Development and Psychometric Assessment of the COVID-19 Health Literacy Scale: Preliminary Testing and Factor Structure

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Received: 06 September 2021
Accepted: 22 November 2021
Doi: 10.22038/jhl.2021.61484.1238

ABSTRACT

Background and Objective: Improving the health literacy in the different populations regarding COVID-19 may be useful in the control of its prevalence. This study examined the psychometric properties of a newly developed disease-specific measure of health literacy related to COVID-19 to be used as a standard measure.

Materials and Methods: Relevant literature was reviewed to identify an item pool, and an expert panel was convened to choose items that might be included in the scale. Content validity ratio (CVR) and content validity index (CVI) was determined and face validity was examined by calculating the impact score in a group of social media users. The factor structure of the initial scale was examined in 590 Iranian individuals participating in online social networks in September 2020. Internal consistency of the scale was assessed by Cronbach's alpha and test-retest reliability of responses was measured by Pearson correlation coefficients.

Results: A five-factor solution for the 51-items scale was obtained through exploratory factor analysis. The five main dimensions were understanding, communication, information seeking, analysis, and behavior. The dimensions explained 47% of the variance in scale scores. Participants whose scores fell in the high category (27%) were significantly different compared to those whose scores fell in the low category (27%) on all dimensions ($p<0.001$). The CVR values for all items were greater than 0.85 and all items also got CVI values higher than 0.79 based on nine-person expert panel. The Cronbach's alpha for the overall scale was 0.89, and it was ranged from 0.71 to 0.90. Test-retest reliability for the scale was high ($r=0.89$).

Conclusion: Health Literacy Scale for protect against COVID-19is a valid and reliable measure for Iranian population. This measure should be translated, and administered, in other settings to replicate the results obtained here.

Paper Type: Research Article
Keywords: Novel Coronavirus, Health Literacy, Measurement, Validity, Reliability.

▶ **Citation:** Sanaeinasab H, Saffari M, Rashidi-Jahan H, Rahmati F, Harold G. Koenig, Chung-Ying Lin, H. Pakpour A. Development and Psychometric Assessment of the COVID-19 Health Literacy Scale: Preliminary Testing and Factor Structure. *Journal of Health Literacy*. Winter 2022; 6(4): 32 46- .

Introduction

Since the emergence of coronavirus disease in December 2019 (COVID-19), there is global concern about this disease that now affects the entire world. The pandemic has affected more than 204 million people and caused over 4,300,000 deaths from August 10, 2021 (1). The rapid distribution of this disease in both developed countries (such as those in the European Union and North America) and developing countries (e.g., India, Brazil, and Iran) led to a high rate of morbidity and mortality (2, 3). In Iran, a country that experiences a poor economic state and undesirable international relations, this situation is critical because of limited access to preventive equipment and medicines that are needed to control this disease (4).

Although hope to control the COVID-19 has arisen given the development of preventative vaccines, the World Health Organization (WHO) has emphasized that the best ways to prevent and manage the disease are dependent on human behavior such as social distancing, avoiding the crowds, staying at home, wearing a mask, and frequent hand washing (5). However, adherence to these recommended behaviors requires adequate information about the disease. People in each society will understand why they need to change their behavior in this regard. Such knowledge will help individuals to make decisions regarding their own health and the health of people who live around them (6). In other words, when people are able to acquire, analyze, and apply appropriate information about the disease, this will not only contribute to their own personal health but also to influence the community's health (7).

There is a great deal of information available on different aspects of the disease including prevention, diagnosis and treatment; however, the reliability and accuracy of this information are widely variable. (8). The best way to empower people during these difficult times is to inform them on how to access and use accurate information on COVID-19 to increase their health literacy (HL)(9, 10). Education on HL has been recognized as an important way to increase information on health behaviors related to the prevention and management of communicable and chronic diseases (11). Health literacy may also serve as main skills for improving the quality of healthcare and enhancing health outcomes (12, 13). According to the WHO definition, HL is a "person's capacity to access, process, comprehend and use health information in order to make deliberate decisions and provide relevant judgments with regard to preserving their mental and physical health through specific health practices" (14). Likewise, HL is considered as a necessary skills of effective public health strategies for protecting populations from community-wide illnesses(15).

