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Research Article

E-Health Literacy and Adherence to Health Protocols Among Self-Quarantined Patients with COVID-19 in a Sub-district in West Java

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ABSTRACT

During the Coronavirus Disease-2019 (COVID-19) pandemic, valid information was crucial and electronic health literacy (EHL) plays a significant role in public adherence to health protocols. This study aimed to evaluate the pattern of COVID-19 information-seeking, and the association between EHL, COVID-19 knowledge, and health protocol adherence among patients with COVID-19 during self-quarantine. Data were collected through an online survey sent to self-quarantined COVID-19 patients during March – December 2020 in a sub-district in West Java. Spearman tests were used to evaluate the relationship between EHL with COVID-19 knowledge, and EHL with health protocol adherence. There were 56 respondents with more than half being female (58.9%), university graduates (64.3%) and having good health status level (57.1%). Social media were the commonest online sources. During self-isolation, the frequency of Internet use increased (i.e., every day) with information on vitamins and supplements as the most commonly searched. Respondents had high scores on EHL (mean= 20.0), knowledge (mean = 8.89/10, SD = 1.796), and adherence (mean = 26.98/30, SD = 3.066). This study found significant relationships between EHL and knowledge (*p*-value = 0.001, r = 0.436), and the adherence (*p*-value = 0.011, r = 0.339). In conclusion, EHL had a modest influence on COVID-19 knowledge and minor relationship with adherence to health protocols among self-quarantined patients with COVID-19.

INTRODUCTION

The Coronavirus Disease-2019 (COVID-19) has spread rapidly worldwide since early 2020 leading to an unprecedented global public health disaster. In the Indonesian context, this infectious disease emerged in March 2020 and since then there was an increased trend in prevalence until July 2021 and again in mid-2022. Since September 2021 for about 6 months, the number of active cases and the daily cases decreased considerably (World Health Organization Indonesia, 2021; The Indonesian COVID-19 Task Force, 2021). The emergence of this new disease has created massive information seeking to gather vast amounts of COVID-19 related information, e.g. nature of disease, preventive measures and treatment management (Dadaczynski *et al.*, 2021). Internet-resourced information has been one of major references among the public to address emerging health issues including COVID-19. This fact is not surprising given the increased public concern to restrict mobility to prevent the transmission. High utilization of digital platforms to access COVID-19 information has also been documented in Indonesia (Nugroho *et al.*, 2021). It is evident that Indonesia is one of the countries with the highest number of Internet active users. There were 202.6 million active users as of January 2021 which had increased by 16% compared to the previous year. Indonesians used approximately eight hours per day on the Internet and more than one-third of the screen

time was spent on social media (Nurhayati-Wolff, 2021).

Nonetheless, quality of digital health information varied so it is necessary to engage and empower public to have accurate health literacy. Indeed, the provision of accurate and quality online information is not adequate if not complemented with the measures to improve public electronic health literacy (EHL) (Chong *et al*., 2020). EHL refers to the ability to search, critically appraise the online information and accordingly use the information in making sound health decisions (Norman *et al.*, 2006) It is vital to note that the sheer volume of COVID-19 information may lead to an "infodemic", a term used to signify rapid spread of misinformation through social media applications and other digital platforms. Massive distribution of information asymmetry may result in false beliefs of COVID-19 related information and inappropriate behaviors jeopardizing the government efforts to contain the outbreak (Centers for Disease Control and Prevention, 2021). The pace of the COVID-19 infodemic might spread faster than the disease itself, but the extent of public health literacy in responding to the pandemic remains inconclusive.

