





## The Role of Information Sources in Shaping Knowledge and Protective Behaviors Against Covid-19 Among Coffee Shop Visitors in Banda Aceh, Indonesia

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### Abstract

Covid-19 presented complex challenges for public health, not only due to the contagious nature of the virus but also because of widespread misinformation that hampers preventive efforts. In regions with strong communal interaction, such as Banda Aceh, Indonesia, informal social settings like coffee shops play a central role in the dissemination and discussion of health information. This study aimed to examine the relationship between information sources, risk knowledge, and protective behaviors among coffee shop visitors in Banda Aceh. A cross-sectional survey was conducted involving 829 respondents. Most participants were male (66.7%) and aged 17–25 years. The findings revealed that while social media was the most frequently used source of information, it did not significantly influence protective behaviors. In contrast, information from authoritative sources—such as government agencies, healthcare professionals, and scientific publications—was significantly associated with increased adherence to protective behaviors (OR = 1.694,  $p = 0.046$ ). Notably, those accessing scientific sources showed even higher likelihood of practicing protective measures (OR = 3.577,  $p = 0.046$ ), despite being a minority. The study also found that females and older individuals were more likely to engage in protective behaviors, aligning with global trends in health risk perception. Participants with higher exposure to risk-related information and better knowledge about Covid-19 exhibited stronger compliance with health protocols, including mask use, handwashing, and social distancing. These findings highlight the critical importance of credible information in shaping public health behavior. Effective risk communication strategies must not only prioritize accuracy but also consider the socio-cultural context, utilizing trusted local actors and informal settings like coffee shops as communication channels. Strengthening information literacy and tailoring messages to demographic characteristics are essential steps to enhance public compliance and resilience in future health crises.

Keywords: Covid-19, information sources, risk communication, knowledge, protective behavior, coffee shop.

### Introduction

The Covid-19 pandemic, which emerged in late 2019, has become a global crisis that triggered massive changes across the world and placed immense pressure on governments and public health authorities. The

provision of accurate and timely information to the public regarding Covid-19 is essential for effective pandemic management, as it helps enhance public understanding and awareness of the virus (Mohamad & Azlan, 2020; Mya et al., 2020). In contrast, misinformation surrounding Covid-19 has further exacerbated the health crisis. Consequently, efforts to control the spread of Covid-19 have required governments and health authorities to fight not only the virus itself but also an infodemic, which may, in some cases, pose an even greater threat (WHO, 2020).

In such crisis situations, public engagement is critical in mitigating the threats posed by the outbreak. Negative information bias can lead individuals or communities to develop a pessimistic outlook on their condition, whereas positive bias may foster unrealistic optimism. Both are common consequences and risks associated with infodemics (van den Broucke, 2020). The spread of misinformation can prompt inappropriate actions among the public, undermining the efforts of governments and health authorities, and even triggering panic or xenophobia. This issue has posed a substantial challenge both in Indonesia and globally in the management of the Covid-19 pandemic (Allahverdipour, 2020; Teluma, 2020). The consequences of misinformation during the pandemic have contributed to widespread panic and uncertainty (Banerjee & Rao, 2020), while also increasing public distrust toward the existence and severity of the virus (Shahsavari et al., 2020; Sallam et al., 2020).

Effective risk communication is vital in mitigating the spread of the virus (Reynolds & Quinn, 2008). Today, people have access to a wide array of Covid-19 information sources—including social media, mainstream media, and official government platforms. Therefore, it is important to understand how the public utilizes these different sources and the kinds of information they acquire, as these factors greatly influence both their knowledge and protective behaviors toward Covid-19.

To prevent further transmission, protective behaviors such as physical distancing, personal hygiene, and mask-wearing have been widely recommended. Countries across the globe implemented various mitigation strategies, including restrictions on public gatherings and stay-at-home policies for non-essential activities (Chernozhukov et al., 2021). However, the success of these strategies is highly dependent on the public's compliance. Governments must ensure that the public receives accurate information about the disease and adopts the recommended preventive behaviors (Azlan et al., 2020; Heydari et al., 2021; Abdelhafiz et al., 2020; Fridman et al., 2020).

