

Empowering Women through a Path Analysis: Identification of Effective Factors based on Social Support and Community Participation on e-Health Literacy in Women's Virtual Health Society

ABSTRACT

Background and Objectives: The virtual community plays a crucial role in increasing health literacy. A successful and empowered woman demands an adequate level of health literacy. Knowing the determinants affecting e-health literacy in the virtual community was hoped to optimize efforts to increase e-health literacy. This research is aimed to assess the determinants that affect e-health literacy in virtual communities for empowering women.

Materials and Methods: A study with a cross-sectional approach was used to assess the determinants of e-health literacy. A total of 117 samples were taken using the total sampling technique. Data was collected using demographic variables checklist, social support, community participation, e-health literacy, and information process paradigms questionnaire. Data was analyzed for path analysis using Stata 13 software.

Results: The path analysis showed that social support and community participation in women had a significant positive direct effect ($p < 0.05$) on health literacy. The community participation, information processing paradigm, ethnicity, number of social media owned, age, education, distance from home to healthcare facilities, and number of healthcare places significantly indirectly affect health literacy ($p < 0.05$).

Conclusion: To empower woman's health literacy in online communities, we should pay attention to increase social support, community participation, processing information paradigm, ethnicity, number of social media owned, age, education, distance from home to healthcare facilities, and number of healthcare places.

Paper Type: Research Article

Keywords: Women Empowerment, E-health Literacy, Virtual Health Community, Path Analysis.

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Introduction

Being in a sophisticated digitalization era provides opportunities for all people to contribute to the nation's development through internet access, social media, smartphones, and other multimedia networks. People increasingly participate in the online health community to fulfill their health information needs. A virtual health community is an online discussion group with members sharing a common interest in health topics (1).

The virtual community plays a crucial role in improving health literacy. It is supported by several studies: online support communities are significant to be able to access patient information and emotional exchange (2); and can be a promising approach to prevent non-adherence to online health interventions related to health behavior change, especially in areas with low social support (3); provides emotional support, insight, advice, and assistance for its users (4); online community users have the health-related quality of life and level of care better self (5); and so on. Social support is information received from other people that the individual is loved, cared for, appreciated, and valued and is part of a communication network and mutual need obtained from parents, husband or loved ones, relatives, friends, social relations, and community. Social support can help psychological relationships, strengthen healthy living practices, and aid recovery from illness only when the relationship is sporting (6).

Adequate health literacy is associated with many health outcomes, including reduced morbidity and mortality and a lower likelihood of using emergency room services

(7). Health literacy should be a central policy strategy for bridging health inequalities, especially in developing countries (8). Women's health literacy is an important skill to participate in the prevention and promotion of public health. More than one-third of women had inadequate or border health literacy (9). In low and middle countries, especially Indonesia, there is still an imbalance in the Digital Literacy Index for men compared to women. The 2021 report noted that men with high digital literacy scores accounted for 55% of respondents, while the proportion of female respondents who scored above the average was around 45%. Women's digital literacy scores are lower or below average than men's (10).

Improving health literacy is one of the most fundamental ways of improving the health level of the entire population. Healthcare professionals and policymakers still need to do a lot to ensure that mothers attain their level of health literacy to improve their and their children's health (11). More empowered women may be able to participate more actively in household decision-making, may be characterized by higher self-efficacy, may experience a more manageable workload, may experience lower levels of intimate partner violence, may also be more likely to access resources outside the household, including health facilities or health services as well as other community resources (12). Empowerment can expand a woman's agency and resources, enabling her to play a crucial role in family decision-making, including limiting the number of children to the desired family size (13).

A successful and empowered pregnancy demands an adequate level of health literacy.

Low health literacy might increase the risk of complications, including gestational diabetes mellitus, maternal stress and depression, low birth weight, stillbirth, and congenital malformations during pregnancy and birth, with consequences for the woman and her child. Low health literacy is associated with lower self-efficacy, education level, employment, age, and ethnicity (14). Women are dying because of the gender data gap in medicine in medical research, medical education, and medical practice, and it needs to be closed as a matter of absolute urgency (15).

In Indonesia, efforts to promote women's empowerment in Information Communication Technology (ICT) have recently increased through various social or community organizations. However, the level of digital media literacy among Indonesian women needs to be higher, primarily due to limited access and skills regarding technology in various regions. Surprisingly, it was discovered that not all Indonesian women are well-versed in digital literacy, even though some have pursued technology-related majors and careers. Furthermore, many Indonesian women still need to familiarize themselves with the terminology associated with digital media literacy despite having varying degrees of digital literacy (16).

