








# Health Locus of Control And COVID-19 Risk Perception Among Iranians: A Cross-Sectional Study

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## Abstract:

**Background:** The COVID-19 pandemic has a significant impact on people's physical, mental, and emotional health. People perceive diseases differently depending on their view of the source of their health.

**Objective:** During the outbreak of COVID-19 among the Iranian population, this study examined the relationship between health locus of control and perceptions of COVID-19 risk.

**Methods:** A cross-sectional study using validated scales was conducted to assess health locus of control and perception of COVID-19 risk. A total of 480 survey responses were analyzed descriptively and inferentially using SPSS software.

**Results:** The mean age of participants was  $22.93 \pm 5.42$  years. The total score of COVID-19 risk perception (CV-19RP) for all study participants was 131.61 (13.49). Also, the total score of the health locus of control was 69.74 (10.58), and the scores of its subdomains, PHLC, IHLC, and CHLC, were 23.70 (5.51), 27.60 (4.03), and 18.4 (5.39), respectively. There is a significant positive correlation between COVID-19 risk perception and the health locus of control  $r = 0.366$  ( $p < 0.001$ ). The health locus of control subdomains PHLC  $r = 0.385$  ( $p < 0.001$ ) and IHLC  $r = 0.251$  ( $p < 0.001$ ) had a positive correlation with the CV-19RP score. However, CHLC  $r = 0.141$  ( $p = 0.02$ ) had no significant correlation with the CV-19RP score.

**Conclusion:** In the present study, we found a direct correlation between health locus of control and perception of COVID-19 risk. Most of the respondents believed their activities and internal factors caused their health. The risk of COVID-19 is higher among those who believe their health is affected by the activities of others. To improve community health and achieve sustainable development goals (SDGs), key stakeholders must implement a number of positive strategies.

**Keywords:** COVID-19, Health locus of control, Iran, Risk perception, CHLC, IHLC, PHLC.

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## 1. INTRODUCTION

A global health crisis brought on by the coronavirus disease 2019 (COVID-19) pandemic has an impact on people's physical, mental, and emotional health. Both the general people and the medical community have been dealing with psychological stress, worry about the future, and other health-related difficulties as a result of the pandemic's accelerated growth in the number of deaths and new instances of infection [1-3]. In reality, more people than COVID-19 patients are impacted by behavioral, mental, and emotional illnesses during this global health crisis. Several studies have been conducted during the COVID-19 pandemic to investigate the impact of the pandemic on people's mental health and health behaviors. These studies have shown that people are facing more mental health disorders during the pandemic, which has potential risks. A study has shown that alcohol consumption has increased unprecedentedly during the pandemic, leading to medium and long-term public health consequences, including the burden of domestic violence, child abuse, and mental illnesses [4]. Another study has shown that reducing specific symptoms of depression and anxiety can be a tool to reduce suicide among teenagers during the pandemic [5]. Moreover, a study has shown that a large population is highly vulnerable to the COVID-19 pandemic, and a large population is also afraid of COVID-19. So, promoting health practices and public awareness can help create positive health behaviors during the COVID-19 pandemic [6]. According to a United Kingdom survey, worries about the social and psychological aspects of infection seem to be more pressing than fears of contracting COVID-19 [7, 8]. While many factors, such as vaccination rates, transmission rates, and the capacity of healthcare systems, influence the spread and severity of COVID-19, it is important to note that individual perceptions of the risk of contracting the virus and their Health Locus of Control (HLC) also play a significant role.

