Health Literacy Among University Students in the COVID-19 Pandemic: A Systematic Review

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ABSTRACT

Background: The purpose of this systematic review was to assess different studies that worked on university students' health literacy during covid19 pandemic and to make an overview of this issue to recognize possible determinants associated with health literacy. Methods: This review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA). Four databases (Google Scholar, Web of Science, Pubmed, and Scopus) were used for searching cross-sectional works that assessed the health literacy of university students. We searched papers from December 1ˢᵗ, 2019 up to June 10ᵗʰ, 2022. English language articles were used. Studies were done in countries including; Iran, Pakistan, the USA, Vietnam, China, Colombia, Germany, and Indonesia. Results: The systematic review contains 12 research studies involving 17773 students. There was a relationship between health literacy and some determinants. Positive determinants included age, female gender, Urban background, cognitive maturity, Higher educational qualification, information source (Health workers), number of semesters, and parental education. Some negative determinants were male gender,

Rural background, smoking, drinking, being able to pay for medication, lower conspiracy beliefs, and higher fear of COVID-19. **Conclusion:** *University students around the world should have courses about health literacy according to university disciplines. These courses should be available for students of different fields to enhance their effectiveness, and training should be associated with students' needs and their subgroup traits.*

INTRODUCTION

Coronaviruses are important pathogens in both humans and animals. A novel coronavirus was reported as the source of a cluster of pneumonia cases in Wuhan, China's Hubei Province, at the end of 2019. It quickly spread throughout China, resulting in an epidemic and a global pandemic.[1] Cases have been reported on all continents since the cases were first reported in Wuhan. Over 500 million confirmed cases of COVID-19 have been reported worldwide.[2] The reported number of cases underestimates the overall burden of COVID-19, as only a small proportion of acute infections have been diagnosed and reported. Seroprevalence studies in the United States and Europe have reported the incidence of cases where previous exposure to SARS-CoV-2, which is reflected in seropositive, was reported after considering the possibility of false positives or negatives. It turned out that it exceeds about 10 times.[3-6]

To get the pandemic under control, people must follow public health measures like social isolation, vaccination, and hygiene. Such adherence necessitates health literacy, which is defined as the knowledge, motivation, and skills needed to understand, access, evaluate, and utilize health information in daily life to make decisions and judgments about healthcare, health promotion, and disease prevention to improve or maintain quality of life over time.[7]

Health literacy is and has been crucial not only in controlling infectious diseases but also in avoiding the devastation that pandemic situations like COVID-19 can cause.[8,9] It also increases an individual's ability to actively interact with the deluge of conspiratorial information that spreads faster than a disease.[10-12] According to a review of existing research, people with low health literacy are more susceptible to COVID-19 infection and are more likely to experience depression and fear.[13] As a result, adequate health literacy is critical in dealing with the current COVID-19 situation because it not only allows individuals to use credible health information but also prepares them to adopt preventive behaviors. Several studies focusing on samples from medical and non-medical populations using an online questionnaire were conducted in Asia and North America, according to a review of published literature on health literacy related to COVID-19.[9,13-15] The findings of these studies revealed that both general and medical populations had suboptimal health literacy, which was concerning. Seng et al.[16] emphasized the importance of healthcare policymakers knowing the levels and risk factors of pandemic-related health literacy throughout different populations to formulate optimal communication methods.

Higher levels of health literacy have been linked to less fear and anxiety of COVID-19 among medical students in recent studies and might act as a protective factor because students are better able to navigate the coexisting and infodemic conspiracy theories.[14]

Therefore, in a review study, we decided to examine health literacy among university students during the COVID-19 pandemic. It should also be noted that so far there has been no review on this issue and this is the first time.

