

## The impact of health literacy of Iranian users on the accuracy of information on COVID-19 in virtual social networks

Impacto de la literatura médica de usuarios iraníes en la exactitud de la información sobre COVID-19 en las redes sociales virtuales

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### ABSTRACT

The aim of the present study is to investigate the impact of health literacy of Iranian users on the accuracy of information on COVID-19 in virtual social networks. This is applied descriptive survey. The population includes all Iranian users of virtual networks (Telegram, WhatsApp, Twitter, Instagram and etc.). In this study, 121 questionnaires were confirmed and studied. For descriptive statistics, SPSS (ver. 32) and for testing hypothesis, Lisrel have been used. The research findings show that according to Iranian users, Internet is the main source for obtaining information on COVID-19. Moreover, the most popular virtual network is WhatsApp. The aim of using virtual social networks is to access to news and information. The results of structural equations show that there is positive meaningful relation between the rate of health literacy and the accuracy of information on COVID-19 ( $p > 0.000$ ,  $\beta = 0.561$ ). In addition, the health literacy can explain 40 percent variance of the accuracy of information on COVID-19 in virtual social networks. Moreover, the results show that there is meaningful difference between the educational level of Iranian users and the health literacy and accuracy of information on COVID-19 in virtual social networks. Concerning the results of this study and meaningful relation between the health literacy level and attention to accuracy of the information on COVID-19 in Iranian users, the authorities of

health system are recommended to consider special planning and policies to increase the health literacy level of users in social networks. In this way, users will be able to verify the accuracy of information on COVID-19 by increasing their health literacy level and therefore, there would be less losses due to unawareness of health literacy and its adverse effect.

**Keywords:** health literacy; virtual social network; Iranian users; accuracy of disseminated information.

## RESUMEN

El objetivo del presente estudio es investigar el impacto de la alfabetización en salud relacionada con la COVID-19 en los usuarios iraníes de las redes sociales virtuales. Se aplicó una encuesta descriptiva, que incluyó a todos los usuarios iraníes de redes sociales virtuales (Telegram, WhatsApp, Twitter, Instagram, etc.). En el estudio se confirmaron y estudiaron 121 cuestionarios. Para estadística descriptiva se utilizó SPSS (versión 32) y Lisrel, para probar la hipótesis. La investigación indicó que, según los usuarios iraníes, Internet es la principal fuente de información sobre COVID-19; además, la red virtual más popular es WhatsApp. El objetivo del uso de las redes sociales virtuales es acceder a noticias e información. Los resultados de las ecuaciones estructurales muestran que existe una relación significativa y positiva entre la tasa de alfabetización en salud y la precisión de la información sobre COVID-19 ( $p > 0,000$ ;  $\beta = 0,561$ ). Asimismo, la alfabetización en salud puede explicar una variación del 40 % en la precisión de la información sobre COVID-19 en las redes sociales virtuales. También que existe una diferencia significativa entre el nivel educativo de los usuarios iraníes, la alfabetización en salud y la precisión de la información sobre COVID-19 en las redes sociales virtuales. Teniendo en cuenta los resultados de este estudio, se recomienda a las autoridades del sistema de salud que consideren una planificación y políticas especiales para aumentar el nivel de alfabetización en salud de los usuarios en redes sociales. De esta manera, estos últimos podrán verificar la información sobre COVID-19 y, por lo tanto, serían menores las pérdidas por desconocimiento.

**Palabras clave:** alfabetización en salud; red social virtual; usuarios iraníes; precisión de la información difundida.

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## Introduction

In the contemporary information society, the advancement in communication and information technologies leads to emergence of social networks. The emergence of virtual social networks is a great revolution in information and communication technology. The networks are widely used by the users, and many people all over the world have access to them. Users could communicate with others through the facilities provided by these networks. *Molaei Noshar*<sup>(1)</sup> argues that virtual social networks are a new generation of media that has changed the nature of news production and broadcasting as a result of incorporating the news providers and receivers and provided the possibility of accessing a new form of communication and content sharing.

Virtual social networks have offered some facilities for users, which caused various people with different characteristics to be attracted to this media. The number of users of these networks is ever increasing. Easy access and convenient use of these networks motivated people to follow or share their favorite content and news in these networks.

Nowadays, one of the main topics published in most virtual social networks is COVID-19 crisis. This infection which has engaged the world for several months is one of the main news headlines followed by people all over the world. It is to the extent that publishing inaccurate information on COVID-19 might lead to actions that threaten the individuals' health against this disease. In this regard, *Zarocostas*<sup>(2)</sup> states that with the onset of Corona, a global epidemic of misinformation has been created, which is rapidly spreading through social media platforms and other media, that is a serious public health problem and motivated the World Health Organization (WHO) launch platforms to deal with misinformation.

*Abel & McQueen*<sup>(3)</sup> claims that along with the spread of COVID-19, lots of misinformation have been published which caused the spread of fear and panic among people. This trend has been even quicker than the spread of infection. He holds that health literacy is important for slowing down the spread of misinformation, preventing the disease and preparing for health care measures in situation when quick reaction is a necessity.

Health literacy is one of the main skills in health and hygiene of society and of high importance for perception of health care related issues. Health literacy was proposed for the first time in 1974 in a training panel on health training as a cognitive skill and an important and effective issue in health care system. It has been so far discussed by researchers of education and health areas and various definitions have been proposed.<sup>(4)</sup> Generally, health

literacy is defined as a wide spectrum of knowledge and skills in acquisition, perception and application of health-related information.<sup>(5,6)</sup> The significance of health literacy on influencing the health results of patients has been well recognized as well it plays a main role in individual's decision making on their health needs.<sup>(7)</sup>

In recent years, the study of health literacy in Iran, as well as other countries, has been considered by the scientific community as an important issue. Despite COVID-19 which has disrupted the social life and health of individuals and created a crisis in the health area, the health literacy skill could be a practical technique in confronting this disease and taking cautious measures.