The link between Health Locus of Control (HLC) and COVID-19 risk perception can be explained by the Health Belief Model (HBM), a theoretical framework. The HBM is predicated on the notion that an individual's behavior with regard to their health is influenced by their perceptions of the seriousness of a health hazard, their vulnerability to that threat, and the advantages and disadvantages of acting to prevent or lessen the threat [9]. In the case of COVID-19, an individual's HLC can affect how susceptible they think they are to the virus and how serious of a threat they think it is. Those who have an internal HLC may believe they have more influence over their health outcomes, making them more vulnerable to the virus. Their view of their susceptibility may lead them to perceive the threat posed by COVID-19 as being more serious, which would result in increased levels of risk perception [10]. Those with an external HLC, on the other hand, might think that outside forces, such as luck or chance, dictate their health results and may so be less susceptible to COVID-19. Lower levels of risk perception could result from this feeling of lesser sensitivity. HLC

measures how much people believe they have influence over their health-related outcomes. HLC has been connected to a variety of health outcomes and behaviors, including prevention and adherence to treatment plans. So, an individual's HLC may be related to how risky they perceive COVID-19 to be, which in turn may have an impact on how likely they are to follow public health recommendations like wearing a mask, keeping a distance from others, and being vaccinated.

Perceptions of COVID-19 risk are consistent with the actual threat and encourage optimal participation in preventative measures [11]. Prior research on risk perception in relation to respiratory infections focused on epidemiological and sociodemographic factors; older age, female gender, lower education, and poor health have been associated with higher perceived risks of contracting COVID-19 [12-14]. People's compliance with preventive measures has been positively correlated with perceived risk during previous respiratory infectious disease outbreaks and the COVID-19 pandemic [15, 16].

Researchers have investigated the relationship between HLC and COVID-19 risk perception in a variety of demographics, including the general public, university students, and healthcare professionals. Multiple research studies concluded that HLC is highly related to COVID-19 risk perception [10, 17, 18]. According to the research, people who have an internal HLC—that is, those who think they have some control over their health outcomes—perceive COVID-19 risk as being higher than people who have an external HLC or those who think outside forces determine their health outcomes [10, 19]. According to HBM, a person's conduct may be influenced by their assessment of their sensitivity to health threats, the gravity of those threats, and the advantages and disadvantages of taking action to lessen or prevent those threats. The degree of susceptibility and danger posed by COVID-19, as well as the advantages and disadvantages of following public health recommendations, can all be influenced by a person's HLC.

The researchers hypothesized that there is a significant relationship between individuals' risk perception of COVID-19 and their health locus of control among the public in Iran during the COVID-19 outbreak. In addition, we hypothesized that these findings will help to determine the long-term effects of COVID-19 and inform future efforts to promote public health and prevention in the region. The aim of this study is to investigate the relationship between individuals' risk perception of COVID-19 and their health locus of control among Iranian residents during the COVID-19 outbreak.

## 2. MATERIALS AND METHODS

### 2.1. Design and Settings

Between March 18, 2021, and April 18, 2021, a cross-sectional survey was conducted on the target population of residents of Sirjan. The research ethics committee of the Sirjan School of Medical Sciences, Sirjan, Iran, approved the study (Ethical Approval Number: IR.SIRUMS.REC.

1399.044). Before participants signed an online informed consent form, study participants received a thorough explanation of the goals and objectives of the study. The Helsinki Declaration was followed in the conduct of this investigation. The inclusion criteria were as follows: (1) residency in Sirjan and (2) proficiency in Persian. Every participant in the study fulfilled the requirements for inclusion, and none was excluded.

## 2.2. Participants' Characteristics

The participants in this study in terms of gender (male, female), marital status (single, married), educational grade (Diploma, Diploma, Associate, Bachelor, Master, and Doctorate), and occupation (Health Care Staff, Housewife, Student, Teacher, Employee, Manual worker, Retired, Free Worker, and Unemployed) were categorized and analyzed in different subgroups.

## 2.3. Data Collection Procedure

Data collection was done through a web-based Persian questionnaire to assess the demographics, Multi-dimensional Health Locus of Control (MHLCS), and the level of COVID-19 risk perception. A pilot test sample consisting of 40 individuals was used to assess the clarity of the research instrument. Following pilot sampling, the survey instrument remained unchanged. The individuals were later added to the completed research. In order to identify a minimum of 5% difference, a convenience sample procedure with a 5% level of significance and 80% power was used. Through the use of an online survey, participation was open to all residents of Sirjan. A total of 480 people expressed interest in taking part in the research.

