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The predictors of the intention to receive Covid-19 vaccine using the health belief model and theory of planned behavior in South Khorasan province

Zahra Khazir[1], Hamideh Kouhpeikar[1], Zohreh Rahaei[2], Moradali Zareipour[3], Saeid Dashti[4], Monireh Gholamian[5]

Department of Nursing, Tabas School of Nursing, Birjand University of Medical Sciences, Birjand, Iran, [1]The Treatment Deputy of Torbat Heydarieh University of Medical Sciences, Torbat Heydarieh, Razavi Province, Iran, [2]Department School of Public Health, Yazd Shahid Sadoughi University of Medical Sciences, Yazd, Iran, [3]Department of Public Health, School of Health, Khoy University of Medical Sciences, Khoy, Iran, [4]Ferdows School of Paramedical and Health, Birjand University of Medical Sciences, Birjand, Iran, [5]BSC in Public Health, Tabas Health Center, Birjand University of Medical Sciences, Birjand, Iran

Address for correspondence:
Dr. Zahra Khazir, Tabas School of Nursing, Birjand University of Medical Sciences, Birjand, Iran.
E-mail: zahrakhazir@gmail.com

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Abstract:

BACKGROUND: Widespread vaccination coverage in the shortest time is one of the most effective ways for controlling the COVID-19 pandemic. Factors affecting people's intention to get the COVID-19 vaccine are of great importance. The present study aimed to investigate the predictors of the intention to receive the Covid-19 vaccine based on the constructs of the health belief model (HBM) and theory of planned behavior (TPB) in South Khorasan Province.

MATERIALS AND METHODS: In this cross-sectional-analytical study, 320 people over 18 years in South Khorasan province were randomly selected by cluster sampling method in 2021. The data was collected by a researcher-made questionnaire, including demographic information (9 questions), and the constructs of the health belief model (19 questions), and the theory of planned behavior (13 questions), using the self-report method. Finally, data were analyzed using *t*-test, ANOVA, linear regression, and Pearson correlation tests.

RESULTS: The mean age of the study participants was 36.57 ± 11.56 with a range of 18-66 years. In the regression model, perceived susceptibility ($\beta = 0.247$, $P = 0.003$), perceived severity ($\beta = 0.247$, $P = 0.003$) from HBM, attitude ($\beta = 0.247$, $P = 0.003$), and perceived behavioral control ($\beta = 0.247$, $P = 0.003$) from TPB were significant predictors of the intention to get the Covid-19 vaccine. The constructs of the two models were able to explain 33% of the variance of the intention to receive the Covid-19 vaccine.

CONCLUSIONS: The study findings reveal that HBM and TPB can predict factors affecting an individual's intention to receive the vaccine. The results can be utilized to design interventions with the aim of increasing vaccine uptake.

Keywords:

Attitude, COVID-19 vaccine, health belief model, self-efficacy

Introduction

Respiratory infections are special since they have rapid widespread and can increase the mortality rate.[1] Irreparable damages have been caused to the health, lives, and economy of many countries during the COVID-19 pandemic. One of the most successful methods for controlling the COVID-19 pandemic is vaccination along with health and behavioral control measures.[2] Vaccination is very effective in reducing and preventing diseases; however, the community will get the vaccine plays a key role.[3] Different factors, such as new vaccine preparation techniques, the speed of

