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The role of health locus of control, health literacy and people attitudes regarding coronavirus (COVID-19) vaccination

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ABSTRACT

Vaccination is of great importance for public health, and widespread acceptance of vaccination may help control the Coronavirus disease 2019 (COVID-19) epidemic more effectively. In order to vaccinate a wide range of people, it is vital to know their views and the factors influencing their behavior. This study was designed to characterize people's views regarding corona virus (COVID-19) vaccination, health locus of control, and health literacy in Iran. This cross-sectional study included 384 people aged 18 to 60 years who attended comprehensive health service centers (Public centers). People were included in the study by stratified random sampling. The tool for data collection was a questionnaire that included demographic questions, questions to examine people's views on corona virus vaccination, and standard questionnaire items on health locus of control and health literacy. The collected data were entered into SPSS 20 and analyzed with descriptive and analytical tests (Spearman's correlation coefficient and logistic regression model). The average age of the participants was 33.35 ± 11.38 years. Most people (57.9%) were married and had some level of higher education (60.4%). Most people (86.2%) had a history of receiving the vaccine and had a positive attitude towards vaccination. On average, 41.8% of people had sufficient health literacy. Women had a more positive attitude towards vaccination (P<0.001). Also, health literacy in basic skills was found to have a significant positive relationship with internal health locus of control (P<0.001). Logistic regression analysis showed that the variables, including attitude (OR=1.092, P=0.001), internal health locus of control (OR=1.072, P=0.001), and health literacy (OR=1.25, P=0.001) were predictors of receiving the vaccine. Considering that health literacy improves people's positive attitude towards vaccines and plays a key role in adopting healthy behaviors, the present findings emphasize that programs organized for the general public should include a strategy to promote health literacy.

INTRODUCTION

The 2019 coronavirus disease (COVID-19) can be transmitted to humans through tiny droplets from the nose or mouth, which can spread when an infected person coughs or exhales, and when another person comes into contact with the droplets directly or by touching or handling objects. Protocols to reduce the spread of the disease include travel restrictions, quarantine, and elimination of silent transmission in the community by reducing interpersonal contact (increasing effective health behaviors) and observing social distancing [1].

One of the ways to reduce severity of symptoms in many people is vaccination. The World Health Organization (WHO) believes that all people, wherever they are, can benefit from safe and effective vaccines for COVID-19, and should have access as soon as possible. Therefore, according to the opinion of the WHO, one of the health strategies to prevent (COVID-19) disease is vaccination [2].

The outbreak began in Iran after the detection of the first death associated with COVID-19, on Feb 19, 2020 in Qom, a holy city in central Iran. After a short period, COVID-19 has widely spread in all other provinces in Iran. As of April 21, 2020, of 330 137 tested patients, 80 868 people have been infected with COVID-19. Of them, 55 987 people have recovered, 3513 people are critically ill and 5031 people have died [3].According to the official information of the Ministry of Health of Iran until 27 October 2021, and the official population of Iran, approximately 85% of the people had received the first dose of the vaccine.

One of the necessary steps to manage the covid-19 epidemic is to adopt preventive behaviors and carry out vaccination. One factors that makes people adopt protective behaviors and participate more in health care is health literacy [4].

Sufficient knowledge of the disease and the factors that affect its occurrence is considered an effective factor in disease prevention and control. In addition, health systems have created new needs among users, and people have assumed new roles in order to make the right decisions about themselves and their families. In this context, one of the most effective factors is health literacy, which influences the level of knowledge and consequently impacts more effective disease control and prevention. Because of the influential role of health literacy on the way people make decisions in health-related fields, policymakers have noted this element as one of the basic tools to improve the overall level of health in society and raise the quality of health care services [5].

Health literacy is defined as people's perceptions, knowledge and ability to understand, access, evaluate and use health information to prevent and treat diseases in the life course to improve the quality of life.[6]. While reducing health inequalities, health literacy helps to create individual and social resilience and allows people to make better health decisions and have higher levels of efficiency. Also, people with low health literacy are less familiar with health concepts and adopt less healthy behaviors. Health literacy capacities allow people to be well informed about risks, resources and recommendations, and ideally, to perform solidarity-based behaviors to achieve public health [7].