## 2.4. Survey Measures

(1). Sociodemographic variables include Age, gender, occupation, marital status, and educational grade.

(2). Wallston *et al.* in 1978 designed the multi-dimensional health locus of control scale (MHLCS) to find out participants' health locus of control [20]. Three domains are evaluated through a questionnaire: Chance's Health Locus of Control (CHLC), Internal health locus of control (IHLC), and Powerful Others Health locus of control (PHLC). The PHLC holds that other people have an impact on an individual's health. The IHLC includes individuals' degrees of belief that their illness and health refer to internal factors and behaviors. The CHLC includes individuals' degrees of believing that chance, fortune, and destiny are responsible for their health. Eighteen questions on a six-point Likert scale, from strongly disagree to strongly agree, created this survey. Strongly disagree and strongly agree are rated on a scale of 1 to 6. The scores for each subscale range from 6 to 36. Three subscales were individually estimated without addition [21]. Moshki *et al.* (2007) in Iran investigated the validity and reliability of this questionnaire [22]. The Cronbach's alpha coefficients were 0.68, 0.66, and 0.72 for the internal health locus of control, Chance health locus of control, and powerful others health locus of control, respectively. The MHLCS reliability measured in our study

had a Cronbach's alpha coefficient (CA) of 0.729 [3]. The COVID-19 risk perception (CV-19RP) questionnaire was a researcher-made questionnaire. A researcher-made questionnaire is a survey instrument created by a researcher to collect relevant data for a research study. In this study, the CV-19RP questionnaire was designed and used by the researchers. Its validation was investigated using pilot samples and statistical methods, and finally, the reliability and validity of the questionnaire were confirmed. The way of designing and validating the questionnaire was such that similar field questionnaires used in different studies were reviewed to design and validate this tool [23,24]. The validity of the CV-19RP questionnaire was determined by measuring the content validity indicators (CVR and CVI) and using the opinions of a panel of experts (5 health education experts and 2 psychologists). The numbers obtained for CVR and CVI were 0.88 and 0.85, respectively. The CV-19RP had good reliability in this study, with a CA of 0.785. The final version of this tool has 40 questions, which are on a 5-point Likert scale from 1 to 5 (completely disagree = 1, disagree = 2, have no opinion = 3, agree = 4, completely agree = 5); a score is given. In cases where the question is negative, scoring will be done in reverse (I completely disagree 5 and I completely agree 1).

## 2.5. Sample Size

In this study, the Type 1 error rate was considered 5%, the Type 2 error probability was considered 10%, the effect size was considered 15% using the pilot study results, and finally, the sample size was determined to be 448 people.

## 2.6. Data Analysis

The computer package SPSS (version 23.0) was used for statistical analysis. Depending on the variable type, mean, standard deviation or frequency and frequency percentage were used to summarize the data. The association between health locus of control and COVID-19 risk perception was examined using Spearman's rank correlation coefficient. Also, Spearman's rank correlation coefficient, Mann-Whitney U test, and Kruskal-Wallis test were used to assess health locus of control and COVID-19 risk perception within the demographic variable subgroups. A significance level of 5% was considered significant.

## 3. RESULTS

### 3.1. General Tendencies Overview

A total of 480 people completed the survey. The participants' mean age was  $22.93 \pm 5.427$  years. In the study, 34.2% of the individuals were men, and 65.8% were women. Around 61% of the participants were unmarried, while the remainder were married. The majority of the participants held diplomas and bachelor's degrees, with many being students. Table 1 provides a detailed overview of the participant's demographic characteristics.

