### INDIVIDUAL CHARACTERISTIC OF THE PARTICIPANT

A total of 1020 Iranian people participated in the study. The mean age of the participants was 38.5 (SD = 12.7), varying between 16 and 75 years old. Other characteristics of the participant have shown in Table I.

### PREVENTIVE BEHAVIORS CONCERNING COVID-19

The mean score of preventive behaviors concerning COVID-19 was 4.27 (SD = 0.60). 40.6% (95% CI: 38.6-43.7%), and 56.5% (95% CI: 53.4-59.5%) of the participants exhibited a high, and moderate level of preventive behaviors, respectively. Table II summarizes the prevalence of related preventive behaviors to

COVID-19 among respondents. Overall, 75.1% of the participants would always/often wear face masks when leaving home or in crowded places to prevent contracting and spreading COVID-19. The most common preventive behaviors were using of personal belongings in the workplace or at home (96.1%) and staying at home except for very necessary or for work (92.9%).

### TESTING THE HEALTH BELIEF MODEL

The mean score of the HBM constructs have shown in Table III. Perceived susceptibility, perceived benefits, and cues to action scores of most of the respondents were at a moderate or high level. The self-efficacy of most of the respondents about COVID-19 was at a high level. In comparison, perceived barriers scores of most of the respondents were at a very low or low level. The most common obstacles in performing preventive behaviors during COVID-19 were dryness, or soreness of the hand skin in case of repeated washing (74.2%), fake, rare, or costly disinfectants such as alcohol (72.4%), sweating the hands due to wearing gloves (53.4%), and the sensation of suffocation when using face masks (46.1%). Individual factors of gender, age, educational level, marital status, smoking, and physical exercise level had a  $P < 0.15$  in the simple linear regression, and therefore entered multivariable linear regression model to control for their effects.

Tab. 1. Characteristics of the participants.

Variable	N.	%
<b>Gender</b>		
Female	606	59.4
Male	414	40.6
<b>Educational level</b>		
High school or less	240	23.5
College	780	76.5
<b>Marital status</b>		
Married	718	70.4
Single/ divorced/ widowed	302	29.6
<b>Income</b>		
Low	176	17.3
Moderate	764	74.9
Good	80	7.8
<b>Occupation</b>		
Employee	370	36.3
Student	182	17.8
Retired	120	11.8
Housewife	163	16.5
Other	180	17.6
<b>Underlying medical condition</b>		
Yes	144	14.1
No	876	85.9
<b>Smoking cigarettes/hookah</b>		
Yes	138	13.5
No	882	86.5
<b>Physical exercise level</b>		
None/mild	692	67.8
Moderate and higher	328	32.2

**Tab. II.** Frequency distribution of preventive behaviors during the COVID-19 pandemic.

Preventive behaviors	Never/rarely	Sometimes	Often	Always
	N (%)	N (%)	N (%)	N (%)
1. I wear a mask when I leave home and in crowded places	116 (11.3)	138 (13.5)	364 (35.7)	402 (39.4)
2. I regularly disinfect items such as mobile phones, tablets, keyboards, etc	22 (2.1)	118 (11.6)	380 (37.3)	500 (49.0)
3. I use my personal belongings at work or home	20 (2.0)	20 (2.0)	126 (12.4)	854 (83.7)
4. I heat the bread before eating it	82 (8.0)	104 (10.2)	342 (33.5)	492 (48.2)
5. I hold as far as possible a distance of at least two meters from other people	82 (8.0)	204 (20.0)	326 (32.0)	408 (40.0)
6. I wash my hands at least 20 seconds with soap and water	48 (4.7)	104 (10.2)	290 (28.4)	578 (56.7)
7. I avoid eating uncooked foods, and I cook them well to ensure their health	28 (2.8)	106 (10.4)	322 (31.6)	564 (55.3)
8. I wear gloves when I go out	116 (11.3)	142 (13.9)	382 (37.5)	380 (37.3)
9. I regularly disinfect all of the house's handles and surfaces	60 (5.9)	194 (19.0)	386 (37.8)	380 (37.3)
10. I'm not going to meet relatives' homes to prevent the spread of COVID-19	68 (6.7)	86 (8.4)	324 (31.8)	542 (53.1)
11. As much as possible, I leave home only in very necessary or for work	24 (2.4)	48 (4.7)	258 (25.4)	690 (67.6)
12. Before consumption, I wash and disinfect fruits and vegetables	48 (4.7)	92 (9.0)	310 (30.4)	570 (55.9)

**Tab. III.** Mean, standard deviation, and level of HBM constructs during the COVID-19 pandemic.

Variables	Mean (SD)	Level, n (%)		
		Very low/Low	Moderate	High
Perceived susceptibility	5.16 (0.86)	128 (12.6)	746 (73.1)	146 (14.3)
Perceived severity	4.03 (1.09)	544 (53.3)	428 (42.0)	48 (4.7)
Perceived benefits	5.93 (0.80)	24 (2.4)	522 (51.1)	474 (46.5)
Perceived barriers	3.36 (1.01)	758 (74.3)	250 (24.5)	12 (1.2)
Self-efficacy	4.61 (0.53)	16(1.6)	286 (28.0)	718 (70.4)
Cues to action	3.56 (0.81)	300 (29.4)	584 (57.3)	136 (13.3)

SD: Standard Deviation.