During the COVID-19 pandemic, HL has never been so important. But, recent evidence showed that people who have lower HL are at higher risk for infection with this disease, and the level of HL in the population can significantly affect planning of health program to reduce the prevalence infection and the mortality rate (16, 17). This is a time full of uncertainties and information about the coronavirus constantly are updating, as research uncovers more information about how the virus spreads and what people need to do to protect themselves and others, which underscores the importance of HL. Studies show that those with low HL experience higher rates of hospitalization, pay more costs for healthcare services, have poorer compliance with medicines, experience lower quality of life, and possess fewer necessary skills for self-care (18-20). Low HL is not specific to low-income countries, as

research indicates that nearly half of European populations and about 60% of Canadians suffer from poor HL (21, 22). Several community-based surveys conducted in Iran demonstrated that less than 10% of the population has an adequate level of HL (23, 24).

To date, many tools have been developed to measure HL. However, most of these measures focus on the overall level of HL and the ability of people to read and understand health information more generally (25). Although these measures may help to assess the knowledge and practices of people regarding health-related issues as a whole, they may not be useful for examining how people may obtain, evaluate, and perform health instructions that related to to COVID-19. To our knowledge there is no specific scale to measure HL specific to COVID-19, which mainly depends on health behaviors such as those described above. Such a measure could greatly assist healthcare professionals and health system decision-makers in their efforts to educate the public on how to limit the spread of the virus and improve COVID-19 outcomes. Therefore, the present study was conducted to design a new health literacy scale specified COVID-19 (the COIVD-19-HLS) and examine its validity and reliability.

Material and Methods

Design and sample

This is a cross-sectional study to design a new health literacy scale specified COVID-19 (the COIVD-19-HLS) in Iran. A convenience sample was invited through social networks to complete an online questionnaire. Individuals were asked to participate in order to help healthcare professionals to find solutions to COVID-19. Data collection was conducted during September 2020 and all qualified Iranian people could participate. The sample size was calculated based on an assumption of having at least 10 participants per item, with a 10% missing values rate involving incomplete questionnaires. Inclusion criteria were: being Iranian, ability to read and write Persian, age ≥18 years old, and registered in a popular social network such as WhatsApp or its Iranian equivalent (e.g., Soroush, Eitta). Individuals with a history of serious mental illnesses such as major depression, post-traumatic stress disorder, or panic attacks were excluded. There were no other exclusion criteria for participation. Participation was voluntary and all participants had the right to withdraw from the study at any time. Questionnaires were anonymously completed and the contact information of participants was kept confidential. The study was approved by the ethical research committee of Baqiyatallah University of Medical Sciences (#IR.BMSU.REC.1399.539).

Scale development

The items of the questionnaire were chosen based on the WHO definition of health literacy, i.e., the ability to access, understand, analyze, and apply health information to make appropriate decisions regarding health (14). The main components of the definition were included in the scale. In a comprehensive literature review using both international and national databases, previously published scales on HL were identified and an item pool was generated. The items were assessed in three separate focus group discussions involving an expert panel including nine specialists in health education (3 individuals), health psychology (2 individuals), nursing (2 individuals), epidemiology (2 individuals), and medicine (1 individual). Based on these discussions, a preliminary 67-item version of the questionnaire was developed. Two additional reviews of the scale were conducted to assess each item in terms of wording, grammar, location in the scale, appropriateness, and scaling. As a

result, 12 items that were similar or inappropriate were removed, and some items modified. The nine-person in expert panel assessed the content validity using the content validity ratio (CVR) and content validity index (CVI). The CVR values for all items were greater than 0.85. likewise, the expert panel evaluated the relevancy, clarity and simplicity of all items, and the CVI values for all items were more than 0.79 (all items at this stage passed this criterion).

Next, the face-validity of the scale was assessed. The 51-item scale was administered to 10 individuals from the general population, who were asked to comment on the item comprehension, relevancy, and readability. An impact score of each item was computed using another convenience sample of 30 participants from the general population. These individuals rated the importance level of each item on a 5- point Likert scale from very important (5) to unimportant (1). The impact score was calculated by identifying the percent of individuals who scored 4 and 5 on each item. All items met this criterion, so all were included. The Impact score for all items was 3.87.

The resulting preliminary version of the scale consisted of 51 items (COVID-19-HLS) and five theoretical dimensions: understanding (11 items), communication (8 items), information seeking (13 items), analysis (6 items), and behavior (13 items). Response options for each item were examined based on a 4-point Likert scale from never (1) to often (4) with regard to frequency. After recoding negative items, the mean score for each dimension was computed by summing the score of items related to that dimension and dividing by the number of items included in the dimension. A total score was calculated by summing the five dimension scores and dividing by five. Both dimensional and total scores ranged from 1 to 4, with higher scores indicating a higher level of health literacy with regard to how to control and prevent COVID-19.

