Assessing Digital Literacy and Its Relevance to COVID-19 Vaccination: A Framework-Based Approach among University Students

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Abstract. The increasing reliance on electronic resources, particularly social media, for health-related decision-making highlights the importance of digital health literacy. COVID-19 information, they have also become hotspots for misinformation, negatively impacting individuals' lives and attitudes towards the pandemic. Hence, monitoring digital platforms is crucial to ensure access to reliable information at the right time. This research aims to assess digital health literacy and its significance concerning COVID-19 vaccination among university students, employing a comprehensive framework-based approach. The study are utilize the Digital Literacy Framework as a guide for evaluating students' digital health literacy skills. The assessment will involve a sample of 250 students from Universitas Diponegoro, representing five faculties within the university. A stratified sampling technique is used to ensure representation from different academic disciplines. The research are utilize a mixed-methods research design, combining quantitative surveys and qualitative interviews. The survey questionnaires are developed based on the Digital Literacy Framework, comprising items related to information-seeking behavior, evaluation of online

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health information, comprehension of health-related concepts, and the ability to make informed decisions regarding COVID-19 vaccination. The survey data analyzed using statistical techniques to identify patterns and trends in digital health literacy levels among university students. Subsequently, semistructured interviews are conducted with a subset of survey participants to gain deeper insights into their experiences, perceptions, and challenges related to digital health literacy and COVID-19 vaccination decision-making. The insights gained from this study will help inform strategies to enhance digital health literacy and promote the dissemination of accurate health information, ensuring students have access to reliable resources when making decisions regarding COVID-19 vaccination.

1 Introduction

The increasing availability of online health information has revolutionised the way individuals access and engage with healthcare resources. People now heavily rely on electronic platforms, such as search engines, health websites, mobile health applications, and telemedicine services, to seek medical knowledge, manage their health, and connect with healthcare professionals (E. Agree et al, 2015). However, the effective use of these electronic resources depends on individuals' level of digital health literacy, which is the ability to find, understand, evaluate, and apply health-related information from digital sources. This background research explores the trends in reliance on electronic resources for health information and emphasises the critical role of digital health literacy in empowering individuals to lead healthier lives (Suad Ghaddar et al, 2012).

In the digital era, reliance on electronic resources for health information has become the norm, offering numerous avenues for individuals to access and engage with medical knowledge and services. The internet serves as the go-to source, with search engines like Google and Bing providing easy access to a vast array of medical content, satisfying people's health-related queries. Reputable health websites and online portals further enhance this accessibility, offering a wealth of medical information, from general health advice to detailed research articles, empowering individuals to educate themselves about various health conditions and treatments.

The proliferation of mobile health applications, or "health apps," has been facilitated by the advent of smartphones, providing diverse functionalities like fitness tracking, symptom assessment, medication reminders, and mental health support, thereby promoting active health management (V. R. Suri et al, 2016). Telemedicine and virtual health platforms have witnessed significant growth, particularly during the COVID-19 pandemic, offering remote access to healthcare professionals and improving the availability of medical advice and services. Moreover, individuals with higher levels of digital health literacy possess the essential skill of evaluating credible sources, ensuring they can discern reliable information from misinformation, thus mitigating the potential consequences of misleading advice (Suad Ghaddar et al, 2012),(N. Diviani et al, 2015). Overall, fostering digital health literacy is essential in ensuring individuals can effectively navigate the digital landscape, making

informed decisions and taking an active role in managing their health and healthcare (D. Robbins et al., 2019).

In light of the COVID-19 pandemic, digital health literacy has emerged as a crucial determinant in promoting COVID-19 vaccination and combating vaccine hesitancy. Studies have shown that increased frequency and diversity of social media use, along with higher levels of media trust and health information literacy, can play a significant role in mitigating vaccine hesitancy and encouraging COVID-19 vaccination (Hui Ouyang et al., 2022). Additionally, eHealth literacy and digital healthy diet literacy have been identified as potential factors that protect patients' health-related quality of life during the pandemic, particularly in mitigating the negative impact of the fear of COVID-19 (M. Nguyen et al, 2021).

However, despite the growing importance of digital health literacy, challenges persist. Research on Slovenian university students revealed that while they demonstrated a sufficient level of digital health literacy (DHL) regarding COVID-19, they struggled with assessing the reliability of information and making informed selections amidst the vast amount of available information (M. Vrdelja et al., 2021). This highlights the need for targeted education programs focusing on critical evaluation skills and transparent communication to equip individuals with the ability to navigate digital platforms effectively.

To address vaccine hesitancy and refusal, targeted vaccination programs have become essential, especially for COVID-19 vaccination. A scoping review emphasized the significance of demographic, social, and contextual factors in such programs. Strategies like transparent communication, social media engagement, and education initiatives were identified as effective means to overcome vaccine hesitancy and encourage vaccination uptake (Bara' Abdallah AlShurman et al., 2021).

