Evaluation of the Preventive Behaviors for COVID-19 Patients and Related Factors based on Health Belief Model of the Residents of North Khorasan Province

T M U

Authors
Mohaddes Hakkak H.[1] *PhD,*
Hashemi S.A.[2] *MD,*
Rajabzadeh R.[3] *PhD,*
Jafari Y.[4] *Msc,*
Hosseini S.H.[5] *Msc,*
Norozi Khalili M.[6] *MD,*
Kaviani F.[6] *Msc,*
Hojjat S.K.*[6] *MD*

[1]Department of Health Education and Health Promotion, School of Health, North Khorasan University of Medical Sciences, Bojnurd, Iran
[2]Department of Infectious Diseases, School of Medicine, North Khorasan University of Medical Sciences, Bojnurd, Iran
[3]Department of Epidemiology, School of Public Health North Khorasan University of Medical Sciences, Bojnurd, Iran
[4]Department of Nutrition and Public Health, School of Public Health, North Khorasan University of Medical Sciences, Bojnurd, Iran
[5]Department of Public Health, School of Public Health, North Khorasan University of Medical Sciences, Bojnurd, Iran
[6]Addiction and Behavioral Sciences Research Center, North Khorasan University of Medical Sciences, Bojnurd, Iran

*Correspondence
Address: Disorders Clinic Ferdowsi, Ibn Sina Hospital, at the beginning of Hor Ameli St., Mashhad, Iran. Postal code: 9185715837.
Phone: +98 (51) 37112721
Fax: +98 (51) 37112721
S.kavehhojjat1@gmail.com

ABSTRACT

Aims Considering that behaviors can be explained based on different theories, one of the most important theories in choosing health behaviors is the Health belief model. Therefore, this study was conducted to determine the preventive behaviors regarding corona disease and its related factors based on the health belief model.

Instrument & Methods The study utilized a cross-sectional study (descriptive-analytical). Web-based sampling methods were used in this study. The sample size was estimated at 2240 samples. Data collection tools included a researcher-made questionnaire. Data were analyzed by Mann-Whitney, Kruskal-Wallis, and Spearman correlation coefficient tests using SPSS 23. Moreover, the coefficient at a significance level less than 0.05.

Findings There was a significant correlation between age with all constructs of the health belief model in terms of preventive behaviors from COVID-19, gender with all constructs except perceived benefits, education with all constructs except the perceived barriers and performance, and occupation with all constructs except perceived sensitivity (p<0.05). There was a statistically significant negative correlation between perceived benefits and perceived barriers and between perceived barriers and performance. There was a positive and significant correlation between performance score with knowledge (p<0.001, r=0.102) and perceived benefits (p<0.001, r=0.066).

Conclusion The results showed that the most source of information for people is social networks and the most trusted source of information is a television program. Variables of age group, education, and occupation had the greatest effect on the constructs of the health belief model, and it is suggested that more attention be paid to the elderly, low-educated people, and non-employed occupational groups.

Keywords Coronavirus; Cross-Sectional Studies; Behavior

CITATION LINKS

[1] A review of novel Coronavirus, cause ... [2] Presumed asymptomatic carrier ... [3] Real-time estimation of the risk of death ... [4] The deadly coronaviruses: The 2003 ... [5] Genomic characterisation and ... [6] Severe acute respiratory syndrome ... [7] Isolation of a novel coronavirus from ... [8] Infection prevention and control ... [9] Is returning to work during the ... [10] Key elements of preparedness for pandemic ... [11] Middle East respiratory syndrome corona ... [12] Community pharmacists and communication ... [13] Health behavior and health education ... [14] A meta-analysis of the effectiveness ... [15] The use of the health belief model to ... [16] Adoption of a contact tracing app for ... [17] Public perception and preparedness ... [18] Principles of health education and ... [19] Web-based network sampling: ... [20] The network investigation on ... [21] Assessing preventive health behaviors from ... [22] Chinese public's knowledge, perceived ... [23] Community responses during the early ... [24] Awareness about Middle East Respiratory ... [25] Banker's awareness of corona ... [26] Increased vaccination coverage among ... [27] Use of mass media campaigns ... [28] Associations between media use ... [29] Social media use, eHealth literacy ... [30] Assessment of Nigerian television ... [31] Internet use, risk awareness, and ... [32] Knowledge of prevention, cause, symptom ... [33] Investigating the relationship between ... [34] The recommended and excessive ... [35] Knowledge and behaviors toward ... [36] Prevalence of intestinal parasitic infections ... [37] Determining the health beliefs and ... [38] Using social media, online social ... [39] Attitudes and behaviors toward ... [40] Health belief model for coronavirus ... [41] Severe outcomes among patients ... [42] HBM model and preventive of ... [43] The Assessing mental Health ... [44] The effect of health education based on health ... [45] The role of exercise in the African ...