This study was conducted in mid-2021 and focuses on patrons of coffee shops in Banda Aceh, the capital city of Aceh Province, Indonesia. Banda Aceh is widely recognized for its strong coffee shop culture (Zulfikar & Auliansyah, 2020). Socializing at coffee shops is a significant aspect of daily life in Acehese society, serving as venues not only for enjoying beverages but also for meeting friends and spending leisure time (Taqwadin et al., 2019; Hafasnuddin et al., 2019). In response to physical distancing regulations aimed at limiting Covid-19 transmission, the Banda Aceh city government issued regulations concerning dining venues, including coffee shops. Through its Covid-19 Task Force, the local government periodically intervened to disperse crowds at such establishments and even closed venues that violated distancing guidelines (merdeka.com, 2021). Previous research indicates that most people understand the risk of transmission in coffee shops and the importance of social distancing (Zulfikar & Auliansyah, 2020), making coffee shop visitors particularly vulnerable to infection.

However, public responses to these restrictions have varied, including distrust of government policies and outright denial of the virus—phenomena also observed in other parts of the world (Allington et al., 2021;

Bolsen et al., 2020; Teck & Chyong, 2020). Therefore, this study aims to investigate specifically the knowledge and protective behaviors of coffee shop visitors in Banda Aceh, with a particular focus on the influence of different information sources they consume.

Several studies conducted in Aceh highlight the importance of information sources in shaping protective behaviors during the pandemic. Putra et al. (2022) emphasized the role of Islamic education as an effective communication channel in raising awareness of health protocols. Meanwhile, Adamy and Rani (2022) revealed low levels of public satisfaction with the government's pandemic response, which may influence public compliance with health policies. Putra et al. (2021) also underscored the importance of effective government communication strategies in disseminating Covid-19 information to the Acehnese public.

The role of *ulama dayah* (Islamic scholars affiliated with traditional boarding schools) has been particularly strategic in promoting public health policies and fostering social solidarity during the pandemic (Muntasir et al., 2024). These religious figures function not only as information sources but also as enforcers of discipline and providers of psychological support for communities. Additionally, Rosemary et al. (2021) found that the public in Aceh predominantly relied on online media and television for Covid-19 information; however, inadequate information dissemination by the government contributed to the spread of hoaxes and diminished public trust. These findings reinforce the significance of credible information sources in shaping protective behaviors. Research by Chavarría et al. (2021) in Aceh also revealed a gap between public knowledge and actual protective actions, indicating that possessing knowledge does not necessarily translate into appropriate behavior. This finding forms an important foundation for exploring how information sources influence protective behavior more specifically among coffee shop patrons in Banda Aceh.

By synthesizing these various findings, this study seeks to provide a comprehensive understanding of how different sources of information shape the knowledge and protective behaviors of coffee shop visitors—an urban population characterized by high levels of social interaction—in Banda Aceh, Indonesia.

## Literature review

### *Credibility of Covid-19 Information Sources*

Lore ipsum Lore ipsum Lore During the Covid-19 pandemic, information circulated in society at an unprecedented rate, often referred to as an "infodemic." While some of this information was accurate, much of it was not, leading to confusion and making it difficult for the public to discern credible facts from misinformation (Garcia & Duarte, 2020; Mohammed et al., 2021; Azlan et al., 2020). The widespread dissemination of misinformation—such as claims that Covid-19 was man-made or originated in a laboratory in Wuhan—further exacerbated the problem (Aharon et al., 2021; Galvão, 2021; Cuan-Baltazar et al., 2020; Bolsen et al., 2020; Hartman et al., 2021). This situation significantly undermined risk mitigation efforts and posed a major challenge for public health authorities and governments in managing the pandemic effectively.

