

## The Role of E-Health Literacy in Preventive Behaviors for COVID-19: A Systematic Review

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### ABSTRACT

**Background and Objective:** E-health literacy is a set of skills that evaluates health information in electronic information resources. Due to the importance of COVID-19 prevention, the present systematic review investigated the role of e-health literacy in preventive behaviors for COVID-19.

**Materials and Methods:** A systematic review was performed following the principles of PRISMA. The main databases including the Scopus, Web of Science, and PubMed databases were searched on August 2, 2021, without restrictions in publication time. The selected keywords were combined via Boolean operators including "Computer Literacy, » «Telehealth literacy, » «Mobile health literacy, » «Electronic health literacy, » «E-Health literacy,» «E-health literacy,» «Health technology literacy,» «Digital health literacy,» «Health Information literacy,» «Digital literacy,» «Technology literacy,» «Internet literacy,» «Online health literacy,» «Online health information literacy» and the words related to the COVID-19. Inclusion criteria consisted of original articles, which evaluated the effect of e-health literacy on the preventive behavior toward COVID-19.

**Results:** Among 694 retrieved articles, eight papers were eventually included in this study, four studies examined the effect of e-health literacy on the acceptance of health behaviors and general behaviors. Moreover, one study reviewed the role of e-health literacy in enhancing preventive behaviors and preventing related infections. Another study investigated the effect of socioeconomic status on e-health literacy and adherence to prevention guidelines. Another research developed and implemented digital health literacy to promote mother, child, and family health regarding disease prevention. Moreover, health behaviors related to COVID-19, health literacy, and e-health literacy were investigated in another study.

**Conclusion:** Enhancing the levels of e-health literacy is one of the recognized methods to increase the observance and adherence to the guidelines which was designated to control and prevention of the COVID-19 disease. Accordingly, relevant organizations and institutions, including the Ministry of Health, universities, and medical centers, need to design and develop appropriate training programs in this context.

**Paper Type:** Systematic Review

**Keywords:** E-health Literacy, Prevention, COVID-19.

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## Introduction

COVID-19 is an acute respiratory syndrome with a viral agent from the coronavirus family. This disease was first reported in 2019 in Wuhan, China, which affected all countries in a short time (1). On March 12, 2020, the World Health Organization declared the coronavirus 2019 outbreak as a global challenge and an epidemic condition (2). According to studies and observations, the COVID-19 virus is highly contagious and has a high rate of prevalence worldwide (3). Informing about this disease among the different strata of the people in the world was extremely important due to their unawareness about ways of prevention, control, and treatment along with the pandemic. Therefore, involved communities and people had to learn how protect themselves from the potential dangers of the outbreak of this new mysterious and unknown virus. Consequently, access to health information, health education messages, and awareness of preventive measures helps choose a healthy lifestyle against COVID-19. Supporting the access of individuals to health information leads to a change in the philosophy of prevention, control, inhibition, and treatment of disease, which leads to national development of health (4).

Since the outbreak of many infectious diseases occurs in a short time with a high incidence and mortality rate, it is challenging for organizations and medical centers to implement adequate interventions to control these diseases in a timely manner (5). Therefore, the interventions through e-health information technology have been welcomed during the COVID-19 epidemic. Accordingly, paying attention to public education is essential to increase health awareness and promote health and e-health literacy (5).

Health literacy includes different skills, which enable individuals to engage in the community more completely and apply further control

over their health measures and decisions (6). This literacy can significantly affect the health outcomes, health promotion behaviors, and patient-physician relationship and lead to the significant improvement in physician-patient communication skills and their self-efficacy and self-care behaviors (7-9).

Moreover, e-health literacy is defined as the ability to search, find, understand, and evaluate health information from electronic sources and use the gained knowledge to solve a health problem (10,11). According to the Affordable Care Act (ACA), e-health literacy is a degree of individual skills and competencies, which are needed to provide, connect, process, and understand basic health information, and services required for making appropriate health decisions (12,13). Therefore, individuals with e-health literacy skills use more efficient web search strategies with a higher ability to identify high-quality health information (14).

Health information websites, health groups on the Web, and mobile interactive applications are prominent examples of electronic technology in the field of health, which were developed in response to the need of users to access information in the field of health (15). Large numbers of people used social media to access some information about COVID-19, such as disease development, news reports, as well as prevention, and control measures (16).

The prevalence of any disease is associated with a type of information tsunami; such a tsunami is always accompanied by false information and rumors. The phenomenon of spreading false information and rumors is strengthened at every moment in social media and is progressing faster and further. This issue looks similar to the spread of viruses that are associated with humans and spread rapidly (17).