MHLCS had good internal consistency and reliability with Cronbach  $\alpha=0.729$ , and the reliability of the CV-19RP

measured had Cronbach  $\alpha = 0.785$ . The total score of COVID-19 risk perception (CV-19RP) for all study participants was 131.61 (13.49). Also, the total score of the health locus of control was 69.74 (10.58), and the scores of its subdomains, PHLC, IHLC, and CHLC, were 23.70 (5.51), 27.60 (4.03), and 18.4 (5.39), respectively (Table 2).

A Spearman's rank correlation coefficient (Table 3) was performed to determine the association between COVID-19 risk perception and health locus of control scores and its subdomains. The results show that there is a

significant positive correlation between COVID-19 risk perception and the health locus of control  $r = 0.366$  ( $p < 0.001$ ). Also, the health locus of control subdomains PHLC  $r = 0.385$  ( $p < 0.001$ ) and IHLC  $r = 0.251$  ( $p < 0.001$ ) had a positive correlation with the CV-19RP score. However, CHLC  $r = 0.141$  ( $p = 0.02$ ) had no significant correlation with the CV-19RP score. In summary, it can be stated that findings indicate a significant positive relationship between COVID-19 risk perception and health locus of control, particularly with the subdomains of PHLC and IHLC. At the same time, CHLC showed no significant correlation with COVID-19 risk perception.

**Table 1. Demographic data of participants.**

-	Group	n = 480 (%)
Gender	Male	164(34.2%)
	Females	316(65.8%)
Marital status	Single	291(60.6%)
	Married	189(39.4%)
Education grade	Under Diploma	44(9.2%)
	Diploma	130(27.1%)
	Associate	28(5.8%)
	Bachelor	171(35.6%)
	Masters	49(10.2%)
	Doctorate	58(12.1%)
Occupation	Health Care Staff	42(8.8%)
	Housewife	59(12.3%)
	Student	241(50.2%)
	Teacher	28(5.8%)
	Employee	57(11.9%)
	Manual Worker	11(2.3%)
	Retired	10(2.1%)
	Free Worker	16(3.3%)
	Unemployed	16(3.3%)

**Table 2. Total health locus of control Score, health locus of control score subdomains, and CV-19RP scores (M  $\pm$  SD).**

Variable	Score (M $\pm$ SD)
Health locus of control Score (Total)	69.74 $\pm$ 10.58
Health locus of control Score subdomains	
PHLC	23.70 $\pm$ 5.51
IHLC	27.60 $\pm$ 4.03
CHLC	18.4 $\pm$ 5.39
CV-19RP	131.61 $\pm$ 13.49

**Table 3. Correlation coefficient between total health locus of control Score, and health locus of control subdomains with CV-19RP. Correlation is significant at the 0.01 level.**

-	Health Locus of Control	PHLC	IHLC	CHLC
COVID-19 risk perception	0.366 ( $p < 0.001$ )	0.385 ( $p < 0.001$ )	0.251 ( $p < 0.001$ )	0.141 ( $p = 0.002$ )