Women with low digital literacy potentially will harm child development. A generation's proficiency in digital media was determined by various factors, including exposure to digital technology, the mother's education level, and the family's economic level. Therefore, women must equip themselves with qualified digital literacy (17). eHealth literacy is essential for comprehending

internet-based health information and reinforcing health-related actions. Health literacy and e-health literacy share similarities since individual factors, including demographic variables such as age, ethnicity, gender, educational attainment, and income level, shaped them (18,19). By looking at determinants that have the potential to affect health literacy, they can better identify which determinants have the potential to increase literacy in online communities.

The issues related to women's low literacy, the occurrence of the COVID-19 pandemic forcing people to adapt to new habits, especially regarding the use of the internet in all aspects of life, and the need for better health promotion than conventional methods, are the underlying problems that prompted researchers to conduct research in the form of online-based health promotion to improve health literacy. Based on the above description, online-based health promotion is a crucial thing to be developed in the community to support dissemination and ease of access to health information. To the best of the researcher's knowledge and search, there is limited research publication on identification of effective factors to improve women's health literacy in virtual community. Therefore, this research aimed to assess the e-health literacy determinants in virtual communities for empowering women.

Materials and Methods

Study Design

A study with a cross-sectional approach was used to determine the effective factors on women's e-health literacy according to what pattern and logic was it. A total of 117 samples were taken using the total sampling

technique in the online community. The inclusion criteria of the sample were women aged 20-45 years old who have accessed virtual health communities. The exclusion criteria were unwilling to participate in the study, male, and do not have a smartphone.

Data Collection

Data was collected from October to December 2021 using the checklist and questionnaires, then distributed via Google Forms for two weeks via an online community based on Instagram social media and WhatsApp instant messaging.

The independent variables observed included age, education, ethnicity, occupation, personal income, family income, number of gadgets owned, number of social media owned, total healthcare facilities, total vehicle access, distance from participant's house to healthcare facilities, social support, community participation, and the information process paradigm. In contrast, the dependent variable of this research point is e-health literacy.

The study instrument for collecting data was demographic variables checklist, social support, community participation, e-health literacy, and information process paradigms questionnaire. The e-health literacy questionnaire was modified from A New Comprehensive Short-form Health Literacy Survey Tool for Patients in General (20), the social support questionnaire was a modification of The Berlin Social Support Scales (BSSS) (21); and the information processing paradigm questionnaire was a modification of The Questionnaire of Information-seeking behaviors of professionals and information sources in IPSP (22). The questionnaire answer options were

in the Likert scale form with a range of 1 to 5 (never-seldom-sometimes-often-always).

The questionnaires used in this study underwent content validity, face validity, and reliability testing. It was distributed to an online community that has similar characteristics to the main target of the research. Thirty respondents completed it over two weeks. Validity and reliability were tested using Stata 13 software. The validity of all instruments was assessed using Pearson product-moment correlation. The valid items were then examined for reliability using Cronbach's Alpha for the social support instrument (15 items) with a value of 0.910 (reliable), the information processing paradigm instrument (10 items) with a value of 0.780 (reliable), e-health literacy instrument (13 items) with a value of 0.725 (reliable), and community participation instrument (7 items) with a value of 0.820 (reliable).

Data Analysis

Data analysis used Stata 13 software to examine the effects of 15 variables (age, education, ethnicity, occupation, personal income, family income, number of gadgets owned, number of social media owned, total healthcare facilities, total vehicle access, distance from participant's house to healthcare facilities, social support, community participation, the information process paradigm, and e-health literacy). A univariate analysis was used to see the distribution of the subject's characteristics. Path analysis was used to draw the effect of the independent to the dependent variable so that it can show the path determinant's influence on e-health literacy. Path analysis based on literature is an extension of multiple

regression that, in particular, can examine situations in which there are several final dependent variables and those in which there are "chains" of influence. It is potent for examining complex models and comparing different models to determine which best fits the data (23).

Results

Respondents Characteristics

This research involved 117 female respondents of various ages, educations, ethnicities, and occupations, as described in Table 1.