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vaccine production, and continuing preventive behaviors even after receiving the vaccine, are effective in the efficiency of COVID-19 vaccination.[4-6] The results of a systematic review of COVID-19 vaccination indicated a decreasing trend from more than 70% to less than 50% in global vaccine acceptance during seven months.[7] Studies have reported that after the availability of the vaccine in the US, 25–50% of people did not intend to get the COVID-19 vaccine, resulting in a new challenge in health promotion.[8] Vaccine hesitancy has been introduced as one of the ten threats to global health by the World Health Organization (WHO).[9] In Iran, the COVID-19 vaccination rate was reported 0.2% until April 27, 2021.[10] Statistics show that a small group of people refused to get the COVID-19 vaccine.[11] Therefore, effective interventions are required to be implemented by policymakers and health planners to increase vaccination acceptance.[12] In order to understand the factors effective in decision-making, it is required to use the theoretical health belief model (HBM) and risk perception. The HBM examines what inhibits and motivates people to adopt health-related behaviors and also assesses the relationship between health behavior and the use of health services. This model predicts and explains preventive health behaviors based on certain belief patterns. In the context of vaccination, the HBM has been widely used, especially the influenza vaccine.[13,14] Based on this model, a number of factors, including perceived severity (reflecting the perception of the threat), perceived susceptibility, perceived barriers (as a function of outcome expectation), and cues to action, as well as perceived benefits, affect the intention to receive the influenza vaccine. The individual's perception regarding the chance of being infected by influenza refers to perceived susceptibility. Some individuals deny the possibility of infection, while others feel the danger of infection. Studies have reported this predictor as a significant predictor of vaccine refusal (43.2%), bias with a sense of disease resistance, a patient's perception of not being at risk of influenza, and a low probability of getting sick. The individual's belief about difficulties that the disease may cause medically and socially refers to perceived severity, such as pain and missed workdays. The individual's perceived negative aspects related to the action of getting vaccinated are perceived barriers, such as psychological considerations, physical pain, and expenses.[15,16] Another theoretical model is the Theory of planned behavior utilized for predicting the behavior of an individual in terms of the intention to get a vaccine. Based on the TPB model, a number of predictors, including subjective norms for carrying out vaccination, the attitude towards the vaccine as well as the perceived behavioral control (PBC) of vaccination affect the intention to receive the influenza vaccine. Another predictor was added to the original model, which was self-efficacy for vaccination. It has been confirmed that a distinction has to be made between self-efficacy and perceived behavioral control.[17] The TPB and HBM approaches have been combined in recent studies to identify health-related behaviors and intentions to receive the influenza vaccine.[18,19] So far, limited studies have investigated the intention to receive the COVID-19 vaccine. The results of a recent study on the effect of the constructs of the HBM and the TPB in predicting the intention to receive the COVID-19 vaccine have shown that these two models have good predictability in determining the intention of vaccination behavior.[17] According to the studies conducted by the researchers, no study has been conducted in Iran on the predictors of the intention to receive the COVID-19 vaccine using the TPB and the HBM. Some other health beliefs have also been associated with the intention to receive the COVID-19 vaccine. For instance, the subjects who had a higher likelihood of contracting the COVID-19 virus and perceived the severity of the COVID-19 disease had more intention to receive the vaccine.[20] In the HBM, the construct of perceived benefit was also significant in the prediction of getting the vaccine.[21] However, the TPB model has been used by several studies in confirming the association between preventive behaviors and the COVID-19 disease, such as washing hands and social distancing.[22,23] Therefore, the present study aims to investigate the predictors of the intention to receive the COVID-19 vaccine based on the constructs of the theory of planned behavior (TPB) and health belief model (HBM) in South Khorasan Province.

Materials and Methods

Study design and setting

The present study was a cross-sectional-analytical in South Khorasan province, Iran, which was conducted to investigate the predictors of the intention to receive the Covid-19 vaccine based on the Health Belief Model and Theory of Planned Behavior in 2021.

Study participant and sample

The population studied in the current research included people aged 18 and over living in the urban areas of South Khorasan province in 2021. The inclusion criteria were the age of over 18 years, and no history of getting the Covid-19 vaccine. The exclusion criteria were not completing the questionnaires. For the sample size to be a good representative of all the people of the covered society (South Khorasan), a multi-stage sampling method was used. In the first stage, the clusters (cities) were identified and then 4 clusters were randomly selected from among them. Finally, equal numbers in each cluster (29 people) were included in the study using the convenience sampling method. People who were referred to health centers and were willing to participate in the study completed the questionnaire. To estimate the

required sample size, the following formula was used and according to the previous study,[24] *r* was considered 0.07 and the minimum sample size was 115 people, and a total of 320 people were sampled.

$$n = \frac{(z1 - \frac{\alpha}{2} + z1 - \beta)\,\hat{}\,2}{\frac{1}{2}\ln(\frac{1+r}{1-r})} + 3$$

$\alpha = 0.05$.

$\beta = 0.2$.

$r = 0.07$.