The WHO guidelines emphasize the importance of preventing the spread of infection by increasing health literacy among the general public worldwide [8]. The need to promote health literacy became especially clear during the COVID-19 pandemic [9]. Improving health-related behaviors can also lead to improvements in people's behavior that enhance their quality of life and reduce healthcare costs [10]. One

of the factors that affects health-related behaviors is the source of health control. Individual perceptions of the source of control help to form a correct understanding of a person's involvement in the development and maintenance of various health-promoting and preventive behaviors [11]. Indeed, the source of health control is the degree of a person's belief that their health is under the control of internal or external factors [12]. The subject that is examined through health locus of control theory is the perception of personal effectiveness and individual responsibility in the field of health. Health control belief theory examines personal beliefs in the control of their health by internal or external factors and causes. According to health locus of control theory, people with an internal locus tend to engage in positive health behaviors, whereas an external locus is associated with negative and weak health behaviors [13].

Because of the pathogenic nature and rapid spread of the COVID-19 virus, as well its associated mortality rates, the health status of people in the general public is at risk. Therefore, in the current high-risk situation, vaccination at different levels of society is needed to maintain the general population's health status. This study aimed to investigate people's views regarding corona virus vaccination and its relationship with health locus of control and health literacy.

METHODS

This cross-sectional descriptive-analytical study was conducted in Gonabad City, Iran. The sampling method was stratified. To calculate sample size, the values of p and q (proportion of vaccinated and unvaccinated people) were calculated based on official information from the Ministry of Health of Iran until October 27, 2021 and the official population of Iran (84,964,556 people as reported by the Iranian Statistics Center). According to

these figures, about 58% of people had received the first dose of the vaccine. Considering a confidence level of 95% and a power of 80%, the formula yielded a calculated sample size of 299 people. The inclusion criteria were age between 18 and 60 years, and willingness to participate in the study. Incomplete or missing responses on the questionnaire were considered an exit criterion.

At first, people were invited through comprehensive health service centers and questionnaires were presented to them. The data collection tool in this study was a multipart and self-administered questionnaire. The first section contained 16 demographic items about age, gender, education, occupation, source of news about the corona virus (COVID-19), vaccination history, infection and hospitalization history for the respondent and people close to respondents who had COVID-19 disease, deaths among people close to respondents, work missed due to COVID-19 illness, history of side effects caused by vaccinations in respondents and people close to them, availability and location of free vaccination, and plans to seek vaccination in the future. The second section contained 8 items that applied from the previous study and examined people's views on corona virus (COVID-19) vaccination according to a 5-point Likert scale with scores ranging from 8 to 40. Low scores indicated a negative attitude and high scores indicated a more positive attitude. Cronbach's alpha coefficient of this part of the questions was 0.67.The third section contained standard health locus of control [14] items that covered two dimensions of internal (6 question) and external health control beliefs (12 question). The external health control section also included two parts that inquired about the role of luck and powerful people. This section comprised 18 items with responses on a 6-point Likert scale, scores for each item ranging from 1 to 6, and a total score in each dimension ranging from

6 to 36. In the present study, the Cronbach's alpha coefficient for this questionnaire was 0.74.The fourth section contained a shortened form of a standard health literacy questionnaire [15] with 9 items. This section covered two dimensions: 1) basic skills with 5 items on a 5-point Likert scale, with scores ranging from 5 to 25, and 2) decision-making skills with 4 items scored between 4 and 20. The level of health literacy in respondents was ranked as follows: scores between 0 and 50 indicated insufficient health literacy, scores between 50.1 and 66 indicated not quite enough health literacy, scores between 66.1 and 84 indicated sufficient health literacy, and scores between 84.1 and 100 indicated levels of health literacy are excellent. In the present study, the Cronbach's alpha coefficient for this questionnaire was 0.78.

Ethical approval

After the study was registered, approved, and assigned an ethics code (IR.GMU.REC.1400.102), it began with a reliability assessment of the questionnaire. Gonabad City has three comprehensive health centers, which were considered as strata for sampling at all three centers. The sampling method was based on patient lists available in each center, and patients were contacted with the relevant contact information provided on these lists. People who had and had not been vaccinated were included in the study if they consented.