Table 1. Respondents Characteristics

Characteristics		n (117)	%
Age (Mean±SD)		35.8 ± 6.9	
Education	Yunior High School	7	6
	Senior High School	39	33.3
	Diploma/Bachelor	49	41.9
	Postgraduate	22	18.8
Ethnic	Java (Javanese, Sundanese, Betawi)	66	56.4
	Sumatera (Palembang, Minangkabau, Malay, Batak, Mandailing, Komerling, Simalungun)	41	35
	Balinese and West Nusa Tenggara (Sasak)	3	2.6
	Sulawesi (Muna, Bugis, Toraja, Tolaki)	3	2.6
	Borneo (Dayak) and Chinese	4	3.4
Occupation	Private sector employee	37	31.6
	Entrepreneur	12	10.3
	Unemployment	61	52.1
	Government employee	7	6
Personal income	< IDR 1.500.000,00 (±96 USD)	47	40.2
	IDR 1.500.000,00 (±96 USD)- s/d Rp. 5.000.000,00 (±325 USD)	53	45.3
	> IDR 5.000.000,00 (±325 USD)	17	14.5
Family income	< IDR 1.500.000,00 (±96 USD)	15	12.8
	IDR 1.500.000,00 (±96 USD)- s/d Rp. 5.000.000,00 (±325 USD)	64	54.7
	> IDR 5.000.000,00 (±325 USD)	38	32.4
	Number of gadgets (Mean±SD)	1.4 ± 0.6	
	Number of social media (Mean±SD)	3.7 ± 1.7	
	Number of health care services (Mean±SD)	3.6 ± 2.2	
	Number of vehicle access (Mean±SD)	1.7 ± 1.1	
Distances to health care services	< 1 km	21	18
	1 km - 5 km	90	76.9
	> 5 km	6	5.1
	Health literacy (Mean±SD)	31.5 ± 6.1	
	Community participation (Mean±SD)	2.8 ± 2.34	
	Social support (Mean±SD)	61.1 ± 11.6	
	Information process paradigm (Mean±SD)	39.4 ± 6.8	

Table 1 shows that respondents are an average of 36 years old. Most of the respondents have a Diploma/bachelor's degree (41.9%); ethnic of Java (Javanese, Sundanese, Betawi) (56.4%); Unemployment (52.1%); the distance from home to health care is 1 km - 5 km (76.9%); personal and family income of IDR. 1,500,000 (± 96 USD) up to IDR. 5,000,000 (± 325 USD) (45.3% & 54.7%); having four social media and one gadget; having four health care facilities;

having two access vehicles; social support score of 61.1, community participation score of 2.8; the information process paradigm score is 39.4; and a health literacy score of 31.5.

Path Analysis Results

The results of path analysis illustrate the path of determinants' influence on e-health literacy shown in Figure 1 and Table 2.