**Table 4. Correlation coefficient between CV-19RP with health locus of control and its subdomains.**

-	Variable	Group	Health Locus of Control			
			Total	PHLC	IHLC	CHLC
CV-19RP	Age	No Group	0.134 p=0.003*	0.180 p<0.001**	0.074 p=0.104*	0.041 p=0.367
	Gender	Male	0.412 p<0.001**	0.357 p<0.001**	0.358 p<0.001**	0.193 p=0.013*
		Female	0.343 p<0.001**	0.401 p<0.001**	0.198 p<0.001**	0.116 p=0.039*
	Occupation	Health Care Staff	0.336 p=0.03	0.232 p=0.139	0.459 p=0.02	0.078 p=0.623
		Housewife	0.472 p<0.001**	0.519 p<0.001**	0.256 p=0.05	0.314 p=0.016*
		Student	0.284 p<0.001**	0.304 p<0.001**	0.152 p=0.018*	0.112 p=0.083
		Teacher	0.571 p=0.002**	0.465 p=0.013*	0.393 p=0.039*	0.306 p=0.113
		Employee	0.375 p=0.004**	0.339 p=0.01**	0.236 p=0.077	0.79 p=0.559
		Manual Worker	0.149 p=0.662	0.408 p=0.212	0.351 p=0.291	0.100 p=0.769
		Retired	0.061 p=0.868	0.326 p=0.358	0.144 p=0.692	0.610 p=0.061
		Free Worker	0.482 p=0.59	0.665 p=0.005**	0.488 p=0.55	0.083 p=0.759
		Unemployed	0.502 p=0.047	0.492 p=0.053	0.298 p=0.262	0.341 p=0.196
		Marital status	Single	0.350 p<0.001**	0.350 p<0.001**	0.204 p<0.001**
	Married		0.383 p<0.001**	0.443 p<0.001**	0.325 p<0.001**	0.101 p=0.165
	Education grade	Under Diploma	0.337 p=0.025*	0.372 p=0.013*	0.211 p=0.170	0.220 p=0.151
		Diploma	0.400 p<0.001**	0.414 p<0.001**	0.233 p=0.008**	0.201 p=0.022*
		Associate	0.390 p=0.040*	0.398 p=0.036*	0.273 p=0.159	0.127 p=0.521
		Bachelor	0.335 p<0.001**	0.306 p<0.001**	0.235 p=0.002**	0.158 p=0.039*
		Masters	0.439 p=0.002**	0.634 p<0.001**	0.248 p=0.076	0.114 p=0.434
		Doctorate	0.416 p=0.001**	0.397 p=0.002**	0.414 p=0.001**	0.006 p=0.963

**Note:** \*\*Correlation is significant at the 0.01 level. \*Correlation is significant at the 0.05 level.

### 3.2. Correlation Evaluation within Subgroups

According to Spearman's correlation coefficient test, there is no statistically significant relationship between COVID-19 risk perception and age  $r = 0.107$  ( $p = 0.019$ ), while according to the findings, there is a significant positive correlation between the health locus of control (HLC) score and age  $r = 0.134$  ( $p = 0.003$ ). Among the health locus of control subdomains, only PHLC had a significant positive relationship with age  $r = 0.180$  ( $p < 0.001$ ), and IHLC  $r = 0.074$  ( $p = 0.104$ ) and CHLC  $r = 0.041$  ( $p = 0.367$ ) did not have a statistically significant correlation with age. The results of the study showed that the correlation between the total health locus of control and the IHLC subdomain with the COVID-19 risk perception is significantly higher in males than females, but in the PHLC subdomain, this correlation is

significantly higher in females than males. These findings provide insights into the relationship between COVID-19 risk perception, health locus of control, and age, which can have implications for understanding and addressing perceptions and behaviors related to the pandemic.

According to Table 4, when the correlation between the health locus of control and risk COVID-19 risk perception was investigated based on occupational groups, it was found that there is no significant correlation between the health locus of control and its subdomains with the COVID-19 risk perception in the healthcare staff, teachers, manual workers, retired, and the unemployed group ( $p > 0.01$ ). In the employees group, a significant positive correlation between COVID-19 risk perception with the health locus of control  $r = 0.375$  ( $p = 0.004$ ) and its PHLC  $r = 0.339$  ( $p = 0.01$ ) subdomains was found. The free

workers' group had a significant positive correlation between COVID-19 risk perception with PHLC  $r=0.665$  ( $p=0.005$ ). In the housewife group, there is a significant positive correlation between COVID-19 risk perception with the health locus of control  $r=0.472$  ( $p<0.001$ ) and its PHLC  $r=0.519$  ( $p<0.001$ ), and CHLC  $r=0.314$  ( $p=0.016$ ) subdomains. In the student group, like the housewife group, there is a significant positive correlation between COVID-19 risk perception with the health locus of control  $r=0.284$  ( $p<0.001$ ) and its PHLC  $r=0.304$  ( $p<0.001$ ) subdomain. These findings suggest varying relationships between health locus of control and COVID-19 risk perception across different occupational groups, with significant correlations observed in specific groups such as employees, free workers, homemakers, and students.