Concerning what has been said about each variable and its significance in contemporary world, the researchers seek to investigate the extent to which the health literacy skill of Iranian users has been influential on the accuracy of information published in this area, concerning the spread of information on COVID-19 in social networks. And, whether the educational level influences the health literacy level of Iranian users and the accuracy of information on COVID-19 in virtual social networks or not? It is clear that achieving useful results in this area could have significant achievement for the health community of the country so that fundamental measures could be taken for promotion of health literacy of Iranian users and optimal use of virtual social networks for publishing information on COVID-19.

### **Theoretical principles and related literature**

Virtual social networks have the highest similarity with the human community and provides the individual with the ability to communicate with lots of individuals regardless of the time, spatial, social, cultural and economic limits.<sup>(8)</sup>

Social network is used to refer to a space with the focus on the virtual and online structure and is accessible through web and mobile devices and used for making relations, sharing resources and collaboration.<sup>(9)</sup> The most extensive interactive communication takes place within virtual social networks.

These networks, which are the result of the communication and technology revolution in the world, have confronted human beings with another type of relationship. In addition to these facilities, there are also abuses of these networks. Data transfer, which can be one of the most important functions of virtual social networks, is one of the most important problems of these networks.

Incorrect information transfer by some users and uncertainty about the accuracy of the information has caused the ratio Criticize these networks and on the other hand, due to their prevalence, there is a possibility of rejecting this technology does not have. Therefore, users should be able to be more aware of the information published by these networks. Publishing/republishing various correct or incorrect messages in these networks has a tangible effect on users' behavior and views. With the growing popularity of virtual social networks and mobile messaging networks, the information market seems to be false and, according to rumors, hotter and, of course, much more accurate, smarter and faster. Therefore, it is necessary to pay attention to the accuracy of the published information so that users have the ability to distinguish right from wrong.

Accuracy of published information means that users can identify which information published in virtual networks is true and which is false. Are the users who publish / republish this information daily aware of their accuracy? Therefore, the accuracy of the information is more and more necessary due to the fact that it is considered correct by the users and the publication and use of the content of the messages in a wide range. In this regard, according to the epidemic of COVID-19, which has spread around the world, we are witnessing the publication of health, treatment and prevention information about this disease in virtual social networks, which are published and republished among users, regardless of their accuracy.

Concerning the role of social networks and health related information, *Maeen & Zykov*<sup>(10)</sup> found that some users get the advises concerning their health-related problem through the social networks. They find it useful to use these networks as they are an alternative to going to a hospital or clinic, which can be very time consuming. According to *Maeen & Zykov*,<sup>(10)</sup> the protective effects of social networks might be the result of several factors, including positive access to health care information and services, encouraging healthy behaviors and taking care for being healthy. They believe that interaction between end users and service providers is made possible by relatively easy provisioning and access without any effective sharing factor. Moreover, *Strekalova*<sup>(11)</sup> argues that the health organizations such as disease control and prevention centers use the social media for health promotion and even for providing information about health risks. In recent years, some studies have focused on health and its relation with social networks in Iran and other countries. Concerning the use of virtual social networks, *View*<sup>(12)</sup> believes that virtual social networks enables individuals to quickly get information and knowledge, make use of applications for interpersonal communications and sharing information. *Mano*<sup>(13)</sup> believes that social media helps us in

getting a better view of the health and hygiene problems and alleviates such concerns. Findings of *Hussain et al*<sup>(14)</sup> showed that the use of social networks promotes educational performance of the students. The respondents of these studies mentioned social networks, Internet, printed sources and audiovisual media as the main sources of information, respectively.

There have been some studies on e-health literacy and published information related to COVID-19. In fact, e-health literacy is based on the concepts of health literacy and media literacy, which refers to the individual's ability to search, understand and evaluate health related information from electronic resources and make informed health decisions to address a health problem in daily activities.<sup>(15)</sup> In this regard, *Chang et al*<sup>(16)</sup> claim that perception of the role of e-health literacy is critical in controlling the prevalence of COVID-19. Irrespective of using valid tools for evaluating the prevalence of e-health literacy in infectious diseases, it is also important to examine the interconnected roles of e-health literacy and health-related misinformation about people's decisions to take action to reduce the spread of COVID-19. They believe that empowering public with better health literacy, enhancing the capabilities of society through social participation and conversation can be one of the ways to deal with misinformation related to COVID-19 on social media. Concerning the definition the health literacy could be taken in the present study as somehow e-health literacy.

*Szmuda et al*<sup>(17)</sup> in their study investigate the reading abilities of people on COVID-19 in Internet. They perceived that Internet is one of the most popular information resources for people; however, recognition of true information is difficult and treading information on COVID-19 is a complicated task. *Aharon et al*<sup>(18)</sup> studied the readiness of nurses in collecting and evaluating information on COVID-19. The results indicated that nurses are better capable of verifying the validity or invalidity of information published about COVID-19 in virtual social networks.