Data collection tools and technique

The data-gathering tool was a researcher-made questionnaire according to the HBM and TPB constructs, which was completed through self-report methods. The questionnaire included three sections. The first section was related to demographic and health-related information (9 questions), including gender, age, marital status, education, occupation, obesity, chronic disease, smoking, and history of being infected with COVID-19. The second section consisted of questions on HBM constructs (19 questions), including perceived susceptibility (5 questions; for example, If I don't get vaccinated, more likely of me getting with corona will increase), perceived severity (4 questions; for example, even if I get infected with covid-19, my mental and emotional peace will be disturbed), perceived benefit (4 questions; for example, If I get the covid-19 vaccine, the risk of others getting the disease is reduced), perceived barriers (3 questions; for example, Getting the covid-19 vaccine has complications), and perceived self-efficacy (3 questions; for example, I can go to vaccination centers to get the covid-19 vaccine). The second section consisted of questions on TPB constructs (13 questions), including attitude (3 questions; for example, getting vaccinated is a tedious process that requires time), subjective norms (4 questions; for example, My family members want me to get the covid-19 vaccine) and perceived behavioral control (3 questions; for example, The decision to receive the covid-19 vaccine is entirely up to me). Finally, intention construct (3 questions; for example, I am trying to get vaccinated this year).

The scoring scale of the theoretical construct questions was based on the Likert-type scale from strongly agree (5) to strongly disagree (1), and some questions were scored in reverse. The reliability and validity of the questionnaire were assessed before collecting the data. Face validity was qualitatively confirmed by a 15-member panel consisting of health education experts to find the level of difficulty, the degree of inconsistency, the ambiguity of expressions, or the existence of inadequacies in the meanings of words. The opinions of panel members were applied to the questionnaire. To qualitatively confirm the content validity, 15 health education experts were asked to provide their corrective viewpoints in writing after carefully studying the tools. The grammar, the use of appropriate words, the placement of the questions in their proper place, and the importance of the questions were considered as well. The necessary changes were made to the tool after collecting the experts' opinions. The content validity ratio (CVR) was used to quantify the content validity and to ensure the selection of the best content (question necessity). Additionally, the content validity index (CVI) was applied to ensure that the tool questions are best designed to measure the content. CVI values for perceived susceptibility, perceived severity, perceived benefit, perceived barriers, self-efficacy, attitude, subjective norms, perceived behavioral control and intention were 0.85, 0.80, 0.86, 0.89, 0.84, 0.88, 0.80, 0.87, 0.86 and 0.86, respectively. Likewise, the corresponding CVR values for the above-mentioned parameters were 0.86, 0.82, 0.88, 0.90, 0.89, 0.92, 0.84, 0.94, 0.92, and 0.91, respectively. Test-retest was employed to evaluate the reliability of the questionnaire. The CVI and CVR values for HBM and TPB were 0.80, 0.72, 0.83, and 0.78, respectively. Further, Cronbach's alpha of each construct was calculated, and Cronbach's alpha reliability was 76% for constructs.

Ethical considerations

This study is the result of a research project with the code of ethics IR.BUMS.REC.1400. 268 in the Research Ethics Committee of Birjand University of Medical Sciences. After obtaining permission from the Ethics Committee of Birjand University of Medical Sciences, the questionnaires were completed by the participants. The authors certify that all data collected during the study are as presented in this manuscript, and no data from the study has been or will be published elsewhere separately.

Statistical analysis

Data processing and analysis were done using SPSS 22 software. To describe the study population characteristics, descriptive statistics were used, including frequencies, percentages, mean, and standard deviations. ANOVA and t-tests were utilized to examine the relationship between dependent and independent variables. A linear regression was performed to investigate determinants of intention to receive the COVID-19 vaccine.

Results

The data of 320 participants were analyzed in this study (The response rate was 100%). The mean (±SD) of the participants' age was 36.57 (±11.56). Most of the participants were females (59.1%) and housewives (36.9%) and had diploma education (42.8%).

Most of them were married (68.4%) and did not smoke (86.9%). Most of the participants had no chronic disease (66.6%), no obesity (52.2%), were being infected with COVID-19 (77.2%). Among the demographic factors, there was a significant relationship between gender ($P < 0.001$), marital status ($P = 0.01$), educational level ($P < 0.001$), occupation ($P < 0.001$), obesity ($P = 0.03$), smoking ($P = 0.01$), and history of being infected with Covid-19 ($P < 0.001$) with the participants' intention to receive the Covid-19 vaccine [Table 1]. Descriptive indicators related to HBM and TPB demonstrated that the lowest mean was related to the perceived susceptibility, while the highest mean belonged to the perceived behavioral control construct [Table 2]. Regarding the relationship between the HBM and TPB constructs with the construct of intention, the Pearson correlation coefficient indicated a significant correlation between Perceived susceptibility ($r = 0.43$, $P < 0.01$), Perceived severity ($r = 0.25$, $P < 0.01$, Perceived benefit ($r = 0.22$, $P < 0.01$), Perceived barriers ($r = -0.25$, $P < 0.01$), and self-efficacy ($r = 0.16$, $P < 0.01$) with the intention [Table 3]. The strongest correlation was observed between perceived susceptibility and intention to get the covid-19 vaccine.