The correlation of the COVID-19 risk perception with the health locus of control and the PHLC and IHLC subdomains is significant in both the single and married groups ( $p<0.001$ ), while the correlations mentioned in the married group are higher than in the single group. Single group  $r=0.165$  ( $p=0.005$ ) as opposed to married  $r=0.101$  ( $p=0.165$ ) had a significant correlation with the CHLC subdomain.

In people with under diploma and associate education grades, there is a significant positive correlation between the COVID-19 risk perception with the health locus of control and PHLC subdomain ( $p<0.05$ ). In individuals with diploma and bachelor education grades, there is a significant positive correlation between the COVID-19 risk perception with the health locus of control and all of its subdomains ( $p<0.05$ ). In the master education grades group, there is a significant positive correlation between COVID-19 risk perception with the health locus of control and its PHLC subdomain ( $p<0.01$ ). A significant positive correlation between the COVID-19 risk perception with the health locus of control and its PHLC and IHLC subdomains was found in people with a doctorate degree ( $p<0.01$ ). According to the above results, it can be stated that the findings suggest that education level is associated with the strength of the correlation between COVID-19 risk perception and health locus of control.

### 3.3. Subgroups Differences Evaluation

According to the Mann-Whitney test, there is a non-significant difference in CV-19RP score ( $p=0.065$ ), health locus of control ( $p=0.49$ ), IHLC ( $p=0.29$ ), PHLC ( $p=0.83$ ), and CHLC ( $p=0.73$ ) between males and females. Also, there is a non-significant difference in CV-19RP score ( $p=0.65$ ) and CHLC ( $p=0.93$ ) in the population between single and married groups. However, there is a significant difference in health locus of control ( $p=0.002$ ), IHLC ( $p=0.004$ ), and PHLC ( $p<0.0001$ ) between single and married groups. According to the Kruskal-Wallis test, there is a non-significant difference in CV-19RP score ( $p=0.16$ ) and CHLC ( $p=0.12$ ) between different groups of occupation, but there is a significant difference in health locus of control score ( $p<0.0001$ ), IHLC ( $p=0.005$ ), and PHLC ( $p<0.0001$ ) between different group of occupation in the population. Results also indicated that there is a

non-significant difference in CV-19RP score ( $p=0.37$ ) and IHLC ( $p=0.35$ ) between different education grades groups. However, there is a significant difference in health locus of control ( $p<0.0001$ ), PHLC ( $p=0.002$ ), and CHLC ( $p=0.045$ ) between different education grades groups in the population. These findings suggest that while there are some significant differences in health locus of control among different groups, the differences in other scores are not significant. The health locus of control appears to be a significant factor in the study, particularly in relation to marital status and occupation.

## 4. DISCUSSION

The study investigated the relationship between COVID-19 risk perception, health locus of control (HLC), and their subdomains among Iranians. The results showed a significant positive correlation between COVID-19 risk perception and the health locus of control, particularly with the subdomains of "personal HLC" (PHLC) and "internal HLC" (IHLC), while "chance HLC" (CHLC) showed no significant correlation with COVID-19 risk perception. The study also found varying relationships between health locus of control and COVID-19 risk perception across different occupational groups, education levels, age, and marital status. The findings suggest that the strength of the correlation between COVID-19 risk perception and health locus of control is associated with education level, age, and occupational groups. The study also highlighted the significant role of health locus of control, particularly in relation to marital status and occupation. However, the study did not find a significant difference in COVID-19 risk perception between different groups based on gender, marital status, occupation, and education level. The findings provide valuable insights into the complex relationship between COVID-19 risk perception, health locus of control, and various demographic factors. Understanding these relationships is crucial for addressing perceptions and behaviors related to the COVID-19 pandemic. According to our findings, most people believe that their internal factors and their behavior determine their health, and they are responsible for their health and illness (IHLC). Finally, they believe that after their role, the behavior of others has the greatest impact on their health status (PHLC) and that after their own role and the other's function, their health is determined by chance (CHLC).