Introduction

Feverish respiratory diseases can cause outbreaks or pandemics [1]. As of December 8, 2019, clusters of patients with a severe respiratory infection (pneumonia) due to an unknown microbial agent were reported in Wuhan, China [2-4]. Subsequently, a new coronavirus was identified as the pathogen, temporarily renamed as the new Coronavirus 2019 [5]. On February 11, 2020, the World Health Organization renamed Coronavirus (COVID-19) for the disease-related to new Coronavirus in 2019. Due to the nature of the virus, the International Committee of the Classification of Viruses renamed COVID-19 as the acute respiratory syndrome coronavirus (SARS-CoV-2) [6]. Common clinical symptoms of COVID-19 are fever, cough, shortness of breath, gastrointestinal symptoms, diarrhea, and in more severe cases: pneumonia, and severe acute respiratory syndrome [7]. Adults can transmit the virus before the symptoms begin. These viruses can cause disease at any age. However, the potential for acute illness and mortality is higher among people over the age of 50, immune-deficient patients, and the underlying diseases, such as heart diseases, hypertension, respiratory problems, diabetes, and BMI> 40, so more care must be taken for them [8].

No vaccine or definitive treatment has been found for the disease so far, and the treatments are symptomatic and supportive [9]. Communities around the world have been advised to stay in their homes as much as possible, avoid gatherings, frequently wash their hands or employ other hand hygiene techniques, remain at least 1–2 m away from others ("social distancing"), and avoid touching their faces to avoid or delay transmission of 2019-nCOV. So, without the people's participation and cooperation in observing personal hygiene and preventive principles, we will not control and eliminate it. These guidelines would severely hamper many day-to-day activities if implemented at a high level of fidelity, so voluntary compliance is likely to be uneven at best [10].

Past studies on people's knowledge and practice in emerging respiratory diseases, such as MERS-CoV, show low awareness of this disease [11]. Behaviors can be explained based on different theories; one of the most important theories in choosing health behaviors is the health belief model. It is possible to explain people's choosing or not to choose the preventive behaviors about COVID-19 with this model, and this is one of the most prominent public health frameworks for understanding why individuals may or may not act in the face of a threat to personal or community health [12]. This model has different structures, including perceived severity, perceived sensitivity, perceived benefits, perceived barriers, etc. Understanding the severity of the disease complications (perceived severity) and perceived sensitivity to these complications can lead to adopting a preventive behavior. A person's mental perception of the risk of exposure to health conditions is called perceived sensitivity, and the perceived severity refers to the extent to which the individuals take the disease seriously [13]. Several studies have used this model for behaviors that required modifying a patient's actions to mitigate a threat to health [14]. This model has been used as a guide for patient communication in coronavirus epidemics [12], to assess predictors of intent to receive the COVID-19 vaccine and willingness to pay [15], Adoption of a Contact Tracing App for Containing COVID-19 [16], and to assess public perception and preparedness for the pandemic COVID 19 [17] And This model had good predictive power in the mentioned studies.

Moderate levels of perceived severity and sensitivity facilitate the preventive behaviors [18], but further studies are needed to elucidate the impact of these and other Health Belief Model structures on health behaviors. Considering the epidemic of this disease in the whole world and its prevalence in Iran, North Khorasan province, like other parts of the country, is not exempt from this rule, and the new 2019 virus has also spread in this province. Therefore, to prevent the higher prevalence of this disease and make fewer complications, considering that no research has been done on this disease in this province, this study aimed at preventive behaviors for COVID-19 and its related factors, based on the health belief model.

Instrument and Methods

This cross-sectional (descriptive-analytical) study was conducted in April-July 2020 in North Khorasan province, Iran. Due to the decrease in the community's presence and the impossibility of direct access to the subjects, a web-based network sampling method was used. Due to the online nature of the study, the Chains of participants was progressing rapidly, so the studies with large samples were expected to be up to 20 times faster than the traditional sampling methods [19]. Due to the emergence of the disease, according to a study conducted in China [20], the commitment to preventive behavior in people was 98%, with a 95% confidence level and an error level of 0.01, the sample size was estimated at 753 samples, but within ten days, 2242 They answered the questions completely. The study's inclusion criteria were 10 years and older, the ability to answer the questions electronically, and residence in North Khorasan province. The participants who did not answer more than 70% of the questions were excluded from the study.

To collect the data, a questionnaire consisting of two parts was used: The first part includes demographic

information, such as age, gender, education, methods of obtaining health information, reliable sources of information, etc., which is a total of 13 questions. The second part was a researcher-made questionnaire based on the constructs of the health belief model, including knowledge (7 questions), performance (6 questions), perceived sensitivity (8 questions), perceived intensity (5 questions), perceived benefits (6 questions), and perceived obstacles (7 questions). The score of each dimension was equal to 100. According to the National Guide to Corona Care published by the Ministry of Health, the questionnaire was designed, but the steps related to its validity and reliability were examined in this study. To assess the validity of the questionnaire, 10 experts in this field participated, and their opinions were applied in the questionnaire. To measure the reliability of the questionnaire, Cronbach's alpha coefficient was used to measure the internal consistency, and Cronbach's alpha was 0.86.