Linear regression analysis was utilized to determine the predictive constructs of intention to receive the covid-19 vaccine in participants, as well as the predictive power of this construct. Based on the regression model coefficients among the constructs, the perceived susceptibility ($\beta = 0.525$, $P < 0.001$), perceived severity ($\beta = 0.176$, $P = 0.047$), attitude ($\beta = 0.114$, $P < 0.001$), perceived behavioral control ($\beta = 0.475$, $P = 0.001$) were predictors of intention to receive the covid-19 vaccine. In other words, by increasing one unit of perceived susceptibility, perceived severity, attitude, and perceived behavioral control, the mean score of intention to get the covid-19 vaccine increased by 0.525, 0.176, 0.114, and 0.475 units respectively. In total, these four constructs predicted 33% of changes in intention to receive the Covid-19 vaccine ($R^2 = 0.330$, Table 4).

Table 1: Mean and SD of the intention to receive COVID-19 vaccine score of participants based on participants' demographic variables (*n*=320)

Variable	Groups	Mean±SD	*P*
Gender	Male	8.51±2.90	<0.001
	Female	9.79±2.65	
Marital status	Single	9.02±2.95	0.01
	Married	11.75±1.16	
	Divorce	9.21±2.80	
	Widow	11.14±1.06	
Education level	Illiterate	10.19±2.72	<0.001
	Lower than high school	8.09±2.72	
	Diploma	9.26±2.69	
	Academic	10.50±3.31	
Occupational status	Worker	7.76±2.98	<0.001
	Government employed	10.45±2.96	
	Farmer	9.00±4.24	
	Self -employed	8.61±2.85	
	Retired	10.03±2.19	
	Unemployed	10.00±3.00	
	Housewife	10.00±2.45	
Chronic disease	Yes	9.52±2.66	0.25
	No	9.14±2.90	
Obesity	Yes	9.60±2.50	0.03
	No	8.94±3.06	
Smoking	Yes	8.28±2.68	0.01
	No	9.41±2.81	
History of being infected with COVID-19	Yes	9.57±2.66	<0.001
	No	8.21±3.10	

Table 2: Mean, SD and range of scores, and percentage of mean from the maximum obtainable score for TPB and HBM Constructs (*n*=320)

Variables	Mean±SD	Range of Scores	Percent
Perceived susceptibility	10.02±1.83	5-25	25.1
Perceived severity	15.25±1.13	4-20	70.3
Perceived benefit	13. 87±3.39	4-20	61.6
Perceived barrier	8.06±2.08	3-15	42.1
Self-efficacy	10.46±1.04	3-15	62.1
Attitude	9.13±2.82	3-15	51
Subjective norms	15.70±0.85	4-20	73.1
Perceived behavioral control	11.97±1.80	3-15	74.7
Intention	9.26±2.82	3-15	52.1

Discussion

According to HBM, perceived susceptibility and perceived severity were the most significant predictors of intention to receive the COVID-19 vaccine. Studies on the disease severity have revealed that those who do not intend to receive the vaccine feel that they will be at lower risk of complications if they become infected with COVID-19, compared to those who intend to receive the vaccine. The result shows that it is required to increase risk perception and severity among people, especially those who believe COVID-19 is not dangerous.[17] Regarding perceived susceptibility, which was the strongest predictor of the intention to receive the vaccine, people who perceived they were at higher risk of COVID-19 had more intention to receive the vaccine, which is in line with the results of other studies. Kamal *et al.* (2017)[25] reported that the higher the perceived susceptibility, the greater chance an individual will take action. According to Janz and Becker (1984), perceived susceptibility is the strongest predictor of preventive health behavior. These findings were reflected in the results of this study.[26] In the study by Kanyangarara *et al.*,[27] in 2021 in the US, conducted on the factors affecting vaccine intention among the citizens of South Carolina, perceived susceptibility and

