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The COVID-19 Infodemic: Women and Digital (Health) Literacy

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Abstract

The COVID-19 infodemics and gender make it challenging to promote science and health via social media. The objective of this study is to analyze the effects of infodemic exposure on women and men. We argue that an inclusive society is equipped with reliable digital literacy that enables women and men to participate in preventing COVID-19. This quantitative research carried out a survey in June–September 2020, with 440 social media users as respondents in Bali, Indonesia. The approach aims to evaluate attitudes regarding the COVID-19 infodemics. We calculated an error margin of less than $\pm 5\%$ at a level of confidence of 95% by combining the online questionnaires and survey analyses. According to the official website of Indonesia's Ministry of Communications and Information, users are grouped based on their age. For sample distribution, trends, and cross-tabulation, a Statistical Package for the Social Sciences was also used. We discovered that women are more inclined than men to accept the material in the COVID-19 infomercials as accurate. Men were more likely to practice the advice given in the infodemics than women, despite the fact that women believed the infodemics to be factual. However, more women than men reported being likely to spread the erroneous information, which indicates that women are more likely than men to do so. When given incorrect information about COVID-19, both men and women react almost exactly the same. When putting the COVID-19 advice into practice, male and female respondents responded in the same way. To empower individuals to disrupt infodemic flows, COVID-19 needs to promote the digital literacy of both men and women.

Keywords: COVID-19, Digital Literacy, Health Promotion, Infodemics, Women

1. Introduction

The World Summit for Social Development coined the term “inclusive society” to describe a society for all, in which every individual, each with rights and responsibilities, plays an active role (UNDESA, 2008). The COVID-19 presents challenges for society to adapt to any way of life, including digital epidemic behaviors. Worldometers has released the number of COVID-19 cases in the global reach (November 2020): 60 million cases, 1.5 million deaths, and 45 people recovered. The new cases every day are around 500.000, with 8.436 deaths each day. This number has been increasing since the pandemic hit the world. The virus is affecting 218 countries around the world.

Eysenbach (2002) argued that infodemiology concerns over infodemics or outbreaks of misinformation are almost as old as the World Wide Web itself. This new emerging research discipline and methodology elaborates on the determinants and distribution of health information and misinformation—which may be useful in guiding health professionals and patients to quality health information on the Internet. The World Health Organization (WHO) describes the infodemic as an overabundance of information, both online and offline. To undermine the public health response, the information attempts to be false. WHO (2020) emphasizes that this epidemic situation may be more dangerous for people with physical and mental health problems. It can even endanger countries' ability to stop pandemics. In September 2020, there was a joint statement by WHO, UN, UNICEF, UNDP, UNESCO, UNAIDS, ITU, UN Global Pulse, and IFRC on "Managing the COVID-19 Infodemic: Promoting healthy behaviors and mitigating the harm from misinformation and disinformation." In March 2020, the Spanish government declared war on hoaxes. After the government declared war on COVID-19 fake news, citizens began to become aware of and look for information related to false information (Gracia et al., 2020). This outbreak was extremely concerning. In April 2020, the UN Secretary-General will submit the United Nations Communications Response to counter the deployment of the infodemic. In the next month, the United Nations also launched a guidance note on addressing and countering COVID-19 related to hate speech, and a WHO member issued Resolution WHA 73.1 regarding the COVID-19 response. These findings demonstrated that controlling the epidemic is critical in this pandemic era. According to the WHO, false information causes public distrust, a lack of trust in testing, and a decrease in immunization campaigns, allowing the virus to thrive. It costs the lives of many people.

This pandemic is spreading widely through the digital sphere. There are too many sources and sites that obtain information about COVID-19, but many of them give incredible information such as misinformation or rumors (Karasneh et al., 2020). The digital sphere is being used in two ways: as a large-scale media to keep people safe, informed, and connected during the pandemic, and as a tool to spread information globally. Korea uses digital technologies to integrate containment and mitigation strategies effectively (Heo et al. 2020). Video applications such as YouTube can be a valuable tool in providing information on COVID-19, but they can also disseminate misinformation. False beliefs or misperceptions disseminated via YouTube can spread mistrust toward authorities, generate confusion, and heighten public anxiety. YouTube can be a powerful tool to keep the public informed during a crisis in a controlled and reassuring manner. However, to do so, accurate information must be made available on such platforms. Therefore, governments should have a stronger presence on social media and produce more online videos to reach a wider audience (Moon & Lee, 2020). For these reasons, social media can be a powerful weapon in spreading epidemics and can be destructive to public health efforts, especially during a pandemic. Abd-Alrazaq et al. (2020) suggested that governments and health systems should also "listen" to or monitor the tweets from the public that relate to health, especially in a time of crisis, to help inform policies related to public health (e.g., social distancing and quarantine) and supply chains, among many others.