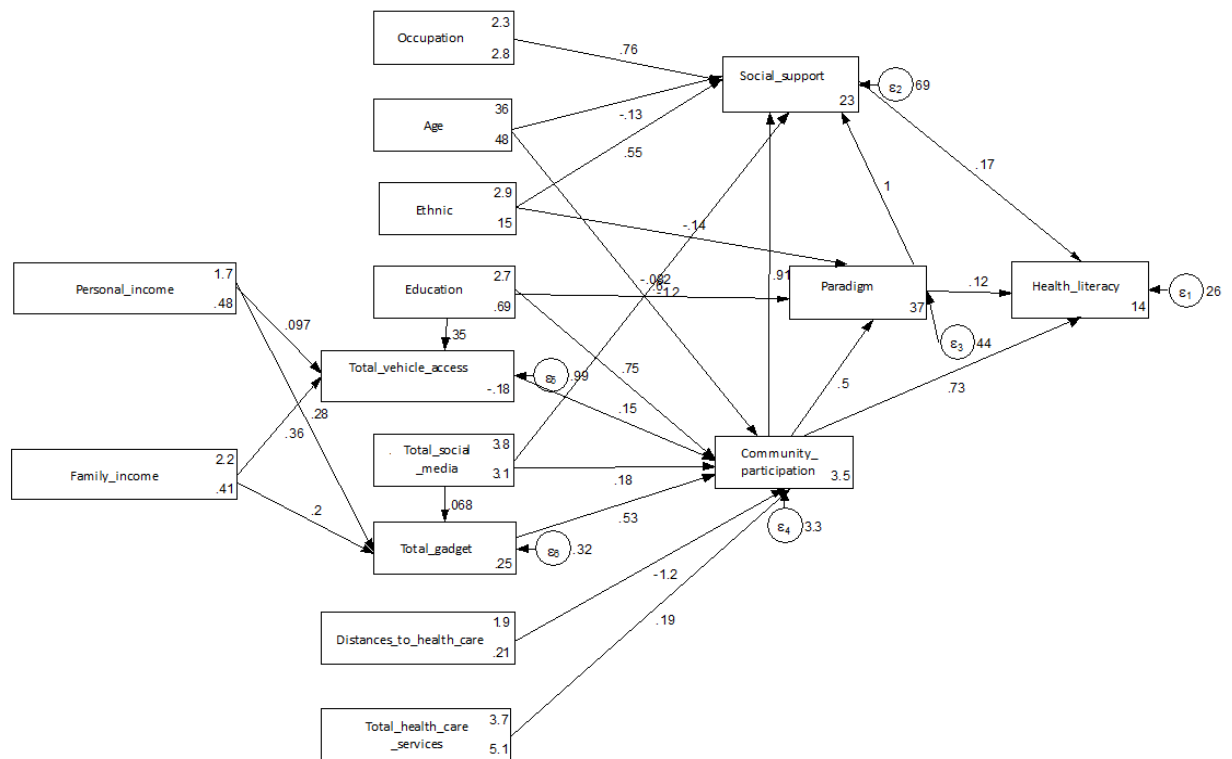


Figure 1. Path analysis result

In this study, path analysis examines the effects of 15 variables, comprising six endogenous variables and nine exogenous variables. The degree of freedom (df)=35; root mean square error of approximation (RMSEA)= 0.048; comparative fit index (CFI)= 0.943; and Tucker–Lewis index (TLI)= 0.915 indicate that path analysis can be performed.

The degree of freedom (df) is defined as the number of manifest variables in the PLS path model and as the number of independent variables to estimate the model-implied covariance matrix (24). RMSEA is an absolute fit index that assesses how far a hypothesized model is from a perfect model. On the contrary, CFI and TLI are incremental fit

indices that compare the fit of a hypothesized model with that of a baseline model (i.e., a model with the worst fit) (25).

The results of the path analysis showed that social support and community participation had a significant positive direct effect ($p < 0.05$) on e-health literacy. The community

participation, paradigm variables for processing information, ethnicity, number of social media owned, age, education, distance from home to healthcare facilities, and number of healthcare places significantly indirectly affect e-health literacy ($p < 0.05$).

Table 2. Path Analysis Results

Dependent Variable	Independent Variable	B	Confident interval (95%)		p
			Lower limit	Upper limit	
Direct effect					
Health literacy	Social support	0.171	0.067	0.274	0.001*
	Information process paradigm	0.115	-0.060	0.292	0.198
	Community participation	0.732	0.322	1.142	0.000*
Indirect effect					
Social support	Information process paradigm	1.045	0.816	1.273	0.000*
	Community participation	0.912	0.190	1.635	0.013*
	Occupation	0.755	-0.175	1.686	0.112
	Age	-0.131	-0.362	0.101	0.269
	Ethnic	0.549	0.149	0.949	0.007*
	Number of social media	-1.175	-2.081	-0.270	0.011*
Community participation	Number of vehicle access	0.154	-0.184	0.492	0.372
	Number of gadgets	0.532	-0.018	1.081	0.058
	Age	-0.083	-0.132	-0.033	0.001*
	Education	0.748	0.307	1.189	0.001*
	Number of social media	0.185	-0.019	0.388	0.075
	Distances to health care services	-1.156	-1.899	-0.414	0.022*
	Number of healthcare services	0.188	0.027	0.349	0.022*
Information process paradigm	Community participation	0.504	-0.042	1.049	0.071
	Ethnic	-0.138	-0.449	0.174	0.386
	Education	0.595	-0.932	2.122	0.445
Number of vehicle access	education	0.352	0.124	0.580	0.003*
	Personal income	0.097	-0.259	0.453	0.592
	Family income	0.358	-0.019	0.737	0.063
Number of gadgets	number of social media	0.068	0.009	0.128	0.023*
	Personal income	0.278	0.079	0.477	0.006*
	Family income	0.199	-0.017	0.416	0.071

*Significant

The results of the path analysis showed that social support and community participation had a significant positive direct effect ($p < 0.05$) on e-health literacy. The community participation, paradigm variables for

processing information, ethnicity, number of social media owned, age, education, distance from home to healthcare facilities, and number of healthcare places significantly indirectly affect e-health literacy ($p < 0.05$).