In this context, the credibility of information sources became a crucial determinant in shaping public understanding and attitudes toward protective behaviors. Credible sources have the potential to enhance comprehension and foster compliance with health protocols, while unreliable sources can fuel skepticism, distrust, and even promote behaviors contrary to public health guidelines (Rui et al., 2021; Li et al., 2020;

Sylvester, 2021). Broadly, information sources can be classified into two main categories: expert sources and non-expert sources. Expert sources include government agencies, health organizations (e.g., World Health Organization (WHO), Ministry of Health), and healthcare professionals, who possess the authority and competence to disseminate pandemic-related information. Non-expert sources, on the other hand, consist of social media, celebrities, influencers, and interpersonal networks such as family and friends. These tend to deliver informal and often unverified information. Reliance on non-expert sources tends to negatively affect the adoption of protective behaviors. Social media, in particular, has become a primary vector for the spread of false information about Covid-19 (Naeem & Bhatti, 2020; Al-Zaman, 2021; Obi-Ani et al., 2020). The lack of content moderation and quality control allows virtually anyone to become an information producer, regardless of scientific validity or expertise.

In the local context, Rosemary et al. (2021) found that people in Aceh were more likely to seek Covid-19-related information through online media and television. However, the same study revealed public skepticism towards direct information from government sources. This suggests that while the media plays a central role, perceptions of government credibility remain a challenge. This lack of trust is further corroborated by Adamy and Rani (2022), who found general public dissatisfaction with the local government's pandemic response, particularly regarding communication and information dissemination.

Meanwhile, Chavarría et al. (2021) identified a knowledge-action gap among Acehnese communities: high knowledge about Covid-19 was not always matched by corresponding preventive actions. This underscores the importance not only of delivering information but also of understanding how it is communicated and the perceived credibility of its sources. Thus, source credibility functions as a key mediating factor in influencing public behavior.

#### *Protection Motivation Theory and Risk Communication in Covid-19 Prevention*

The Covid-19 pandemic has forced governments worldwide to adopt a wide array of mitigation strategies, such as quarantine measures, social restrictions, bans on mass gatherings, and health protocols including handwashing, mask-wearing, physical distancing, and mobility limitations. The success of these strategies hinges on public compliance with protective behaviors recommended by health authorities. Such behaviors are instrumental in reducing infection rates and limiting the spread of the virus (Olaimat et al., 2020). In this regard, knowledge and awareness play a central role in shaping public attitudes and behaviors toward disease prevention (Dönges et al., 2022; Ye et al., 2020; Kaur et al., 2021; Teslya et al., 2020; Pan et al., 2022).

However, the effectiveness of these protective behaviors ultimately depends on public adherence. Authorities must ensure that the public receives accurate and reliable information to guide behavior. Knowledge has been shown to be a strong predictor of protective action. Awareness of the disease is closely linked to exposure to various information sources such as television, social media, and interpersonal networks like family and friends (Chavarría et al., 2021). Conversely, lack of knowledge has been associated with low adherence to health protocols (Azlan et al., 2020). Understanding risk—both in terms of severity and susceptibility—is critical in motivating individuals to adopt preventive actions (Khosravi, 2020; Ibuka et al., 2010).

To explain why individuals choose to engage in protective behavior, Protection Motivation Theory (PMT), developed by Rogers (1975), provides a relevant theoretical framework. PMT posits that protective behavior is the result of two cognitive processes: threat appraisal and coping appraisal. Threat appraisal consists of perceived severity (the seriousness of Covid-19) and perceived vulnerability (one's likelihood of being infected). Coping appraisal includes response efficacy (belief that the protective behavior is effective), self-efficacy (confidence in one's ability to carry out the behavior), and response cost (the perceived barriers or costs of taking protective action).