In a study that was conducted on Iranian students [21], contrary to the results of the present study, they found that a group of Iranian students consider their health to be influenced by the actions of others (PHLC). In contrast, in our studied population, people in the first stage consider their health to be the result of their actions and activities. They know and consider themselves responsible for their health (IHLC). This difference can be explained because Ganjoo *et al.* study was conducted on the Iranian student population and they were all students of a university of medical sciences, and their level of knowledge about health issues influenced their opinions. But our studied population was not a special stratum, and there were

people from different strata of society among them. We found that the COVID-19 risk perception has a significant positive correlation with all the subdomains of the health locus of control, while the intensity of the correlation is higher in the PHLC subdomain. This can mean that people who consider their health to be influenced by the behavior of others have a higher perception of the COVID-19 risk than those who relate their health to internal factors and their behavior or chance. The evidence shows that the correlation between COVID-19 risk perception and health locus of control is higher in males in the IHLC subdomain, while in females, this correlation is higher in the PHLC subdomain. It can be concluded that males feel more at risk from their own behavior against contracting COVID-19 and females feel more at risk from the behavior of others against contracting COVID-19. One of the notable findings of this study is that in the healthcare staff group, we do not see a significant correlation between the COVID-19 risk perception and the health locus of control. Maybe this finding is due to the fact that the healthcare staff cannot define their health locus of control against COVID-19 as well as ordinary people due to the forced exposure to the COVID-19 outbreak, and maybe their COVID-19 risk perception be affected due to the forced exposure to this disease. Nie *et al.* (2022) showed that the COVID-19 risk perception is higher in the elderly with a more powerful health locus of control [25]. This finding is in line with the results of our study because our study showed that the COVID-19 risk perception based on age had a significant positive correlation with the health locus of control, so it can be concluded that with increasing age, the COVID-19 risk perception increases. Health locus of control becomes more powerful. This can lead to an increase in preventive behaviors and a decrease in high-risk manners. Chandra *et al.* (2022) showed that people who perceive their source of health control as external will experience more anxiety in front of COVID-19 [26]. Our findings also showed that people in the PHLC group who consider their health to be influenced by external factors and others had a higher COVID-19 risk perception. In Chandra *et al.*'s study (2022), no correlation was found between occupation and health locus of control. Still, in our study, a significant positive correlation was observed between occupation and health locus of control. Anagnosti *et al.* (2023) showed that during the COVID-19 pandemic, emotional problems such as anxiety have a significant positive correlation with the health locus of control and the external source of health locus of control plays a more prominent role in these emotional problems [27]. Tagini *et al.* (2021) showed in their study that against COVID-19, people with higher levels of anxiety have a higher risk perception of COVID-19, as well as people who believe that their health depends on incomprehensible forces such as fate and God or other people (*i.e.* a have an external source of control), perceive more risk [10]. Anagnosti *et al.* (2023) and Tagini *et al.* (2021) findings were consistent with the findings of our study. Ganjoo *et al.* (2021) showed in an Iranian population that Internal Health Locus of Control (IHLC) was associated with a decrease in Perceived Stress, and others-induced Health Locus of

Control (PHLC) was associated with an increase in perceived stress in students during the COVID-19 pandemic [21]. In the present study, we found that both PHLC and IHLC had a significant positive correlation with COVID-19 risk perception, while the intensity of the correlation between PHLC and COVID-19 risk perception is higher.