Statistical analysis

After the data were collected, the responses were analyzed with SPSS 20 software for descriptive and analytical tests (Spearman's correlation coefficient and logistic regression model) (Table5). The reason for non-normality in the distribution of some responses was because nonparametric equations were used.

RESULTS

Background characteristics of the participants

Average age of the participants was 33.35±11.38 years. Most participants were women (66.8%). Most (57.9%) were married and had some level of higher education (60.4%). Most (86.2%) had a history of receiving vaccines. About two fifths of our respondents (40.5%) noted absence from their workplace due to COVID-19. The most frequent source of information about COVID-19 was through social networks (37.5%) (Table 1).

Table 1. Frequency distribution of the research community according to demographic characteristics

Variables		N (%)
Sex	Men	101 (33.2)
	Female	203 (66.8)
Marital status	Married	176 (57.9)
	Single	93(30.6)
	Widow	14(4.6)
	Divorced	21(6.9)
Educational status	Elementary or lower	14 (4.6)
	Diploma or lower	106 (35.0)
	Bachelor's degree or above	183 (60.4)
Job	Unemployed	70 (23.0)
	Free	54 (17.8)
	Housewife	73 (24.0)
	Employee	107(35.2)

Variables		N (%)
The source of news follow-up	TV	88 (28.9)
	News site	32 (10.5)
	Virtual network	114 (37.5)
	The people around	23 (7.6)
	Doctors and health workers	47 (15.5)
Vaccine history	Yes	262 (86.2)
	No	42 (13.8)
History of side effects of vaccines	Yes	134 (44.4)
	No	168 (55.6)
Absence from work due to illness	Yes	123 (40.5)
	No	181 (59.5)
Relatives getting sick	Yes	208 (68.4)
	No	96 (31.6)
Information about the free COVID-19 vaccine	Yes	293 (96.4)
	No	11 (3.6)
Information on how to access	Yes	270 (88.8)
	No	34 (11.2)
Plan to get the vaccine in the future	Yes	165 (54.3)
	No	139 (45.7)
Hospitalization of relatives	Yes	124 (40.8)
	No	180 (59.2)
Death of relatives	Yes	83 (27.3)
	No	221 (72.7)

The results summarized in Table 2 show a significant relationship between the educational level variable and attitude, health literacy (basic skills and decision-making), internal health locus of control, and chance (P<0.001). Also, significant relationships were observed between the marital status and attitude variables and internal health locus of control (P<0.001).

Lastly, a significant relationship was observed between the occupation variable and attitude, internal health locus of control, and health literacy (decision-making) (P<0.001). There was a significant relationship between attitude and gender (P<0.001): a positive attitude towards COVID-19 vaccination was significantly more frequent in women than in men.

Table 2. The median and the interquartile range of the subjects under study according to the variable of attitude, health literacy and health locus of control by demographic characteristics

Variable	Attitude	Health literacy		Health locus of control		
		Basic skill	Decision making	Internal	Powerful people	Chance
	Median (interquartile range)	Median (interquartile range)	Median (interquartile range)	Median (interquartile range)	Median (interquartile range)	Median (interquartile range)
Education level						
Elementary or lower	20.1±6.25	10.85±4.25	14.28±5	21.71±4.25	17.85±3.25	12.85±3
diploma or lower	24.60±11.25	19.87±5	14.09±5.25	23.96±7	17.74±4.50	14.61±4
bachelor's degree or above	27.24±10	20.74±4	15.65±4	25.31±7	17.79±5	13.32±5
P value	P<0.001	P<0.001	P<0.001	P<0.001	P=0.966	P=0.004