Exposure to misinformation on the Internet or conspiracy theories about COVID-19 is related to a lower level of adherence to prevention guidelines (18). The World Health Organization (WHO) and health authorities worldwide are currently collaborating closely with social media, including Facebook, Google, Twitter, and YouTube, to provide evidence-based information to the public and actively deal with misinformation being shared (19). However, ignoring e-health literacy leads to insufficient provision of accurate and high-quality information to ensure optimal public health outcomes (19). The use of the media to educate the public and increase their health awareness about the COVID-19 epidemic reduces public panic, leads to share of health knowledge, and increases public cooperation (5).

Since an extensive range of people in the community received information related to the COVID-19 disease from web-based tools such as social networks during the COVID-19 pandemic, such information has played a crucial

role in changing disease prevention and control behaviors (20, 21). Therefore, benefiting from accurate and reliable information seems essential to improving people's health levels. Accordingly, this systematic review has focused on examining the role of e-health literacy in the prevention behaviors of COVID-19 disease.

## Materials and Methods

The present study is a systematic review and performed following the principles of PRISMA (22) and aimed to evaluate the role of e-health literacy in preventive behaviors for COVID-19.

### Search strategy and selection of articles

In order to retrieve English articles, the PubMed, Scopus, and Web of Science databases were searched on August 2, 2021, without a time limit. Searching the resources in the mentioned scientific databases was conducted independently by two researchers based on the search strategy presented in Table 1.

**Table 1: Resource search strategy in scientific databases**

Time	Until 2 August 2021
Language	English
Database	PubMed, Scopus, Web of science
PubMed	((((( (((((((((((((((((((((((("COVID 19") OR ("COVID-19")) OR ("2019-nCoV")) OR ("2019 nCoV")) OR ("Coronavirus Disease-19")) OR ("Coronavirus Disease 19")) OR ("2019 Novel Coronavirus")) OR ("2019-nCoV Disease")) OR ("Coronavirus Disease 2019")) OR ("SARS Coronavirus 2")) OR ("SARS-CoV-2")) OR ("SARS CoV 2")) AND ("Computer Literacy") OR ("telehealth literacy") OR ("mobile health literacy") OR ("electronic health literacy") OR ("ehealth literacy") OR ("e-health literacy") OR ("health technology literacy") OR ("digital health literacy") OR ("Health Information literacy") OR ("Digital literacy") OR ("technology literacy") OR ("Internet literacy") OR ("online health literacy") OR ("online health information literacy"))
Scopus	TITLE-ABS-KEY ( ( "computer literacy" OR "telehealth literacy" OR "mobile health literacy" OR "electronic health literacy" OR "ehealth literacy" OR "e-health literacy" OR "health technology literacy" OR "digital health literacy" OR "Health Information literacy" OR "Digital literacy" OR "technology literacy" OR "Internet literacy" OR "online health literacy" OR "online health information literacy" ) AND "COVID 19" OR "COVID-19" OR "2019-nCoV" OR "2019 nCoV" OR "Coronavirus Disease-19" OR "Coronavirus Disease 19" OR "2019 Novel Coronavirus" OR "2019-nCoV Disease" OR "SARS Coronavirus 2" OR "SARS-CoV-2" OR "SARS CoV 2" )
Web of science	TS= (((("computer literacy") OR ("telehealth literacy") OR ("mobile health literacy") OR ("electronic health literacy") OR ("ehealth literacy") OR TITLE: ("e-health literacy") OR ("health technology literacy") OR ("digital health literacy") OR ("Health Information literacy") OR ("Digital literacy") OR ("technology literacy") OR ("Internet literacy") OR ("online health literacy") OR TITLE: ("online health information literacy")) AND ("COVID 19") OR ("COVID-19") OR ("2019-nCoV") OR ("2019 nCoV") OR ("Coronavirus Disease-19") OR ("Coronavirus Disease 19") OR ("2019 Novel Coronavirus") OR ("2019-nCoV Disease") OR ("SARS Coronavirus 2") OR ("SARS-CoV-2") OR ("SARS CoV 2"))

### Inclusion and exclusion criteria

The inclusion criteria were original research articles, which investigated the role of e-health literacy in preventive behaviors for COVID-19. The exclusion criteria were all short articles, letters to the editor, editorial, commentary, conference abstracts, review articles, as well as articles with no available full versions for any reason. Data were collected using a data extraction form based on the research objectives after selecting the studies according to the inclusion and exclusion criteria. These data included the author's name, study location, study design, study objectives, participants, collection tools, and main outcome.