The results of multivariable linear regression showed that all the six HBM constructs were statistically significant in the prediction of COVID-19 associated preventive behaviors, after controlling the effects of individual characteristics. In summary, perceived susceptibility ( $B = 0.07, P < 0.001$ ), perceived severity ( $B = 0.08, P < 0.001$ ), perceived benefits ( $B = 0.25, P < 0.001$ ), perceived barriers ( $B = -0.12, P = 0.001$ ),

cues to action ( $B = 0.07, P < 0.001$ ), and self-efficacy ( $B = 0.26, P < 0.001$ ) were significant predictors of related preventive behaviors to COVID-19. Also, the results showed that respondents with gender female ( $B = 0.19, P < 0.001$ ) would more obey preventative behaviors (Tab. IV). The multivariable linear model's adjusted R-squared coefficient value was 0.511. In other words, 51.1% of the preventive behavior variation was

**Tab. IV.** Associated factors with preventive behaviors during the COVID-19 outbreak based on HBM constructs and individual characteristics.

Predictors	Simple linear regression					Multiple linear regression				
	B	Beta	SE	t	P	B	Beta	SE	t	P
Age	0.005	0.10	0.001	3.24	0.001 <sup>+</sup>	0.001	0.03	0.001	1.22	0.222
Gender: female <sup>a</sup>	0.33	0.27	0.04	8.78	< 0.001 <sup>+</sup>	0.18	0.15	0.03	6.22	< 0.001
Educational level: college <sup>b</sup>	0.15	0.11	0.04	3.36	0.001 <sup>+</sup>	0.05	0.03	0.03	1.58	0.115
Marital status: married <sup>c</sup>	0.18	0.14	0.04	4.37	< 0.001 <sup>+</sup>	-0.05	-0.04	0.03	-1.56	0.119
Smoking cigarettes/hookah: yes <sup>d</sup>	0.25	0.14	0.06	4.57	< 0.001 <sup>+</sup>	-0.04	-0.03	0.04	-1.03	0.303
Physical exercise level: moderate and higher <sup>e</sup>	0.07	0.06	0.04	1.83	0.06 <sup>+</sup>	0.01	0.01	0.03	0.45	0.656
Income: low <sup>f</sup>	0.06	0.04	0.05	1.12	0.265	-	-	-	-	-
Underlying medical condition: yes <sup>d</sup>	0.07	0.04	0.05	1.34	0.180	-	-	-	-	-
Perceived susceptibility	0.16	0.23	0.02	7.63	< 0.001 <sup>+</sup>	0.07	0.10	0.02	4.31	< 0.001
Perceived severity	0.07	0.12	0.02	3.91	< 0.001 <sup>+</sup>	0.08	0.14	0.01	5.78	< 0.001
Perceived benefits	0.44	0.58	0.02	22.58	< 0.001 <sup>+</sup>	0.25	0.33	0.02	11.97	< 0.001
Perceived barriers	-0.24	-0.40	0.02	-13.86	< 0.001 <sup>+</sup>	-0.12	-0.20	0.01	-7.74	< 0.001
Self-efficacy	0.66	0.58	0.03	22.63	< 0.001 <sup>+</sup>	0.26	0.23	0.03	7.68	< 0.001
Cues to action	0.22	0.30	0.02	10.00	< 0.001 <sup>+</sup>	0.07	0.09	0.02	3.64	< 0.001

B: unstandardized coefficient; Beta: standardized coefficient; SE: Standard Error; <sup>+</sup>:  $P < 0.15$ ; <sup>a</sup> reference category: Male; <sup>b</sup> reference category: high school and less; <sup>c</sup> reference category: single/widowed/divorced; <sup>d</sup> reference category: no; <sup>e</sup> reference category: none/mild; <sup>f</sup> reference category: moderate or above.



explained by the multivariable model's independent variables [ $F(12, 1,007) = 89.57, P < 0.001$ ].

## Discussion

This study was aimed to evaluate the preventive behaviours related to COVID-19, and associated factors based on the theoretical framework of HBM among Iranians.

Our findings showed that most of all respondents adopted related preventive behaviors to COVID-19 (e.g., wearing face masks, stay-at-home, and avoiding unnecessary commuting out), which was in line with the results of the study by Kwok et al., in Hong Kong during the early phase of COVID-19 pandemic [14].