In the context of Covid-19, PMT suggests that the more individuals perceive the virus as a serious threat and believe in the effectiveness of protective behaviors (e.g., wearing masks, hand hygiene), the more motivated they will be to adopt those behaviors. Conversely, if individuals consider Covid-19 as a minor threat or see protective behaviors as ineffective or burdensome, their motivation tends to diminish (Ezati Rad et al., 2021). The effectiveness of PMT is also influenced by the source and delivery of information. This is where risk communication becomes critical. According to WHO (2020), risk communication is the timely, transparent, and trustworthy exchange of information between authorities and the public to support rational decision-making in the face of health threats.

The success of risk communication in shaping public behavior largely depends on the credibility of the information source. Studies by Karasneh (2021) and Gehrau et al. (2021) show that messages from credible sources—such as health professionals and official institutions—are more effective in increasing compliance with health protocols. In contrast, information from unreliable sources can reduce perceived risk and weaken public adherence (Naeem & Bhatti, 2020; Chou & Budenz, 2020). Karasneh (2021) also found that effective risk communication improves public awareness and compliance, especially when information is delivered through trustworthy and familiar channels. On the other hand, exposure to non-expert sources such as social media influencers or peers can lower risk perception and hinder the adoption of protective behaviors (Naeem & Bhatti, 2020; Chou & Budenz, 2020). Credible sources—such as government institutions, health professionals, and mainstream media—are more capable of fostering trust, enhancing public knowledge, and promoting adherence to health guidelines (Lin et al., 2020).

In Aceh, communication strategies grounded in local values and religious authority have proven effective. Research by Putra et al. (2021; 2022) demonstrates that Islamic educational institutions and *ulama dayah* serve as credible communicators who not only disseminate information but also reinforce community trust and promote adherence to protocols. Muntasir et al. (2024) further emphasize the strategic role of *ulama* as social change agents who build public confidence and psychological resilience during the pandemic. These findings highlight that credibility is not solely based on formal authority, but also on cultural and relational proximity to the local population.

In Acehnese society, coffee shops function not only as consumption spaces but also as venues for social interaction and information exchange. These interactions reflect informal communication dynamics that significantly shape public perceptions of health-related issues. Coffee shops may thus serve to amplify or distort health messages, depending on the credibility of the dominant voices within them. This underscores the complexity of the risk communication chain. Information from official authorities may not be directly accepted by individuals, but rather filtered through social discourse in informal settings like coffee shops. Consequently, it is essential to explore how coffee shop patrons—as representatives of informal social communities—interpret and respond to Covid-19 information, and how this affects their protective behaviors.

By integrating Protection Motivation Theory and risk communication approaches, this study constructs a comprehensive theoretical framework for understanding protective behavior during the pandemic. PMT offers a psychological lens through which to view individual threat responses and self-assessed coping abilities, while risk communication emphasizes the role of channels and source credibility in shaping perception and behavior.

This study also addresses a gap in the regional literature on Aceh. While studies such as those by Rosemary et al. (2021), Adamy and Rani (2022), and Chavarría et al. (2021) have explored the importance of information sources in shaping public perception and response, few have examined how this information is processed in informal social spaces such as coffee shops. Thus, this study not only complements existing research but also provides a more nuanced, context-sensitive contribution to understanding how information is produced, shared, and acted upon within micro-level community interactions.

In line with the credibility of Covid-19 information sources, the Protection Motivation Theory (PMT), and Risk Communication in Covid-19 Prevention as previously presented, the following research hypotheses can be formulated:

H1: There are significant differences in Covid-19 risk information, knowledge, and protective behaviors across demographic groups (age, gender, education, occupation) and coffee shop visitation frequency.

H2: Covid-19 information sources — particularly those from health authorities and scientific sources — significantly predict protective behavior after controlling for demographic variables (age, gender, education).

## **Methodology**

### *Design & Data Collection*

This study employed a cross-sectional design. The data analysis was conducted using IBM SPSS version 24.0. Data were collected through a survey technique involving questionnaires distributed to 840 respondents across various coffee shops as research samples. Following the selection process, only 829 questionnaires were included in the data analysis, as 11 questionnaires were deemed unusable due to incomplete responses.

