ACHSM Asia-Pacific Journal of Health Management

RESEARCH ARTICLE

IS "E-HEALTH LITERACY" RELATED TO "CORONAVIRUS-RELATED HEALTH LITERACY": FACILITATING DISSEMINATION OF HEALTH INFORMATION THROUGH SOCIAL MEDIA IN THE POST-COVID-19 ERA

Maryam Kazerani[*1], Sana Zandkarimi[1], Mahdieh Mottaghi[2], Marzieh Kazerani[3], Sara Jambarsang*

1. Department of Medical Library & Information Science, School of Allied Medical Sciences, Shahid Beheshti University of Medical Sciences, Tehran, Iran
2. School of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran
3. Department of Infectious Disease, Islamic Azad University of Mashhad, Mashhad, Iran
4. Departments of Biostatistics and Epidemiology, School of public health, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

*Correspondence: kazerani.m@gmail.com

ABSTRACT

To use electronic health information resources correctly and effectively, a set of skills and capabilities called "electronic health literacy" is needed. . This study aims to assess the E-health literacy of patients with COVID-19 in a university-affiliated education hospital and its relationship with coronavirus-related health. Using convenience sampling, 190 patients were selected, filling out the eHEALS (eHealth literacy scale) questionnaire with their consent.

The mean level of E-health literacy was 27.74 (out of 40) indicating a medium level of E-health literacy. The participants reported the most difficulty using Internet information for health-related decisions and distinguishing quality and reliable health information sources from low-quality sources. There is a significant relationship between the E-health literacy level and the age, education, and income variables, but nothing was observed with the gender variable. E-health literacy was significantly related to coronavirus-related health literacy.

In the post-corona era, considering the comprehensive impact of electronic health literacy and disease-related health literacy on the process of control and prevention, it is suggested that health policymakers internationally first get information about the state of health literacy in both dimensions, electronic and disease-related. Also, it is expected of policymakers to find tested solutions to upgrade the level of E-health literacy and coronavirus-related health literacy.

KEYWORDS

E-health literacy, COVID-19, corona, social media, coronavirus-related health literacy, coronavirus

INTRODUCTION

Reliable information is a first necessity for people in a sickness crisis when they have to make accurate decisions. Advances in digital technology have greatly enhanced the accessibility and effectiveness of online resources for disease prevention and control. The widespread use of the Internet and mobile devices now allows people to quickly and easily access health information at any time and from any location, making the internet a vital source for health education and public health guidance. This rapid, on-demand access to reliable information plays a significant role in promoting healthier behaviors and improving overall public health outcomes. Social media shapes health literacy outcomes by increasing access to health information, enhancing digital literacy skills, boosting self-efficacy for health behaviors, and empowering users through shared experiences. However, maximizing these benefits requires addressing challenges related to misinformation and the ethical use of digital platforms [1]. Misinformation spreads rapidly in the digital era, often through social media and online platforms. This proliferation can manipulate public opinion, erode trust in institutions, and even contribute to public health crises so individuals require a specific set of skills to locate and assess accurate information online effectively. E-health literacy refers to the ability to seek, find, understand, and evaluate health information from electronic sources and then use that knowledge to address or solve health-related problems [2–4].

Overall, health literacy comprises a set of six basic competencies: Traditional literacy, health literacy, information literacy, practical literacy, media literacy and computer literacy. [5] Also, having data literacy is essential to effectively read and comprehend the necessary information. [6]. What is the meaning of data literacy? According to [7], "Some people can work nimbly with this data: gathering, analyzing, and finding stories in it with ease. Others don't have the awareness, knowledge, skills, or access to resources needed to do so. Data literacy generally refers to this ability to acquire, analyze, represent, and argue with this type of information." This type of literacy and social media are deeply interconnected in today's digital society, shaping how individuals interact with information, make decisions, and participate in online communities. [8].