METHODS

For this systematic review, we followed the guidelines outlined in the PRISMA Statement (priority reporting items for systematic reviews and meta-analyses).[17] The authors have prepared a review protocol, which can be requested. The following study characteristics were used to determine whether a study was eligible for inclusion in the review: The review included cross-sectional studies (study design) examining the health literacy (outcome) of students in

tertiary education of any age (population) in the COVID-19 pandemic. There were no health-related restrictions. Health literacy and related influencing factors are the outcome variables of interest. Nutbeam's health literacy definition[18,19], as well as common health literacy definitions[7], served as a guiding principle in this regard. In terms of eHealth literacy, Norman and Skinner's[20] definition was a deciding factor. The outcome variables in the studies had to be designated as either primary or secondary outcome variables. Three electronic databases were searched to find studies (PubMed, Scopus, and Google Scholar). On July 15, 2021, the last search was conducted. Additionally, the already qualified studies were reviewed for new pertinent references after the search procedure. The databases were searched using combinations of the following keywords: college; university; adolescents; students; eHealth literacy; health literacy; and COVID-19. This review considered studies published in English. **Table 1** contains the

entire search query. Two authors conducted the study selection process (title, abstract, and full text). Also, this study is registered on the OSF (ID: https://osf.io/s8c7q/) website.

A data extraction sheet based on the patient/population, intervention, comparison, and outcomes (PICOS) model was used to extract the desired data. Data items were study-relevant information consisting of the name of the study, corresponding authors, the year of publication, the country, characteristics of participants (e.g., age, gender, study program, and course of studies), the underlying setting (university, college), information on the outcome variables consisting of the theoretical background, the assessment instruments used, and information on the results of the study regarding the health literacy of students and its determinants. The data extraction was always performed independently by at least two authors. Any discrepancies between the authors were resolved through discussion until a consensus was reached.

Table 1. The search strategy of PubMed and Scopus databases.

Search engine	Search strategy	Additional filters
PubMed/Medline	(((health literacy[Title/Abstract]) OR (health literacy[MeSH Terms])) AND ((university students[Title/Abstract]) OR (health students, public[Title/Abstract]) OR (dental students[Title/Astract])OR(health occupations students[Title/Abstract]) OR(medical students[Title/Abstract]) OR (nursing students[Title/Abstract]) OR (premedical students[Title/Abstract]) OR (pharmacy students[Title/Abstract])OR (health students, public[MeSH Terms]) OR (dental students[MeSH Terms]) OR (health occupations students[MeSH Terms]) OR (medical students[MeSH Terms]) OR (nursing students[MeSH Terms]) OR (premedical students[MeSH Terms]) OR (pharmacy students[MeSH Terms])) AND ((covid19[Title/Abstract]) OR (covid19 pandemic[Title/Abstract]) OR(covid19[MeSH Terms])))	English June 9th 2022
Scopus	(health literacy*) AND(university students*OR health students, public* OR dental students*OR health occupations students*OR medical students*OR nursing students* OR premedical students*OR pharmacy students*) AND(COVID-19*OR COVID-19 Pandemics*)	English June 9th 2022
CENTRAL	#1:((health literacy): ti, ab,kw #2: MeSH descriptors : [health literacy] explode all trees #3 (university students): ti, ab,kw OR (health students, public): ti, ab,kw c OR(dental students): ti, ab,kw OR(health occupations students): ti, ab,kw OR(medical students): ti, ab,kw OR(nursing students): ti, ab,kw OR(premedical students): ti, ab,kw OR (pharmacy student)s: ti, ab,kw OR(health students, public): ti, ab,kw OR (dental students): ti, ab,kw OR(health occupations students): ti, ab,kw OR (medical students): ti, ab,kw OR(nursing students): ti, ab,kw OR(premedical student): ti, ab,kw s OR(pharmacy students): ti, ab,kw #4 MeSH descriptors: [students] this term only #5 (covid19) :ti,ab,kw or (covid 19 pandemic) :ti,ab,kw #6 Mesh descriptors [covid19] explode all tree #7 #1 or #2 #8 #3 or#4 #9 #5 or #6 #10 #7 and #8 and #9	English June 10th 2022

The risk of bias in the included studies was evaluated using The JBI Critical Appraisal Checklist For Systematic Reviews AND Research Synthesis (HTTPS://JBI.GLOBAL/ CRITICAL-APPRAISAL-TOOLS). The caliber of the studies was evaluated independently by two authors. A second author was consulted in the event of a disagreement, and discussions continued until an agreement was reached. To determine the degree of bias present in specific studies, a scoring system was modified.[17,21] According to this method, studies were classified as having a very low risk of bias if they answered at least 10 of the 11 questions correctly, as having a low risk of bias if they answered 8 or 9 of the 11 questions correctly, as having a moderate risk of bias if they answered 6 or 7 of the 11 questions correctly, and as having a high risk of bias if they answered 5 or fewer questions correctly.