Discussion

The importance of women's empowerment in e-health literacy has been acknowledged as a crucial element. Nevertheless, the outcomes of these studies vary depending on some determinants. The results of the path analysis show that social support and community participation have a positive direct effect on e-health literacy. Social support in the community has a positive impact on individual e-health literacy. Encouragement from family, friends, and community members can contribute to an increased understanding of health information and better decision-making abilities regarding health. Active participation in the health community also positively impacted e-health literacy. Participating in community activities such as workshops, discussions, and meetings can increase knowledge, skills, and awareness about health issues. Avogo says direct participation in voluntary communities is associated with good health status (26).

Social support and community participation enable individuals to change to positive health behavior. A study stated that social engagement increases trust and a sense of coherence and identity, which are central to the production and maintenance of well-being (7). On the other hand, community participation, information processing paradigm, ethnicity, and the number of social media owned through social support significantly influence e-health literacy. The information processing paradigm does not directly affect e-health literacy but can significantly impact e-health literacy when mediated through social support. It indicates that social support plays a crucial role in e-

health literacy. The literature stated that the critical and reflective information processing paradigm can encourage higher health literacy in understanding health information and making better health-related decisions. According to Nielsen-Bohlman, seen from a public health perspective, health literacy is now a requirement for individuals and groups as health systems continue to make more complex demands on consumers and expect greater understanding from them (27).

Social support was newly identified as a factor influencing health literacy among patients undergoing breast cancer treatment. The health literacy level of patients undergoing breast cancer treatment should be assessed, and nursing interventions to improve health literacy should be developed for the low-level health literacy group. Policy and institutional-level strategies to strengthen social support must also be developed in the interventions to improve e-health literacy (19). Empowering Indonesian women needs collaboration among empowerment programs from the government as the policymakers and infrastructure builders; non-governmental organizations as the initiators/creators of women's empowerment actions; and from communities as the developers to support and expand Indonesian women's empowerment directly, especially to reach out to Indonesian women who live in rural areas (16). Incorporating policies and institutional-level approaches into interventions is imperative for enhancing social support and advancing e-health literacy (19).

The amount of social media owned by an individual can also affect health literacy.

Freeman et al. stated that social media is a promising tool for health promotion; however, as was evident during the COVID-19 pandemic, social media also has the potential to spread health miscommunication. It has significant implications for individual health, given that health content on social media influences their health decisions and behaviors (28). Suanrueang et al., in their research, state that things learned through social media can defend us from other emerging infectious diseases. Social media is considered worthy, timely, and easily accessible and prioritizes the availability of health information in electronic form on various platforms to educate people to protect themselves from the spread of disease (29).

Other variables that indirectly impact e-health literacy are age, education, distance from home to health service, and the number of health service places. These variables can influence e-health literacy when mediated through community participation. A previous study showed that education is one of the most important determinants of women's empowerment because it was correlated with knowledge of marriage and the autonomy to engage in discussions about fertility and reproductive health issues among young girls. Most of the studies indicated that women with higher education and employment had greater empowerment in decision-making, which in turn contributed to reduced fertility rates and improved healthcare-seeking behaviors within the family (13).

Based on the author's observation on social media, during the COVID-19 pandemic, hoaxes about health are increasingly

circulating, including COVID-19 only attacking the elderly, alcohol spray all over the body can kill the coronavirus, healing COVID-19 with coconut shell smoke, the COVID-19 vaccine can increase the size of male genitalia, and others. During this pandemic, turbulence of information via the internet occurred with rapid disinformation and misinformation in the form of manipulated content, wrong content, wrong connections, fake content, imitation, misleading, and satire or parody. According to Purnamasari et al., the rampant circulation of hoax news on social media from time to time shows that amidst the abundance of available information, people still need to develop good digital skills fully. Most users take advantage of the features on their devices to communicate, including sharing messages in the chat column, without checking the correctness of the information first. Hoax news is fake news and has not been proven true (30).