Risk perception of a disease, even when it becomes a pandemic like COVID-19, can injure the mental health of society [28-30]. One of the ways to deal with this impairment is to know the health locus of control in detail, which can help both society and policy-making organizations in this direction. Our study highlights the association between the health locus of control and its subdomains with the COVID-19 risk perception in such a way that this issue can be used in health policy programs, and with accurate knowledge of the source of people's health control, better and more effective policies can be prepared for improving the society mental health status.

According to the World Health Organization report, "In recent years, there has been increasing acknowledgment of the important role mental health plays in achieving global development goals, as illustrated by the inclusion of mental health in the Sustainable Development Goals." So, this point shows the need to pay attention and give importance to mental health and try to improve it and deal with its injuries.

Our study's primary strength is that it was conducted before Iran began implementing COVID-19 public immunization programs, as these initiatives have the potential to impact people's perceptions of COVID-19 risk and health locus beliefs. As far as we know, this is the first study that investigates the association between health locus of control and COVID-19 risk perception among a general population without any demographic restrictions in Iran. In addition, we used a self-developed, validated, and specific instrument that was able to accurately measure changes in the COVID-19 risk perception during the COVID-19 pandemic and was tailored to our target population.

Due to the remote performance of this study and online data collection, samples were not randomly selected in different geographical locations. Also, some may have lost the opportunity to participate in the study due to not having access to the Internet. The current data were collected by the self-report method. Due to the special COVID-19 pandemic circumstances, the data may be affected by self-reporting bias. Since this study only examined Sirjan residents, there was a limitation in the generalizability of the results. It is suggested to remove the limitations of the present study and to achieve more results, qualitative and longitudinal studies should be conducted in this field. Also, a larger target population should be investigated, and other mental health indicators should be evaluated, except for the COVID-19 risk perception.

## CONCLUSION

The present study indicated a strong positive

relationship between COVID-19 risk perception and HLC, particularly with PHLC and IHLC, while CHLC showed no significant correlation with COVID-19 risk perception. The study also revealed varying associations between HLC and COVID-19 risk perception across different occupational groups, education levels, age, and marital status. These results suggest that the strength of the correlation between COVID-19 risk perception and health locus of control is linked to education level, age, and occupational groups. The research emphasized the importance of considering these factors when examining the relationship between COVID-19 risk perception and health locus of control. Most of the Sirjan population consider their health to be caused by internal factors and their activities, and then they consider the role of others and then a chance to be effective. The COVID-19 risk perception has a higher correlation with the PHLC subdomain of the health locus of control, so those who consider their health to be affected by others' activities feel more at risk of COVID-19. The results offer an important understanding of the intricate connection among COVID-19 risk perception, health locus of control, and different demographic factors. It is essential to comprehend these connections to tackle attitudes and actions related to the COVID-19 outbreak and key stakeholders should execute several positive strategies to recognize and manage the health locus of control carefully [31].

#### LIST OF ABBREVIATIONS

COVID-19	=	Coronavirus disease 2019
HLC	=	Health locus of control
HBM	=	Health belief model
MHLC	=	Multidimensional health locus of control
PHLC	=	Powerful others health locus of control
IHLC	=	Internal health locus of control
CHLC	=	Chance health locus of control
CV-19RP	=	COVID-19 risk perception

#### ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was approved by the Research Ethics Committee of the Sirjan School of Medical Sciences, Sirjan, Iran (Ethical Approval Number: IR.SIRUMS.REC.1399.044).

#### HUMAN AND ANIMAL RIGHTS

In this study, no animals were used. All participants were used in accordance with the 2013 revision of the 1975 Helsinki Declaration and the institutional and national committees in charge of human experimentation's ethical standards.

#### CONSENT FOR PUBLICATION

Consent was obtained from all participants of this study.

#### STANDARDS OF REPORTING

STROBE guidelines were followed in this study.

#### AVAILABILITY OF DATA AND MATERIALS

The datasets used and/or analyzed during the current study are available from the corresponding author [H.A] upon reasonable request.

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#### CONFLICT OF INTEREST

The authors declare that they have no competing interests.

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