All types of infectious diseases can affect our daily activities. For example, COVID-19 has affected daily life and slowed down the global economy. The epidemic affected thousands of people who were either dying or suffering from complications due to the outbreak. The virus spread exponentially in the region. Many countries have locked down their populations and imposed strict quarantines to control the devastating outbreak of this highly contagious disease. **COVID-19 has rapidly disrupted our daily lives, businesses, trade and global mobility. The effects of COVID-19 on daily life are widespread and have far-reaching implications. These can be divided into health care, economic and social categories. [9] Observance of extensive precautionary measures such as washing hands frequently, avoiding face-to-face interaction, social distancing and wearing masks, etc., which were made available to people through social media, would help them not to get involved in the disease. As mentioned, because COVID-19 is a common and highly contagious disease, the need for correct and reliable information through social media is more important than ever. [10] It is clear that since the outbreak of COVID-19, the production and consumption of information has increased rapidly and significantly. [11]

One of the first needs of people during a disease crisis is to obtain reliable information for making accurate decisions. For example, during the spread of the COVID-19 virus, preventive behaviours and personal hygiene were important measures that reduced the spread of the disease. [12,13]

Increasing public awareness about preventive measures improving the level of health and empowering society is the main key to solving this problem. This empowerment has a positive effect through health literacy programs and official campaigns using television, radio, and other media, especially in the context of epidemics. [14]

In fact, In the future, to face pandemic diseases such as COVID-19, we need to measure the level of E-health literacy of people, so that we can plan to improve it in various ways. One of these ways is to use the educational capabilities of

college and research libraries. In other words, recognizing the infrastructure problems from both individual and social aspects in an infodemic disease helps to better plan to face similar problems in the future.

Researcher studies show that a study is necessary to investigate the E-health literacy level of COVID-19 patients in a developing country, like Iran, which is facing many health problems. Although we found that the level of coronavirus-related health literacy is favourable in this study [15], we want to know if there is a relation between these two types of literacy. Therefore, this research examined E-health literacy among patients with the coronavirus and its relation between coronavirus-related health literacy at an educational Hospital. The results of this research can clarify the status of E-health literacy in affected patients and provide valuable information to policymakers and health trustees for effective and targeted planning as an effective experience to encounter the next pandemic.

METHODOLOGY

This study is a cross-sectional survey. The population of the study includes all patients diagnosed with COVID-19 referred to Imam Reza teaching hospital, University of Medical Sciences from December 5, 2020, to July 5, 2021. Because COVID-19 illness can range from mild to severe, with most cases being mild or moderate, we asked patients who were moderately ill at the time of referral and could fill in the questionnaire or reply to the questions of the interviewer.
Considering the minimum value of correlation between the E-health literacy score and demographic variables at the level of 0.20 and the significance level of 0.05 and the power of 80%, the sample size has been calculated using the formula below:

$$n = \left(\frac{z_{1-\frac{\alpha}{2}} + z_{1-\beta}}{0.5 \ln(\frac{1+r}{1-r})} \right)^2 + 3$$

Because travel restrictions were in place during the coronavirus pandemic, we used the convenience sampling where participants are selected based on their easy availability and proximity to the researcher. Using convenience sampling, 190 patients were selected.

DATA COLLECTION:

At first, the researcher went to Imam Reza Hospital, Mashhad University of Medical Sciences, which had the highest number of hospitalized patients with COVID-19. Then she introduced herself to the hospitalized COVID-19 patients who were able to answer the questionnaire and explained the purpose of the study to them. If the patient expressed their desire and initial consent to complete the questionnaire, additional explanations were given to them to answer the questions. The questionnaires were completed in the presence of the researcher and collected at the same time so that if they had any questions or doubts about completing the questionnaire, they could ask the researcher.

PATIENT-REPORTED OUTCOME MEASURE:

The data collection tool has two parts: the first part includes consent form and background information. Some variables like age, income, education and gender were asked in this part because it seemed that they might have relationship with eHEALS literacy. The second part is the modified version of the eHEALS (eHealth literacy scale) standard [16]. In this part we asked the participants for their opinion and about their experience using the Internet for health information. We asked them to tell us which response best reflects their opinion and experience right now. This scale is an 8-item scale based on perceiving the skills or knowledge of individuals in each of the areas being measured. The questionnaire also includes 5-point Likert scale answers with a range of "strongly disagree" to "strongly agree." The researchers calculated this tool's total score from 8 to 40 scores, which represents a higher level of E-health literacy. This scale contains two additional questions designed to appraise the study population's interest in the use of E-health information. Using these questions, the importance of access to health information available on the Internet and the usefulness of the Internet in

health-related decisions is asked, and based on a 5-point Likert scale (from "completely useless" = 1 to "completely useful" = 5), with a total score between 2 and 10. According to the percentage, scores obtained were classified in four levels as low (zero to 25%), medium (25 to 50%), good (50 to 75%), and very good (75 to 100%).