Variable	Attitude	Health literacy		Health locus of control		
		Basic skill	Decision making	Internal	Powerful people	Chance
	Median (interquartile range)	Median (interquartile range)	Median (interquartile range)	Median (interquartile range)	Median (interquartile range)	Median (interquartile range)
Marital status						
married	26.78±12	20.09±3.75	15.26±3.75	25.72±8	17.72±6	14.13±6
Single	26.07±12.50	20.08±6.5	14.91±4	24.27±6	17.81±4	14.85±2.50
the widow	22.28±9.50	20.50±3.25	13.57±6.25	19.21±4.50	18.92±1	14.32±4.50
Divorced	21.61±6.50	18.14±8	14.76±5	17.72±6	16.90±5	14.32±4.50
P value	P=0.002	P=0.317	P=0.380	P<0.001	P=0.537	P=0.233
Job						
Unemployed	27.50±10.25	19.69±5.25	14±5	24.1±7	17.85±5	13.87±4.25
free	23.20±13.25	19.62±5	14.20±5.25	23.29±7	18±6	14.60±6
housewife	25.90±13	20.05±6.25	15.10±3.50	P=0.02	17.75±4	13.31±5
Employee	26.46±10	20.28±4	16.10±4	22.57±7	17.75±5.7	13.61±5
P value	P=0.035	P=0.412	P<0.001	P=0.020	P=0.646	P=0.360
Sex						
Man	22±10.50	19.32±4	14.95±4	22.57±7	17.75±5.7	14.35±5
Female	27.51±10	20.29±5	15.08±4	25.72±6	17.78±5.7	13.48±5
P value	P<0.001	P=0.680			P=0.08	

The results in Table 3 show a significant inverse relationship between attitude and age (r=0.006, P=0.159): older respondents more often expressed a negative attitude towards vaccination. A significant direct relationship was observed between internal health locus of control and attitude (r=0.484, P<0.001). A significant inverse relationship was observed between chance and internal control belief (P=0.045, r=0.115). Basic skills in health literacy showed a significant inverse relationship with attitude (P=0.023, r=0.131) and luck (P=0.005, r=0.163), and a significant direct relationship was seen with internal health locus of control (P=0.031, r=0.124). We observed a significant direct relationship between decision-making health literacy and basic skills (r=0.462, P<0.001), and a significant inverse relationship with chance. P<0.001, r=0.263).

Table 3. Correlation coefficient of attitude, health locus of control and health literacy with age

Variable	Age	Attitude	Internal	Powerful people	Chance	Health literacy Basic skill	Decision making
Age	1						
Attitude	r=-0.159* P=0.006	1					
Internal	r=-0.02 P=0.728	r=0.484* P<0.001	1				
Powerful people	r=-0.031 P=0.590	r=-0.026 P=0.657	r=0.170* P=0.03	1			
Chance	r=0.074 P=0.198	r=-0.139* P=0.016	r=-0.115* P=0.045	r=0.201* P=<0.001	1		
Health literacy Basic skill	r=-0.009 P=0.871	r=-0.131* P=0.023	r=0.124* P=0.031	r=-0.023 P=0.688	r=-0.163* P=0.005	1	

Variable	Age	Attitude	Internal	Powerful people	Chance	Health literacy Basic skill	Decision making
Decision making	r=0.048 P=0.402	r=0.014 P=0.810	r=0.095 P=0.098	r=-0.033 P=0.565	r=-0.263* P=<0.001	r=0.462* P=<0.001	1

The results in Table 4 show a significant relationship between health literacy levels and the variables for education and occupation (P<0.001).

Table 4. Relationship between health literacy levels and demographic characteristics