This study selected 21 crowded coffee shops distributed across 9 sub-districts in the Banda Aceh City area of Indonesia. The identification of crowded coffee shops was based on monitoring and estimates of visitor numbers exceeding 300 people per day, even during the Covid-19 pandemic. The selection process involved dividing the coffee shops into three sub-district clusters. In the first cluster, sub-districts with more than 6 coffee shops were identified, and 3 coffee shops were selected from each of these sub-districts. In the second cluster, sub-districts with 5 or fewer coffee shops had 2 coffee shops selected. In the third cluster, sub-districts with 3 or fewer crowded coffee shops resulted in the selection of 1 coffee shop. This selection methodology aimed to ensure a representative distribution of samples from the coffee shop community in Banda Aceh.

### *Sampling*

Respondents aged 17 years and older who were present in each coffee shop were asked to voluntarily complete the provided questionnaire, without any incentives. A total of 40 respondents were selected from each coffee shop. The confidentiality of the information provided by the respondents was ensured, and their answers were treated with strict confidentiality. Each questionnaire also included a cover letter explaining the purpose of the study, the voluntary nature of participation, and the participants' right to withdraw at any time if they chose not to complete the distributed questionnaire.

Data collection was conducted over a 12-day period from July 4 to July 14, 2021. Six trained surveyors carried out the data collection, divided into three groups, with each group consisting of two people responsible for seven coffee shops. Despite the presence of the Covid-19 pandemic, the survey activities ran smoothly. The assigned surveyors adhered to strict health protocols and had been vaccinated, enabling the completion of the survey without any of the surveyors contracting the coronavirus.

### *Questionnaire*

The questionnaire was prepared based on several scientific literature and previous studies to measure the perception of Covid-19 risk and the role of information sources in shaping the perception of Covid-19 risk. The questions formulated in the questionnaire were reviewed by five experts consisting of two fields of public health and 3 fields of communication. These experts were asked to provide input to determine the validity and see the suitability of the contents of the questionnaire to what was sought in this study. Furthermore, the reliability of the questionnaire was assessed through a trial involving 20 coffee shop visitors who were selected randomly and were not included in the research sample. They were asked to fill out the questionnaire individually and encouraged them to think and articulate their reasons for each answer, as well as how they understood each question.

The questionnaire consists of 24 questions, divided into five sections. The first section focuses on the demographic information of respondents such as age, gender, education level, occupation and monthly income. The second section assesses the Covid-19 information received by respondents. This is related to the source of Covid-19 information or the use of what media such as social media (Youtube, Facebook, Instagram, WhatsApp and TikTok), mainstream media (television, radio, printed newspapers/news portals), Health Authorities (WHO website, health workers and government websites), family/friends and the surrounding community, and other media (scientific journals). The third section concerns the types of information related to Covid-19 that respondents frequently encounter. This includes information that affirms the reality of Covid-19, explanations of its dangers and modes of transmission, and the importance of implementing health protocols to control the virus's spread. The fourth section addresses the respondents' protective behaviors. Protective behavior refers to actions taken to safeguard oneself from the transmission of the coronavirus. This includes adhering to health protocols recommended by health authorities, such as wearing masks in crowded settings, washing hands after touching objects that may have come into contact with others, maintaining physical distance from others, avoiding handshakes, and steering clear of crowded places.

### *Statistical Analysis*

The methods used for data analysis included descriptive analysis, the Kruskal-Wallis test, and multivariate logistic regression analysis. Descriptive analysis involved summarizing the characteristics of the respondents by assessing weights through frequency and percentage. Additionally, descriptive analysis was conducted to provide an overview of the respondents' perceptions of the research variables by calculating the mean and standard deviation (SD) values for each research question. A Likert scale with five options (1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree) was employed to measure responses to each question associated with each variable. The results were then grouped into five category scores as follows: very low (1.00 - 1.80), low (1.81 - 2.60), moderate (2.61 - 3.40), high (3.41 - 4.20), and very high (4.21 - 5.00).