Moreover, *Hatami*<sup>(19)</sup> in Iran concluded that social health, as a social structure, is affected by the quality and quantity of presence and activity in social networks. *Memar et al*<sup>(20)</sup> believe that based on a classification, the cyberspace users in Iran are mostly from third generation, who are more exposed to the effects of virtual social networks than others. *Montazeri et al*<sup>(7)</sup> studied the role of media in promoting the health literacy level. They believe that social media play significant role in creating, encouraging and motivating some behaviors, habits and attitudes and it is possible to use them to provide health training in the society.

The investigation of overseas studies showed that health literacy and information published in the field of COVID-19 in virtual networks have been considered and studies have been conducted in this field, including research.<sup>(16,17,18)</sup> But in studies conducted in Iran, the results showed This issue has not been considered by researchers. Therefore, the authors of the present study perceived that in Iran, there is research gap concerning the health literacy and the accuracy of information published on COVID-19. Hence, concerning the significance of health literacy and the information on COVID-19 in virtual social networks, there is a need to perform study in this area. Moreover, as far as in the studied researches, the demographic information of users including education level and descriptions about most used network, motivation to use network, the rate of using the desired network, user's history in the network, attention to accuracy of published information has been rarely considered; in this study, in addition to examining the impact of health literacy on the accuracy of the published information related to COVID-19, the above-mentioned cases were also considered. So that it is possible to gain a deep understanding of the research results by studying these variables.

### **Research questions**

1. From what source do Iranian users get most information on COVID-19?
2. How many Iranian users republish the information on COVID-19 on social networks without paying attention to its accuracy?
3. In which virtual social network do Iranian users have the most activity? How long have they been active in the network? How long have they been active in the network?
4. How much time do Iranian users spend browsing virtual social networks?
5. What is the main motivation of Iranian users to use virtual social networks?
6. How many posts do Iranian users publish or republish on virtual social networks related to COVID-19?

### **Research hypotheses**

1. There is meaningful direct relation between the health literacy level of users and the accuracy of published information on COVID-19 in virtual social networks?
2. There is meaningful relation between the health literacy and the education level of users of virtual social network.

3. There is meaningful direct relation between the accuracy of published information on COVID-19 by the users in virtual social networks and their education level.

## Methodology

The present study is applied in terms of objective and descriptive survey in terms of method. The population of this study includes all users of virtual social networks (Telegram, WhatsApp, Instagram, Twitter and etc.). Finally, 121 questionnaires were returned back through sending the electronic questionnaire link in these networks. In this study, a two-part questionnaire has been used for data collection (annex). The first part includes the health literacy of users and the second part the accuracy of published information on COVID-19 by the users in virtual social networks. The health literacy questionnaire has been designed by *Montazeri et al.*<sup>(7)</sup> This questionnaire includes 33 items which evaluate the subscales of reading (4 questions), accessibility (6 items), perception and understanding (7 items), evaluation (4 items) and decision making and behavior (12 items). In the present study, the validity of questionnaire was confirmed by several experts in health field. For testing reliability, Cronbach Alpha test was used and the reliability coefficient was estimated as 0.95.

The questionnaire of accuracy of published information in social networks has been designed by *Esmailzade & Hasanzade*<sup>(21)</sup> In the present study, this questionnaire has been used with a few modifications to verify the accuracy of published information on COVID-19 in virtual social networks. For measuring the users' attention to the accuracy of the published information in these networks, some indices were defined and for each index, some items were considered and defined. The documentality of information, health of content and the expertise of the message transmitter are some of these indices. In the present study, the opinions of 5 members from department of Science and Knowledge of Shahid Chamran University of Ahwaz have been asked and the questionnaire was confirmed. The reliability coefficient of the questionnaire was estimated as 0.93 in the present study.

In the present study, for data analysis, descriptive statistics (frequency and percentage) and inferential tests (one-sample t-test, Spearman and Pearson correlation test and structural equation model) were used. For measuring data normality, Kolmogorov-Smirnov test, skewness and elongation were used.

## Conceptual and operational definitions of research variables

### Health literacy

**Conceptual definition:** The World Health Organization (WHO) defines health literacy as cognitive and social skills that determine the motivation and ability of individuals to acquire, understand and use health information to promote and maintain good health.<sup>(22)</sup>

**Operational definition:** In this study, health literacy is the amount of points that users receive in response to the health literacy questionnaire in indicators (reading, access, comprehension, evaluation, decision making and behavior).

### Virtual social networks

A virtual social network is a set of web-based services that allow people to create public or private profiles for themselves, or to interact with other network members, share resources with them, and share descriptions. Use other people to find new connections.<sup>(23)</sup>

**Operational definition:** In this research, the meaning of virtual social network is networks (WhatsApp, Telegram, Instagram, Likendin, etc.) that are used to exchange information among Iranian users.

**Published information:** In this study, we mean information, news messages and information about COVID-19 disease that people publish / republish on virtual social networks such as (WhatsApp, Telegram, Twitter, Instagram).

**Accuracy of published information:** In this research, the meaning of information accuracy is the ability of users of virtual social networks to distinguish correct from incorrect information related to COVID-19.

**Social network users:** Social network users are people who do not use the various capabilities and features of virtual social networks to the same extent and at the same level. Some Internet users are members of several social networks, they visit these sites daily and use most of their features, and others may be members of only one site and from time to time only refer to their personal page.