During the COVID-19 pandemic, valid information is crucial and EHL might play a significant role to influence public knowledge and their adherence to health protocols. Some previous studies demonstrated that health literacy related to digital information might provide the skills to differentiate the accuracy of the information from varying digital platforms and more knowledge on health information in general with the similar context to COVID-19 (Norman *et al.*, 2006; Zarocostas, 2020). A systematic review conducted by Jacobs and colleagues highlighted the positive role EHL in improving health knowledge (Jacobs *et al*., 2016). Further, EHL is expectedly to be correlated with the improved practice to implement health behaviors as an essential part of preventive measures (Squiers *et al*., 2012). Indonesian government has launched a campaign called "3M" since the beginning of the pandemic to control the disease across the country. 3M refers to the precautionary actions to prevent the COVID-19 transmission i.e., wearing mask, washing hand regularly with soap/hand sanitizer and maintaining physical distancing. In addition, the government has updated the campaign into "5M" by incorporating two other actions, namely restricting people's mobility and avoiding crowded public places (Djalante *et al*., 2020, The Ministry of Health of Indonesia, 2020). Some studies indicated that EHL can motivate individuals to practice healthy behavior in general, not specifically relevant to COVID-19 management supporting behavior (Nugroho *et al*., 2021; Britt *et al*., 2017; Ajzen, 2011). Nevertheless, the relationship between EHL and COVID-19 specific knowledge, and the influence of EHL on behavior to implement COVID-19 health protocol were supported by little evidence. Thus, this study aimed to explore the pattern of COVID-19 information-seeking among self-quarantined patients with COVID-19 and their level of EHL. In addition, this study analyzed the association between EHL with COVID-19 knowledge, and between EHL with health protocol adherence.

METHODS

Study Design and Sample

A cross-sectional study with purposive sampling was conducted in a sub-district in West Java during March – December 2020. The study site was considered as a COVID-19 red zone during the data collection. The inclusion criteria of the respondents were COVID-19 patients aged >18 years old who underwent self-quarantine during the study period and their data were registered in the sub-district primary health center (PHC). The respondents were excluded if they disagreed to participate in the study. Total sampling approach was used to determine the sample size. Based on the preliminary data from the study site, there were approximately 156 potential respondents. The study was granted permission from the District Health Office and approved by the appropriate Institutional Ethics Committee (No: 174/IV/2021/KEPK). Informed consent was obtained from the respondents and participation was completely voluntary.

Data collection and analysis

An online questionnaire was distributed to potential respondents. The database of patients meeting the inclusion criteria was obtained from the assigned PHC. The questionnaire was disseminated through the WhatsApp® application to collect data from respondents. A set of questionnaires was adopted from some studies (Norman *et al.*, 2006; Saefi *et al*., 2020) to assess patients' EHL, COVID-19 knowledge and adherence to health protocols. Validity and reliability of the questionnaire was assessed using 45 self-quarantined patients with COVID-19 in other sub-districts. Validity of the questionnaire was determined valid (calculated r/correlation coefficient for each questionnaire item > r table) and reliability was considered

adequate (Cronbach's alpha = 0.840). The questionnaire consisted of four sections. Section 1 collected information on patients' socio-demographic characteristics and the pattern of COVID-19 information seeking. Section 2 comprised of 5 questions to rate patients' EHL level using the electronic Health Literacy Scale (eHEALS) with five answer choices ('strongly agree', 'agree', slightly disagree', 'disagree', 'strongly disagree'). Answers from each EHL question were totaled and median value was calculated. EHL status was categorized into 'good EHL' (patients' median EHL ≥ questionnaire median i.e., 15) and 'poor EHL' (median EHL < questionnaire median i.e., 15). Section 3 was comprised of 10 questions with 'true' and 'false' answer choices to assess patients' knowledge on COVID-19. Knowledge level of patients were rated using scores ranging from 0-10 and patients were categorized into three ranks: good knowledge (score of 7.6-10), fair (5.6-7.5) and poor (<5.5). Section 4 contained 10 questions with a 3-point Likert scale: ('always', 'sometimes', and 'never') to rate patients' adherence to health protocol before and during self-isolation. Answers from each question were summed up to get the total adherence score and mean value was calculated. Based on the score, adherence status was categorized into 'good adherence' (mean adherence score > median value i.e., 20) and 'poor adherence' (mean adherence score < median value). The questionnaire required approximately 10-15 minutes to complete.