An ethics code was obtained from the Research Ethics Committee of the Vice Chancellor for Research and Technology of North Khorasan University of Medical Sciences (IR.NKUMS.REC.1399.002). In order to encourage people to participate in the study, at first, while introducing the objective of the study and asking people to participate in the study, it was mentioned that at the end, Beck Anxiety Inventory and its interpretation were placed, and the feedback would be given to the participant in the study. The link (https://survey.porsline.ir/s/WwLYEq4) was placed on the front page of the virtual networks continuously for ten days. People answered the questions after entering the research page. Every time, only one question was displayed on the screen, and after answering the existing question, the person was redirected to the next page to answer the next question.

After entering the data in SPSS 23 software, central descriptive indices and scattering were used. Kruskal-Wallis and Spearman correlation coefficients were used, and a significance level of less than 0.05 was considered.

Findings

In this study, the data were collected online, and finally, 2242 people participated in the study and completed the inventory.

In terms of demographic characteristics, the majority of participants (994 people, 44.4%) were in the age group of 30 to 40 years, and the majority (1628 people, 74.1%) were women, in terms of marital status, most participants (1770 people, 79.1 %) were married, and 933 people (41.7%) had a bachelor's degree (Table 1). The majority of participants (1377 people, 61.5%) stated that most information about the disease was social networks (WhatsApp, Telegram, etc.).

Table 1) Frequency of demographic variables in participants

Variable	Number (%)
Age	
>20	70 (3.1)
20-29	590 (26.4)
30-39	994 (44.4)
40-49	424 (18.9)
50-60	123 (5.5)
<60	39 (1.7)
Total	2240 (100)
Sex	
Male	569 (25.9)
Female	1628 (74.1)
Total	2197 (100)
Marital status	
Single	467 (20.9)
Married	1770 (79.1)
Total	2237 (100)
Residence area	
Province	1924 (85.9)
Other	252 (11.3)
Village	63 (2.8)
Total	2239 (100)
Education	
Illiterate	4 (0.2)
Elementary	18 (0.8)
Middle School	96 (4.3)
Diploma	510 (22.8)
Associate Degree	231 (10.3)
Bachelor	933 (41.7)
MA	356 (15.9)
PhD and higher	89 (4)
Total	2237 (100)
Employment Status	
Employee	643 (28.8)
Shopkeeper	123 (5.5)
worker	45 (2)
Unemployed	9 (4.4)
Housewife	686 (30.7)
Student	35 (1.6)
Collegian	166 (7.4)
Farmer	5 (0.2)
Other	432 (19.3)
Total	2234 (100)

The majority of the participants (1427 people, 64.8%) reported the highest number of cases of death due to COVID-19 on social networks or television, and 383 people (17.4%) announced corona affliction or death of those they knew, 216 people (9.8%) watched clips of patients who were hospitalized for COVID-19 in intensive care units, and 176 people (8%) watched clips of the patients falling on the street due to COVID-19. Also, most people, 1594 people (72.8%) stated that the increase in the number of deaths due to Corona was the most important factor in wearing a mask, frequent hand washing, and staying at home (Table 2). According to 779 individuals (35.2%) of the participants, the most reliable source of information was the representatives of the Ministry of Health on television, according to 781 individuals (35.3%), it was experts of satellite networks, according to 122 individuals (5.5%), it was doctors and nurses in social networks, and according to 530 individuals (24%), it was physicians and nurses who were familiar with them. The increase in the number of deaths due to Corona, from 1594 individuals

(72.8%), was the most important factor in wearing masks and frequent hand washing. Participants also stated that the most important factor in staying at home was the momentary report of the increase in the number of deaths due to Corona (35.2%; Table 2).

Table 2) Frequency distribution of study participants according to the most effective factor of wearing a mask or frequent hand washing and the decision to stay at home

	Number (%)
The most effective factor in applying the mask by frequent hand washing	
Report on the increase in the number of corona deaths	1594 (72.8)
Corona or death of people you know	255 (11.6)
View clips of coronation patients admitted to intensive care units	269 (12.3)
View clips of Corona hospitalized patients in intensive care units	72 (3.3)
Total	2190 (100)
The most influential factor in the decision to stay home	
Moment-by-moment report of increasing corona deaths	779 (35.2)
Hear the news of the illness or death of people you knew	781 (35.3)
See photos and videos from the hospitalized patients in ICU	122 (5.5)
See clips of corona patients falling	530 (24)
Total	2212 (100)

The mean±SD score of participants' knowledge was 80.89±20.36. The difference in knowledge of the age group of 60 years and above with other age groups, except for the age group under 20 years, was significant (p<0.05). The scores of individuals in different educational groups had a statistically significant difference (p<0.05), so that the scores of illiterate people were significantly lower than other groups. In general, the scores of participants with low education were lower than those with high education. Awareness scores in different occupational groups were statistically significant (p<0.05), and the farmer job group had the least and the staff job had the most level of awareness. Also, the lowest knowledge was among those who cited "friends and acquaintances" as the most important source of information about the disease. The perceived sensitivity score of most participants (94.6%) was at a good level, and The mean±SD of the perceived sensitivity score was 92.10±27.22 (p<0.001). The perceived sensitivity group in the age group of 60 and older were significantly less than other groups (p<0.001). Also, the scores of the people in different educational groups were significantly different, so the higher the people in terms of education, the more perceived sensitivity. In terms of source of information, the least

perceived sensitivity was in people who introduced "friends; relatives" as the most important source of information about the disease (p<0.001).