Statistical analyses

Data were analyzed using SPSS software version 22 for Windows (IBM Statistics). All continuous variables were presented using means and standard deviations, whereas categorical variables were described by number and percent. To construct validity, an exploratory factor analysis (EFA) using principal components analysis was performed. Before EFA, the appropriateness of the data for factor analysis was examined using the Kaiser-Meyer-Olkin (KMO) statistic and Bartlett's test of sphericity. If the KMO is greater than 0.6 and Bartlett's test is significant ($p<0.05$), the data are considered acceptable for EFA. An exploratory factor analysis was performed using Varimax rotation with maximum likelihood estimation to determine factor loadings. In addition, correlations between individual items were examined and to ensure that none were greater than 0.9. Furthermore, any items with commodities less than 0.3 were removed (none). Discriminant validity indicates the ability of the scale to differentiate between two or more groups. This was determined by comparing the mean score on the COVID-19-HLS between those who scored among the 27% with the highest scores and the 27% with the lowest scores using the Student's t test. Then discriminant validity is established If the result is significant ($p<0.05$).Test-retest reliability was conducted in a small sample of 35 participants, who completed the scale twice at two weeks apart. A Pearson correlation coefficient was computed between total scores at each time point. A value greater than 0.75 or higher is considered acceptable. The internal consistency of the scale was assessed via the Cronbach's coefficient. An alpha of greater than 0.70 is considered acceptable.

Results

In this study, of the 800 invitation letters sent to users of virtual networks, 590 people responded (74%). Table 1 details the demographic characteristics of the sample. The mean age of participants was 37.7 (SD, 11.1) and the majority were females (71%). More than 80% of the participants had a university education and more than half of the participants were graduated from academic major, which were not related to health. Nearly two-third of respondents were married and about 60% were employed. More than 90% of participants lived in urban areas, and among them nearly 70% were also born in urban areas. Most participants (73%) rated their economic status as average. Less than 10% of participants reported symptoms from contracting COVID-19, although more than half said they knew family members who were affected by the disease. Internet and TV were the most important media sources for information on COVID-19.

Table 1. Sample characteristics (n=590)

Variables	Number (%)	Variables	Number (%)
Age		Gender	
<30	159 (26.9)	Male	171 (29.0)
≥30	431 (73.1)	Female	419 (71.0)
Education		Academic major	
University	475 (80.5)	Health related	268 (45.4)
High school or less	115 (19.5)	others	322 (54.6)
Marital status		Job status	
Single	198 (33.6)	Employed	351 (59.5)
Married	392 (66.4)	Unemployed	239 (40.5)
Birth location		Living place	
Urban	432 (73.2)	Urban	541 (91.7)
Rural	158 (26.8)	Rural	49 (8.3)
COVID-19 contraction		Family/relatives contraction with COVID-19	
Yes	43 (7.3)	Yes	344 (58.3)
No	547 (92.7)	No	246 (41.7)
Media*		Economic status	
TV	198 (33.6)	Good	75 (12.7)
Radio	26 (4.5)	Mediocre	432 (73.2)
Print (Newspapers, magazines, …)	18 (3.0)	Poor	83 (14.1)
Internet (including social networks)	323 (54.7)		
Others	25 (4.2)		

*Most important medium to get information on COVID-19

With regard to data adequacy for factor analysis, the KMO was 0.91 and Bartlett's test of sphericity was significant at p<0.001. Concerning the communalities, no items were correlated with each other at an r>0.90. As indicated in Table 2, most items, which were theoretically assigned, were loaded from different dimensions. However, some items (21, 24, 27, 41, 44) loaded with a value higher than 0.40 on other factors along with their theoretically assigned factors. Overall, 47.3% of variance was explained by the five scale factors. Concerning discriminant validity, the scale was able to distinguish (p<0.001) between participants whose total scores and dimensional subscale scores fell in the lower or upper groups (Table 3). Average scores for behavior, information seeking, and understanding subscales were higher than for other subscales.