Table 3: Pearson correlation coefficients among the constructs of TPB and HBM (*n*=320)

Variables	1	2	3	4	5	6	7	8	9
1. Perceived susceptibility	1								
2. Perceived severity	0.65**	1							
3.Perceived benefit	0.64**	0.73**	1						
4. Perceived barrier	-0.72**	-0.79**	-0.75**	1					
5. Self-efficacy	0.45**	0.69**	0.73**	-0. 66**	1				
6. Attitude	0.38	0.56**	0.49**	-0.58 **	0.61**	1			
7. Subjective norms	0.004	0.042	0.28**	-0.01	0.39**	0.18**	1		
8. Perceived behavioral control	0.48**	0.72**	0.71	-0.73**	0.91**	0.61**	0.22**	1	
9. Intention	0.43**	0.25**	0. 22**	-0.25**	0.16**	0.08	0.002	0.17**	1

**P<0.01

Table 4: Linear regression analysis for predicting intention to receive COVID-19 vaccine based on the constructs of the HBM and TPB

Independent Variable	*B*	SE	β	*t*	*P*
Constant	30.05	7.31		4.110	<0.001
Perceived susceptibility	0.808	0.110	0.525	7.370	<0.001
Perceived severity	0.440	0.221	0.176	1.995	0.047
Perceived benefit	0.020	0.075	0.025	0.274	0.784
Perceived barriers	-0.049	0.136	-0.036	-0.358	0.721
Self-efficacy	0.282	0.379	0.104	0.744	0.457
Attitude	0.566	0.114	0.114	4.971	<0.001
Subjective norms	0.013	0.194	0.004	0.065	0.948
Perceived behavioral control	0.746	0.231	0.475	3.226	0.001

HBM=health belief model, TPB=theory of planned behavior, SE=standard error

severity had a significant relationship with vaccination decision-making.

Finally, according to the TPB model, attitude and perceived behavioral control were significant predictors of intention to receive the COVID-19 vaccine. All three TPB constructs are important predictors of intention and behavior.[28] Although most studies showed that only part of the constructs was related to individuals' intention, to the best of the authors' knowledge, only one study reported that all three TPB constructs were related to the intention to receive the COVID-19 vaccine.[29] Chu and Liu's study reported that there was no relationship between perceived behavioral control and Americans' intention.[30] In the study by Shmueli, no relationship was observed between the attitudes and the intention of people in Israel.[17] The differences in results have been caused due to methodological variations, such as data collection periods, differences in population, and TPB constructs assessment measures. Some research studies have reported factors such as socioeconomic status improvement, infection risk reduction, and returning to normal life can lead to a positive attitude toward vaccination. However, factors including the COVID-19 vaccine's low effectiveness, absence of accurate vaccine information, underestimating the disease severity, and belief in the natural immune system may lead to a negative attitude towards vaccination.[31,32] The strategic use of social media can have a positive attitude toward vaccination.[33] In total, the constructs of both models were able to explain 33% of the variance of the intention to receive the COVID-19 vaccine. In the study by An *et al*.,[34] the constructs of both HBM and TPB models predicted 32% of the variance in the intention to receive a Covid-19 vaccination.

Regarding the relationship between demographic variables and the intention to receive the COVID-19 vaccine, the results of the present study showed that gender had a significant relationship with the intention so the mean score of the intention to get the COVID-19 vaccine was higher in women than in men, which is in line with the results of other studies.[1,35] It is recommended that efforts be made in future vaccination programs to target men who are less willing to receive the vaccine. Marital status was also significantly related to the intention to receive the Covid-19 vaccine so the intention was higher in a married group than in other groups, which is in line with the results of Nejaddadgar *et al*.[1] Occupational status had a significant relationship with the intention to receive the COVID-19 vaccine so it was more in the government employed than in other occupation groups, which is in line with the results of other studies.[1,36] A significant relationship was observed between educational level and the intention to receive the COVID-19 vaccine so the intention to get the vaccine was higher in people with a university education than in other groups. Research in Jordan and Kuwait reported a higher COVID-19 vaccine acceptance among people with higher educational levels.[37]

The study results indicated a higher mean score of intention to receive the COVID-19 vaccine in people with chronic disease, which is consistent with other studies.[17] It is due to the fact that chronic disease causes severe involvement and mortality in people infected with COVID-19.[38] However, people without chronic disease should consider the COVID-19 risk and vaccination, since vaccination will be efficient in only 70–80% of the vaccinated people.