The mean±SD score of perceived severity of participants was 89.11±50.80. The results of the t-test showed that the perceived severity score in women was significantly higher than in men (p<0.001). The perceived severity of 60 years and older people was significantly lower than other age groups except for those under 20-years-old and 50 to 59 years (p<0.001). The perceived severity score of illiterate people was significantly lower than other groups, and in general, the perceived severity score of participants with low education was lower than those with high education (p<0.001). The occupational group of farmers had the lowest, and, on the other side, the group of housewives had the highest perceived severity (p<0.001). The mean±SD of the performance score of the participants was 84.82±14.97. Performance scores in different age groups had a statistically significant difference, and the highest performance score was in the age group under 20 years old (p<0.001). In occupational groups, the laborer group had the weakest performance in terms of performance, and the student group had the strongest performance (p<0.001). Individuals with the source of information of "Radio and Television of Iran" had the highest performance, and it was statistically significant (p<0.001). The mean±SD score of perceived benefits by participants regarding preventive behaviors was 94.9±45.31. Perceived benefits in different educational groups were statistically significant (p<0.05), and the score of illiterate people was significantly higher than other groups (p<0.001). The farmer occupation group had the lowest, and the employee group had the highest perceived benefits (p<0.001; Table 3).

The mean±SD of perceived barriers to adopting preventive behaviors was 53.13±5.77. In terms of job status, the student group had the lowest, and the employee group had the highest rate of perceived barriers. There was no significant difference in the score of single and married people in all dimensions (p>0.05).

There was a positive and statistically significant correlation between performance score with knowledge and perceived benefits, and knowledge and perceived sensitivity, and perceived severity and perceived benefits, and perceived severity and perceived barriers. There was a statistically significant negative correlation between perceived benefits and perceived barriers and perceived barriers and performance (Table 4).

Table 3) Relationship between personal characteristics and source of information or score of health belief model constructs in the field of Corona

Variable	Awareness	Perceived susceptibility	Perceived severity	Perceived benefits	Perceived barriers	Performance	Number
Age (n=2240)							
>20	77.6	88.7	87.2	92.1	47.6	90.9	70
20-29	81.2	92.1	90.5	93.5	52.6	86.1	590
30-39	82.2	93.1	91.2	94.6	55.1	83.2	994
40-49	81.8	92.4	89.1	95.5	53.3	84.7	424
50-60	82.7	91.2	87.5	96.6	50.0	88.4	123
<60	81.5	83.0	83.9	90.0	51.6	84.2	39
p-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Sex (n=2195)							
Male	81.1	93.2	87.2	94.4	58.2	79.8	567
Female	81.5	92.1	94.4	94.5	51.9	86.6	1628
p-value	0.661	0.022	<0.001	0.965	<0.001	<0.001	-
Education (n=2237)							
Illiterate	28.6	68.8	68.3	96.4	53.6	81.1	4
Elementary	73.8	86.1	92.2	90.1	57.1	80.2	18
Middle School	74.2	90.0	91.4	93.4	52.3	85.7	510
Diploma	78.4	91.8	91.0	93.8	52.9	85.7	510
Associate Degree	80.3	91.8	90.1	94.1	53.3	84.6	231
Bachelor	83.0	92.6	90.4	94.8	54.0	84.3	933
MA	84.1	92.1	89.6	95.8	53.8	84.3	356
PhD and higher	82.9	95.6	87.6	95.8	50.1	86.1	89
p-value	<0.001	<0.001	0.001	<0.001	0.392	0.415	-
Employment status (n=2234)							
Employee	83.7	92.6	89.2	95.6	88.1	79.4	643
Shopkeeper	77.7	92.6	90.1	94.5	61.6	76.4	123
worker	74.6	92.4	89.2	91.2	65.3	72.5	45
Unemployed	76.6	92.0	90.8	91.1	50.6	89.0	99
Housewife (female)	80.6	91.1	92.2	93.6	49.1	89.7	686
Student	76.7	90.1	88.1	92.9	48.6	90.2	35
Collegian	82.7	91.9	89.7	94.3	47.9	91.5	166
Farmer	51.4	90.8	87.7	73.3	59.0	77.8	5
Other	82.6	92.7	89.6	95.3	53.3	85.1	432
p-value	<0.001	0.834	<0.001	<0.001	<0.001	<0.001	-
Source of information (n=2239)							
National Radio and Television	81.1	92.3	89.7	94.7	52.6	85.9	712
Satellite Networks	81.8	91.3	91.3	94.4	53.6	84.7	127
Social networks	81.4	92.5	90.6	94.4	53.1	84.4	1377
Friends; relatives	64.6	86.2	86.1	89.9	57.1	78.2	23
p-value	0.001	0.017	0.072	0.111	0.117	0.026	-