Health literacy has many dimensions, including what it means to be able to read, understand, and communicate important medical and health information during different phases of life. Health literacy is central to multiple health system priorities, including quality, cost containment, safety, and patients' involvement in health care decisions (Parker *et al.*, 2003). Information and communication technologies (ICTs) play a role in network theory research, where target audiences are a major contributor to the online health communication arena, shaping the conversations with individual sentiments and social engagements (Roberts et al., 2017). This current study suggests the importance of digital health literacy for women and men in preventing infodemics. In response to the COVID-19 infodemics, we conducted online questionnaires, SPSS analysis, and survey analysis of social media users' behaviors. This study aims to provide insight into how digital literacy among men and women needs to be improved for the purpose of breaking infodemic flows.

2. Method

The research was quantitative, conducted by conducting a survey of 440 social media users in Bali, Indonesia, between June and September 2020. SPSS, online questionnaire analysis, validity, and reliability testing Demographic variables of interest in this study comprise gender and age (17–60 years old). The behavioral variables of interest are social media usage, which will be used to determine how respondents reacted when they

were exposed to false information about the COVID-19. There were various types of false information in different contexts, such as health, national policy, other country policies, the impact of the COVID-19 on tourism, places to avoid due to the COVID-19, and lockdowns issued in some places.

There were 12 false statements in some questions to all the respondents, such as: "Did they believe them?", "Did they practice what has been suggested in the information?", and "Did they share and verify the information they received?". The false information being tested is that: 1) Drinking water every 15 minutes will make the virus drift to our digestion, 2) The COVID-19 would die if it were exposed to the sun, 3) Hot lemon tea can cure people who get infected by the COVID-19, 4) We can simply test if we get infected by holding our breath for 10 seconds, 5) We will be immune to COVID-19 if we eat a boiled egg, 6) A thermogun aimed at our brow will cause brain damage, 7) You should not go to Renon Square because a lot of people have been infected, 8) Vladimir Putin released 800 tigers and lions to make people in Russia stay at their homes, 9) A list of hotels being sold due to bankruptcy because of COVID-19, 10) Bali will be lockdown, 11) Access to Bali from Java has been restricted, and 12) Policy to obtain the requirement to receive free electricity. We tested the information on all of the women and men in the sample. The data were processed with SPSS to obtain a distribution sample, trends, and a cross-tabulation.

The Pearson correlation product with two-tailed significance was used to test the data's validity. According to the validity test, all questions were declared valid, so the r count was greater than r . The reliability test result using SPSS shows that the number of Cronbach's alphas is 0.820 from 48 questions. It was above 0.6, so the data can be used and is reliable. The data were compared after processing to see how men and women responded differently. This paper is discussing how women react when exposed to infodemics or false information about COVID-19.

Denpasar's population ranges from 15 to 25 years old, with high school and undergraduate education being the most recent. The occupations are quite diverse, dominated by private employees at 27.3%, followed by college students at 22.3%, and entrepreneurs at 15.3%. Denpasar people have various incomes; however, 24.8% of them earn between IDR 2.500.000,00 and IDR 4.000.000,00; 24.3% of them earn IDR 1.000.000,00 to IDR 2.500.000,00; and 21% of them earn IDR 500.000,00 to IDR 1.000.000,00 per month.

There are various social media platforms. Social media: Facebook is the most widely used, with an ownership rate of 76.3%, followed by Instagram at 70%, YouTube at 66.8%, Twitter at 66.8%, and TikTok at 22%. For message services, WhatsApp is the most widely used in Denpasar, reaching 97% of the population, followed by Facebook Messenger (56.3%), LINE (55%), and Telegram (41.5%). According to 39% of the population, most people in Denpasar spend 2 to 4 hours per day on the internet, followed by 25% who spend 4 to 8 hours per day, 19% who spend less than 2 hours, and 16% who spend more than 8 hours.

3. Results

We measured and analyzed how people reacted due to the COVID-19 epidemic by comparing how women and men responded. We asked some questions, such as, "Did they believe them?" and "Did they practice what has been suggested in the information?" and "Did they share and verify the information they received?"

According to misinformation about the COVID-19, women have a higher number than men. Women tend to believe it more than male respondents. For almost all of the 12 false information items, the number of female respondents who believed it was true was higher than the number of male respondents. Even though there are some issues, men and women have the same number, such as the information that talks about the COVID-19 dying if exposed to the sun, and if we eat boiled eggs, we will be immune to the COVID-19. Only in one data set was the number of male respondents likely greater than the number of female respondents. It was about a list of hotels that were being sold due to bankruptcy because of COVID-19 (Table 1).