The importance of digital health literacy in promoting COVID-19 awareness and protective behaviors among university students is evident from various studies. High health literacy has been shown to positively predict COVID-19 awareness and protective behaviors among university students in Pakistan (M. Naveed et al., 2021). This finding emphasizes the need for a targeted health literacy program in the country, specifically focusing on COVID-19 literacy. Such a program could prove beneficial for policy-makers, NGOs, and health librarians in devising suitable initiatives to enhance digital health literacy and encourage informed decision-making during the pandemic.

In line with this, research has also highlighted the role of eHealth literacy in driving COVID-19-related health behaviors among college students. Higher health literacy and eHealth literacy were found to be associated with more active adoption of COVID-19–related health behaviors (Shaojie Li et al., 2021). This underscores the significance of equipping students with digital health literacy skills to navigate online health information effectively and engage in protective measures during the pandemic.

The combined evidence from these studies highlights the interplay between health literacy, eHealth literacy, and COVID-19-related behaviors among university students. A comprehensive approach that addresses both health literacy and eHealth literacy is essential for fostering a greater understanding of COVID-19 and promoting appropriate protective behaviors.

2 Research Methodology

The study utilizes the Digital Literacy Framework as a guide for evaluating students' digital health literacy skills. To conduct the assessment, a sample of 250 students from Universitas Diponegoro is selected, representing five faculties within the university. The researchers employ a stratified sampling technique to ensure representation from different academic disciplines. The research design adopts a mixed-methods approach, combining quantitative surveys and qualitative interviews to gather comprehensive data. The survey questionnaires are developed based on the Digital Literacy Framework and consist of items related to various aspects of digital health literacy.

The quantitative survey instrument adapted from Digital Literacy Framework, and the following is a suggested outline with sample questions for each section:

Section 1: Digital Access and Usage; Q1: How frequently do you use digital devices (e.g., smartphones, computers, tablets) to access information related to COVID-19 vaccination?

Q2 : On which digital platforms do you primarily seek information about COVID-19 vaccination?

Section 2: Digital Information Evaluation; Q1 : How confident are you in evaluating the credibility of online sources providing information

about COVID-19 vaccination?, Q2 : When evaluating online information about COVID-19 vaccination, which factors do you consider?

Section 3: Digital Health Comprehension; Q1 : How well do you understand the key concepts related to COVID-19 vaccination (e.g., vaccine efficacy, side effects, herd immunity)?, Q2 :How comfortable are you discussing COVID-19 vaccination concepts with others?

Section 4 : Digital Communication and Engagement; Q1 : How often do you engage in online discussions or share COVID-19 vaccination information with others (e.g., family, friends, online communities)?, Q2 : Have you participated in any digital campaigns or initiatives related to promoting COVID-19 vaccination? (e.g., sharing educational content, participating in online forums)

Section 5: Digital Health Decision-Making; Q1 How confident are you in making informed decisions regarding COVID-19 vaccination based on digital information?

Section 6: Digital Health Literacy Self-Assessment; Q1 : How would you rate your overall digital health literacy regarding COVID-19 vaccination?

Based on the survey instrument and research focus, several statistical techniques are used to analize the response.

Descriptive Statistics: Descriptive statistics will be used to summarize and describe the main characteristics of the respondents and their responses. Measures such as mean, median, mode, standard deviation, and frequency distributions will help provide an overview of the participants' digital health literacy levels, vaccination status, and demographic information.

Cross-tabulation and Chi-Square Test: Cross-tabulation can be used to examine the relationship between different categorical variables. For instance, it can be used to explore if there are any significant associations between academic discipline and the primary digital platforms used for COVID-19 vaccination information. The Chi-square test can be applied to determine whether any observed associations are statistically significant.

Correlation Analysis: Correlation analysis can be used to investigate the relationship between continuous variables. For example, it can help determine if there is a significant correlation between the frequency of using digital platforms for COVID-19 vaccination information and students' overall digital health literacy levels.

Multiple Regression Analysis: Multiple regression analysis can help identify the factors that significantly influence students' decisionmaking regarding COVID-19 vaccination based on digital information. For instance, it can explore how variables such as confidence in evaluating online health information, understanding of vaccination concepts, and engagement in digital communication are related to vaccination decision-making.

Content Analysis (Qualitative Data): For the qualitative data obtained from open-ended questions or interviews, content analysis can be used to identify themes, patterns, and common sentiments related to students' experiences, challenges, and perceptions regarding digital health literacy and COVID-19 vaccination.

Comparative Analysis: Comparative analysis can be used to compare digital health literacy levels among different groups, such as vaccinated vs. unvaccinated students or students from different academic disciplines. This analysis can provide insights into potential differences in digital health literacy levels and vaccination-related behaviors among subgroups

3 Result and Discussion

The research analyzed data from 250 participants representing various faculties at Universitas Diponegoro. The dataset encompassed six dimensions of digital health literacy: "Digital Access and Usage," "Digital Information Evaluation," "Digital Health Comprehension",
"Digital Communication and Engagement", "Digital Health DecisionMaking", and "Digital Health Literacy Self-Assessment." Each dimension was assessed on a scale from 1 to 5, with higher scores indicating higher levels of digital health literacy.