Descriptive analysis was conducted to determine patterns of online information-seeking for COVID-19, EHL score, COVID-19 knowledge, and health protocol adherence. Spearman test was used to evaluate the relationship between EHL and COVID-19 knowledge, and EHL and health protocol adherence. Statistical significance was established at $p<0.05$ for the test.

RESULT AND DISCUSSION

There were 56 respondents who participated in this study. The sociodemographic characteristics of the respondents are detailed in Table 1, which shows more than half of the respondents were female (N=33, 58.9%), graduated from university as the highest education level (N=36, 64.3%). Just over 60% of the respondents were employees and approximately half of them earned IDR 5-10 million per month. Interestingly, nearly all respondents perceived their health status as good and very good. Self-rated health status is commonly used to examine someone's overall health at a given point in time underlining the broad picture of a person's current health status (Wuorela *et al*., 2020).

Table 1. Sociodemographic Characteristics of the Respondents (N=56)

Characteristics	No. (%)
Gender	
Male	23 (41.1)
Female	33 (58.9)
Age (years)	
18 - 25	13 (23.2)
26 - 33	18 (32.1)
34 - 41	16 (28.6)
42 - 49	7 (12.5)
≥ 50	2 (3.6)
Education level	
Elementary	1 (1.7)
Secondary	19 (33.9)
Tertiary	36 (64.3)
Employment status	
Unemployed	13 (23.2)
Self-employed	9 (16.1)
Employee	34 (60.7)
Monthly Income (IDR)	
< 5 million	23 (41.1)
5 – 10 million	29 (51.8)
>10 million	4 (7.1)
Self-assessed health status	
Very good	23 (41.1)
Good	32 (57.1)
Fair	1 (1.7)

Table 2. Type of COVID-19 Online Information Navigated by Respondents Prior to and During Self-Quarantine

Type of COVID-19 Information	Prior to Self-Quarantine No. (%)	During Self-Quarantine No. (%)
Symptoms of the disease	45 (80.4)	43 (76.8)
Preventive measures	36 (64.3)	35 (62.5)
Treatment	33 (58.9)	44 (78.6)
Self-isolation procedures	24 (42.9)	38 (67.9)
Laboratory testing	15 (26.8)	21 (37.5)
Vitamin and Supplement	39 (69.6)	45 (80.4)
Herbal medicine	16 (28.6)	25 (44.6)
Long-term effect of the disease	1 (1.8)	1 (1.8)

Table 3. eHealth literacy Scale (N=56)

Questions	Strongly agree N (%)	Agree N (%)	Slightly disagree N (%)	Disagree N (%)	Strongly disagree N (%)
Q1. I know how to use the internet to answer my questions about health	15 (26.8)	40 (71.4)	0	1 (1.7)	0
Q2. I know where to find health resources on the internet	14 (25.0)	41 (73.2)	1 (1.7)	0	0
Q3. I know how to find helpful health resources on the internet	18 (32.1)	37 (66.1)	1 (1.7)	0	0
Q4. I know how to use the health information I find on the internet to help me	15 (26.8)	41 (73.2)	0	0	0
Q5. I feel confident in using information from the internet to make health decision	9 (16.1)	35 (62.5)	9 (16.1)	3 (5.4)	0
eHealth literacy Median	20				

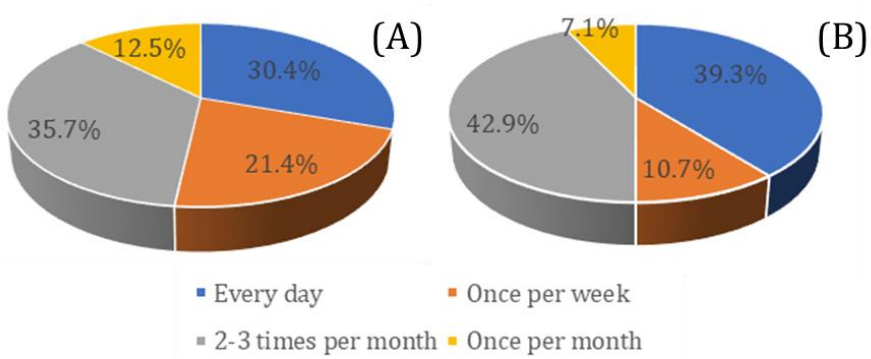


Figure 1. Frequency of Internet Use for COVID-19 Information-Seeking by Respondents Prior to Self-Isolation (A) and During Self-Quarantine (B)