Table 2. Factor loadings using exploratory factor analysis on COVID-19 health literacy scale (constructive validity)

Item no.	Theoretical class	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
1	U	0.092	0.033	0.325	0.142	0.195
2	U	0.134	0.017	0.678	0.083	0.177
3	U	0.205	0.038	0.688	0.113	0.211
4	U	0.240	0.222	0.496	0.053	0.168
5	U	0.213	-0.034	0.447	0.249	0.235
6	C	0.278	0.218	0.306	0.306	-0.133
7	IS	0.358	0.434	0.127	0.227	0.044
8	U	0.378	0.345	0.550	0.054	0.217
9	C	0.312	0.362	0.140	0.462	0.060
10	B	0.423	0.090	0.371	0.108	-0.043
11	A	0.255	0.319	0.398	0.140	0.459
12	A	0.153	0.230	0.322	0.098	0.549
13	IS	0.211	0.457	0.285	0.133	-0.058
14	U	0.358	0.287	0.418	0.089	0.280
15	IS	0.388	0.563	0.217	0.121	0.142
16	IS	0.293	0.427	0.327	0.085	0.040
17	IS	0.364	0.464	0.242	0.137	-0.020
18	U	0.335	0.185	0.563	0.155	0.130
19	U	0.390	0.349	0.522	0.137	0.113
20	U	0.374	0.294	0.595	0.120	0.082
21	A	0.311	0.412	0.266	0.053	0.613
22	A	0.343	0.198	0.287	0.128	0.558
23	A	0.298	0.129	0.192	0.035	0.612
24	C	0.214	0.236	0.562	0.500	0.067
25	IS	0.198	0.423	0.357	0.016	0.182
26	IS	0.278	0.488	0.154	0.131	0.168
27	C	0.255	0.138	0.482	0.455	0.071
28	B	0.573	0.388	0.073	-0.066	0.079
29	B	0.432	0.353	0.335	-0.018	-0.039
30	B	0.612	0.389	0.160	0.001	0.122
31	B	0.515	0.313	0.217	-0.019	0.004
32	B	0.484	0.226	0.247	0.033	0.025

Table 2. Factor loadings using exploratory factor analysis on COVID-19 health literacy scale (constructive validity)

33	B	0.442	0.135	0.387	-0.066	0.088
34	IS	0.377	0.529	0.227	0.149	0.046
35	IS	0.355	0.547	-0.026	0.002	-0.097
36	C	0.066	0.430	0.342	0.342	-0.048
37	U	0.145	-0.026	0.345	0.368	0.230
38	A	0.045	0.132	-0.077	0.377	0.602
39	IS	0.321	0.447	0.352	-0.098	0.214
40	IS	0.018	0.425	0.052	0.367	0.141
41	C	0.083	0.457	0.364	0.521	0.100
42	C	0.113	-0.020	0.057	0.588	-0.005
43	IS	0.337	0.508	-0.102	-0.022	-0.104
44	IS	0.173	0.607	0.117	0.445	0.183
45	C	0.093	0.176	0.045	0.581	0.287
46	B	0.707	0.258	0.198	0.053	-0.098
47	B	0.585	0.389	0.328	0.007	-0.004
48	B	0.643	0.332	0.124	-0.057	0.161
49	B	0.605	0.377	0.242	0.172	0.093
50	B	0.443	0.289	0.316	0.183	0.044
51	B	0.363	0.393	0.227	0.088	0.138
Eigenvalue		6.465	5.998	5.973	2.927	2.770
Explained variance (%)		12.67	11.76	11.71	5.73	5.43

A, Analysis; B, Behavior; C, Communication; IS, Information seeking; U, Understanding
Factor 1, behavior; Factor 2, information seeking; Factor 3, understanding; Factor 4, communication; Factor 5, analysis
Loading values greater than 0.4 are in bold

Table 3. Discriminant validity of COVID-19 health literacy scale

Factors	Score range	Mean**(SD)	Mean **(SD)		t value
			Upper group	Lower group	
Behavior	13-52	3.67 (0.33)	3.96 (0.04)	3.26 (0.33)	26.71*
Info. seeking	13-52	3.50 (0.34)	3.86 (0.08)	3.04 (0.28)	35.61*
Understanding	11-44	3.45 (0.35)	3.82 (0.09)	3.01 (0.26)	37.23*
Communication	8-32	3.29 (0.39)	3.75 (0.12)	2.86 (0.28)	36.95*
Analysis	6-24	3.29 (0.42)	3.77 (0.14)	2.74 (0.30)	39.35*
Total score	51-204	3.49 (0.28)	3.76 (0.08)	3.14 (0.24)	31.00*