## Research findings

121 subjects have participated in the present study out of which 42 subjects (35%) are male and 79 subjects (65%) are female. Concerning the age of participants, 21.49% were up to 25 years old, 45.45% were 26-35 years old, 23.97% were 36-45 years old, 9.09% were 36-

45 years old and 9.09% were above 46 years old. Examination of the education variable, 24.79% hold diploma, 0.83% hold associate degree, 40.50% hold bachelor, 19.01 hold master degree and 14.88% hold PhD degree. Concerning the age of participants, 28.1% were staff, 18.2% were households, 4.1% were student, 21.5% were university student, 8.3% were self-employed, 6.6% were unemployed and 13.2% selected the “other” option. In following section, the descriptive findings related to how the content on COVID-19 are obtained have been reported (fig. 1).

### 1. The resources of content about COVID-19

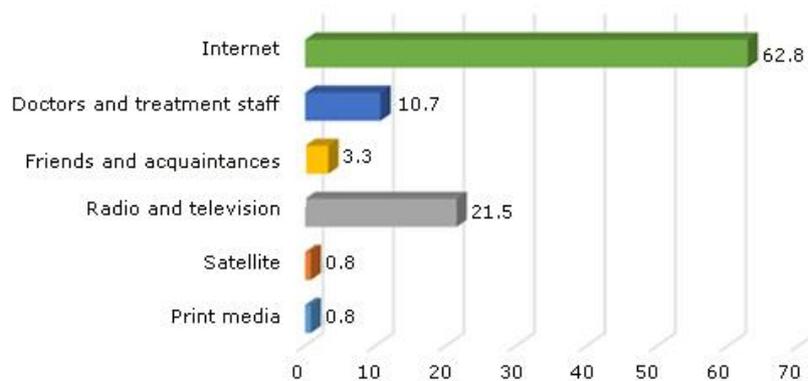


Fig. 1 - The descriptive findings related to how the content on COVID-19 are obtained.

Concerning figure 1 on how the content on COVID-19 are obtained, the highest percentage (62.8) is related to Internet (Instagram, Telegram, WhatsApp, Twitter and others) and the lowest is related to satellite networks and booklet, training and advertising brochures (0.8%). about the accuracy of published information on COVID-19 in social networks, the descriptive indices have been obtained as follow:

### 2. Taking action to republish information on COVID-19 on social networks without paying attention to its accuracy

Table 1 – Republishing information on COVID-19 in social networks without being informed of its accuracy

Variable	Component	Frequency percentage
Republishing information on	Yes	4/36
	No	6/63

COVID-19 in social networks without being informed of its accuracy	Total	100%
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Concerning the results of table 1 on republishing information in social networks without being informed of its accuracy, 36.4% of the participants republish information without enduring its accuracy; while 63.6% of individuals do not republish it in social networks without ensuring its accuracy.

### 3. The highest activity in each virtual social network

**Table 2 - The highest activity in each virtual social network**

Variable	Component	Frequency percentage
Activity in virtual social networks	Instagram	26
	Telegram	18
	WhatsApp	49
	Others	7
	Total	100 %

As reported in table 2, concerning activity in each of virtual social network, the highest participation is in WhatsApp with 49%, Instagram with 26%, Telegram with 18% and the lowest participation rate is in other networks with 7%.

### 4. Membership in virtual social networks

**Table 3 – Membership in virtual social networks**

Variable	Component	Frequency	Frequency percentage
Membership in virtual social networks	Less than one year	6.	5
	Between one to two years	7	8/5
	Between 2 to 3 years	17	14
	Above 3 years	91	2/75

	Total	121	100%
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Concerning the results of table 3, 75.2% of the participants have more than 3 years membership in virtual social networks, which means that most participants have good history on the use of virtual networks.

## 5. The time spent for browsing virtual social networks

**Table 4** – The time spent for browsing virtual social networks

Variable	Component	Frequency	Frequency percentage
Time spent for browsing virtual social networks?	Less than one hour in a day	12	9/9
	1-3 hours in a day	58	9/47
	3-5 hours in a day	29	24
	Above 5 hours in a day	22	2/18
	Total	121	100%

As seen in table 4, concerning time spent for browsing virtual social networks, it is seen that most participants of this study (about 47.9%) spent 1-3 hours in a day for browsing virtual social networks. This is while, the least amount (9.9%) spend less than one hour in a day for browsing social networks.

## 6. The main motivation to use virtual social networks

**Table 5** – The main motivation to use virtual social networks

Variable	Component	Frequency	Frequency percentage
The main motivation to use virtual social networks	Communicating with friends	31	6/25
	Entertainment	26	5/21
	News and information	50	3/41
	Others	14	6/11
	Total	121	100%

Concerning the results of table 5, most participants of the study (41.3%) has reported reviewing news and information as the main motivation to use virtual social networks. Therefore, the significance of the accuracy of information is highlighted.

### 7. The number of posts related to COVID-19 (publishing and republishing) per day in virtual social networks

**Table 6** - The number of posts related to COVID-19 (publishing and republishing) per day in virtual social networks

Variable	Component	Frequency	Frequency percentage
The number of posts related to COVID-19	1 Post	82	8/67
	2 Posts	15	4/12
	3 Posts	5	1/4
	More than 3 posts	19	7/15
	Total	121	100%

According to table 6, concerning the number of posts about COVID-19 (published or republished) on social virtual networks, the highest percentage (68.8%) is related to 1 post about COVID-19 per day. In follow, in order to test research hypotheses, the normality or non-normality of data has been studied.

In this study, in order to find out whether the data are normal or non-normal, the Kolmogorov-Smirnov test, skewness and elongation of the data were used, the results of which are reported in table 7.