This scale was first designed in 2006 by Norman and Skinner. [16] . In an Iranian study conducted by Bazm and coauters (17), the Persian version's validity and reliability have also been confirmed. The data related to coronavirus-related health literacy was achieved from similar research with these participants. [15].

DATA ANALYSIS

Data was analyzed using IBM SPSS26 software. Descriptive statistics including frequency, percentage, mean, median and standard deviation are used to perform descriptive statistics. Pearson's correlation coefficient was used in the inferential statistics section.

RESULTS

BACKGROUND INFORMATION RESULTS

52.1% of the participants were female (n=99) and 47.9% of them were male (n=91). Most of the participants were between 30 - 50 years old (54.2%) and under-educated (41.6%). The monthly income of most participants was between 30-60 million Rials (64.2%). The level of education among participants was diploma and less (41.6%). The level of English proficiency among the participants was moderate (54.2%). (Table 1)

TABLE 1: DEMOGRAPHIC INFORMATION OF THE PARTICIPANTS

Variables	(n=190)	Frequency	Percentage
Gender	Male	91	47.9
	Female	99	52.1
Age	< 30	72	37.9
	30-50	103	54.2
	>50	15	52.1
Education	Diploma and less	79	41.6
	Associate	11	5.8
	Bachelor	73	38.4
	Master and higher	13	6.9
Work status	Unemployed	3	1.6
	Homemaker	9	4.7
	Retired	4	2.1
	Student	10	5.3
	Employed	164	86.3
Household income	Below 30 million Rials	7	3.7
	30 – 60 million Rials	122	64.2
	60 million Rials +	27	14.2
English language proficiency	Very High	17	8.9
	High	55	28.9

	Moderate	103	54.2
	Low	11	5.8
	Very Low	2	1.1

Most of the participants obtained the information related to COVID-19 mostly by asking "Physicians and health staff" (67.9%). After this, "Internet" (45.3%), "Radio/ Television" (22.6%), "Friends and acquaintances" (17.4 %) and "Brochure/Booklet/Leaflet" (14.2 %) were each respectively the source of health information related to COVID-19. Also among the internet-based sources of health information related to COVID-19 used among the participants were search engines such as Google, Yahoo, and Bing (51.1%) After this, social media (49.5%), life sciences and biomedical information databases (31.1%), health websites on COVID-19 (18.4%), and Website of infectious diseases specialists (16.3%) were the Internet-based sources for obtaining information related to COVID-19, respectively.(Table 2)

TABLE 2: TYPES OF HEALTH INFORMATION SOURCES RELATED TO COVID-19

	Variables	Variable levels	Frequency	Percentage
1	Physicians and health staff	No	61	32.1
		Yes	129	67.9
2	Internet	No	104	54.7
		Yes	86	45.3
3	Interactive Voice Response	No	184	96.8
		Yes	6	3.2
4	Radio/ Television	No	147	77.4
		Yes	43	22.6
5	Magazine/ Newspaper	No	171	90
		Yes	19	10
6	Friends and acquaintances	No	157	82.6
		Yes	33	17.4
7	Brochure/Booklet/Leaflet	No	163	85.8
		Yes	27	14.2
8	Search engines (Google, Yahoo, Bing)	No	93	48.9
		Yes	97	51.1
9	Life sciences and biomedical information databases	No	131	68.9
		Yes	59	31.1
10	Social Media	No	96	50.5
		Yes	94	49.5
11	Health websites on COVID-19	No	155	81.6
		Yes	35	18.4
12	Website of infectious diseases specialists	No	159	83.7
		Yes	31	16.3
13	Others	No	171	90
		Yes	19	10
14	I do not actively search for information	No	182	95.8
		Yes	8	4.2

MAIN RESULTS:

The level of E-health literacy was measured by the eHEALS questionnaire and all participants answered the questions of this questionnaire. Most of the participants in most components of E-health literacy reported their response on a five-point Likert scale, at the "good " level. The items " I feel confident in using information from the Internet to make health decisions" which implies the degree of confidence in the health information available on the Internet" and " I can tell high-quality health resources from low-quality health resources on the Internet " which implies the ability to distinguish

quality health resources from low or poor quality resources" received lower scores than other components with scores of 3.20 and 3.32, respectively which indicates that the participants reported the most difficulty in using Internet information for health-related decisions and distinguishing quality and reliable health information sources from low-quality sources .(Table 3)