The findings of the current study showed the HBM's usefulness in identifying the determinants of related preventive behaviors to COVID-19 among Iranians, which was in line with similar studies. For instance, in one study by Tang et al., on Chinese adults in Hong Kong, during the severe acute respiratory syndrome (SARS) outbreak, the efficiency of the HBM in predicting the practice of face mask-wearing was revealed [15]. Another study by Najimi et al., among Iranian high school students indicated the efficacy of the HBM in improving preventive behaviors of influenza A [9]. Similarly, in one study by Tan et al., the adequacy of HBM for explaining the use of personal protection equipment among family physicians in Singapore during the SARS outbreak was verified [16].

The present study found that the perceived benefits were the first important factor in determining the preventive behaviors linked to COVID-19, which is consistent with the findings of previous similar studies [17-19]. This finding indicates that if people perceive the positive aspects of preventive behaviors in the deal with COVID-19, it is more likely to push them towards changing behaviors and adopting healthy practices in society by reducing the barriers.

The results of our study indicated that raising the level of self-efficacy is a significant factor to have more preventive behaviors. Previous research also reported self-efficacy as an influential element in determining health behaviors [20-22]. People with a higher level of self-efficacy have higher motivation and greater awareness of environmental opportunities. They increase their efforts in the event of a failure [22, 23].

Our findings revealed that perceived barriers have a significant negative correlation with the preventive behaviors related to COVID-19. This result is consistent with the results from the study by Coe et al., which found that people with lower scores on the perceived barriers are more likely to conduct the H1N1 vaccine [24]. In this study, the most common obstacles in performing preventive behaviors during COVID-19 were as follows: dryness or soreness of the hand skin in case of repeated washing, fake, rare, or costly disinfectants such as alcohol, sweating the hands due to wearing gloves, and the sensation of suffocation when using face masks. Therefore, to improve preventive behaviors during

the COVID-19 epidemic, it is necessary to reduce the current barriers and present the appropriate approaches to overcome them. These study results indicated that perceived severity, perceived susceptibility, and cues to action were the next influential factors amongst the HBM's constructs in determining preventive behaviors. A previous study during the early Hong Kong SARS epidemic also showed that perceived susceptibility, perceived benefits, and cues to action were significant predictors of wearing face masks [15]. Similarly, in a study, on a Hispanic population in Northern Manhattan, it is revealed that higher scores of perceived severity concerned with influenza were associated with more usage of face masks [25].

The study results showed that perceived susceptibility, perceived benefits, and self-efficacy of most of the respondents about COVID-19 were at a high level. These suggest that most respondents believed they were at high risk of contracting COVID-19. They were also conscious of the effectiveness of preventive behaviors in preventing COVID-19 from spreading. Moreover, they had a high perceived of their capability to successfully implementation of preventive health behaviors. In comparison, perceived barriers scores of the respondents were at an average level. Thus, reducing the factors that potentially prevent individuals from adopting health behaviors to avoid COVID-19 spread is demanded. Besides, perceived severity and cues to action scores were at average levels. COVID-19 is a novel disease and may be occurred asymptomatic in some cases. Therefore most people may imagine it like simple flu. According to these results, giving more information to people to understand the depth of the risk of COVID-19 through mass media and government is crucial to stimulate individuals to admit health recommendations.

There is some evidence on the associations between individuals' demographic characteristics and their preventive behavioral practices [15, 18, 26]. Based on the results of the present study, women would more obey preventative behaviors.

This study had some limitations. First, it was a web-based survey, and due to the non-random sampling procedure, which was unavoidable to prevent infection with COVID-19, there were concerns concerning the sample representative. Second, self-reported questionnaires in this sample could be a further source of bias. Third, the causal relationships could not be determined due to the cross-sectionalism of the study design.

Notwithstanding, these limitations, this research presented valuable information on influencing factors on the preventive behaviors concerning COVID-19 that could be used to increase the efficacy of interventions against the spread of COVID-19.

In this study, we solely focused on the HBM constructs as potential predictors of COVID-19 preventive behaviors. Psychological factors or emotional responses to COVID-19 could affect health behaviors [15, 27, 28]. Therefore, we suggest further researches to investigate the effect of them in predicting preventive behaviors during COVID-19.

## Conclusions

There were high levels of related preventive behaviors to COVID-19 among the respondents. Women would more obey preventative behaviors. This study provided evidence on the efficacy of HBM in predicting related preventive behaviors to COVID-19 among Iranians.

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## Conflicts of interest statement

The authors declare no conflict of interest.

## Authors' contributions

ADN contributed to the design, concepts of the work, data acquisition, revising the draft, approval of the final version of the manuscript, and agreed for all aspects of the work. FM contributed to the design, analysis, interpretation, drafting and revising the draft, approval of the final version of the manuscript, and agreed for all aspects of the work. NY contributed to the design, concepts of the work, revising the draft, approval of the final version of the manuscript, and agreed for all aspects of the work. SJ contributed to the design, concepts of the work, revising the draft, approval of the final version of the manuscript, and agreed for all aspects of the work.

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