**Table 7** - Kolmogorov-Smirnov test, skewness and elongation of the data for measuring normality of data

Variables	Kolmogorov-Smirnov test		Skewness	Elongation
	Statistics	Significance level		
Health literacy	104/0	053/0	-511/0	-481/0
Accuracy of published information on COVID-19	102/0	074/0	-611/0	-219/0

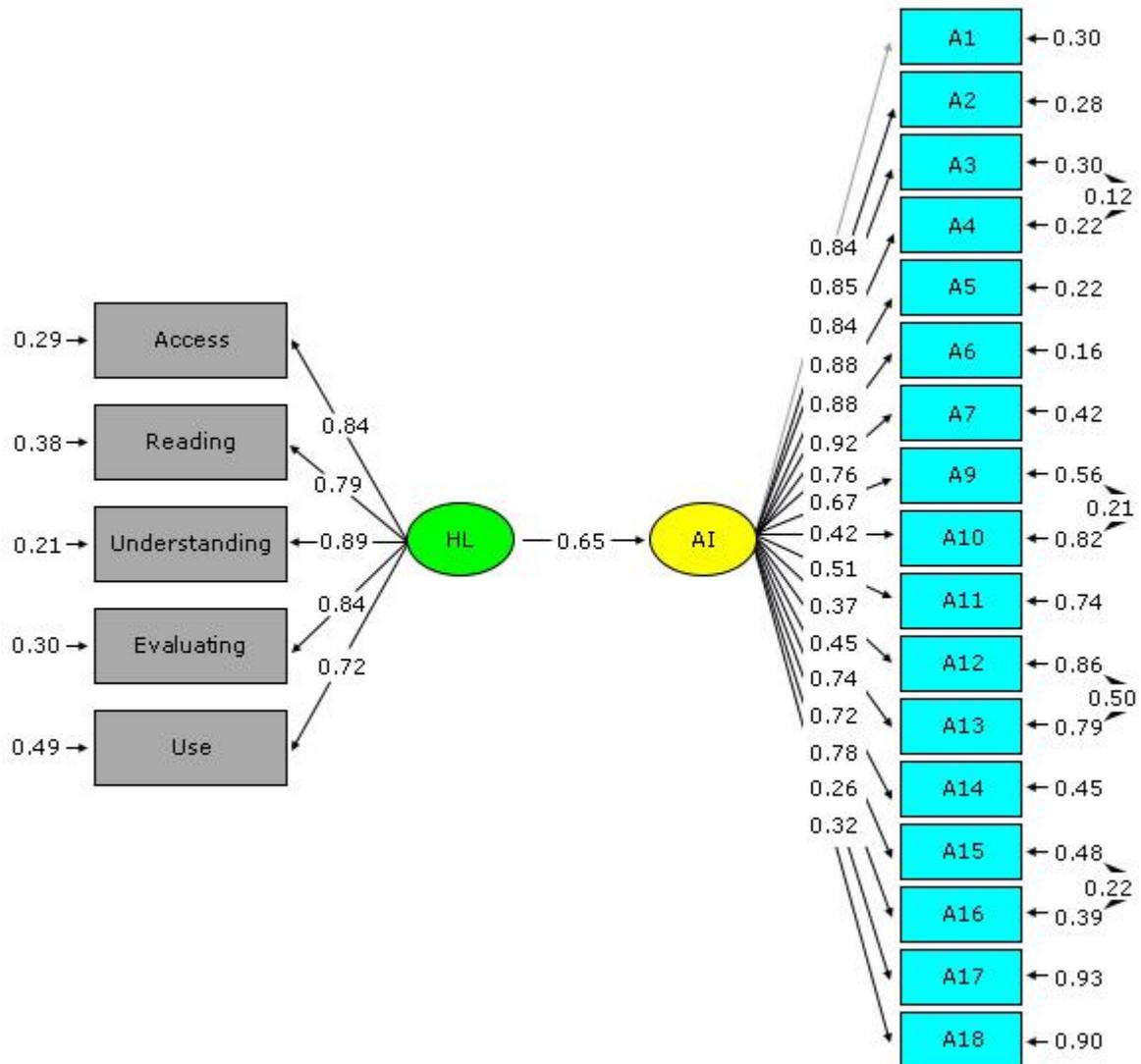
As reported in table 7, the results of Kolmogorov-Smirnov test ( $p > 0.50$ ) and data skewness and elongation show that research data have normal distribution; therefore, it is possible to use parametric tests to test research hypotheses.

### 8. There is direct meaningful relation between health literacy level of users and their precision about the accuracy of information related to COVID-19.

**Table 8 - Correlation matrix**

	Accuracy of information	Health literacy	Accessibility	Reading	Understanding	Evaluation	Decision making and application
Accuracy of information							
Health literacy	561/0						
Accessibility	**442/0	**809/0					
Reading	**414/0	**780/0	**683/0				
Understanding	**474/0	**840/0	**743/0	**728/0			
Evaluation	**443/0	**809/0	**714/0	**642/0	**786/0		
Decision making and application	**519/0	**845/0	**606/0	**527/0	**616/0	**611/0	
** $p < 005/0$							

The results of table 8 show that there is a good pair correlation between variables and it is possible to use the structural equation model to measure the effect (relation) of health literacy (HL) and accuracy of information on COVID-19 (AI) in the virtual social networks by confirming the presence of good correlation between variables. In the following figure 2, the standard coefficients related to research variables have been reported.



Chi-Square = 390.44, df = 198, P-value = 0.00000, RMSEA = 0.090

Fig. 2 – Standardized regression coefficient from the research results.