TABLE 3. THE SCORE OF E-HEALTH LITERACY ITEMS IN THE RESEARCH POPULATION

		Items	Very Poor Frequency (percentage)	Poor Frequency (percentage)	Fair Frequency (percentage)	Good Frequency (percentage)	Excellent Frequency (percentage)	Mean
Access health information	1	I know what health resources are available on the Internet	6 (3.2)	19 (10.0)	62 (32.6)	78 (41.1)	25 (13.2)	3.51
	2	I know where to find helpful health resources on the Internet	6 (3.2)	14 (7.4)	62 (32.6)	84 (44.2)	24 (12.6)	3.56
	3	I know how to find helpful health resources on the Internet	8 (4.2)	19 (10.0)	40 (21.1)	89 (46.8)	34 (17.9)	3.64
	4	I know how to use the Internet to answer my questions about health	6 (3.2)	13 (6.8)	60 (31.6)	73 (38.4)	38 (20.0)	3.65
	5	I know how to use the health information I find on the Internet to help me	6 (3.2)	22 (11.6)	67 (35.3)	65 (34.2)	30 (15.8)	3.48
	6	I have the skills I need to evaluate the health resources I find on the Internet	5 (2.6)	34 (17.9)	58 (30.5)	70 (36.8)	23 (12.1)	3.38
Evaluate health information	7	I can tell high-quality health resources from low-quality health resources on the Internet	5 (2.6)	32 (16.8)	67 (35.3)	69 (36.3)	17 (8.9)	3.32
	8	I feel confident in using information from the Internet to make health decisions	10 (5.3)	31 (16.3)	75 (39.5)	59 (31.1)	15 (7.9)	3.20

From the total of 190 participants, the average score of the respondents to the questions related to the skill of "Access health information" is 10.71 out of a 15, which is equivalent to 71.40%. The average score of the respondents to the questions related to the skill of "Evaluate health information" is 17.03 out of 25, which is equivalent to 68.12%. This means that the skill of "Access health information" is in a better state than the skill of "Evaluate health information". And the overall average of E-health literacy is 27.74, which indicates that 69.35% of the total 40 E-health literacy scores have been obtained. Considering that the maximum score of this questionnaire is 40 and a score above 35 indicates an acceptable level of E-health literacy, therefore, the average obtained shows that people with covid-19 have a medium level of E-health literacy. (Table 4)

TABLE 4: THE LEVEL OF E-HEALTH LITERACY BY SKILLS

Skills / Score	Score range	Mean (Percentage)	Min (Percentage)	Max (Percentage)	SD (Percentage)
Access health information	3-15	10.71 (71.40)	3 (20.00)	15 (100.00)	2.63 (17.54)
Evaluate health information	5-25	17.03 (68.12)	5 (20.00)	25 (100.00)	4.09 (16.37)
E-health literacy	8-40	27.74 (69.35)	8 (20.00)	40 (100.00)	6.44 (16.11)

The minimum E-health literacy score is related to people over 50 years old, and the maximum score is related to people under 30 years old. There is a significant difference in the E-health literacy score at different age levels. In other words, E-health literacy score was significantly higher in patients less than 30 years old than others. (p-value < 0.05) (Table 5).

TABLE 5: THE IMPACT OF AGE ON E-HEALTH LITERACY LEVEL

Age	Min	Max	Mean	SD	p-value
< 30	14	39	28.18	5.31	0.027
30-50	11	40	28.05	6.43	
>50	8	40	23.46	9.70	

Inferential statistics of the pair wise comparison of E-health Literacy level by age shows that there is no significant difference in comparing the age of less than 30 years with 30 to 50 years. There is a significant difference between the age of less than 30 years and more than 50 years. There is a significant difference between the age of 30 to 50 years and the age of more than 50 years. (p-value < 0.05) (Table 6)

TABLE 6: INFERENTIAL STATISTICS OF THE PAIRWISE COMPARISON OF E-HEALTH LITERACY LEVEL

Age		Min	Max	MD (mean difference)	SD (standard deviation)	p-value
<30	30-50	-2.23	2.48	0.12	0.97	1.00
	>50	0.35	9.07	4.71	1.80	0.02
30-50	<30	-2.48	2.23	-0.12	0.97	1.00
	>50	0.34	8.83	4.59	1.75	0.02