*p<0.001
**mean score for each domain is computed based on mean of crude scores dividing by number of domain items

Internal consistency, as measured by Cronbach's alpha, was high for the total scale (α=0.89). Items belonging to the behavioral subscale dimension had the highest reliability with an alpha greater than 0.90. Alphas for information seeking and understanding subscales also demonstrated satisfactory internal consistency (i.e., 0.80-0.90), and the two communication and analysis subscales also had adequate consistency (i.e., 0.70-0.80). With regard to test-retest reliability, the total scale score and all subscales demonstrated high correlations between the two times of measurement (0.84<r<0.96).

Table 4. Reliability of COVID-19 health literacy scale

Factors	Number of items	Cronbach's alpha (n=590)	Test-retest (r) (n= 35)
Behavior	13	0.904	0.845*
Info. seeking	13	0.833	0.873*
Understanding	11	0.821	0.896*
Communication	8	0.707	0.953*
Analysis	6	0.797	0.932*
Total Score	51	0.894	0.936*

*p<0.01

Discussion

The purpose of this study was to develop and assess a HL scale focused on the prevention and control of COVID-19 in an Iranian population. We assessed the psychometric properties of the scale using content and discriminant validity, as well as reliability by measures of internal consistency and test-retest reliability. The findings indicated that the COVID-19-HLS has acceptable validity and reliability, with the items loading on five separate factors as theoretically predicted using exploratory factor analyses. With regard to sources of information about COVID-19, we found that the most important sources of information were obtained from the Internet through virtual networks. Health literacy was the greatest effect on the behavior and information-seeking dimensions.

Others have also sought to identify a specific measure to assess HL regarding COVID-19. For example, in a similar study conducted in Germany, Okan et al. developed a measure to assess knowledge related to coronavirus health information that consisted of four dimensions: access, understanding, assessment, and application. They also used an online survey to determine the psychometric properties of the measure, which were found to be acceptable (26). However, several differences were found between their psychometric approach and our findings as follow:(1) Okan et al. began the validation process using factor analysis, whereas the present study followed a standard protocol. First establishing the face and content validity of the measure, and then using factor analysis to identify the factor structure of the scale; (2) Okan et al. identified items for their measure based on the European Health Literacy Survey, while we identified items from previously published HL measures using an expert panel to generate an item pool; (3) as a part of the validation process, we assessed discriminative validity to confirm the results of face, content, and construct validity, which was not done by Okan et al, and (4) they included the four primary domains in their study, while we only included a communication domain that focused on the importance of interpersonal relationships in improving HL. The findings from the study conducted in Germany also have similarities to the present study. For example, these investigators found that the overall level of COVID-19 health literacy among participants was high. However, about half of participants in this study doubted on the trustworthiness of the information about COVID-19 that they had learned during training program. This finding is consistent with the findings from the current study, such that people may be exposed to a considerable amount of health information on

COVID-19 that they do not possess sufficient skills to analyze the trustworthy nature of this information.

In a study that sought to develop a HL scale for infectious diseases in China, researchers followed the same procedure as the current study in developing a 22-item scale with two subscales includes preventive/curative and cognitive knowledge. Although these investigators found that the scale generally had acceptable psychometric properties, factor analysis demonstrated that items loaded on a five-factor solution that was different from what they had theorized (27). This may have been due to insufficient identification of potential items for the scale prior to administration. Moreover, this scale was designed for use in identifying HL with regard to any infectious disease and was not specific to COVID-19. The present scale also differs from the Chinese HL scale in that we focused on the prevention of disease because there was no treatment for the disease up to the time of our survey. With regard to similarities between approaches, that study also examined discriminative validity by comparing average scale scores between participants who scored in high and low categories.

There have been other efforts to assess HL with regard to COVID-19 and more generally. For example, in a cross-sectional study, Szmuda et al. assessed the readability of online educational material on COVID-19. They found health education content available through the Internet was too difficult for the general population to understand (28). The present study found that the understanding subscale score was average in comparison to other dimensional scores. This result may due to that we included other sources of information besides that accessed over the Internet. These findings may support the notion that readability and level of understanding of content related to COVID-19 should be considered in the population during education programs related to this disease. In another survey by Gautam et al., these investigators measured health literacy in patients who were registered at a health care center in rural India. General health literacy was examined using phone interviews, and their results showed that about two-thirds of those surveyed had poor HL (29), which is not consistent with our finding because they considered only the rural nature of the population, and the level of health literacy in India may be lower than in Iran.