Concerning the results of above model and meaningfulness of the relation between the health literacy of users and the accuracy of information on COVID-19 at significance level of  $p < 0.001$  and T-value of 6.90, the research hypothesis is confirmed. Therefore, it can be said that there is direct and significance relation between the fitness indices of the model indicate appropriate fitness of the model. results of Chi-square on the degree of freedom 1.971; the reported GFI value for this model is 0.83. In order to investigate how the intended model combines the goodness of fit and saving, RMSE has been used. RMSEA value in this model (0.090) indicates the good explanation of variance. GFI (0.83), NFI (0.94), IFI (0.97), CFI (0.97) and high value of other indices indicate good fit of designed model.

**Table 9 - GFT**

Index name	The estimations of main model	Good index (Gefen et al. 2001)
Chi2 on Degree of Freedom	971/1	Better if close to 3 and less.
FGI	83/0	Above 0.80
RFI	93/0	Above 0.80
PGFI	81/0	Above 0.80
RMSEA	090/0	Below 0.50
CFI	97/0	Above 0.80
NFI	94/0	Above 0.80
IFI	97/0	Above 0.80

In follow, the results of analyzing direct effect of health literacy of users on the accuracy of published information on COVID-19 have been calculated and reported in table 10.

**Table 10 – Direct effect of health literacy of users on accuracy of published information on COVID-19 in virtual social networks**

Predictive variable	B	SE	Beta	T	P
Health literacy	687/0	093/0	561/0	389/7	000/0
361/0 = R    314/0 = R <sup>2</sup> 309/0 = ADJ.R <sup>2</sup>					

As seen in table 10, health literacy variable ( $p < 0.561$ ,  $\beta = 0.000$ ) has positive meaningful effect on the accuracy of published information related to COVID-19 in virtual social networks. This means that increased score of health literacy variable leads to increase in the accuracy of information and vice versa, i.e. decrease in the score of this variable leads to decrease in the accuracy of published information on COVID-19 in virtual social networks. Moreover, concerning the reported results above, in the table 11, the health literacy is capable of explaining 40% of variance of accuracy of published information on COVID-19 in virtual social networks.

### 9. Relation between health literacy and education level of users of virtual social networks

With regards to the scale of variables for testing the above hypothesis, Spearman correlation

coefficient has been used.

**Table 11** - Correlation between health literacy level and education level of users of virtual social networks

	<b>Spearman correlation coefficient</b>	<b>Significance level</b>	<b>Number</b>
Health literacy level and education level	249/0	006/0	121

According to the results of table 11, and the significance level ( $p < 0.50$ ) and Spearman correlation coefficient (0.249), the research hypothesis is confirmed. Therefore, it can be said that there is direct meaningful relation between the health literacy level and education level of users of virtual social networks.

### **10. The relation between accuracy of published information on COVID-19 and education level of users of virtual social networks**

To test the above hypothesis, Spearman correlation coefficient has been used.

**Table 12** – Correlation between the accuracy of information on COVID-19 and education level of users of virtual social networks

	<b>Spearman correlation coefficient</b>	<b>Significance level</b>	<b>Number</b>
Accuracy of information on COVID-19 and education level	303/0	001/0	121

According to the results of table 12, concerning the significance level ( $p < 0.50$ ) and Spearman correlation coefficient, the research hypothesis is confirmed. Therefore, it can be said that there is direct meaningful relation between the accuracy of information on COVID-19 and education level of users of virtual social networks.

## **Discussion**

The present study has been done aiming at investigating the effect of health literacy of Iranian users and the accuracy of information on COVID-19 in virtual social networks.

The descriptive findings of this study showed that according to Iranian users, Internet is one of the main sources of getting required information on COVID-19.

The study of the research hypothesis showed that there is direct and meaningful relation between the health literacy and accuracy of information on COVID-19 in virtual social network and the health literacy has direct effect on the accuracy of information on COVID-19. This result is consistent with the results of *Aharon et al.*<sup>(18)</sup> and *Chang et al.*<sup>(16)</sup>

Health literacy is one of the skills that seems to be effective and useful in individuals' ability to understand the correctness and accuracy or inaccuracy of content published on COVID-19. Obviously, only experts can provide accurate opinions on how to prevent COVID-19 infection and how to treat it and provide proper diet; however, sometimes some untrue and even contradicting views with that of health experts are published in cyberspace. In this regard, the findings of *Aharon et al.*<sup>(18)</sup> showed that nurses are better able to identify the validity or invalidity of published information on COVID-19 in social networks.

The other findings of the present study showed that there is direct and meaningful relation between health literacy and accuracy of information on COVID-19 with the education level of users of virtual social network. This finding is consistent with the results of *Szmuda et al.*<sup>(17)</sup>

The research results showed, individuals who had higher educational level benefit from good health literacy level and their attention to the accuracy of information on COVID-19 in virtual social network has been higher than others. Based on this result, it can be said that individuals with higher education level are more familiar with health literacy than others, and it is important for them what information and from what source they receive or share with others.

Concerning the results of this study and the meaningfulness of the relation between health literacy and attention to the accuracy of information on COVID-19 in Iranian users, it is recommended that the authorities of health organization consider special programs to increase the health literacy of users in virtual social network so that the users will be able to evaluate whether the information are correct or not. In this way, there will be less losses due to ignorance of health literacy and its complications. Moreover, in order to promote the health literacy level of society, the health officials of the country are recommended to consider a team for inspecting the health messages related to COVID-19 in cyberspace and surely, take action to publish accurate health and treatment content on COVID-19 in these networks so that the health literacy level of the society will increase and this crisis could be overcome without significant casualties.