Regarding the source of general health information searched by the respondents, social media (e.g., WhatsApp®, Facebook®, Instagram®) accounted for the most common references used to navigate for health information with 53.6%. The other Internet-based information sources, namely search engines, appeared popular which nearly 40% of the respondents chose this mode during information seeking. Meanwhile, conventional sources i.e., television was preferred by only 7% and none of the study participants considered printed newspaper as their preference to find health information.

As depicted in Figure 1A, before self-quarantine, most respondents (N=20, 35.7%) spent several times a month to navigate COVID-19 information using the Internet to search for COVID-19 information and around 30.0% reported daily searching. Meanwhile, during self-isolation (Figure 1B) there was a slight increase in the frequency of Internet use where nearly all respondents (N=52, 93.0%) browsed online COVID-19 information at least several times in a month.

Table 4. Respondents' Knowledge on COVID-19

	Correct	Wrong
	N (%)	N (%)
COVID-19 is not dangerous and like common cold	52 (92.9)	4 (7.1)
Corona virus cannot be transmitted when an infected person talks	49 (87.5)	7 (12.5)
Only those with COVID-19 symptoms can spread the virus	48 (85.7)	8 (14.3)
Healthy people do not need to wear masks when they go outside	52 (92.9)	4 (7.1)
There is no need for children and adolescents to practice preventive measures as they have strong immune	53 (94.6)	3 (5.4)
Antibiotic is effective for COVID-19 treatment	41 (73.2)	15 (26.8)
Corona virus can survive a few hours outside human body	48 (85.7)	8 (14.3)
Elderly people are likely to develop more severe symptoms than younger adults	53 (94.6)	3 (5.4)
Death risk in COVID-19 patients is higher than those with chronic disease like diabetes, cardiovascular diseases, and obesity	53 (94.6)	3 (5.4)
Self-isolation for infected persons is no longer required for those developing no COVID-19 symptoms	50 (89.3)	6 (10.7)
Knowledge score: *Mean (SD)	8.89 (1.796)	

*10 is set as maximum score

Table 5. Compliance to Health Protocol During and After Self-Quarantine

During Self-Quarantine	Always N (%)	Sometimes N (%)	Never N (%)
Did you consume vitamin or supplement to improve your immune system?	31 (55.4)	24 (42,9)	1 (1,7)
Did you do exercise regularly?	17 (30.4)	35 (62,5)	4 (7,1)
Did you practice cough etiquette?	49 (87.5)	6 (10,7)	1 (1,7)
Did you have enough rest?	50 (89.3)	5 (8,9)	1 (1,7)
Did you clean your home more often using disinfectant?	32 (57.1)	19 (33,9)	5 (8,9)
After Self-Quarantine	Always N (%)	Sometimes N (%)	Never N (%)
Over the past few months, have you practiced physical distancing in a public place?	43 (76.8)	12 (19.6)	1 (1.7)
Over the past few months, have you used hand sanitizer while being in a public place?	45 (80.4)	10 (17.9)	1 (1.7)
Over the past few months, have you washed your hands when returning from a public place?	50 (89.3)	5 (8.9)	1 (1.7)
Over the past few months, have you changed your clothes when returning home?	39 (69.6)	15 (26.8)	2 (3.4)
Over the past few months, have you worn mask in a public place?	52 (92.9)	4 (7.1)	0 (0%)