On the principles of data synthesis, narrative synthesis was developed.[22] The studies were first organized into groups according to the PICOS scheme, the data were prepared and put into a common descriptive format, and patterns were discovered alongside the studies. Next, a preliminary synthesis was created, which included initial descriptions of the results of the studies used. The links between and within the studies' data were then looked at. It was determined what constitutes general health literacy, as well as its limitations and practical applications. Additionally, logical explanations for the variations between the research's characteristics and findings were developed.

RESULTS

The search in the databases PubMed, Scopus, and Google Scholar resulted in a total of 960 studies. Out of those,780 duplicates were removed. Out of 180 studies, 64 studies were removed for the irrelevant topic. The remaining 116 results were scanned. Eighty-eight studies
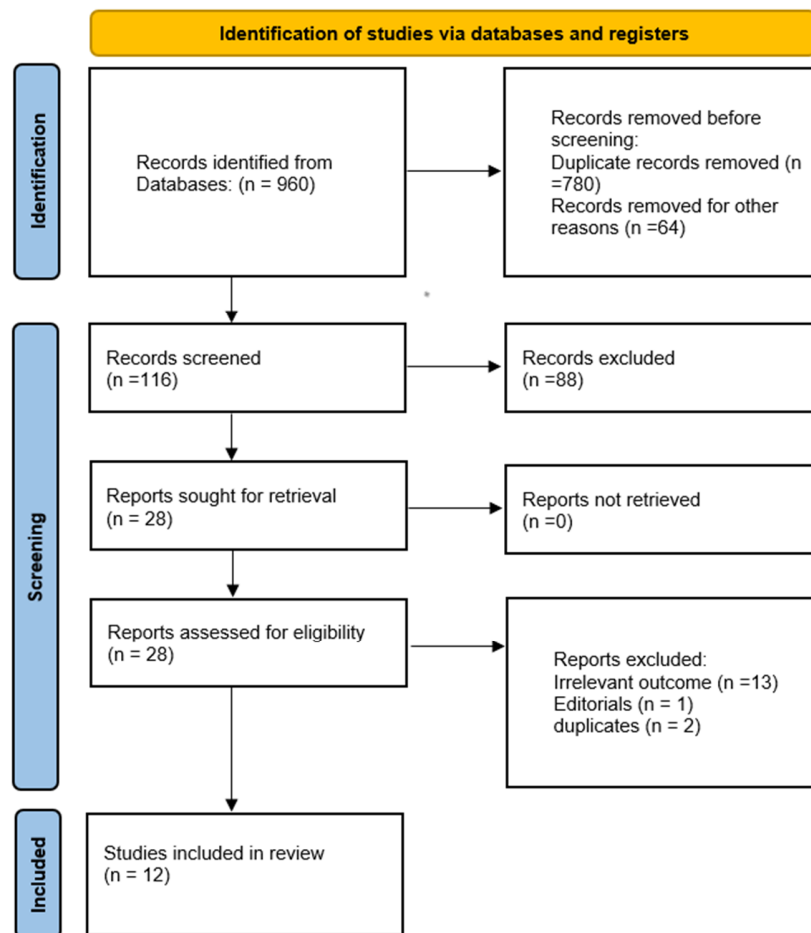

Figure1. PRISMA 2020 flow diagram of the study.

were excluded due to irrelevant topics/abstracts. The full texts of the remaining 28 studies were then reviewed in detail. Thirteen of these did not meet the specified inclusion criteria. Studies that didn't have university students as participants were excluded. Reviews, commentaries, and editorials were excluded. One study was excluded for being an editorial and two studies were removed because of duplicates. Finally, a total of 12 studies were included in the review (**Figure 1**).

Twelve cross-sectional studies investigated health literacy among university students in the COVID-19 pandemic which involved 17773 students. Four studies were performed in Pakistan.[23-26] Two studies were done in Iran.[27,28] The remaining studies were conducted in the USA[29], Vietnam[30], China[31], Colombia[32], Germany[33], and Indonesia[13]. The percentage of female participants ranged from 38.5 to 88.9.