The study reveals a significantly higher mean score of intention in people who do not smoke compared

to smokers. The results of this part of the study are consistent with the results of the study by Ezati Rad *et al*.[39] One of the most important risk factors for respiratory infections is smoking; therefore, if smokers become infected with COVID-19, they will be at high risk of the disease.[40] It is required to design interventions and use a multilateral approach to inform attitudes and ultimately the intention of getting the COVID-19 vaccine to received in smokers.

The study also showed that those who were previously infected with COVID-19 were more likely to receive the vaccine compared to those who were not infected, which is similar to the studies in France[41] and Saudi Arabia.[42] The disease has affected both the mental and physical health of people worldwide. As a result, those who were previously infected might have a higher intention to receive the vaccine.

There was also a relationship between the constructs of susceptibility, severity, benefits, barriers, and perceived self-efficacy with the participants' intention to receive the COVID-19 vaccine. This finding is consistent with the findings of the study by Mahmud in Saudi Arabia, in which the HBM was used to assess the intention of the COVID-19 vaccine in the general population.[43] In the study of Ung *et al*.,[44] which was conducted based on PMT and HBM constructs, the intention to receive the COVID-19 vaccine had a significant relationship with perceived susceptibility, perceived severity, self-efficacy, response efficacy, and response cost. This result is generally in line with the HBM, indicating that when individuals do not benefit from such behaviors, they are less likely to get the vaccine. Therefore, it is required to provide vaccine communication measures to reduce the perceived risk of vaccine side effects and increase the perceived benefits of the vaccine.[45] Moreover, interventions to promote COVID-19 vaccination, targeting high-risk individuals may be effective in overcoming barriers and increasing the intention to receive the vaccine. The results of the present study can be used as a framework to identify the beliefs and attitudes affecting the intention to receive the vaccine in the age group over 18 years. Also, these factors can be used to carry out effective interventions to improve the intention to get the 3rd and 4th doses of the COVID-19 vaccine.

One of the limitations of the present study is that the intention to receive the vaccine was mainly self-reported, which is more subjective. A more objective evaluation index can subsequently be considered to investigate the intention to get the vaccine and its effective factors. The cross-sectional design of the study also limited causal inference, and the use of self-reported data may increase this association. Finally, the authors only examined the intentions of the study participants and did not consider their actual behavior. Considering the gap between intention and behavior, investigating this issue in future studies will be necessary and promising.

Conclusion

The study results indicated that the intention to receive the vaccine based on demographic variables and health-related characteristics, including occupation, educational level, marital status, chronic diseases, obesity, smoking, as well as history of being infected with COVID-19, high Perceived susceptibility, high perceived severity, attitude and perceived behavioral control are different. Policymakers and healthcare providers can use the results of the present study to improve vaccine uptake. Research studies have to focus on males, people without academic education, workers, people without a history of chronic diseases and obesity, as well as those with no history of being infected with COVID-19. In addition, susceptibility and perceived severity of the disease should be promoted using public health intervention programs. It is also required to strengthen perceived behavioral control by reducing barriers (e.g., fear of side effects, misconceptions about vaccines) and promoting facilitators (e.g., desire to protect self and family from COVID-19, education about the covid-19 vaccine, seeing others receiving the covid-19 vaccine). positive attitudes toward the vaccine should also be promoted providing positive information to help evaluate the vaccines positively.

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Conflicts of interest

There are no conflicts of interest.

References

1. Nejaddadgar N, Jafarzadeh M, Ziapour A, Rezaei F. Determinants of COVID-19 vaccine acceptance in Ardabil: A web-based survey. Health Educ Health Promot 2022;10:221-5.
2. Pogue K, Jensen JL, Stancil CK, Ferguson DG, Hughes SJ, Mello EJ, *et al.* Influences on attitudes regarding potential COVID-19 vaccination in the United States. Vaccines 2020;8:582.
3. Syed Alwi S, Rafidah E, Zurraini A, Juslina O, Brohi I, Lukas S. A survey on COVID-19 vaccine acceptance and concern among Malaysians. BMC Public Health 2021;21:1129.