Table 4) Results of Pearson correlation coefficient between dimension score

variable		Awareness	Perceived susceptibility	Perceived severity	Perceived benefits	Perceived barriers	Performance
Anxiety	r	-0.35	0.087	0.381	-0.125	0.133	-0.096
	p	0.100	<0.001	<0.001	<0.001	<0.001	<0.001
Awareness	r	1.000	0.229	0.076	0.247	-0.096	0.102
	p	-	<0.001	<0.001	<0.001	<0.001	<0.001
Perceived susceptibility	r	-	1.000	0.198	0.020	0.020	0.009
	p	-	-	<0.001	0.335	0.355	0.672
Perceived severity	r	-	-	1.000	-0.009	0.049	-0.011
	p	-	-	-	0.671	0.021	0.617
Perceived benefits	r	-	-	-	1.000	-0.071	0.066
	p	-	-	-	-	<0.001	<0.001
Perceived barriers	r	-	-	-	-	1.000	-0.923
	p	-	-	-	-	-	<0.001
Performance		-	-	-	-	-	1.000

Discussion

COVID-19 is a challenge to public health, and effective prevention of the disease requires a collective effort by people in the community to maintain social distance, reduce unnecessary interactions, and wear masks. The health belief model analyzes the nature of preventive health behaviors.

The results of this study, which was performed on 2242 individuals living in North Khorasan province, showed that the scores of knowledge, sensitivity and perceived severity, perceived benefits, and performance of most people are at a high level, and the score of perceived barriers in most people is moderate. Shahnazi *et al.* also concluded in their study that most people consider themselves

sensitive to the Coronavirus and consider this disease to be a dangerous disease in terms of perceived severity [21]. In a study conducted by Li Ping Wong *et al.*, there was also a high understanding of the sensitivity, severity, and benefits perceived in the participants [15]. Highly perceived sensitivity and severity are important variables in preventive measures. Lee et al. showed that high perceived severity increases negative emotions, cell phone use, and caution in COVID-19 [22]. In their study, Cook et al. also found that people perceived the sensitivity and severity of COVID-19, so that 89% of them considered themselves at risk for COVID-19, and 97% of them expressed severe symptoms of COVID-19 [23].

In this study, the perceived barriers as the perceived negative aspects of adopting preventive behaviors were also moderate. Low perceived barriers are considered as a score; because they believe that the subjects in the prevention of preventive behaviors face fewer obstacles and have fewer problems in this way, also the objective and psychological costs of the recommended activities are low or that it is preferable to the benefits of the behavior. Therefore, by performing a series of interventions and anticipating appropriate policies, it is possible to reduce the barriers to behaviors as much as possible.

The mean±SD score of knowledge in the subjects showed a good awareness. This result seems to be due to the high prevalence of COVID-19 globally and in Iran, especially in North Khorasan province. Also, it can be due to the widespread information provided by social networks (WhatsApp, Telegram, etc.), radio and health centers, and the creation of sensitivities among the people regarding the awareness of the disease. In a study performed by Almutairi on dental students 'awareness of the MERS-CoV virus, although the students' awareness was satisfactory, it was necessary to increase their knowledge of the virus [24]. This finding is also consistent with Bukht *et al.* conducted on bank employees [25].

The existence of a positive and significant correlation between awareness and perceived benefits, sensitivity and intensity, and the performance with perceived awareness and benefits were some of the significant results of this study. Shahnazi *et al.* also concluded in their study that most people consider themselves sensitive to the Coronavirus and consider this disease to be a dangerous disease in terms of perceived severity [21].

In this study, most participants stated that the main source of information about the disease was social networks (WhatsApp, Telegram, etc.) and the most reliable source of information in their opinion was the Ministry's representatives of Health on television. The underlying mechanisms of the effects of using social media on behavioral changes in health are that news of an epidemic on social media can provoke public fear and encourage people to take preventative measures [26]. Previous studies showed that mass media could positively change health-related behaviors or prevent negative changes in large populations [27]. For example, listening to the radio; reading the newspaper about the benefits of vaccination increased the likelihood of getting vaccinated [28].

Social media, as a social mediator, formulates; reinforces social norms and enables people to receive health information, such as news, knowledge, and patterns of health behavior, and in general, by providing two-way communication between health authorities and the public, it can provide people and health institutions with new ways to prevent the disease during an epidemic [29].

A study by Effiong *et al.*, which aimed to evaluate the television programs on Coronavirus, showed that giving awareness by television should be continued and improved [30].

One of the reasons people are more confident in the health information of television than other media outlets is that television has been able to provide news and information and educate people by providing information from specific reliable sources and employing qualified people, and acting as an honest mediator between reality and people. Another reason for the success of television in gaining people's trust is that these media pay attention to the news value and speed of news coverage and provide health messages and health information to the people as soon as possible. Professional performance and the correct way of expressing the content are also among the factors that affect the acceptance of the message when using the media.

According to the participants, the most important factor in performing preventive behaviors was reporting and increasing the number of deaths due to Corona. In Li *et al.*, death by Corona was an important factor in preventive behaviors in family and acquaintances [31].