Table 1: Percentage of respondents that believing the false information about COVID-19

Infodemics	Women	Men
Drinking water every 15 minutes will make the virus drift to our digestion.	11%	8%
The COVID-19 would die if it were exposed to the sun.	41%	41%
Hot lemon tea can cure people who get infected by the COVID-19	19%	14%
We can simply test if we get infected by holding our breath for 10 seconds.	9%	7%
We will be immune to COVID-19 if we eat a boiled egg.	3%	3%
A thermogun aimed at our brow will cause brain damage.	6%	5%
You should not go to Renon Square because a lot of people have been infected.	13%	9%
Vladimir Putin released 800 tigers and lions to make people in Russia stay at their homes.	6%	5%
A list of hotels being sold due to bankruptcy because of COVID-19	13%	15%
Bali will be lockdown	14%	13%
Access to Bali from Java has been restricted	34%	32%
Policy to obtain the requirement to receive free electricity	19%	17%

Female respondents are more likely than male respondents to believe the COVID-19 infodemics are true, according to Table 1. Despite the fact that female respondents believed the information to be true, male respondents were more likely than female respondents to put the information into practice. Drinking water every 15 minutes to keep the virus from drifting to their digestion, eating boiled eggs to be immune from COVID-19, and not checking their body temperature with a thermogun in the forehead are the issues that men practice more than women. Women respondents are more likely to have problems drinking lemon tea on a regular basis, and they did not visit Renon Square because there are a lot of infected people there. issues or information with the same number is that they hold their breath for 10 seconds to see if they have the virus or not (Table 2).

Table 2: Percentage of respondents who practicing what has been suggested in the false information about the COVID-19

Advices	Women	Men
Drinking water every 15 minutes will make the virus drift to our digestion.	22%	23%
Hot lemon tea can cure people who get infected by the COVID-19	47%	39%
We can simply test if we get infected by holding our breath for 10 seconds.	22%	22%
We will be immune to COVID-19 if we eat a boiled egg.	8%	13%
A thermogun aimed at our brow will cause brain damage.	2%	8%
You should not go to Renon Square because a lot of people have been infected.	24%	21%

Table 2 shows that there is no difference in the reactions of male and female respondents to the information suggested in the COVID-19. However, when it comes to spreading information, the number of women respondents who are likely to share infodemics outnumbers the number of men respondents who share false information. In almost all of the 12 false pieces of information, the number of female respondents who shared the false pieces of information was greater than the number of male respondents. Even though there are some issues, men and women have the same number, such as false information that they should not go to Renon Square because a lot of people have been infected there. There are four false statements: that the number of male respondents is likely to be higher than the number of female respondents. It was about a list of hotels being sold due to bankruptcy as a result of COVID-19, how pointing a thermogun in our forehead will damage our brain, how access to Bali from Java has been closed, and how Bali will be placed under lockdown (Table 3).

Table 3: Percentage of respondent who shared the information

Infodemics	Women	Men
Drinking water every 15 minutes will make the virus drifting to our digestion	10%	6%
The COVID-19 would die if it exposed to the sunshine	28%	26%
Hot lemon tea can cure people who get infected by the COVID-19	15%	12%
We can simple test do we get infected by holding our breath for 10 seconds	7%	3%
If we eat boiled eggs, we will be immune from the COVID-19	4%	2%
Pointing thermogun in our forehead will damage our brain	4%	6%
Should not go to Renon square because a lot of people have been infected	9%	9%
Vladimir Putin released 800 tigers and lions to make people in Russia stay at their home	4%	2%
List of hotels being sold due to bankruptcy because of the COVID-19	6%	8%
Bali will be lockdown	8%	12%
Access to Bali from Java has been restricted	14%	15%
Policy to get electricity free obligation	12%	9%

Table 3 shows women are more likely to share false information through social media than men. Before sharing the information, we should verify it first. According to the COVID-19, more than half of the respondents, both men and women, were checking or verifying the information they received. It shows that both women and men have a mutual awareness of the need to check or verify the information they get. Data also show that a higher percentage of women than men do not verify the information.

Table 4: Percentage of Respondents Checking/Verifying Information About the COVID-19

Sex		Checked and verified the information about COVID-19			Total
		Yes	No	Sometimes	
Men	Men	54%	7%	37%	100%
	Women	53%	8%	37%	100%

Table 4 shows that the reasons given by men and women respondents for verifying the information are nearly identical. Most of them thought it was important to verify the information because they were aware that there was a lot of false information on social media about COVID-19. There were 32 % of respondents, both men and women, who were skeptical, so they did not easily believe all the information they got.