Table 2 describes the type of COVID-19 information navigated during online search. Before contracting the disease, the respondents predominantly searched for the disease symptoms. Additionally, information on the use of vitamins and supplements, and preventive were accessed by at least three out of five respondents. The nature of information searched after being infected slightly differed. During self-quarantine period, the respondents revealed that the top three most frequent health information was related to the use of vitamins and supplements, COVID-19 treatment and its symptoms. In line with our study, Nugroho *et al*. also found that the commonest types of information searched in Indonesia were disease symptoms and healthy lifestyles to prevent the disease (Nugroho *et al*., 2021). Similarly, an Italian study found the most common searched information during the pandemic included the preventive-related information (i.e., using face mask, disinfectant), symptoms of coronavirus and treatment (Rovetta *et al.*, 2020)

The eHEALS was used in this study to rate respondents' digital health literacy. The scale is able to measure individual's perception of their knowledge and skills in using health information from electronic sources and to find out if the eHealth approach can be suited to the individual (Choi *et al*., 2021). Assessment of EHL (see Table 3) uncovers the fact that respondents had high scores on digital health literacy (median 20 out of 15). Most respondents were confident in using the Internet to navigate health information and make informed health decisions related to COVID-19. The high level of EHL may prompt people to triangulate information to verify its credibility by comparing it with other trusted digital sources. The next stage of information triangulation involves discussion of the information with others and making sense the massive flow of information (Sykes *et al*., 2021). Similar finding was reported in an Indonesian study where 9 in 10 people had good COVID-19 related knowledge (Sulistyawati *et al*., 2021).

Meanwhile, a study in South Korea documented lower EHL with respondents having moderate EHL (Choi *et al*., 2021). By contrast, another Indonesian study involving a younger population found more than half of the respondents had low EHL despite their increased access to online information as opposed to older population (Nugroho *et al*., 2021). This evidence may signify the fact that the youths had greater access to online platforms and more familiarity with the digital environments, yet they lacked the ability to evaluate and apply the information (Li *et al*., 2021).

It is noteworthy that respondents had a good level of COVID-19 knowledge (mean = 8.89/10, SD = 1.796). As illustrated in Table 4, the majority of the questions could be answered correctly by more than 80% of the respondents. Intriguingly, only one question, namely the effectiveness of antibiotics for treating COVID-19, in which less than three-quarter of them could choose the right option. Corresponding to our study, Yanti and colleagues also identified good COVID-19 knowledge among the Indonesian community. That study signified good knowledge related to mitigation measures to prevent the pandemic (Yanti *et al*., 2020). Another Indonesian study generally identified good knowledge since more than 70% of the respondents were able to correctly answer the questions related to symptoms, transmission modes and preventive strategies (Sulistyawati *et al*., 2021). Considerable knowledge on COVID-19 was also mentioned in a study involving respondents from United States of America (USA) and United Kingdom (UK) (Geldsetzer, 2020). Likewise, modest level of COVID-19 knowledge was documented in a Chinese study with the questions relating to transmission route and clinical symptoms having the lowest correct responses (Yue *et al*., 2021). On the contrary, a systematic review involving people on the American Continent revealed that many Americans had poor knowledge toward COVID-19 risks (Yohanna *et al*., 2021).

Table 5 reveals that respondents had good adherence to health protocol (mean = 26.98/30, SD = 3.066) both during and after self-quarantine. During contracting the disease, more than 80% of the respondents always implemented cough etiquette to prevent transmission and had adequate amount of time to rest. In addition, 1 in 2 respondents always consumed vitamins and supplements to boost their immunity, and practiced hygiene by cleaning their home more regularly with disinfectant. It appears that the threat of imminent disease elicits fear leading people to improve health knowledge and apply their adaptive behaviors (Ling *et al*., 2019). In accordance with our study, an Indonesian study involving respondents from many provinces reported a promising result with the majority of the respondents implementing good practice to prevent the disease transmission (Yanti *et al*., 2020). High levels of preventive behavior practice against COVID-19 were also

documented in China where respondents cited the three most frequent implementation of preventive behaviors included wearing face masks in public places, avoiding mobility to areas with high prevalence and restricting interaction with those showing flu-like symptoms (Liu, 2020). In contrast, a study by Gharpure *et al*. showed that nearly one third of the respondents in USA have adapted some high-risk COVID-19 preventive misbehavior e.g., washing fruits and vegetables with bleach, and applying household cleaning products on hands (Gharpure *et al*., 2020).