In order to select articles and extract data,

first, all articles containing the desired keywords in their titles or abstracts were included in the study. Two individuals independently evaluated the quality and extraction of articles, and in the absence of an agreement between the two, assistance was sought from an independent third party.

### Data extraction

In the initial review of three databases, 864 articles were retrieved and imported to EndNote resource management software, and irrelevant items were selected based on the evaluation of the titles, abstracts, and full texts of eight articles after removing duplicates (Fig.1.).

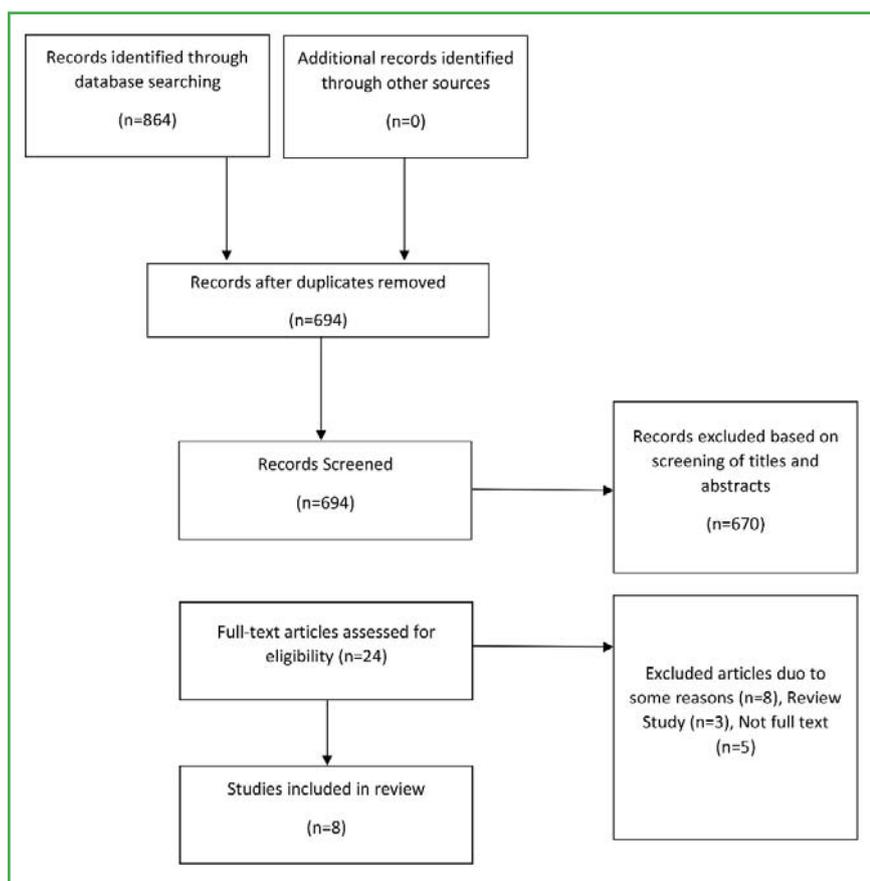


Fig.1. Study identification flow diagram

### Results

Eight studies were evaluated in this systematic review which are listed in Table 2. Four out of eight

selected investigations were cross-sectional, and survey, retrospective quantitative, randomized

controlled trial (RCT), and qualitative research types were observed in one article for each. These investigations were conducted in the United States (one study), Nigeria (one study), South Korea (one study), Pakistan (one study), China (two studies), Hong Kong (one study), and Tanzania (one study).

In total, 50% of the studies (n=4) evaluated the effect of raising awareness through social media, mass media, and the role of e-health literacy in accepting health behaviors, influencing public behaviors, and ultimately reducing the COVID-19 outbreak. The role of e-health literacy in COVID-19 safety and preventive behaviors to prevent healthcare-related infections in students was studied in 12.5% of investigations (n=1). The effect of socioeconomic status on e-health literacy, its relationship with coronavirus preventive behaviors, and adherence to preventive behavioral guidelines were addressed in 12.5% of the studies (n=1). Moreover, in 12.5% of the studies, digital health literacy was developed and promoted to support the health of mother, child, and family in the fields of health, as well as awareness and prevention for COVID-19. The status of health behaviors related to COVID-19 and the relationship between these behaviors, health literacy, and e-health literacy were evaluated in 12.5% of studies (n=1).