The result is Table 7 shows that there is no significant difference between E-health literacy and gender variable (p-value<0.05). Therefore, gender does not affect the level of E-health literacy. In other words, the E-health literacy score was not significantly different in men and women. (p-value < 0.05)

TABLE 7: THE IMPACT OF GENDER ON E-HEALTH LITERACY LEVEL

Gender	Min	Max	Mean	SD	p-value
Women	8	40	27.93	6.54	0.661
Men	10	40	27.52	6.36	

There is a significant difference between the E-health literacy level and the education variable (p-value <0.05). With the increase in the level of education, the level of E-health literacy has increased. (Table 8). It means that E-health literacy score was significantly higher in patients with high-level education. (p-value < 0.05)

TABLE 8: THE IMPACT OF EDUCATION ON E-HEALTH LITERACY LEVEL

Education	Min	Max	Mean	SD	p-value
Diploma and less	9	40	26.75	6.14	0.024
Associate	11	37	27.18	7.94	
Bachelor	18	40	29.36	5.12	
Master and higher	22	40	30.3	6.19	

The inferential statistics of the pair wise comparison of E-health Literacy level by education show that there is no significant difference between the variable of diploma and less, with associate degree. But there is a significant difference between the diploma and less variable, with the bachelor variable. Also, there is no significant difference between the variables of associate degree with bachelor and master degrees. There is no significant difference in the comparison between master degree and diploma and bachelor variables. There is no significant difference between master degree and other educational level variables. .(p-value < 0.05) (Table 9).

TABLE 9: THE INFERENTIAL STATISTICS OF THE PAIRWISE COMPARISON OF E-HEALTH LITERACY LEVEL BY EDUCATION

Education	Variables	Min	Max	MD	SD	p-value
Diploma and less	Associate	-5.46	4.62	-0.42	1.88	1.00
	Bachelor	-5.15	-0.06	-2.61	0.95	0.04
Associate	Bachelor	-7.25	2.87	-2.18	1.89	1.00
	Master and higher	-9.54	3.29	-3.12	2.40	1.00
Master and higher	Diploma and less	-8.23	1.14	-3.54	1.75	0.27
	Bachelor	-5.65	3.77	-0.93	1.76	1.00

Our study shows that E-health literacy has a significant difference with income (Table 10). In other words, E-health literacy score was significantly higher in patients with higher income. (p-value < 0.05)

TABLE 10: THE IMPACT OF HOUSEHOLD INCOME ON E-HEALTH LITERACY LEVEL

Household income	Min	Max	Mean	SD	p-value
Below 30 million Rials	24	32	27.85	2.79	0.020
30 – 60 million Rials	15	39	28.09	5.28	
60 million Rials +	22	40	31.55	5.39	

Based on the research of Motaghi et al. (15) showed in table 11, the mean (standard deviation) of health literacy in this community, was 84.31 (18.41). Among the dimensions of heath literacy, the highest score belonged to "Understanding health information" (D3) with a mean (standard deviation) of 23.38 (5.66) and the lowest score belonged to "Evaluate health information" (D1) with a mean (standard deviation) of 19.03 (4.69).

TABLE 11: CORONAVIRUS-RELATED HEALTH LITERACY RATES IN PARTICIPANTS (15)

Variables	Dimensions		Min	Max	Mean	SD
Coronavirus-Related Health Literacy	D1	Evaluate health information	5	25	19.03	4.69
	D2	Access health information	6	30	22.21	4.88
	D3	Understanding health information	6	30	23.38	5.66
	D4	Apply health information	5	25	19.67	4.78
Total (N=190)			**22**	**110**	**84.31**	**18.41**

If we test the results of the mentioned research with the results of the present study (Table 4), we will find that there is a correlation between coronavirus-related health literacy and E-health literacy. It means that E-health literacy was significantly related to coronavirus-related health literacy. By increasing the level of E-health literacy, the level of health literacy of people with covid-19 can be improved. (p-value < 0.05) (Table 12)

TABLE 12: THE RELATIONSHIP BETWEEN CORONAVIRUS-RELATED HEALTH LITERACY AND E-HEALTH LITERACY

Items	Coefficient correlation	Significant level
coronavirus-related health literacy	0.589	0.001
E-health literacy		