Among the limitations of the present study was the lack of quick and easy access of users to some virtual social networks (Telegram, Facebook, Twitter, etc.). Following the Iranian protests in January 2017, the government filtered two well-known messengers, Telegram and Instagram. Telegram was filtered after about two weeks. But in May 2018, Telegram was filtered by court order. Also, since 2012, blocking or slowing down the connection to port 443 has been one of the tricks used to cut off or make it difficult for users to access hackers, messengers, and other software based on the HTTP protocol. These are some of the restrictions that exist for Iranian users.

## Recommendations

Concerning the results of this study, there are some recommendations:

1. Evaluate the health literacy of Iranian users and present strategies for its elevation.
2. Provide required training on recognition of the accuracy of information on health and COVID-19.
3. Inform Iranian users of the channels that they should refer to get information on COVID-19.
4. Ask the users about what channels they use to receive information on COVID-19 and provide necessary training in these channels by health teams.

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**Annex****Questionnaire**

Greetings and Regards

Dear user,

The questionnaire in front of you is related to the ongoing research on "Health Literacy and its role in the accuracy of information published by Quid 19 on social networks". Please cooperate in order to conduct this research by answering the present questionnaire. Obviously, your accurate answers in order to make better use of the information collected can have a positive effect on the research result. You are assured that your answers will be completely confidential and will only be used in the statistical calculations of the research. Thank you in advance for your cooperation.

Shahnaz Khademizadeh

Faculty member of Shahid Chamran University of Ahvaz

**Demographic information**

**Gender:** Female  Male

**Education:** Undergraduate  Diploma  Bachelor  Master  Doctorate

**Age:**

**Occupation:** Employee  Unemployed  Freelance  Housewife  Student

Retired  Other

**Marital status:** Married  Single

**State:**

**How do you get the most out of health and illness information?**

- Ask your doctor and healthcare staff
- Radio and television
- IVR
- Internet (Instagram, Telegram, WhatsApp, Twitter, etc.)
- Newspapers, magazines and magazines
- Booklets, pamphlets, educational and promotional brochures
- Asking friends and acquaintances
- Satellite channels

I do not know where to get the information I need.

Health Literacy for Iranian Adults (HELIA). Montazeri *et al.*(2014)

This questionnaire has been prepared to assess the health literacy of Iranians. You can only select one option for each of the following questions.

<b>Item: Access</b>	<b>Not at all</b>	<b>Rarely</b>	<b>Sometimes</b>	<b>Most of the times</b>	<b>Always</b>
I can get the health information I need from various sources.	1	2	3	4	5
I can get information about healthy eating.	1	2	3	4	5
I can get mental health information like depression and stress.	1	2	3	4	5
I can get information about the disease I want.	1	2	3	4	5
I can get the information I need about some health problems and diseases such as high blood pressure as well as high blood sugar and lipids.	1	2	3	4	5
I can get information about the harms and dangers of smoking.	1	2	3	4	5
<b>Item: Reading skills</b>	<b>It is quite difficult</b>	<b>It's difficult</b>	<b>Neither easy nor difficult</b>	<b>It is easy</b>	<b>It's quite easy</b>
It is easy for me to read educational materials about health (booklets, pamphlets, educational brochures and advertisements).	1	2	3	4	5
It is easy for me to read the specific written instructions that doctors, dentists and health professionals give me about my illness.	1	2	3	4	5
It is easy for me to read medical and dental forms (such as patient admission forms, consent forms, file form, etc. in hospitals and treatment centers).	1	2	3	4	5
It is easy for me to read the handbook and prepare before the examination, ultrasound or radiology.	1	2	3	4	5
<b>Item: Understanding</b>	<b>Not at all</b>	<b>Rarely</b>	<b>Sometimes</b>	<b>Most of the times</b>	<b>Always</b>

I understand the recommendations for healthy eating.	1	2	3	4	5
I understand the doctor's explanations about my illness.	1	2	3	4	5
I understand the meaning of the contents written in medical and dental forms (such as patient admission form, consent form, file formation, etc. in hospitals and medical centers).	1	2	3	4	5
I understand the meaning and significance of the signs and materials written on the signboards in hospitals, clinics and health centers.	1	2	3	4	5
I understand how to take the medicine that is written on the medicine packaging.	1	2	3	4	5
I understand the advantages and disadvantages of the treatments prescribed by the doctor.	1	2	3	4	5
Understand the meaning of what is written in the handbook before the test, ultrasound or radiology.	1	2	3	4	5
<b>Item: Evaluation</b>	<b>Not at all</b>	<b>Rarely</b>	<b>Sometimes</b>	<b>Most of the times</b>	<b>Always</b>
I can assess the accuracy of the health information provided on the Internet.	1	2	3	4	5
I can assess the accuracy of the health information provided by television and radio.	1	2	3	4	5
I can evaluate the correctness of the health advice given to me by friends and relatives.	1	2	3	4	5
I can pass on the health information I have learned to others.	1	2	3	4	5
<b>Item: Decision making and application of health information</b>	<b>Not at all</b>	<b>Rarely</b>	<b>Sometimes</b>	<b>Most of the times</b>	<b>Always</b>
Seeing the symptoms of the disease, I know where or to whom to refer.	1	2	3	4	5
When the doctor recommends that you "take the antibiotic capsule three times a day for an hour," I follow an 8-hour interval..	1	2	3	4	5
I do not stop the medication prescribed by my doctor for my illness without her permission, even if the symptoms of the disease have disappeared.	1	2	3	4	5
If one of my first-degree relatives has had some cancers (such as prostate, breast, cervical, colon, etc.), I should see a doctor.	1	2	3	4	5