In this study, knowledge, perceived sensitivity, and perceived severity significantly correlated with the level of education, and the score of participants with low education was lower than those with higher education. This has been confirmed in various studies; for example, in a study on malaria prevention, high levels of education were positively correlated with increased knowledge and health behaviors about malaria [32].

There was a statistically significant difference in the knowledge of the individuals in different educational groups. The score of illiterate people was significantly lower than other groups, and in general, the score of the participants with low education was lower than those with high education. This finding is consistent with other studies [33].

Knowledge, perceived sensitivity, and perceived severity were significantly low with age. In Ye *et al.*, the elderly performed less preventative behaviors than the younger population [34]. Moreover, in another study, it was shown that older people are reluctant to accept the recommendations of the disease control centers to use masks [35].

Older people have a lower level of education than the rest of the population. Previous studies showed that people with low levels of education report poorer health habits and have less knowledge of self-care [34, 36]. In this study, gender was an effective variable, so that the perceived severity was higher in women than men. In their study, Li & Liu also found that women had more preventive behaviors than men during the outbreak of COVID-19 in China [29]. The higher perceived severity in this group indicates that women have more health motivation and more sensitivity and interest in health information than men. As in other studies, this has been proven [37-39]. In a study by Costa, people with lower levels of education had a higher perceived threat than people with higher levels of education, which was not consistent with our study. Given that having high perceived sensitivity and severity in people with low education and knowledge can lead to medical centers with the slightest symptom and be more exposed to the disease, it is necessary to make more efforts to raise the knowledge in this group [40].

In this study, the performance of most participants was high, which is consistent with the results of a study in Hong Kong, China, which showed that more than 77% of participants reported good performance for COVID-19 [23]. The Centers for Disease Control and Prevention estimates that 38% of COVID-19 hospitalizations occur in patients under 55 years of age, and considering this fact, proper functioning of preventive behaviors in this age group is of high importance. In this study, The mean±SD performance score showed a statistically significant difference in different age groups, and the highest performance score was in the age group below 20 years [41].

In HBM (Health Belief Model), perceived benefits are the benefits that one expects to achieve by performing the desired behavior, and in this case, the adverse health consequences covered by threat-related constructs are not merely avoided, but another benefit is also gained by performing it. For example, a person who engages in smoking cessation behavior avoids the threat of chronic lung disease; receives the greater benefits of reducing tobacco costs [12].

In this study, the perceived benefits in illiterate individuals and the occupational group of employees are higher than others. The perceived benefits of doing COVID-19 related behaviors can include having free time due to reduced travel and spending more time with family or a great opportunity to spend high-quality time; for example, staying home leads to studying hobbies like walking.

Barriers perceived in HBM are cases, which prevent the change of desirable behavior in the individual. These barriers are among important and effective constructs of the health belief model because people must cross the behavior barriers despite their inner desire to take preventive behaviors. In general, as it increases, the person is less likely to engage in desirable and preventative behaviors. Therefore, finding causes and factors related to reducing or eliminating perceived barriers helps people choose the desired behavior more easily. In this study, the group of students had the least barriers, and the group of employees had the most barriers in performing preventive behaviors. After the cases of COVID-19 were found, theory classes of students were held virtually, and universities were closed.

On the other hand, the office staff was required to attend, and only at certain times, staff attendance was limited. Compulsory presence can be a barrier to preventive behavior from COVID-19, and to remove this barrier, the instructions for attending offices should be used. For example, observing social distance with other employees and clients and observing personal hygiene can be somewhat effective in preventing infection.

There was a statistically significant positive correlation between the perceived benefits and the performance, and there was a statistically significant negative correlation between the perceived barriers and the performance. By increasing the perceived benefit score, the individual becomes more sensitive to the disease, and the performance related to the prevention of the disease is improved. Consistent with the results of our study, the study of Davati *et al.* Showed that the structure of the perceived benefits is mostly associated with the adoption of sun protection behaviors in women [42]. The higher a person's understanding of the benefits of preventive behaviors in reducing illness, the better his or her performance. Perceived barriers have also been suggested as strong construction and the most important component of the health belief model in performing recommended behaviors [43]. If a person realizes that he or she is at risk for the disease even without symptoms, this sensitivity leads to preventive behavior [44]. In the study by Koch *et al.*, with the removal of perceived barriers, diabetic patients were more likely to walk [45], and all these results indicate that if the barriers are removed, the preventive function of the individuals is improved.

One of the limitations of the present study is that despite the advantages of web-based sampling methods, it may be difficult to obtain a general population sample in this sampling method, but due to the epidemic conditions, the disease must be used. The data used in the analysis of this study are self-reported, which may report bias.

Conclusion

The most source of information for people is social networks, and the most trusted source of information is television. Therefore, the evaluation and monitoring of disseminated information about the disease on social networks and continuous messaging by health officials and government on TV programs. It is essential. Variables of age group, education, and occupation had the greatest effect on the constructs of the health belief model. It is suggested that to achieve optimal performance in society, in preventive interventions, more attention is paid to the elderly, low-educated people, and non-employed occupational groups.