Variable	Health literacy					P value
	Insufficient	**Not quite**	**enough**	**Excellent**	**Total**	
Sex						
Male	13(12.9%)	28(27.7%)	37(36.6%)	23(22.8%)	101(100%)	0.174
Female	20(9.9%)	37(18.2%)	56(27.6%)	56(27.6%)	203(100%)	
Total	33(10.9%)	65(21.4%)	127(41.8%)	79(26%)	304(100%)	
Level of Education						
Elementary and lower	11 (78.6%)	2 (14.3%)	1(7.1%)	0(0%)	14(100%)	<0.001
Diploma and lower	14 (13.2%)	23(21.7%)	48(45.3%)	21(19.8%)	106(100%)	
Bachelor degree and above	8 (4.4%)	39 (21.3%)	78(42.6%)	58(31.7%)	183(100%)	
Total	33(10.9%)	64(21.1%)	127(41.9%)	79(26.1%)	303((100%)	
Marital status						
Married	13(14%)	19(20.4%)	35(37.6%)	26(28%)	93(100%)	0.457
Single	14(8%)	36(20.5%)	80(45.5%)	46(26.1%)	176(100%)	
The widow	2(14.3%)	5(35.7%)	3(21.4%)	4(28.4%)	14(100%)	
Divorced	4(19%)	5(23.8%)	9(42.9%)	3(14.3%)	21(100%)	
Total	33(10.9%)	65(21.4%)	127(41.8%)	79(26%)	304(100%)	
Job						
Unemployed	10(14.3%)	21(30%)	24(34.3%)	15(21.4%)	70(100%)	0.005
Free	7(9.6%)	19(35.2%)	15(27.8%)	13(24.1%)	54(100%)	
Housewife	7(9.6%)	14(19.2%)	36(49.3%)	16(21.9%)	73(100%)	
Employee	9(8.4%)	11(10.3%)	52(48.6%)	35(32.7%)	107(100%)	
Total	23(10.9%)	65(32.4%)	127(41.8%)	79(26%)	304(100%)	

Logistic regression was used to determine the predictive value of each variable for receiving vaccination. According to the univariate logistic regression model, factors and parameters that were related to receiving the vaccine included attitude towards the vaccine (OR=1.092, P<0.001) and internal health locus of control (P<0.001, OR=0.072). Basic skills in health literacy (OR=1.245 P<0.001) and decision-making skills (OR=1.254, P<0.001) were predictors of receiving vaccination. For example, the odds ratios showed that with every unit increase in the score for attitude towards the vaccine, the chance of receiving the vaccine increased by 9.2%. Also, with an increase of one unit in the variable score of health literacy in the basic skill dimension, the rate of vaccine receipt increases by 24.5%, and with an increase of one unit in the variable score of health literacy in the decision-making dimension, the amount of vaccine receipt increases by 25.4% (Table 5). Multivariate regression was also used to reduce the influence of confounding variables; after removing the effects of confounders, the attitude, health literacy, basic skills, and decision-making variables were predictors of receiving vaccination.

Table 5. Findings of univariate and multivariate logistic regression model in predicting the receipt of COVID-19 vaccine

The dependent variable	independent variable	Crude Odds Ratio	CI 95%		p-value	Adjusted Odds Ratio	CI 95%		p-value
			lower	upper			lower	upper	
Getting the COVID-19 vaccine	Attitude score	1.092	1.045	1.142	<0.001	1.126	1.058	1.198	<0.001
	Internal locus of control score	1.072	1.008	1.139	0.026	1.004	0.922	1.094	0.923
	Powerful people score	0.991	0.907	1.083	0.842	1.017	0.910	1.137	0.764
	Chance score	0.961	0.879	1.050	0.378	1.033	0.922	1.156	0.579
	Health literacy Basic skill score	1.245	1.154	1.344	<0.001	1.190	1.097	1.309	<0.001
	Decision making score	1.254	1.129	1.392	<0.001	1.180	1.037	1.361	0.013

DISCUSSION

The purpose of this study was to characterize people's views regarding corona virus vaccination, health locus of control, and health literacy in the population covered by comprehensive health centers in an Eastern Asian City. In this study, 86.2% of the respondents had a history of receiving vaccination. A literature review shows that vaccination rates have differed in different populations and countries [16] For example, a study by Lazarus et al. [17] reported vaccination rates of 55% in Russia and 90% in China. A study by Sallam et al. [18] noted that the highest vaccination rate was 97% in Ecuador, and the lowest was 28% in Kuwait.

In the present study, people's attitude towards vaccination was mostly favorable; this result may encourage greater vaccination uptake, as suggested by the findings of other studies [19, 20]. A study by Abebe [21] in Ethiopia in 2021 also showed that most people were positive about getting vaccinated. The studies conducted in different countries of the world showed that various factors determine the acceptance of the vaccine, still one of the most decisive factors in the willingness to use the COVID-19 vaccine is awareness and attitude towards the COVID-19 vaccine. Low knowledge, attitude and low intention to accept the COVID-19 vaccine may be one of the world's concerns [22, 23]. In fact, attitude indicates a person's general thoughts and feelings about the desirability or denial of various objects. People's attitudes during their lifetime, as they gain positive experiences about certain behaviors, become more inclined towards performing these behaviors in the future. Therefore different beliefs and attitudes, derived from internal factors, affect health behaviors including vaccination acceptance.[24].