## Discussion

The present systematic review aimed to evaluate the role of e-health literacy in preventive health behaviors related to COVID-19.

The results obtained from reviewing six articles showed that e-health literacy significantly affects the promotion of awareness, knowledge, and adherence to health behaviors during the COVID-19 epidemic, as well as increasing public awareness through the media to prevent and reduce the outbreak of this disease. E-health

literacy is an important component of health literacy in advancing preventive strategies related to COVID-19 control.

Moreover, people with higher levels of e-health literacy have more adhered to health guidelines, which had led to appropriate preventive behaviors during the COVID-19 pandemic. In this regard, Do et al. reported that higher levels of e-health literacy have led to more adherence of health care workers to measures designed to prevent and control occupational infections (30). Mitsutake et al. also demonstrated that e-health literacy appropriately influences the behaviors related to health and sports, as well as leads to appropriate nutrition behaviors among Japanese adults (31). Raisi Filabadi et al. also indicated that promoting e-literacy results in improved life quality (32).

An et al. (23) concluded that some of the most important strategies needed to control COVID-19 and to address the issue of e-health literacy and its continuous evaluation. The development of various social media platforms allows doctors, healthcare staff, and the public to access health information quickly. Users can search and use health information online to manage the disease, improve health, and select health care facilities (33). Thus, the importance of the Internet is increasing as a source of health information (34). On the other hand, since e-health literacy is a mixture of health, information, knowledge, media, computer, and Internet literacy, the shortcomings in any of these cases lead to a lack of access to appropriate information in the context of information technology (35). Therefore, it seems necessary to continuously evaluate e-health literacy to make it as effective as possible.

Li et al. indicated that health literacy and e-health literacy are essential for improving people's health and affecting people's preventive behaviors during the COVID-19 pandemic.

Table 2. Results of reviewing the selected studies

Name of the first author and Year	Country	Type of Study	Objective of the Study	Number of Samples/Sampling Method	Tools	Main Consequence
Lawrence An 2021 (23)	USA	Web-based scrolling	Evaluating e-health literacy related to COVID-19 and the relationship between e-health literacy and COVID-19-related knowledge, attitudes, and practices	1074/Random sampling	Web-based survey	a significant portion of adults in the United States has had low e-health literacy regarding the COVID-19 disease (CoV-eHEALS score<26); moreover, in these individuals, the levels of knowledge, attitude, and COVID-19-related performance have been reported to be low and equal to 3.8 (SD 0.8), 2.9 (SD 1.1), and 3.9 (SD 0.9), respectively. In controlling for demographic characteristics, CoV-eHEALS scores demonstrated positive independent associations with knowledge (standardized $\beta=0.168$ , $P<0.001$ ) and adherence to protective behaviors (standardized $\beta=0.241$ , $P<0.001$ ) and a negative association with conspiracy beliefs (standardized $\beta=-0.082$ , $P=0.009$ ).
Chinedu Eugenia Anumudu 2020 (24)	Nigeria	Quantitative retrospective	Investigating the field of cognitive behaviors and health information literacy strategies to control infectious diseases	388/Random sampling	Electronic questionnaire	12.4%, 46.6%, and 41.0% of people had high, moderate, and low levels of perceived sensitivity to the COVID-19 disease, respectively. The results showed that people need to increase their susceptibility to infection with the disease to enhance their awareness about the severity of the virus to take further action to limit the outbreak of the COVID-19 virus; this can be done by organizing health campaigns and using various media platforms such as Facebook, WhatsApp, Twitter, and TV to inform people about the acceptance of these health behaviors. In addition, disseminating the results of this study through various media platforms may have a significant impact on curbing the spread of the virus in Nigeria.
Ziqiu Gu 2021 (17)	Hong Kong	Cross-sectional	Assessing the socioeconomic status of e-health literacy and preventive behaviors related to COVID-19	1501/Census	Phone and web-based surveys	adults with higher social and economic status had higher levels of e-health literacy and sought more web-based information regarding the COVID-19 disease (AOR 1.56, 95% CI 1.15-2.13). These factors have been associated with greater adherence to guidelines related to preventive behaviors during the COVID-19 pandemic.
Kyung Jin Hon 2021 (18)	South Korea	Descriptive-cross-sectional	The effect of e-health literacy on preventive behaviors for COVID-19 students in nursing, clinical pathology, and occupational therapy	274 students/Convenient sampling	Questionnaire	The findings demonstrated that the high level of e-health literacy among healthcare students had an effective role in preventing related infections during the COVID-19 pandemic ( $P<0.001$ ). Overall health literacy was significantly positively related to functional ( $r=0.77$ , $P<0.001$ ), communicative ( $r=0.86$ , $P<0.001$ ), and critical e-HL ( $r=0.88$ , $P<0.001$ ).