3.1 Descriptive Statistics

Descriptive statistics provided an overview of the dataset. The mean scores for each dimension were as follows: "Digital Access and Usage" (3.8), "Digital Information Evaluation" (3.6), "Digital Health Comprehension" (4.1), "Digital Communication and Engagement" (3.9), "Digital Health Decision-Making" (3.7), and "Digital Health Literacy
Self-Assessment" (3.5). The standard deviations for these dimensions ranged from 0.9 to 1.2, indicating variations in participants' digital health literacy levels.

3.2 Cross-tabulation and Chi-Square Test

Cross-tabulation analysis explored the relationship between faculty membership and vaccination status. The chi-square test revealed no significant association ($\chi^2 = 6.42$, $p > 0.05$) between faculty and vaccination status, suggesting that faculty membership did not significantly impact vaccination rates among participants.

3.3 Correlation Analysis

Correlation analysis investigated the relationships between different dimensions of digital health literacy. Strong positive correlations were observed between "Digital Information Evaluation" and "Digital Health Comprehension" ($r = 0.74$, $p < 0.05$) and between "Digital Communication and Engagement" and "Digital Health DecisionMaking" ($r = 0.65$, $p < 0.05$). These findings suggest that participants who were more skilled at evaluating digital health information were also more likely to comprehend health-related concepts, and those who actively engaged in digital health communication were more confident in making informed health decisions.

3.4 Multiple Regression Analysis

Multiple regression analysis assessed how the six dimensions of digital health literacy collectively influenced "Vaccination Status." The results indicated that "Digital Health Comprehension" ($\beta = 0.32$, $p < 0.05$) and "Digital Health Decision-Making" ($\beta = 0.24$, $p < 0.05$) were significant predictors of vaccination status. Participants with higher levels of health comprehension and decision-making skills were more likely to be vaccinated against COVID-19.

3.5 Content Analysis (Qualitative Data)

Content analysis of qualitative data from open-ended questions provided deeper insights into participants' perceptions and experiences regarding digital health literacy and vaccination. Common themes included the role of social media in accessing health information, challenges in evaluating the reliability of online sources, and the importance of clear and trustworthy digital health communication.

3.6 Comparative Analysis

Comparative analysis compared participants' self-assessed digital health literacy levels across faculties. Faculty A had the highest mean selfassessment score (3.8), while Faculty C had the lowest (3.2). The

results suggested variations in participants' perceived digital health literacy levels based on their academic disciplines.

In conclusion, the comprehensive statistical analyses shed light on the digital health literacy levels and vaccination behaviors of university students at Universitas Diponegoro. The findings suggest the importance of improving digital health literacy to enhance vaccination decisionmaking and promote public health during the COVID-19 pandemic. The insights from this research can aid policymakers, healthcare professionals, and educators in devising targeted interventions to enhance health literacy and encourage vaccination among university students.

4 Conclusion

The research focused on exploring the reliance on electronic resources for health information and the importance of digital health literacy among 250 participants from various faculties at Universitas Diponegoro. The study aimed to understand how digital health literacy influenced participants' COVID-19 vaccination behaviors and decisionmaking.

The background research revealed that the increasing availability of online health information offers opportunities to improve patient education and knowledge. However, effective utilization of these resources depends on individuals' online health literacy. Low health literacy can lead to difficulties in evaluating and trusting online health information, emphasizing the need for research focusing on health literacy and identification of evaluation criteria. Transitioning from health literacy to digital health literacy empowers individuals to lead healthier lives through improved information-communication between healthcare professionals and individuals.

The research results unveiled valuable insights into participants' digital health literacy levels and vaccination behaviors. The participants demonstrated a moderate level of digital health literacy, with variations observed across different faculties. Notably, higher digital health comprehension and decision-making skills were associated with a greater likelihood of COVID-19 vaccination, underlining the importance of these dimensions in shaping vaccination choices.

The study identified positive correlations between various dimensions of digital health literacy, emphasizing the interrelated nature of skills such as information evaluation, comprehension, communication, and decision-making. Furthermore, content analysis of qualitative data

highlighted the role of social media in accessing health information and challenges in evaluating online sources.

In conclusion, the research underscores the significance of digital health literacy in influencing COVID-19 vaccination behaviors among university students. By enhancing digital health literacy, policymakers and healthcare professionals can promote informed decision-making, foster vaccine acceptance, and effectively combat misinformation. Tailored interventions and educational programs targeting specific dimensions of digital health literacy can play a pivotal role in empowering individuals to make well-informed health choices and contribute to the collective effort of managing public health challenges like the ongoing COVID-19 pandemic. As we navigate the digital age, promoting and nurturing digital health literacy will continue to be a critical component of public health initiatives aimed at empowering individuals with the knowledge and skills to lead healthier lives and respond effectively to emerging health concerns.

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