4. Nossier SA. Vaccine hesitancy: The greatest threat to COVID-19 vaccination programs. J Egypt Public Health Assoc 2021;96:18.
5. Palamenghi L, Barello S, Boccia S, Graffigna G. Mistrust in biomedical research and vaccine hesitancy: The forefront challenge in the battle against COVID-19 in Italy. Eur J Epidemiol 2020;35:785-8.
6. Sun S, Lin D, Operario D. Interest in COVID-19 vaccine trials participation among young adults in China: Willingness, reasons for hesitancy, and demographic and psychosocial determinants. Prev Med Rep 2021;22:101350.
7. Cooper S, van Rooyen H, Wiysonge CS. COVID-19 vaccine hesitancy in South Africa: How can we maximize uptake of COVID-19 vaccines? Expert Rev Vaccines 2021;20:921-33.
8. Lueck JA, Spiers A. Which beliefs predict intention to get vaccinated against COVID-19? A mixed-methods reasoned action approach applied to health communication. J Health Commun 2020;25:790-8.
9. Gür E. Vaccine hesitancy-vaccine refusal. Turk Arch Pediatr 2019;54:1-2.
10. Yahaghi R, Ahmadizade S, Fotuhi R, Taherkhani E, Ranjbaran M, Buchali Z, *et al.* Fear of COVID-19 and perceived COVID-19 infectability supplement theory of planned behavior to explain Iranians' intention to get COVID-19 vaccinated. Vaccines 2021;9:684.
11. Anderson RM, Heesterbeek H, Klinkenberg D, Hollingsworth TD. How will country-based mitigation measures influence the course of the COVID-19 epidemic? Lancet 2020;395:931-4.
12. Betsch C, Böhm R, Chapman GB. Using behavioral insights to increase vaccination policy effectiveness. Policy Insights Behav Brain Sci 2015;2:61-73.
13. Kan T, Zhang J. Factors influencing seasonal influenza vaccination behaviour among elderly people: A systematic review. Public Health 2018;156:67-78.
14. Rosenstock IM, Strecher VJ, Becker MH. Social learning theory and the health belief model. Health Educ Q 1988;15:175-83.
15. Organization WH. Assessment report of the Global Vaccine Action Plan: Strategic advisory group of experts on immunization. World Health Organization; 2018.
16. Schmid P, Rauber D, Betsch C, Lidolt G, Denker M-L. Barriers of influenza vaccination intention and behavior–a systematic review of influenza vaccine hesitancy, 2005–2016. PLoS One 2017;12:e0170550.
17. Shmueli L. Predicting intention to receive COVID-19 vaccine among the general population using the health belief model and the theory of planned behavior model. BMC Public Health 2021;21:1-13.
18. Asihaer Y, Sun M, Li M, Xiao H, Amaerjiang N, Guan M, *et al.* Predictors of influenza vaccination among Chinese middle school students based on the health belief model: A mixed-methods study. Vaccines 2022;10:1802.
19. Keshavarz A, Karimi M, Nazari M, Ghaem H. The effect of a health belief model based educational intervention on the determinants of intention to influenza prevention behaviors among the older adults. Educ Gerontol 2022;48:381-9. DOI: https://doi.org/10.1080/03601277.2022.2043612.
20. Reiter PL, Pennell ML, Katz ML. Acceptability of a COVID-19 vaccine among adults in the United States: How many people would get vaccinated? Vaccine 2020;38:6500-7.
21. Wong LP, Alias H, Wong P-F, 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;16:2204-14.
22. Lin CY, Imani V, Majd NR, Ghasemi Z, Griffiths MD, Hamilton K, *et al.* Using an integrated social cognition model to predict COVID-19 preventive behaviours. Br J Health Psychol 2020;25:981-1005.
23. Thu TPB, Ngoc PNH, Hai NM. Effect of the social distancing measures on the spread of COVID-19 in 10 highly infected countries. Sci Total Envir 2020;742:140430.
24. Didarloo A, Khalkhali HR, Ghorbani B. Relationship between health belief model and human papillomavirus vaccine intent among female students of Urmia university of medical sciences. Nurs Midwifery J 2020;17:897-906.
25. Kamal A-HM, Sarkar T, Khan MM, Roy SK, Khan SH, Hasan SM, *et al.* Factors affecting willingness to receive COVID-19 vaccine among adults: A cross-sectional study in Bangladesh. J Health Manag 2021:09735984211050691.