Meanwhile, the Kruskal-Wallis test was used to examine Hypothesis 1 (H1) regarding differences among respondent characteristic variables by comparing the average values of the respondent groups across the analysis variables, which include types of Covid-19 information, knowledge, and protective behavior. A p-value of less than 0.05 was considered indicative of a significant difference.

In addition, this study also conducted a multivariate logistic regression analysis to test Hypothesis 2 (H2), assessing the influence of Covid-19 information sources on respondents' protective behaviors. This analysis aimed to control for confounding variables such as age, gender, and education level, as well as to identify the independent effect of each information source on the likelihood of respondents engaging in protective actions.

## Results

### *Demographic Characteristics*

The characteristics of the respondents are presented in Table 1. This study included a total of 829 coffee shop visitors in the city of Banda Aceh. The majority of the respondents were male (66.7%), and approximately 73.9% had a university education (undergraduate level). Most respondents were aged 17 to 25 years (75%). The largest groups among the respondents were students (58.3%) and casual workers/self-employed individuals (13.4%). Many respondents reported a decrease in their frequency of visiting coffee shops during the Covid-19 pandemic, with 25% indicating they rarely visited, while 29.4% stated they sometimes went to coffee shops, and 20.6% reported they did so infrequently. This contrasts with their behavior prior to the Covid-19 pandemic, when respondents reported visiting coffee shops always (31.2%) or often (35.6%).

Table 1: Respondent Characteristics (n = 829).

<b>Variables</b>	<b>Frequency</b>	<b>(%)</b>
<b>Gender</b>		
Male	553	66.7
Female	276	33.3
<b>Age group</b>		
17 – 25	622	75.0

26 – 45	174	21.0
> 45	33	4.0
<b>Levels of Education</b>		
Senior high school	177	21.4
Undergraduate & Diploma	613	73.9
Postgraduate	27	3.3
Others <sup>a</sup>	12	1.4
<b>Employment</b>		
Student	483	58.3
Government employee	41	4.9
Private employee	55	6.6
Contract employees	65	7.8
Self-employed	111	13.4
Others <sup>b</sup>	74	8.9
<b>Monthly Income (Rp.)</b>		
No income	392	47.3
Less than 1 million	96	11.6
1 - 2 million	175	21.1
3 - 5 million	116	14.0
More than 5 million	50	6.0
<b>Frequency of respondents visiting coffee shops during Covid-19</b>		
Always	207	25.0
Often	207	25.0
Sometimes	244	29.4
Rarely	171	20.6
<b>Frequency of respondents visiting coffee shops before Covid-19</b>		
Always	259	31.2
Often	295	35.6
Sometimes	177	21.4
Rarely	98	11.8

Source: Own elaboration. Note: <sup>a</sup>Respondents educated in Islamic boarding schools, elementary and junior high schools or those who did not attend school; <sup>b</sup>Respondents who did not work or were confused about determining the type of work provided in the research questionnaire.

#### *Covid-19 Information Assessment*

Table 2 presents the Covid-19 risk information received by coffee shop visitors. For example, the Covid-19 information they received mostly called for implementing health protocols ( $4.17 \pm 0.89$ ), and they also received a lot of Covid-19 information explaining the dangers of Covid-19 ( $4.03 \pm 0.91$ ). Questions related to Covid-19 information received mostly told that Covid-19 is real ( $3.86 \pm 1.03$ ), but it decreased slightly

and had a high standard deviation (SD). This means that many coffee shop visitors received information stating that Covid-19 is a hoax and a conspiracy.

Table 2: Covid-19 Risk Information.