One study included students of One of the 20 health-related degree programs (e.g. nursing, healthcare services, and sciences).[29] Two studies have only medical students as participants. Also, In two studies, most of the participants were studying health-related programs. Seven studies included students from various fields of study.[23-26,32-33,13]

Scales used were HLS-EU (29), HLS-SF12[23,25,26,30], HELIA[28], FCOV-19S[25,28], HLQ (online) (KAP)[24,27,31,13], CHL-p[33], heals[31,33], and pre-validated COVID-19 literacy questionnaire (CLQ) designed by Fauzi et al.

There was a relationship between health literacy and some determinants. Positive determinants included age, female gender, Urban background, cognitive maturity, Higher educational qualification, information source (Health workers), number of semesters, and parental education. Some negative determinants were male gender, rural background, smoking, drinking, being able to pay for medication, lower conspiracy beliefs, and higher fear of COVID-19.

The connection between age and health literacy was shown in seven studies.[24,27,28,30,32-33,13] Better health literacy with increasing age was displayed in five of them.[24,27,10-12] Regarding gender, five studies identified female gender as a positive determinant[23,27,28,31,33] and two

studies showed male gender as a negative determinant.[30,33]

Two studies showed a relationship between the course participants were studying and their level of health literacy.[32,33] Two studies suggested that the more mature students were, the better health literacy they had.[29,13]

According to two studies, geographical background played a role in health literacy level, and having an urban background was identified as a positive determinant.[23,26]

DISCUSSION

Among 12 included articles, COVID-19 health literacy was reported as sufficient in 6, insufficient in 3, and not reported in 3. This observation included both health-related and other study fields. Students in health-related fields seem to have higher COVID-19 health literacy. There were several factors introduced to be related to high COVID-19 health literacy; age, female gender, higher educational qualification, parental education, number of semesters, the field of study, source of information, and being from an urban setting. Most of the studies announced that age and number of semesters are positive factors, probably because of increasing cognitive and critical thinking abilities.[34,35] Lower health literacy in rural settings might be associated with limited access to the Internet and a lack of communication channels in these areas. Medical students had higher COVID-19 health literacy scores because they are future doctors and is necessary for them to know more about symptoms, way of transition, diagnosis, treatment, and prevention of disease. Higher health literacy is followed by taking more preventive behaviors and adhering to recommendations.[36,37] Although most students knew the way to search, social media was the most important popular information resource because of its attraction and visualization.[38-41] Information credit is the most determinant of health literacy and the use of social media has a high risk of misinformation.[42,43] One of the abilities of highly health-liberated people is to assess data whether is right or not.[20,44-46] Unfortunately, people with low health literacy have more tendency to trust whatever is said on

social media.

Several factors are said to be relevant to lower COVID-19 fear, including older age, later academic semester, higher educational grades, being male, being single, ability to take medication, and higher health literacy.[47,48] People who had higher fear scores also had unhealthy lifestyles. Moreover, students with higher fear scores tended to smoke or drink to ease their negative emotions temporarily[49-51]; which is in line with several studies indicating that mental disorders and more stressful life status are followed by a higher rate of smoking, substance abuse and dependence.[52,53] Being male was reported to be related to lower fear, possibly because of more stressful life events and higher burdens of duties for women during the pandemic like housework, caregiving, domestic violence, etc.[54-56] Married people are reported to have more fear; one of the main reasons is the fear of infecting their couple and losing their families.[57,58] Although a higher literacy level is associated with lower fear, the results of a study done in Pakistan indicated that health literacy does not predict COVID-19 fear; it might be due to cultural issues and religious beliefs. COVID-19 fear may increase mortality and morbidity rates together with a growing incidence rate of diabetes and heart disease.[59,60] Health literacy was introduced to be a protective factor against depression and anxiety during the pandemic and therefore impacts students' physical and mental health.[61,62]