Table 2. Results of reviewing the selected studies

Sara Rizvi Jafree 2021 (27)	Pakistan	RCT controlled randomized trial	Development and implementation of digital health literacy intervention for disadvantaged women in the fields of health, awareness, and prevention of COVID-19	1000 women/ Randomly in intervention and control groups	Questionnaire	The development and implementation of a digital health literacy intervention for disadvantaged women in the health field have led to increased awareness and prevention of COVID-19.
Rashid Maalim Khamis 2021 (28)	Tanzania	Qualitative	Application of social media in health communication to reduce COVID-19	30/Purposive	Interview	Social media has played an important role in reducing COVID-19 disease by providing health information.
Shaojie Li 2021 (29)	China	Cross-sectional	Investigating the relationship between health behaviors and e-health literacy about COVID-19 in students	85/Snowball	Questionnaire	Students with higher e-literacy levels had more effective health behaviors about COVID-19. The health literacy and eHealth literacy were positively associated with COVID-19-specific predictive behaviors ( $\beta$ health literacy=0.149, $\beta$ eHealth literacy=0.368; $P<0.001$ ) and conventional health behaviors ( $\beta$ health literacy=0.219, $\beta$ eHealth literacy=0.277; $P<0.001$ ).
Xiaojing Li 2020 (5)	China	Web-based cross-section	Application of social media on preventive behaviors related to COVID-19	802/Proportion probability and Sampling method	Questionnaire	Social media is useful for broadcasting the news of COVID-19 and promoting knowledge about the disease, which can help the general public take preventive measures to control the disease. Social media use frequency ( $\beta=0.20$ , $P<0.001$ ), disease knowledge ( $\beta=0.11$ , $P=0.001$ ), and eHealth literacy ( $\beta=0.27$ , $P<0.001$ ) significantly and positively predicted preventive behaviors.

According to their investigation, general intervention measures based on health literacy and e-health literacy were needed to promote COVID-19 health behaviors during the pandemic, which can help reduce the risk of infection (5). In addition, other review articles emphasized the role of e-health literacy in facilitating the prevention and control of the disease (36,37).

In general, people with higher levels of e-health literacy benefit from further motivation and efficiency concerning the use of the Internet to obtain health-related information (38).

The results also revealed that different strata of society are not in similar levels of health literacy. For instance, students and individuals with higher levels of education had higher levels of e-health literacy compared to the rest of society. In addition, people with higher social and economic status benefit from higher levels of e-health literacy.

Education plays a more significant role in e-health literacy than economic status, suggesting the key role of education in promoting e-health literacy. Some other studies have also demonstrated that differences in e-health literacy are due to knowledge gaps and not merely due to the lack of proper Internet access (39). Such differences in e-health literacy result in inequality in the implementation of guidelines related to preventive behaviors, which would lead to health inequality (40).

Since vaccination of the population groups and its acceptance is one of the most important ways to prevent COVID-19, e-health literacy can play an important role in raising public awareness in eliminating misconceptions and emphasizing the benefits of vaccination. Luo et al. indicated that social media could increase students' decision to be vaccinated against COVID-19 (41).

## Conclusion

Much false information has been published on the Internet during the COVID-19 pandemic; low levels of e-health literacy can lead to problems in fact-checking, which complicates the performance of preventive behaviors. Information technology and electronic health tools are powerful in promoting health; therefore, the users' level of e-health literacy significantly affects the ability to make optimal use of e-health applications and interventions. Moreover, appropriate use of information technology for health requires the use of e-health literacy. According to the studies conducted in this field, promoting e-health literacy can increase people's adherence to health instructions against COVID-19. On the other hand, inadequate e-health literacy is a global threat, so that people with low e-health literacy cannot make proper health decisions. In general, international evidence emphasizes the importance of public literacy in the use of information technology, which is defined as e-health literacy.

Due to the dangerous nature of the COVID-19 disease and its rapid spread, adherence to preventive behaviors against this infectious illness will promote the health of individuals and society. Therefore, it seems essential to encourage people to follow preventive behaviors; one of the methods is to enhance the level of e-health literacy. Accordingly, relevant organizations and institutions, including the Ministry of Health, universities, and medical centers, need to design and develop appropriate training programs in this context.

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