Table 5: Reason Why Respondents verified the information

Sex		The reason why verified the information				Total
		There were a lot of false information	Source is lack of competence	The information unbelievable/	I do not believe easily	
Men	Men	45%	11%	12%	32%	100%
	Women	46%	8%	13%	32%	100%

Health literacy was coined in 1974 by Simonds (Frisch, et.al., 2012) at a health education conference discussing health education as a social policy issue. Media literacy, information literacy, science literacy, cultural literacy, and political literacy are needed to retrieve dimensions included in the concepts of these domains and to understand how health literacy research can profit from the dimensions. The women expressed a reluctance to send images to healthcare providers. This is because some women believe that images of women should not be circulated among men who are not direct relatives (e.g., husbands, sons, brothers). Another cultural consideration relates to how men should be integrated in the design processes related to their wives' health (Talhouk, et al., 2016). As seen in Table 5, both men and women are motivated to verify infodemics and lack competence in information sources that lead to 'do not believe easily'. Verifying means comparing the old and the current ones to distinguish and filter the infodemics. Finding appropriate languages and innovative approaches to dealing with infodemics are two of the challenges that health professional educators face.

Table 4 shows both women and men have almost the same reaction when receiving false information about the COVID-19. Even though most of the respondents verified and checked the false information, there are still people in Denpasar who believe the information to be verified and checked the false information. Women are more likely than men to believe false information, and women are more likely than men to share false information with other social media users. But men practice the false information they get more easily than women. Women have a greater role to play in stopping the pandemic by not easily sharing false information and increasing awareness to verify every piece of COVID-19 information they receive. Meanwhile, the digital divide and health information could be tackled by 1) using more sources of information (magazines, books, television, radio, and interpersonal resources), 2) using a variety of search strategies in addition to googling, 3) judging the information on the internet more critically and using more criteria for evaluating health information, and 4) experiencing more outcomes and a higher level of satisfaction because of using the internet (Neter & Brainin 2012). There are four important aspects of health literacy. First, people need to not only be able to obtain relevant health information, but they must also possess the motivation to do so. Second, the health-literate individual will be able to understand the information that he or she is motivated to gather. Third, health literacy also involves the confidence and competence to utilize health information. Finally, these definitions suggest that possessing the motivation and ability to gather, understand, and use health information in the appropriate ways should have a positive impact on health and wellbeing (Bodie & Dutta, 2008). Nowadays, most people spend time on social media platforms. In this article, we discuss how the flow of health information during COVID-19 can be widely distributed by Facebook, followed by Instagram, YouTube, Twitter, and TikTok. How can we absorb all of the information presented in such a short period of time? Collaborations of health educators, scientists, governments, physicians, and citizens are needed to prevent the digital divide and infodemics.

4. Discussions

Salathé (2018) predicted infodemics, or false information, about pandemics spreading through the digital sphere. The amount of data generated on the internet, particularly on social media, is rapidly increasing, which is helping to fuel the growth of digital epidemiology. The implementation of digital epidemiology into the daily workflow of public health authorities is perhaps the key goal of digital epidemiology in the future. Therefore, the field needs to focus on finding ways to make data openly accessible, at least to health authorities and researchers, and ideally to the community at large.

Eysenbach (2020) defined infodemics as part of infodemiology, an important emerging scientific field and critical area of practice during a pandemic. He posted four pillars of infodemic management: (1) information monitoring (infoveillance); (2) building eHealth literacy and science literacy capacity; (3) encouraging knowledge refinement and quality improvement processes such as fact checking and peer review; and (4) accurate and timely knowledge translation, minimizing distorting factors such as political or commercial influences. The current infodemic is a crisis to distill the sheer quantity of information, which is occurring on four levels: (1) science, (2) policy and practice, (3) news media, and (4) social media. The use of digital interventions can also help people who are traumatized by the disruption caused by this pandemic. They also inform governments, health professionals, agencies, and institutions on how to react to the current COVID-19 pandemic as well as future pandemics (Oyebode et al., 2020). consumptions based on the most recent COVID-19 information provided by scientists that

flows in a circular fashion from one node to another. Understanding and filtering information before sharing it with contact lists can be proposed as a potential solution to reduce the risk of infodemics.