Although their sample was different from our study, these results are comparable to our findings because both studies emphasize the critical role of health literacy in the general population. Of course, the difference between their study and ours is that they used a general measure of HL, while the present study used a specific measure to COVID-19.

In another study examining HL with regard to COVID-19, one that was conducted in Ghana, researchers used social media to measure digital health literacy using a standard scale. In that study, 325 participants completed the survey. These researchers found the level of digital HL among participants was quiet high, but the ability of participants to differentiate between trustworthy and non-trustworthy information about COVID-19 and their ability to find accurate information was quite low (30). In that study, the level of health literacy was quite similar to our findings (despite their low response rate). Although, in both studies, the overall level of HL were adequate, there are certain dimensions that need improvement (e.g., how to locate trustworthy information and distinguish it from inaccurate information).

The health literacy concept has a scientific contribution to health studies. However, despite

the importance of specific health literacy scales to provide a database for understanding how people may obtain, analyze and use the information, there are limited efforts to collect information in this regard, and the current study as the pioneer study may encourage researchers to design similar works in other settings and cultures and set the stage for a better perception on how the health literacy may directly or indirectly impact the health status of the community particularly when preventive behaviors are the key strategies to prevent health-threatening conditions like COVID-19.

Study Limitations: The present study has several limitations that may affect the generalizability and interpretation of the results. First, participants were a convenience sample who may not be representative of the Iranian population overall. Second, we used an Internet platform to identify participants to complete the scale, resulting in a relatively young and well-educated sample. Therefore, results may not apply to those without Internet access or who were not registered in the database used. In order to corroborate these results, future studies should focus on recruiting a random sample that may be representative of the entire population in Iran. Third, we assessed only the face, content and discriminative validity of the COVID-19-HLS, no other methods of validation such as concurrent validity, other methods of discriminant validity, or confirmatory factor analysis. However, because there were no similar scales that had been administered in Iran or in Persian, we felt that the present analysis provided at least preliminary information about the scale's psychometric properties. Fourth, the COVID-19-HLS is limited in that has only been administered to a Persian-speaking population in Iran with specific cultural influences (although we include here a translated version of the scale in English, see appendix 1). Thus, the application of the COVID-19-HLS should be done cautiously when administering the scale in other settings and communities. Fifth, regarding the feasibility of the scale to be applied amid general populations the potential barrier may be unawareness of the people on how to address their information to answer the scale without any recall biases. This may be addressed by including proper directions in the scale or providing an oral presentation to communicate how to complete the scale informatively. Finally, administering a general health literacy scale along with this newly developed measure might be useful in distinguishing how the level of general HL may differ from this COVID-19 specific measure.

Conclusions

This study provides preliminary findings indicating that the COVID-19 HLS may be a valid and reliable measure for assessing health literacy in Iranian people with regard to the control and prevention of the current COVID-19 pandemic. Since there is no evidence on the psychometric properties of this measure in other populations and cultural contexts, we suggest the scale be translated into other languages and psychometric properties are also examined. Considering the fact that even with vaccination, which may take several years to achieve a worldwide vaccination, the coronavirus (and future variants) may not be eradicated soon. The best strategy is to prevent and control the disease across all communities. Therefore, both researchers and public health specialists should pay more attention to improving health literacy, and designing a valid and reliable measure.

Ethics approval and consent to participate: Participation was voluntarily and all participants had the right to withdraw from study at any time. They signed the informed consent form

before participation. Questionnaires were completed anonymously and contact information of participants was kept confidential. The study was approved by ethical research committee of Baqiyatallah University of Medical Sciences (#IR.BMSU.REC.1399.539).

Competing interests: There is no conflict of interests to declare.

Funding: None.

Acknowledgments: The authors would like to acknowledge appreciation to those who participated in the study voluntarily. This study was conducted without formal funding support.

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Appendix 1. COVID-19 Health Literacy Scale (English translation)

Please choose a single response for each item which best indicates your perspective related to the disease caused by the new coronavirus (COVID-19). All items involve information, educational materials, and behaviors related to COVID-19.