I avoid doing things or consuming substances that increase blood pressure.	1	2	3	4	5
Even if I do not have any symptoms, I go to the doctor every year for a check-up (periodic examination).	1	2	3	4	5
In every job and situation, I take care of my health.	1	2	3	4	5
If I have any questions about my illness, I will ask the medical staff.	1	2	3	4	5
I buy dairy products (milk, yogurt, cheese, etc.) according to the percentage of fat in it.	1	2	3	4	5
I avoid doing things or consuming substances that cause weight gain.	1	2	3	4	5
I wear a seat belt while driving.	1	2	3	4	5
When buying food, I pay attention to its nutritional value.	1	2	3	4	5

### **Questionnaire related to the accuracy of information in virtual social networks**

(Taken from Ismailzadeh and Hassanzadeh questionnaires, 2018)

This questionnaire is designed to check the accuracy of information published on information (COVID-19) on social networks and is assessed in three parts of questions, each of which consists of several questions.

#### **A) Have you ever republished news on social media without knowing its authenticity? (Answer to this question is required)**

Yes  No

1. Which of the following virtual social networks is your most active?

Telegram  Instagram  WhatsApp  Other

2. What is your membership history in virtual social networks?

Less than 1 year  Between 1 to 2 years  Between 2 to 3 years  More than 3 years

3. How much time does it take to browse virtual social networks?

Less than 1 hour per day  Between 1 to 3 hours per day

Between 3 to 5 hours per day  More than 5 hours per day

4. What is the main motivation for using virtual social networks?

Get information and news  Entertainment  Communication with friends  Other

5. The number of posts related to COVID-19 that you publish or republish on average in these networks per day?

Note: It is necessary to mention that in this questionnaire, sending the article means the action in which the person prepares the article himself. Publishes in various groups and channels, and republishing content means sending a ready-made article to others.

1 post  2 posts  3 posts  more than 3 posts

The second part is the accuracy of information published in cyberspace

**B) When posting or republishing an article about the COVID-19 virus on social media, how much do you pay attention to the following?**

1. Having a citation source (For example, if you intend to publish an article about COVID-19, make sure that your article is documented so that the name of the author or publishing organization is known. Very low  Low  Medium  High  Very high

2. The validity of the source (For example, if you intend to publish an article about COVID-19, make sure that the person or organization publishing the article has enough credibility)

Very low  Low  Medium  High  Very high

3. Accuracy of the source (logical connection between the source and the text): (For example, if you intend to publish an article about COVID-19, make sure that the text is consistent with the source to which the article is cited)

Very low  Low  Medium  High  Very high

4. Not being fake (using terms such as eyewitnesses, Internet or Google citations, etc. Do not doubt the content)

Very low  Low  Medium  High  Very high

5. Availability of content sources: (For example, if you want to publish an article about COVID-19, you use resources that can be linked to if necessary and the main source has access)

Very low  Low  Medium  High  Very high

6. Reliability of the source: (For example, if you are planning to publish an article about COVID-19, make sure that the source you are using is sufficiently credible and that it is documented in this article so that the name of the author or publishing organization is known.)

Very low  Low  Medium  High  Very high

The third part is the accuracy of the published information

**C) When posting or republishing an article about COVID-19 on social media, how much do you pay attention to the following?**

1. Completeness of the content (not being part of a content):

Very low  Low  Medium  High  Very high

2. A combination of falsehood and reality: (For example, content should be presented that, although it has a valid context, but to make it more attractive and attract the audience, it should be given unreal leaves)

Very low  Low  Medium  High  Very high

3. The correctness of its correct writing style from a scientific and logical point of view:

Very low  Low  Medium  High  Very high

4. No spelling, typing and spelling mistakes and haste of content:

Very low  Low  Medium  High  Very high

5. Lack of sophisticated and misleading expressions: (It means confusing and confusing the contents and incorrect conclusion of the contents).

Very low  Low  Medium  High  Very high

6. Lack of expressions based on lamentation, begging, intimidation and request, etc.:

Very low  Low  Medium  High  Very high

7. Not wanting to be a group, party, etc.:

Very low  Low  Medium  High  Very high

8. Procurement from reliable sources:

Very low  Low  Medium  High  Very high

**D) How much do you pay attention to the following when posting or republishing an article about COVID-19 on social media?**

1. The author's expertise regarding the submitted content:

Very low  Low  Medium  High  Very high

2. The sincerity of the author regarding the submitted content:

Very low  Low  Medium  High  Very high

**E) To what extent do you agree with the following statements?**

1. Do the authors of COVID-19 content on social media have enough expertise in their submissions?

Very low  Low  Medium  High  Very high

2. Are the authors of COVID-19 content on social media honest enough?

Very low  Low  Medium  High  Very high

**Conflicto de intereses**

Los autores declaran que no existe conflicto de intereses.

**Contribución de los autores**

*Conceptualización:* Shahnaz Khademizadeh.

*Curación de datos:* Shahnaz Khademizadeh.

*Análisis formal:* Shahnaz Khademizadeh.

*Adquisición de fondos:* Shahnaz Khademizadeh.

*Investigación:* Shahnaz Khademizadeh, Farhad Fatehi.

*Metodología:* Shahnaz Khademizadeh.

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*Supervisión:* Shahnaz Khademizadeh.

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*Redacción – corrección y edición:* Shahnaz Khademizadeh, Zeinab Mohammadi, Farhad Fatehi.

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