One way to deal with health hoaxes is by empowering women to increase e-health literacy skills. A literature stated that women are the most vulnerable group to receiving hoax news. More than that, they are also transmitters of spreading hoaxes through their families and communities. The background of hoax circulation among women is ignorance and inability to recognize the media credibility; lack of understanding of the hoax concepts, characteristics, and ways to distinguish; women do not know how to check facts of the news, and they do not understand the risks of spreading fake news via the internet. In conclusion, women are often trapped in hoaxes due to a lack of digital literacy (30), so researchers, healthcare

professionals, and other stakeholders need to recognize that the publication of high-quality, evidence-based health information is often insufficient to reach individuals. It is necessary to explore how social and psychological factors such as identity and beliefs influence individuals' engagement with health content on social media (28).

The unique finding of this study is that the variable of age does not directly affect e-health literacy when mediated by social support. However, it significantly influences e-health literacy when mediated through community participation. Regarding the reason people hang out online, a study tried to explain that across 27 communities in five different broad types, 569 different reasons from 399 people indicated that most sought either friendship or exchange of information, and a markedly lower percentage sought social support or recreation (31).

A study in Bangladesh found that empowerment factors such as women's education, working status, involvement in household decision-making, participation in economic decision-making, and freedom in movement influenced fertility and reproductive health status (13). In empowering women, adequate health literacy is associated with many health outcomes, including reduced morbidity and mortality and a lower likelihood of using emergency room services (7). Health literacy should be a central strategy policy for bridging health inequalities, especially in developing countries (8). The government, through the Ministry of Women's Empowerment and Child Protection and the Ministry of Communication and Informatics in Indonesia, should pay more attention to

Indonesian women in their digital access and digital media literacy development because women play essential roles in educating children, improving the quality of families, and developing their nation (16).

Conditional on other household and community characteristics, community-level ethnic diversity is positively associated with various child health outcomes and attitudes towards modern healthcare and women's empowerment (32). The culture shared by various ethnic groups also has the potential to influence health beliefs, the concept of health and illness, and how to interpret health messages. Culture will also influence patterns of seeking health services and various health myths that apply in everyday life (33,34).

In the study that focuses on the prenatal period, low health literacy is associated with socio-economy, including education, employment, ethnicity, and age (14). Age and socio-economic determinants are associated with pregnant women's health literacy. Education, employment, and ethnicity increase the risk of low health literacy in the prenatal period. Interactive health literacy in the prenatal period includes active technology engagement (e-health Literacy), social networks, interaction with health professionals, and group antenatal care and interactions (14). Full-time employment status, higher family monthly income, higher education level, and greater social support were significant predictors of e-health literacy, accounting for 40.2% of the total variance (19). Through determinants that influence e-health literacy identification, hopefully, it will be the first step in creating

an appropriate e-health literacy improvement program.

Study Limitations and Strengths: The authors acknowledge that this path analysis was limited to gender (only in female virtual health communities) and age (20-45 years old). Further follow-up may be needed by using focus group discussions or in-depth interviews. Besides the limitation, this research has strength in a sample of women as the spearhead of the next generation. By looking at the factors that influence women's e-health literacy, we hope to see what they need to become empowered in their digital literacy abilities.

Conclusion

In e-health literacy, factors such as community participation, information processing paradigm, individual demographics, number of social media, distance from home to health service, and availability of health service places play a crucial role in empowering and shaping women's e-health literacy levels. Understanding these factors can assist in designing e-health literacy programs that are effective and relevant to the target population.

Future research should pay more attention to the determinants that influence e-health literacy programs regarding empowering women so that the program can run well.

Expanded research is needed to identify a more diverse range of online communities or social media platforms (such as Facebook, X, and TikTok) and instant messaging applications (like Telegram or dating apps) to target a more diverse audience (such as teenagers and the elderly) and address more specific themes such as nutrition, non-

communicable diseases (Diabetes, hypertension, heart disease, and others), Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS), sexually transmitted infections, environmental health, and others.

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Conflict of interest: The authors declare that there is no conflict of interest.

Consent for publication: Not applicable.

Ethics approval and consent to participate: This research was done by the Declaration of Helsinki and was approved by the research ethics committee at the Faculty of Medicine, Universitas Sebelas Maret, Surakarta, Indonesia (UNS No:20/UN27.06.6.1/KEP/EC/2021). Before obtaining the data, all participants signed informed consent.

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