References

1- Vahdat K, Amini A, Najafi A, Haerinejad MJ. A review of novel Coronavirus, cause of Middle East respiratory syndrome. Iran South Med J. 2014;16(6):486-92. [Persian]

2- Bai Y, Yao L, Wei T, Tian F, Jin DY, Chen L, et al. Presumed asymptomatic carrier transmission of COVID-19. JAMA. 2020;323(14):1406-7.

3- Jung SM, Akhmetzhanov AR, Hayashi K, Linton NM, Yang Y, Yuan B, et al. Real-time estimation of the risk of death from novel coronavirus (COVID-19) infection: Inference using exported cases. J Clin Med. 2020;9(2):523.

4- Yang Y, Peng F, Wang R, Yange M, Guan K, Jiang T, et al. The deadly coronaviruses: The 2003 SARS pandemic and the 2020 novel coronavirus epidemic in China. J Autoimmun. 2020;109:102434.

5- Lu R, Zhao X, Li J, Niu P, Yang B, Wu H, et al. Genomic characterisation and epidemiology of 2019 novel Coronavirus: Implications for virus origins and receptor binding. Lancet. 2020;395(10224):565-74.

6- Lai CC, Shih TP, Ko WC, Tang HJ, Hsueh PR. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and corona virus disease-2019 (COVID-19): The epidemic and the challenges. Int J Antimicrob Agents. 2020;55(3):105924.

7- Zaki AM, van Boheemen S, Bestebroer TM, Osterhaus ADME, Fouchier RAM. Isolation of a novel coronavirus from a man with pneumonia in Saudi Arabia. N Engl J Med. 2012;367(19):1814-20.

8- World Health Organization. Infection prevention and control during health care when novel coronavirus (nCoV) infection is suspected: Interim guidance, January 25 2020. Geneva: World Health Organization; 2020.

9- Tan W, Hao F, McIntyre RS, Jiang L, Jiang X, Zhang L, et al. Is returning to work during the COVID-19 pandemic stressful? A study on immediate mental health status and psychoneuroimmunity prevention measures of Chinese workforce. Brain Behav Immun. 2020.

10- Assadi M, Gholamrezanezhad A, Jokar N, Keshavarz M, Picchio M, Seregni E, et al. Key elements of preparedness for pandemic coronavirus disease 2019 (COVID-19) in nuclear medicine units. Eur J Nucl Med Mol Imaging. 2020;47(8):1779-86.

11- Shammah A, Budoor H, Suad M, Richard K, Maha S, Asokan GV. Middle East respiratory syndrome corona virus (MERS-CoV): Levels of knowledge and awareness in Bahrain. KnE Life Sci. 2018;98-114.

12- Ron Carico Jr R, Sheppard J, Thomas CB. Community pharmacists and communication in the time of COVID-19: Applying the health belief model. Res Soc Adm Pharm. 2021;17(1):1984-7.

13- Glanz K, Rimer BK, Viswanath K. Health behavior and health education: theory, research, and practice. 4th Edition. Hoboken: John Wiley & Sons; 2008.

14- Carpenter CJ. A meta-analysis of the effectiveness of health belief model variables in predicting behavior. Health Commun. 2010;25(8):661-9.

15- Wong LP, Alias H, Wong PF, Lee HY, AbuBakar S. The use of the health belief model to assess predictors of intent to receive the COVID-19 vaccine and willingness to pay. Hum Vaccin Immunother. 2020;16(9):2204-14.

16- Walrave M, Waeterloos C, Ponnet K. Adoption of a contact tracing app for containing COVID-19: A health belief model approach. JMIR Public Health Surveill. 2020;6(3):e20572.

17- Jose R, Narendran M, Bindu A, Beevi N, Manju L, Benny PV. Public perception and preparedness for the pandemic COVID 19: A health belief model approach. Clin Epidemiol Glob Health. 2020;9:41-6.

18- Butler JT. Principles of health education and health promotion. Unknown **City**: Morton Publishing Company; 1994.

19- Wejnert C, Heckathorn DD. Web-based network sampling: Efficiency and efficacy of respondent-driven sampling for online research. Sociol Method Res. 2008;37(1):105-34.

20- Chen Y, Jin YL, Zhu LJ, Fang ZM, Wu N, Du MX, et al. The network investigation on knowledge, attitude and practice about Novel coronavirus pneumonia of the residents in Anhui Province. Zhonghua Yu Fang Yi Xue Za Zhi. 2020;54:E004. [Chinese]

21- Shahnazi H, Ahmadi-Livani M, Pahlavanzadeh B, Rajabi A, Hamrah MS, Charkazi A. Assessing preventive health behaviors from COVID-19: A cross sectional study with health belief model in Golestan Province, Northern of Iran. Infect Dis Poverty. 2020;9:157.

22- Li JB, Yang A, Dou K, Wang LX, Zhang MC, Lin XQ. Chinese public's knowledge, perceived severity, and

perceived controllability of COVID-19 and their associations with emotional and behavioural reactions, social participation, and precautionary behaviour: A national survey. 2020;20(1):1589.