No.	Item	Never	Seldom	Sometimes	Often
1	When reading educational materials you found nothing helpful.	□	□	□	□
2	When reading the educational materials you found words or terms that you didn't know their meanings.	□	□	□	□
3	When reading educational material you had some difficulties in understanding them.	□	□	□	□
4	It took too much time to read and understand educational materials.	□	□	□	□
5	You needed help from someone to read and understand educational materials.	□	□	□	□
6	Since the pandemic, you have collected information from different resources to prevent and control it.	□	□	□	□
7	You found all the information you needed.	□	□	□	□
8	You were able to understand all the information you found.	□	□	□	□
9	You shared the information on disease prevention and control with others.	□	□	□	□
10	You applied the information regarding disease prevention and control in your daily life.	□	□	□	□
11	You examined the validity and credibility of the information you found.	□	□	□	□
12	You examined the source of information that you found related to the disease.	□	□	□	□
13	Before making any decision related to disease prevention and control, you first collected the necessary information.	□	□	□	□
14	Understanding the recommendations provided by healthcare professionals was easy for you.	□	□	□	□
15	You were able to access health information to prevent and control the disease without difficulty.	□	□	□	□
16	You were able to access information regarding healthy nutrition during the pandemic without difficulty.	□	□	□	□
17	You were able to find information on how to control stress and anxiety during the pandemic.	□	□	□	□
18	You could understand information and advices on prevent and control of the disease provided by the mass media (TV, radio,…) .	□	□	□	□
19	You could understand the advantages and benefits of recommended health practices.	□	□	□	□
20	You were able to understand information on diagnosis and complications of the disease.	□	□	□	□
21	You were able to assess information on disease prevention and control obtained through the internet.	□	□	□	□
22	You were able to assess information on disease prevention and control obtained from your friends or relatives.	□	□	□	□

23	You were able to assess information on disease prevention and control obtained from mass media (TV, radio,…).	□	□	□	□
24	You were able to teach lessons learned on disease prevention and control to others.	□	□	□	□
25	You had obtained information on centers where you might be referred to if you were to experience symptoms of the disease.	□	□	□	□
26	You had obtained information on symptoms of the disease.	□	□	□	□
27	If you encountered people with symptoms of the disease you were able to provide them with needed health information.	□	□	□	□
28	You avoided high risk behaviors such as face-to-face contact or hand shaking with people suspected of having the disease.	□	□	□	□
29	When experiencing symptoms such as cough, fever, sore throat and short breath you consulted a physician.	□	□	□	□
30	You engaged in preventive strategies such as wearing a mask and social distancing when meeting with others or in work setting.	□	□	□	□
31	You avoided crowded environments or high risk places to prevent infection.	□	□	□	□
32	You put into practice recommendations on how to maintain your mental health when in lockdown or isolation at home.	□	□	□	□
33	When in lockdown or isolation at home you engaged in regular physical activity.	□	□	□	□
34	You had enough information on how to prevent the disease through your actions.	□	□	□	□
35	You were responsible in obtaining information to keep yourself and your family safe from the disease.	□	□	□	□
36	You asked help from others to get information about or prevent the disease.	□	□	□	□
37	You encountered health information or educational materials that were ambiguous and hard to understand.	□	□	□	□
38	You used information from different sources without ensuring their validity.	□	□	□	□
39	You obtained information on health centers or healthcare professionals that might be visited if symptoms occurred.	□	□	□	□
40	You were satisfied with the information you received on the disease prevention and so did not look for updated and valid information.	□	□	□	□
41	You asked others for clarification if you encountered dubious information about the disease.	□	□	□	□
42	When trying to obtain information on how to prevent and control disease you felt yourself alone and without any support from others.	□	□	□	□
43	Having enough information to keep yourself and your family healthy was very important for you.	□	□	□	□
44	You felt you did not need to get any information to prevent the disease.	□	□	□	□
45	You felt since the healthcare professionals did not have useful information or skill to prevent the disease it was not necessary to visit them.	□	□	□	□

46	You engaged in preventive measures such as hand washing and hand disinfection, using mask and gloves regularly.	□	□	□	□
47	When you were in a crowd, you kept yourself at least 1.5 meters far away from others.	□	□	□	□
48	You avoided crowds or did not go out without a good reason.	□	□	□	□
49	You used mask and gloves as suggested and disposed them after using them in a hygienic manner.	□	□	□	□
50	Before meals, you washed your hands with soap and water at least for 20 seconds.	□	□	□	□
51	If there was no soap or water, you disinfected your hands with alcoholic solutions.	□	□	□	□