LIMITATIONS

This systematic review had some limitations. The included articles used different questionnaires with various question levels, so the data were not comparable. Some did not use validated scales and pre-tested questionnaires due to the pressure of time. Those studies that reported higher scores might be in ceiling effect due to easiness of questions. Besides, some of them used online surveys which have the following problems: lack of control over the sample size, selection bias, and the tendency of participating students to be healthy and so possibly of higher health literacy level. Some studies gathered data using a self-report scale which may cause

over or lower-estimation of the adherence to recommendations and protocols. Some studies were conducted on limited society, thus they could not be the voice of all (for example, only in one university or only in health-related fields students who might overrepresented in tests). Those articles assessed fear of COVID-19 scales online; thus psychological and mental status of the participants could not truly be evaluated which might affect the final results. As the studies were cross-sectional, we cannot conclude casual relationships between COVID-19 health literacy and the variables investigated. These studies were done in different periods; since the first emergence of covid-19 disease, lots of events occurred including progression in our knowledge of this disease, vaccine production, and mutation formation in the structure of its virus, which influenced our attitude and behavior over time.

IMPLICATION FOR PRACTICE

Health literacy is associated with better health status and plays a protective role against mental and physical health disorders and it reduces carelessness and overreaction.[8,23,62] Additionally, a health-literate society is more likely to adopt health health-protective attitude.[36] There must be an interdisciplinary approach when aiming to promote health literacy. These groups must be prioritized in the plan for COVID-19 health literacy increase: younger students, male gender, lower semester of education, students with low-educated parents from rural settings, and lower grade qualified students. It is not known how exactly the determinants of COVID-19 health literacy interact but it is worthies for policymakers to take into account as many as possible. Universities can conduct online attractive lectures about COVID-19 control and preventive methods for teachers and students. Furthermore, they can implement a competition on the knowledge of this disease to encourage students to learn.

IMPLICATION FOR RESEARCH

There is a need to design an exhaustive questionnaire to examine COVID-19 health literacy. Moreover, extra research is needed to

Table 2. Summary of included studies.

First author (year)	Country	Design	Participants	sex	Theoretical frame(s)	Scaled used	Determinants of health literacy	Quality score	Ref
Vamos et al. (2021)	USA	Cross-Sectional Survey	169 students of one of the 20 health-related degree programs (e.g., nursing, social work, physical therapy, occupational therapy, healthcare services, and sciences) offered by a College of Health and Human Services at a state institution in Michigan was chosen as a sample for research participation.	female (88.9%)	Sørensen et al. [63] Pelikan et al. [64]	HLS-EU	More Mature students [+] Health behaviors: using a hand sanitizer when the water/soap is not available [+] Self-isolation whenever feeling sick or told by a physician [+]	6/8	[29]
Shaukat et al. (2021)	Pakistan	Cross-Sectional Survey	387 students of various fields of social science from the universities of Punjab, Sargodha, and Lahore.	(60.4%) females	Duong et al. [65, 66] Sørensen et al. [67] Liu et al. [68]	HLS-SF12	Geographical background: Urban background [+] Rural background [-]	6/8	[26]
Pourfridoni (2021)	Iran	Cross-Sectional Survey	278 students studying at Jiroft University of Medical Sciences,	192 (69.1%) females	Sánchez et al. [69] Broche-Pérez et al [70]. Nakhostin-Ansari et al. [71] Nemati et al. [72] Barsell et al. [73] Salari et al. [74] Vahedian-Azimi et al. [75]	HELIA FCOV-19S	[+] marital status [+/-] education grade [+] place of residence (rural area) [+] Female gender [-] age	6/8	[28]
Naveed et al. (2022)	Pakistan	Cross-Sectional Survey	249 students of the University of the Punjab, Lahore, the University of Sargodha, Sargodha, and the University of Management and Technology, Lahore in social and business science disciplines.	female (58.6%)	Duong and et al. [65] Sørensen et al. [67]	HLS-SF12	Geographical background: Urban background [+] Rural background [-] Female gender [+]	6/8	[75]