DISCUSSION

Advances in Information and communication technologies have been continuously playing an important role in empowering communication and accessing information among people, which is one of its unique applications in library services. Indeed, the use of social network platforms in the health field, effectively, depends on E-health literacy [18]. In today's world, particularly in the digital world, there is no more important and influential role than social networks. They have had a profound impact on events in the real world, in particular on the lives of their members. Technology and social networks play a vital role in human life. People can also talk about health care with one another through social networks, as long as they can exchange ideas and information. Although this can be a paradoxical effect, in some cases, health information obtained on social networks has helped to treat disease, sometimes recommendations concerning the treatment of diseases are harmful because they do not include accurate scientific support. The widespread outbreak of COVID-19 affected various restrictions such as quarantine and social isolation, which affected the quality of life and interpersonal social interactions. At that time, all people, especially patients, needed accurate and reliable information, mostly published on social networks. If their E-health literacy status were favorable, they would be fewer victims of misinformation in social networks and all those disasters might not happen. Therefore, acting more thoughtfully to face future pandemic diseases and find solutions to improve people's E-health literacy is better. One of these solutions is E-health literacy education for people through all kinds of virtual or real libraries. Before the COVID-19 pandemic, many libraries had an important role to play in changing from information gathering and storage into a place of social exchange where knowledge was generated and disseminated. [19] However, more changes have occurred since the pandemic, and most libraries have moved their services to an online format, increasing access to digital materials and helping people get online with easy access to digital resources. [20] Libraries played a crucial role in the COVID-19 crisis, aiding the community in adapting to online environments. [20–22]

Any effort to improve the evaluation of health information will lead to the improvement of E-health literacy because we saw that the ability of the participants to be aware of online health information sources, the search method and finding information are at a higher level than the ability to evaluate and distinguish quality information sources from unreliable

and low-quality information sources which is consist with [14,23,]. The study highlights that participants often struggle to distinguish reliable health sources online. This challenge aligns with global trends where misinformation and difficulties in evaluating online health content are widespread issues. For example, research shows that while many individuals believe they have the skills to assess online health information, fewer express confidence in their ability to make health decisions based on that information, especially among older adults and certain demographic groups [24]

If there are some educational programs regarding E-health literacy for older adults in non-hospital settings like all kinds of libraries, then we can expect more favorable conditions in this matter. This suggestion is because that we concluded the age variable affects E-health literacy in such a way that the younger the age, the higher the level of E-health literacy which is consistent with [23,25]. The level of education and income have a direct relationship with health literacy, the higher the level of these two variables, the higher the level of E-health literacy which is consistent with. [3,26-27]. We found that higher education levels are consistently associated with higher E-health literacy. Individuals with advanced education (e.g., master's or bachelor's degrees) tend to have better health literacy scores compared to those with lower educational attainment such as diplomas or associate degrees. This is because education enhances the ability to access, understand, and use digital health information effectively. On the other hand; Lower family income is associated with lower E-health literacy levels. This may be due to limited access to digital resources, internet connectivity issues, and fewer opportunities for digital skill development. Income influences access to Internet services which in turn affects E-health literacy and self-efficacy related to online technologies.

By increasing the level of E-health literacy and improving access and evaluation skills, we found that the level of health literacy of people with COVID-19 can be improved. However, in general, the state of health literacy related to the coronavirus is better than digital health literacy, and this may be associated with the occupation of the people studied, who are mostly in the medical field.

CONCLUSION

In the post-corona era, considering the comprehensive impact of electronic health literacy and disease-related health literacy on the process of control and prevention, it is suggested that health policymakers in countries first get information about the state of health literacy in both dimensions- electronic and disease-related-. It is expected that they will be active in promoting and strengthening the E-health literacy of patients, especially in resource appraisal skills and ensuring health-related decisions. It can be done via educators and planners of the Ministry of Health in both formal and informal training. All courses and workshops on the mentioned training can emphasize E-health literacy. Besides, medical librarians and information professionals should be more active in this regard due to their expertise in retrieving and appraising information resources. It is suggested that this training starts at the older adult level to strengthen the patients' ability and skills

The following recommendations aim to bridge gaps exacerbated by age, education, and income while fostering equitable access to digital health resources:

- Targeted Educational Programs with Demographic-specific training. Implementing age- and education-tiered interventions and offering workshops for older adults or less-educated groups. It can be implemented and developed by both formal and informal education via libraries as Hubs for E-health literacy, health institutions and medical informatics canters as educational gateways, etc,
- Addressing Socioeconomic and Digital Divides with Infrastructure Investment. Expanding internet access and digital tool availability in rural, low-income, and minority communities to reduce disparities linked to socioeconomic status. Considering subsidized programs and providing free or low-cost digital devices and data plans for underserved populations, particularly during public health crises like COVID-19.
- Monitoring and Evaluation of E-health literacy across demographics and track progress
- Prioritizing studies on intersectional factors (e.g., gender, income, education) influencing E-health literacy.

Generally, the findings from these studies strongly suggest that enhancing E-health literacy should be a cornerstone of future pandemic preparedness strategies.

ETHICS STATEMENT

This research was approved by the Shahid Beheshti University of Medical Sciences (IR.SBMU.RETECH.REC.1400.111)

ACKNOWLEDGEMENT

The authors thank the medical staff of Imam Reza hospital for graciously and generously providing support in the design of this study.

AUTHOR CONTRIBUTIONS

Kazerani, Maryam: Conceptualization, writing, review and editing, supervisor.
Zandkrimi, Sana : Data Curation
Mottaghi, Mahdieh: Data gathering
Kazerani, Marzieh: Infectious disease specialist, advisor
Jambarsang, Sara: Statistical advisor

References:

1. Rivera-Romero OG Elia; Miron Shatz, Talya; Petersen, Carolyn; Denecke, Kerstin. Social Media, Digital Health Literacy, and Digital Ethics in the Light of Health Equity. Yearb Med Inform [Internet]. 2022 Jun 2;31(01):082–7. Available from: http://www.thieme-connect.de/products/ejournals/abstract/10.1055/s-0042-1742503
2. Collins SA, Currie LM, Bakken S, Vawdrey DK, Stone PW. Health literacy screening instruments for eHealth applications: A systematic review. J Biomed Inform. 2012 Jun 1;45(3):598–607.
3. Do BN, Tran TV, Phan DT, Nguyen HC, Nguyen TTP, Nguyen HC, et al. Health Literacy, eHealth Literacy, Adherence to Infection Prevention and Control Procedures, Lifestyle Changes, and Suspected COVID-19 Symptoms Among Health Care Workers During Lockdown: Online Survey. J Med Internet Res. 2020 Nov 12;22(11):e22894.
4. Levin-Zamir D, Bertschi I. Media Health Literacy, eHealth Literacy, and the Role of the Social Environment in Context. Int J Environ Res Public Health. 2018 Aug;15(8):1643.
5. Shiferaw KB, Link to external site this link will open in a new window, Tilahun BC, Endehabtu BF, Gullslett MK, Mengiste SA. E-health literacy and associated factors among chronic patients in a low-income country: a cross-sectional survey. BMC Med Inform Decis Mak. 2020;20:1–9.
6. Deja M, Januszko-Szakiel A, Korycińska P, Deja P. The Impact of Basic Data Literacy Skills on Work-Related Empowerment: The Alumni Perspective. Coll Res Libr Vol 82 No 5 2021 JulyDO - 105860crl825708 [Internet]. 2021 Jun 30; Available from: https://crl.acrl.org/index.php/crl/article/view/25016/32893
7. Bhargava R. Data Literacy. In: The International Encyclopedia of Media Literacy [Internet]. 2019 [cited 2023 Jun 13]. p. 1–5. Available from: https://doi.org/10.1002/9781118978238.ieml0049
8. Hartl A, Starke E, Voggenreiter A, Holzberger D, Michaeli T, Pfeffer J. Empowering Digital Natives: InstaClone - A Novel Approach to Data Literacy Education in the Age of Social Media. In: Proceedings of the 55th ACM Technical Symposium on Computer Science Education V 1 [Internet]. New York, NY, USA: Association for Computing Machinery; 2024. p. 484–90. (SIGCSE 2024). Available from: https://doi.org/10.1145/3626252.3630839
9. Haleem A, Javaid M, Vaishya R. Effects of COVID-19 pandemic in daily life. Curr Med Res Pract. 2020;10(2):78–9.
10. Sentell T, Vamos S, Okan O. Interdisciplinary Perspectives on Health Literacy Research Around the World: More Important Than Ever in a Time of COVID-19. Int J Environ Res Public Health. 2020;17(9).
11. Okan O, Bollweg TM, Berens EM, Hurrelmann K, Bauer U, Schaeffer D. Coronavirus-Related Health Literacy: A Cross-Sectional Study in Adults during the COVID-19 Infodemic in Germany. Int J Environ Res Public Health. 2020;17(15).
12. da Silva JG, Silva CS, Alexandre B, Morgado P. Health Literacy of the Inland Population in Mitigation Phase 3.2 of the COVID-19 Pandemic in Portugal: A Descriptive Cross-Sectional Study. Port J Public Health. 2020 Dec 14;38(2):1–11.
13. Silva MJ, Santos P. The Impact of Health Literacy on Knowledge and Attitudes towards Preventive Strategies against COVID-19: A Cross-Sectional Study. Int J Environ Res Public Health. 2021;18(10).