It is important to consider how to continue to use social media in a positive way as a public teaching tool to raise awareness about the interprofessional team and the different roles and possible variations of professions involved in the delivery of healthcare (El-Awaisi, et al., 2020). The main difference is that, whereas most traditional health technologies required a health professional gatekeeper to gain access, digital health interventions have a greater direct impact on patients. There is still a paucity of research and evaluation of digital technologies for health (Azzopardi-Muscat & Sørensen, 2019). Another changing aspect is the shift to the human side of medicine. In the traditional setting of healthcare, patients were not involved in decision-making about their own health and disease management. Medical professionals had to take on the burden and all the responsibility concerning medical decisions and consequences. This insecurity and exposure to decisions out of their control served as the primary motivation behind patient empowerment that included the use of disruptive technologies, which were also becoming available (Meskó, et al., 2017). Meanwhile, telehealth services are currently provided through Zoom and Skype. As a result, ransomware like Maze, Mummy Spider, AZORult (information-stealing malware targeting coronavirus online map trackers), Zloader, and data theft and breach (visiting calls, hijacking video conferences, and phishing) are becoming more common (Hakak et al. 2020). Measures of information-seeking behaviors should be expanded to include the ability to assess the quality of the information one finds, as well as the ability to use this information to alter health behaviors (Rosenbau, et al., 2019). The complexity of the risks during the pandemic necessitates more assistance for internet users in consuming COVID-19-related information. Trends toward believing harmful conspiracy theories also potentially polarize society and drive violent extremism.

The stay-at-home policy increases the number of internet users, and COVID-19 has isolated people in many parts of the world. It makes people rely on information and socialization through social media such as Facebook, Instagram, and Twitter (Croucher, et. al., 2020). Wearesocial and Hootsuite recorded in October 2020, there are 4.66 billion people using the internet in the world, an increase of 7.4% compared to October 2019. There are 4.14 billion social media users worldwide, up 12.3% from October 2019. The netizen recorded 47% more time spent on social media and 46% more time on messenger services. There are more women than men who use smartphones or mobile phones. Facebook is the most popular social media platform. Women were more likely than men to have liked a post in the previous 30 days on Facebook. Women are more likely than men to comment on and click on Facebook advertisements. This figure applies to all age groups, from 25–34 years old to more than 65 years old. Wearesocial also recorded that women users are more likely to comment on Facebook than men, especially those who are between 35 and 65 years old. In the 45–54 age group, women are nearly three times more likely to comment than men. It shows that women are more active when using their smartphones compared to men.

As a result, women are more vulnerable to an infodemic than men. Women can spread the infodemic unknowingly, and not just by being exposed to it. Given that Kibbe (2020) highlighted the fact that women in COVID-19 are less aware of how this virus evolves, it may be vulnerable. Women with children may be conducting less research, participating in the management of fewer clinical trials, and engaging in fewer local, regional, or national committees and societies. The difficulties that women as parents face in providing clinical care are also significant. Women worried more about childcare, while men were more concerned about paid work and the economy. The COVID-19 pandemic is affecting women more heavily than men, not only at the physical level of work (e.g., but women are also reducing more paid work hours than men) (Czymara, et al. 2020). Kurnia et al. (2020) studies' in Indonesia said that women tend to ignore misinformation, even though each respondent responds in numerous ways to misinformation and hate speech depending on the context. Kurnia also found that the intensity of the use of WhatsApp is the strongest factor influencing digital competence. The more active use of WhatsApp predicts a higher score of digital literacy competence and a stronger correlation. As women's behaviors are shaped by socio-cultural and material practices that are embedded into their everyday lives, it is important that digital health design interventions carefully consider this embeddedness and experiential knowledge to explore the design space on how to support women's literacy on the COVID-19 in their ongoing efforts to navigate social relationships, information, and advice at different levels and from multiple sources (Bagalkot, et al., 2020). The social networks of men and women can be a tool to map and identify the most powerful node(s), who deliver information more

frequently than others. Digital methods and methodologies can be applied for further studies to tackle infodemics, cyberattacks, and conspiracy theories.

5. Conclusion

Women play important roles in disseminating this information to their families. As a result, when a woman becomes a mother, she becomes a reference point and a source of knowledge for the family. Their ability to break the infodemic chain that is harmful during this pandemic will increase if their digital literacy skills are improved. Women will be trusted parties and a place to verify families and children in addition to being able to distinguish between different types of information, particularly when it comes to false information about viruses that, if ignored, will reduce the effectiveness of government efforts to combat the virus while also decreasing public compliance with health protocols. The emergence of infodemics or incorrect information, revolves around the role of women. According to the principle of two-step flow communication, it's crucial to empower women and raise their digital literacy in order to stop the infodemic in the largest circle, namely the family.

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