23- Kwok KO, Li KK, Chan HHH, Yi YY, Tang A, Wei WI, et al. Community responses during the early phase of the COVID-19 epidemic in Hong Kong. Emerg Infect Dis. 2020;26(1);1575-9.

24- Almutairi MA. Awareness about Middle East Respiratory syndrome-corona virus (MERS-CoV) among dental students in Riyadh, Saudi Arabia. Pak Oral Dent J. 2016;36(3).

25- Bukht N, Javed MK. Banker's awareness of corona virus. Int J Medical Sci Clin Res Rev. 2020;3(03):251-5.

26- Costantino C, Restivo V, Ventura G, D'Angelo C, Randazzo MA, Casuccio N, et al. Increased vaccination coverage among adolescents and young adults in the district of Palermo as a result of a public health strategy to counteract an 'Epidemic Panic'. Int J Environ Res Public Health. 2018;15(5):1014.

27- Wakefield MA, Loken B, Hornik RC. Use of mass media campaigns to change health behaviour. Lancet. 2010;376(9748):1261-71.

28- Kim J, Jung M. Associations between media use and health information-seeking behavior on vaccinations in South Korea. BMC Public Health. 2017;17(1):700.

29- Li X, Liu Q. Social media use, eHealth literacy, disease knowledge, and preventive behaviors in the COVID-19 pandemic: Cross-sectional study on Chinese netizens. J Med Internet Res. 2020;22(10):e19684.

30- Effiong AI, Nseobot IR, Johnny AE, Frank EI, Abere OJ, Essien MO, et al. Assessment of Nigerian television authority (NTA) ongoing programme awareness campaigns on corona virus in Nigeria. Electron Res J Soc Sci Hum. 2020;2.

31- Li S, Feng B, Liao W, Pan W. Internet use, risk awareness, and demographic characteristics associated with engagement in preventive behaviors and testing: Cross-sectional survey on COVID-19 in the United States. J Med Internet Res. 2020;22(6):e19782.

32- Yaya S, Bishwajit G, Ekholuenetale M, Shah V, Kadio B, Udenigwe O. Knowledge of prevention, cause, symptom and practices of malaria among women in Burkina Faso. PLoS One. 2017;12(7):e0180508.

33- Zebardast E, Baniamerian M. Investigating the relationship between objective and subjective indicators of public-services domain of urban quality of life in Hashtgerd new town. J Architecture Urban Plann. 2010;2(3):5-22. [Persian]

34- Ye Y, Wang R, Feng D, Wu R, Li Z, Long C, et al. The recommended and excessive preventive behaviors during the COVID-19 pandemic: A community-based online survey in China. Int J Environ Res Public Health. 2020;17(19):6953.

35- Clements JM. Knowledge and behaviors toward COVID-19 among US residents during the early days of the pandemic: Cross-sectional online questionnaire. JMIR Public Health Surveill. 2020;6(2):e19161.

36- Al-Mohammed HI, Amin TT, Aboulmagd E, Hablus HR, Zaza BO. Prevalence of intestinal parasitic infections and its relationship with socio–demographics and hygienic habits among male primary schoolchildren in Al–Ahsa, Saudi Arabia. Asian Pac J Tropic Med. 2010;3(11):906-12.

37- Ersin F, Gözükara F, Polat P, Erçetin G, Bozkurt ME. Determining the health beliefs and breast cancer fear levels of women regarding mammography. Turk J Med Sci. 2015;45(4):775-81.

38- Huesch MD, Galstyan A, Ong MK, Doctor JN. Using social media, online social networks, and internet search as platforms for public health interventions: a pilot study. Health Serv Res. 2016;51(Suppl 2):1273-90.

39- Nahcivan N, Seçginli S. Attitudes and behaviors toward breast cancer early detection: Using the health belief model as a guide. CU J Sch Nurs. 2003;7:33.

40- Costa MF. Health belief model for coronavirus infection risk determinants. Rev Saude Publica. 2020;54:47. [Portuguese]

41- CDC COVID-19 Response Team. Severe outcomes among patients with coronavirus disease 2019 (COVID-19)-United States, February 12–March 16, 2020. MMWR Morb Mortal Wkly Rep. 2020;69(12):343-6.

42- Davati A, Moradi M, editors. HBM model and preventive of cancer skin. Proceedings of the 3th national congress on health education and promotion. Hamedan: Iran; 2008. [Persian]

43- Mosalanefad L, Kheshti A, Gholami A. The Assessing mental Health in pregnancy and relative psychopathologic factors in Jahrom. Pars J Med Sci. 2007;5(3-4):23-9. [Persian]

44- Karimy M, Ghofranipor F, Heidarnia A. The effect of health education based on health belief model on preventive action of aids on addict in Zarandieh. J Guilan Univ Med Sci. 2009;18(70):64-73 . [Persian]

45- Koch J. The role of exercise in the African-American woman with type 2 diabetes mellitus: Application of the health belief model. J Am Acad Nurs Pract. 2002;14(3):126-30.