14. Park H, Lee E. Self-reported eHealth literacy among undergraduate nursing students in South Korea: A pilot study. Nurse Educ Today. 2015 Feb 1;35(2):408–13.
15. Mottaghi M, Zandkarim S, Kazerani M, Kazerani M, Jambarsang S. Coronavirus-Related Health Literacy: A cross-sectional study during the COVID-19 infodemic in a developing country. Asia Pac J Health Manag. 2023;18(3):189–96.
16. Norman CD, Skinner HA. eHEALS: The eHealth Literacy Scale. J Med Internet Res. 2006 Nov 14;8(4):e27.
17. Bazm S, Mirzaei M, Fallahzadeh H, Bazm R. Validity and reliability of Iranian version of eHealth literacy scale. J Commun Health Res. 2016;5(2):121–30.
18. Zhang Y, Xu P, Sun Q, Baral S, Xi L, Wang D. Factors influencing the e-health literacy in cancer patients: a systematic review. J Cancer Surviv. 2023 Apr 1;17(2):425–40.
19. Zhou J. The role of libraries in distance learning during COVID-19. Inf Dev. 2022 Jun;38(2):227–38.
20. Abdrasheva D, Escribens M, Sabzalieva E, Vieira do Nascimento D, Yerovi C. Resuming or reforming? Tracking the global impact of the COVID-19 pandemic on higher education after two years of disruption. 2022 [cited 2024 Apr 8]; Available from: https://policycommons.net/artifacts/6941065/resuming-or-reforming-tracking-the-global-impact-of-the-covid-19-pandemic-on-higher-education-after-two-years-of-disruption/7850872/
21. Decker EN. Reaching academic library users during the COVID-19 pandemic: New and adapted approaches in access services. J Access Serv. 2021 Apr 3;18(2):77–90.
22. Martzoukou K. Academic libraries in COVID-19: a renewed mission for digital literacy. Libr Manag. 2021;42(4/5):266–76.
23. Abdulai AF, Tiffere AH, Adam F, Kabanunye MM. COVID-19 information-related digital literacy among online health consumers in a low-income country. Int J Med Inf. 2021 Jan 1;145:104322.
24. Chen SCI, Yu M, Yu Y, Wang R, Zhu Z, Liu S, et al. The Impact of e-Health Literacy on Risk Perception Among University Students. Healthcare [Internet]. 2025;13(3):265. Available from: https://www.proquest.com/scholarly-journals/impact-e-health-literacy-on-risk-perception-among/docview/3165888036/se-2?accountid=42543
25. Guo Z, Zhao SZ, Guo N, Wu Y, Weng X, Wong JYH, et al. Socioeconomic Disparities in eHealth Literacy and Preventive Behaviors During the COVID-19 Pandemic in Hong Kong: Cross-sectional Study. J Med Internet Res. 2021 Apr 14;23(4):e24577.
26. Dashti S, Peyman N, Tajfard M, Esmaeeli H. E-Health literacy of medical and health sciences university students in Mashhad, Iran in 2016: a pilot study. Electron Physician. 2017 Mar 25;9(3):3966–73.
27. Ghazi-Mirsaeed SJ, Ghaemizade M. E-Health Literacy among Postgraduate Students in Tehran University of Medical Sciences, Iran, during 2015-2016. Health Inf Manag. 2018;14(6):243–8.