In addition, this study also examined the relationship between EHL and knowledge and EHL and health protocol. A modest correlation was found between EHL and knowledge (p-value = 0.001, r = 0.436), whilst a weak relationship was revealed between EHL and compliance to health protocol (p-value = 0.011, r = 0.339). Consistent with our study, some studies conducted in China (Li *et al*., 2021), Norway (Riiser *et al*., 2020), Denmark (Klinker *et al*., 2020), South Korea (Li *et al*., 2021) and the USA (Wolf *et al*., 2020) identified significant relationships between EHL and COVID-19 preventive behaviors. Li and colleagues revealed a positive association between EHL versus COVID-19 knowledge (R=0.220, p<0.001) and between EHL and COVID-19 specific precautionary behaviors e.g., hand hygiene habit, regular exercise and nutritious diet (R=0.476, p<0.001) (Li *et al*., 2021). Similarly, a Norway study conducted during the early phase of COVID-19 pandemic exhibited significant relationship between EHL and health protective measures (Riiser *et al*., 2020). It has been thought that the Internet-based pandemic information might exacerbate concerns among the population and trigger them to follow protective behaviors as a routine health protocol (Sun *et al*., 2020). When comparing with previous pandemics (e.g., SARS, H1N1), a similar finding was revealed that devoting considerable amount of time to search for specific information may affect adherence to preventive strategies (Bults *et al*., 2011; Leppin *et al*., 2009). By contrast, a study conducted in Yogyakarta, Indonesia found that EHL did not directly affect self-care behavior since individuals with low level of EHL were still able to implement healthy behavior (Nugroho *et al*., 2021). It appears that the influence of more senior family members of the youth respondents in that study are likely to affect the practice of health behavior despite insufficient comprehension of their health literacy. Additionally, EHL is not the only factor affecting health behavior because people with low EHL can still access health information from non-digital source (e.g., television) and adopt relevant health behaviors as the part of the COVID-19 preventive protocols (Li *et al*., 2021).

The findings of this research contribute to the limited existing knowledge on understanding the nature of health information seeking among people before and during contracting COVID-19, and their health literacy in relation to digital information. Improved community engagement through empowering them with sufficient health literacy could be used as one mode to resolve COVID-19 information asymmetry (Chong *et al*., 2020). In this sense, government institutions and other reputable non-government organizations can collaborate with social media giants (e.g. Facebook®, YouTube®, Google®, Instagram®) in order to design and disseminate targeted learning programs to improve public health literacy. In addition to its influence on knowledge and adherence to health behavior, it is of special importance to evaluate the impact of EHL on other parameters as previous studies signified the association between poor health literacy with undesirable health outcomes, e.g., health-related quality of life (Castro-Sánchez *et al*., 2016; Lorini *et al*., 2018; Neter and Brainin, 2019).

Several limitations need to be considered in interpreting the findings of this study. This study applied a cross-sectional approach using non-probability sampling in a sub-district resulting in modest sample size, which limits the generalizability of the findings. In addition, the study may reflect some reporting bias since the respondents self-completed the questionnaire and further explanations were given only if they required additional information from the researchers. Furthermore, this study employed an online format for the questionnaire for collating the information. It is likely that a certain segment of the population such as the elderly cannot be included as the study samples due to their barriers to access digital platforms.

CONCLUSION

EHL had modest influence on COVID-19 knowledge and insignificantly affected adherence to health protocol among self-isolating patients with COVID-19. It is of paramount importance that access to official social media providing reliable information on COVID-19 should be widely disseminated by the Indonesian Authorities. However, the provision of health information through electronic platforms will be more beneficial if supported by the measures to improve people' EHL. This

approach to the diverse level of EHL may provide insights for authorities on formulating valid and understandable digital materials regarding COVID-19 to the targeted populations.

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