The results of the present study showed that attitude was significantly related to age, sex, marital status, and

education variables, which is consistent with studies [19, 21]. Notably, younger participants in the present study had a more negative attitude towards the vaccine a finding consistent with results published by Zhang [25]. This result may indicate that the vulnerability of older adults may make them more inclined to get vaccinated. Another finding worth highlighting in the present study is that women more often expressed a positive attitude towards vaccination which contrasts with the results reported in studies [19, 25]. Married people had a positive attitude towards the vaccine, which may be due to economic and emotional support from their families, seeking more information, and having a more positive attitude towards vaccination [26]. Therefore, policymakers should consider individuals' age and gender in developing interventional programs for different populations.

The present results document a significant relationship between attitude variables, internal belief in health control, and health literacy. Similar results have been reported by Aharon et al.,[27] and Silva and Santos [28].

The results of earlier studies [29-31] showed that an internal health locus of control affects vaccination behaviors. Internal health locus of control refers to the level of people's belief in their ability to influence their own behaviors. Therefore, the stronger a person's internal health locus of control, the more likely that they will have a positive attitude towards adopting healthy behaviors.

The most important findings in the present study are that decision making health literacy was the variable that best predicted vaccinated vs. non-vaccinated status, followed by the attitude and internal health locus of control variables. These results align with earlier studies [20, 25, 28, 32]. The findings of the study by Pisl et al. [32] showed that the role of powerful people such as doctors is influential in the decision-making process to get vaccinated,

while respondents in the present study believed in the importance of their own role in health and vaccination. People who have an internal health locus of control believe that certain outcomes in life are a result of their own behaviors, and that their health is directly determined by their behaviors and actions.

The sufficient level of health literacy allows individuals to make better health decisions and have a stronger commitment and higher levels of efficiency. Health literacy helps people to understand and evaluate the effectiveness of the COVID-19 vaccine, which increases their self-efficacy in deciding to get vaccinated [33]. In addition, people with lower health literacy may be more sensitive to misinformation about the vaccine. COVID-19 and its vaccines are more susceptible to biases in social media, and this makes it more difficult for people to decide whether to get vaccinated.

Other findings in the present study showed that participants had a sufficient level of literacy, which is in line with the results of studies [28, 34]. Previous studies [35, 36] have shown that health literacy and health behaviors are related. Inadequate health literacy seems to act as an obstacle or a serious risk factor in health care and makes it difficult for people to understand the advice and training provided to them and ultimately adopt healthy behaviors [14]. In addition, we observed that the health literacy variable showed a significant relationship with level of education and occupation, which is consistent with findings reported by Silva et al [28]. Various studies conducted in the field of health literacy also show that with the increase in the level of education, people's health literacy increases. For example, in their study, Chu et al. found education to be effective on health literacy. It has been reported that the low level of health literacy is a big problem, and this problem is especially evident in people without a diploma. Therefore, considering this issue,

it is better to use simple and understandable educational media such as pictures and radio tapes, video tapes, non-written materials such as picture books or multimedia shows to educate these people [37]. Considering the effectiveness of health literacy in encouraging vaccination, educational policies and programs are advisable to overcome the challenges posed by inadequate levels of health literacy in the general population.

LIMITATIONS OF THE STUDY

Our study had limitations, including the cross-sectional design and the self-reporting nature of the questionnaire items, which can lead to information bias.

CONCLUSION

Considering that health literacy improves people's attitudes and plays a key role in adopting healthy behaviors, the present findings emphasize that programs for the general public should include a strategy to promote health literacy. The design of these programs should take into account the needs and characteristics of people, such as job and educational level. In addition, policymakers and the media should emphasize the positive relationship between the belief in health control and vaccination, in order to provide correct health information to the public and thereby strengthen the internal health locus of control as a way to support health and provide encouragement and assurances that people's behavior determines their health outcomes.

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