Nguyen et al. (2020)	Vietnam	Cross-Sectional Survey	5423 students at eight universities across Vietnam, including five universities in the North, one university in the Center, and two universities in the South.	(52.1%) females	Spitzer et al. [76]	HLS-SF12	Older age [-] last academic years [-] being men [-] being able to pay for medication [-] smoking [-] drinking [-]	6/8	[14]
Rozeen Shaukat (2021)	Pakistan	Cross-Sectional Survey	271 students of social science and business science disciplines at the Punjab, Lahore, and University of Sargodha, Sargodha.	145 (53.51%) females	Chen et. al. [77] Bierwiaczonek et al. [78] Allington et al. [79] Nguyen et al. [15] Seng et al. [16]	HLS-SF12 FCOV-19S Health Protective Behaviors Conspiracy Beliefs	[+] Higher health protective behavior [-] lower conspiracy beliefs [-] higher fear of Covid-19	6/8	[25]
Fauzi et al. (2020)	Indonesia	Cross-Sectional survey	290 students of the Faculty of Teacher Training and Education in one of the private universities in Malang (biology teacher candidates)	N/A	Maverick Insider [80] Sørensen et al. [7] Mullan et al. [81]	HLQ (online)	Student's year (-), age (+), cognitive maturity (+), information source (Health workers) (+)	6/8	[13]
Faisal et al (2021)	Pakistan	Cross-Sectional survey	353 students from various universities in Pakistan	38.5 % Females	Reuben et al. [83] Azlan et al. [84] (Azlan et al., 2020) (84) Huynh et al. [85] Li et al. [86] Al-Hanawi et al. [87]	HLQ (online) (KAP)	Age (28–38 age group) (+), Education, Study Province	7/8	[82]
Pablo Antonio Archila (2021)	Colombia	Cross-sectional survey	4168 university students in private and state Colombian universities were chosen by convenience sampling	Female (55.2%)	Anju & Arulsamy [88] Hamza et al. [89] [89] (Hamza et al., 2021) Nguyen et al. [90] Seale et al. [91]	Pre-validated COVID-19 literacy questionnaire (CLQ) designed by Fauzi et al.	(+) 21–25-year age group, graduate students (+) graduate students (+) lower than the 2015 year of entry group (+) medical students (-) lower and equal to the 20-year age group (-) undergraduates (-)The 2019–2020 year of entry group (-) arts and humanities students	5/8	[32]

Fazaeli Et al (2021)	Iran	Cross-Sectional Survey	411 students, staff, and faculty in Mashhad University of Medical Science were selected through available sampling as participants	female (65.2%)	Seng et al. [16] Jafari et al. [92] Abel et al. [8] Mntazeri et al. [93] Fazaeli et al. [94] Javadzadeh et al. [95] Patil et al. [96]	HLQ	(+) Higher educational qualification (+) female gender (+) age	6/8	[27]
Heinrichs et al (2021)	Germany	Cross-Sectional Survey	5,021 students at four German universities participated	(69%) females	Tasso et al. [97] Goldstein et al. [98] Margraf et al. [99] Al-Hasan et al. [100](Al-Hasan et al., 2020)(100) Abel et al. [8]	CHL-p wheels	(+) age (+) female gender (+) number of semesters (+)course of studies (+) parental education (+) socioeconomic background (-) male gender (-) frequency of consumption of organic food.	6/8	[33]
Yuehui Jia et al. (2020)	China	Cross-Sectional Survey	753 eligible respondents participated in the survey, among which 740 respondents 561 (75.81%) were medical students, and 179 (24.19%) were nonmedical students. A total of 83 (11.22%) students were from 985 or 211 universities, which are the key universities in China	Female (61.89 [25]%)	Yimenu et al. [101](Yimenu et al., 2020) (101) Al Ahdab et al. [102] Alrasheedy et al. [103] (Alrasheedy et al., 2021) (103)	heals KAP HLQ (online) (KAP)	(+) female gender (+) COVID-19-related KAP among students from key universities in China (+) Good knowledge , attitude and practice among college students	6/8	[31]

+ for promoting determinants
- for inhibiting determinants

determine other potential COVID-19 health literacy determinants and the causal relationships between them and health literacy. Also, future designed interventioMuld be evaluated in the aspect of their effectiveness and cost benefits.

ACKNOWLEDGMENTS

The authors would like to thank the researchers whose work was included in this study.

CONFLICTS OF INTEREST

None.

AVAILABILITY OF DATA AND MATERIAL

The data that support the findings of this study are available from the corresponding author, upon request.

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