26. Janz NK, Becker MH. The health belief model: A decade later. Health Educ Q 1984;11:1-47.
27. Kanyangarara M, McAbee L, Daguise VG, Nolan MS. Factors associated with COVID-19 vaccine intentions among South Carolina residents. Vaccines 2022;10:942.
28. Ajzen I. The theory of planned behavior: Frequently asked questions. Hum Behav Emerg Technol 2020;2:314-24.
29. Hossain MB, Alam MZ, Islam MS, Sultan S, Faysal MM, Rima S, *et al.* Health belief model, theory of planned behavior, or psychological antecedents: What predicts COVID-19 vaccine hesitancy better among the Bangladeshi adults? Front Public Health 2021;9:711066.
30. Chu H, Liu S. Integrating health behavior theories to predict American's intention to receive a COVID-19 vaccine. Patient Educ Couns 2021;104:1878-86.
31. Chen Y-L, Lin Y-J, Chang Y-P, Chou W-J, Yen C-F. Differences in the protection motivation theory constructs between people with various latent classes of motivation for vaccination and preventive behaviors against COVID-19 in Taiwan. Int J Environ Res Public Health 2021;18:7042.
32. Liu S, Liu J. Understanding behavioral intentions toward COVID-19 vaccines: Theory-based content analysis of tweets. J Med Internet Res 2021;23:e28118.
33. Cordina M, Lauri MA. Attitudes towards COVID-19 vaccination, vaccine hesitancy and intention to take the vaccine. Pharm Pract (Granada) 2021;19:2317.
34. An PL, Nguyen HTN, Dang HTB, Huynh QNH, Pham BDU, Huynh G. Integrating health behavior theories to predict intention to get a COVID-19 vaccine. Health Serv Insights 2021;14:11786329211060130.
35. Fisher KA, Bloomstone SJ, Walder J, Crawford S, Fouayzi H, Mazor KM. Attitudes toward a potential SARS-CoV-2 vaccine: A survey of US adults. Ann Intern Med 2020;173:964-73.
36. Garcia L. Willingness to pay for a COVID-19 vaccine high in Chile. PharmacoEcon Outcomes News 2020;858:35.
37. Sallam M, Dababseh D, Eid H, Al-Mahzoum K, Al-Haidar A, Taim D, *et al.* High rates of COVID-19 vaccine hesitancy and its association with conspiracy beliefs: A study in Jordan and Kuwait among other Arab countries. Vaccines 2021;9:42.
38. Andarge E, Fikadu T, Temesgen R, Shegaze M, Feleke T, Haile F, *et al.* Intention and practice on personal preventive measures against the COVID-19 pandemic among adults with chronic conditions in southern Ethiopia: A survey using the theory of planned behavior. J Multidiscip Healthc 2020;13:1863-77.
39. Ezati Rad R, Kahnouji K, Mohseni S, Shahabi N, Noruziyan F, Farshidi H, *et al.* Predicting the COVID-19 vaccine receive intention based on the theory of reasoned action in the south of Iran. BMC Public Health 2022;22:229.
40. Kashyap VK, Dhasmana A, Massey A, Kotnala S, Zafar N, Jaggi M, *et al.* Smoking and COVID-19: Adding fuel to the flame. Int J Mol Sci 2020;21:6581.
41. Ward JK, Alleaume C, Peretti-Watel P, Seror V, Cortaredona S, Launay O, *et al.* The French public's attitudes to a future COVID-19

vaccine: The politicization of a public health issue. Soc Sci Med 2020;265:113414.

42. Al-Mohaithef M, Padhi BK. Determinants of COVID-19 vaccine acceptance in Saudi Arabia: A web-based national survey. J Multidiscip Healthc 2020;13:1657-63.
43. Mahmud I, Kabir R, Rahman MA, Alradie-Mohamed A, Vinnakota D, Al-Mohaimeed A. The health belief model predicts intention to receive the covid-19 vaccine in Saudi Arabia: Results from a cross-sectional survey. Vaccines 2021;9:864.
44. Ung COL, Hu Y, Hu H, Bian Y. Investigating the intention to receive the COVID-19 vaccination in Macao: Implications for vaccination strategies. BMC Infect Dis 2022;22:218.
45. Rehati P, Amaerjiang N, Yang L, Xiao H, Li M, Zunong J, *et al.* COVID-19 Vaccine hesitancy among adolescents: Cross-sectional school survey in four Chinese cities prior to vaccine availability. Vaccines 2022;10:452.