Statement	Mean (SD)
Much of the Covid-19 information I received tells us that Covid-19 is real.	3.86 (1.03)
Much of the Covid-19 information I received calls for implementing health protocols (such as washing hands, wearing masks, and maintaining distance) to control transmission.	4.17 (0.89)
Much of the Covid-19 information I received explains the dangers of Covid-19 and how it is transmitted.	4.03 (0.91)

Source: Own elaboration

#### *Covid-19 Risk Knowledge Assessment*

Table 3 shows the average score of answers to questions assessing knowledge related to the risks of Covid-19 and how to avoid transmission. Most participants scored high (between 3.96 and 4.10). The participants know that Covid-19 is a highly contagious disease ( $4.01 \pm 0.93$ ), and can spread through coughing, sneezing, touching, fluids from the nose and mouth of people who are infected with the corona virus ( $4.07 \pm 0.95$ ). Nearly all participants acknowledged the importance of adhering to health protocols to prevent Covid-19 infection, expressing strong agreement on the necessity of practices such as frequent handwashing ( $4.09 \pm 0.92$ ), maintaining social distancing ( $4.07 \pm 0.97$ ), and wearing masks ( $4.10 \pm 0.96$ ).

#### *Covid-19 Protective Behavior Assessment*

Table 4 presents the protective behaviors of coffee shop visitors in relation to Covid-19, which received high scores ranging from 3.82 to 4.11. Most coffee shop visitors reported that they wear masks in crowded environments ( $4.11 \pm 0.91$ ) and wash their hands after handling objects that have come into contact with others ( $4.00 \pm 0.94$ ). However, responses varied regarding the question about avoiding handshakes with others, where the average score was  $3.82 \pm 1.04$ , indicating a high standard deviation (SD). This suggests that some coffee shop visitors do not consistently avoid handshaking, which puts them at risk of contracting Covid-19. Similarly, responses related to avoiding crowded places resulted in an average score of  $3.87 \pm 0.99$ , implying that not all individuals visiting coffee shops consistently maintain social distancing or avoid crowded environments.

Table 3: Covid-19 Risk Knowledge.

Statement	Mean (SD)
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I know that Covid-19 is a highly contagious disease.	4.01 (0.93)
I know that Covid-19 can spread through coughing, sneezing, touching, fluids from the nose and mouth of someone who is infected with the corona virus.	4.07 (0.95)
I know that people who have a history of lung disease, heart disease, diabetes and weak immune systems are at high risk of death if infected with Covid-19.	3.96 (1.01)
I know that to avoid Covid-19 infection, you must wash your hands frequently.	4.09 (0.92)
I know that to avoid Covid-19 infection, you must often maintain social distancing.	4.04 (0.97)
I know that to avoid Covid-19 infection, you must often wear a mask.	4.10 (0.96)

Source: Own elaboration

Table 4: Covid-19 Protective Behavior.

Statement	Mean (SD)
I have the awareness to use a mask when in crowds.	4.11 (0.91)
I have the awareness to wash my hands after handling objects that have been in contact with other people.	4.00 (0.94)
I have the awareness to keep my distance from other people.	3.95 (0.97)
I have the awareness to avoid shaking hands with other people.	3.82 (1.04)
I have the awareness to avoid crowded places.	3.87 (0.99)

Source: Own elaboration

#### *Covid-19 Information Sources*

Table 5 presents the results of the distribution analysis based on frequency and percentage values of the characteristics of coffee shop visitors and their sources of information. To address the question regarding the sources of information utilized by respondents when receiving Covid-19 updates, open-ended response options were provided, allowing respondents to identify more than one source. The findings indicate that nearly all coffee shop visitors prefer using social media as their primary channel for obtaining Covid-19 information, surpassing the use of other media. In terms of gender, the results reveal that women demonstrate a higher level of social media usage (75%) compared to men (67.7%) for receiving Covid-19 information. Conversely, when it comes to mainstream media, men have a higher usage rate (15.5%) than women (10.6%). Regarding age, the utilization of social media is most prevalent among those aged 17 to 25 years (73.6%). In contrast, individuals over 45 years old access mainstream media more frequently (29.5%) compared to those aged 26 to 45 years (18.0%) and 17 to 25 years (11.8%). In terms of education, undergraduate and diploma holders are more likely to obtain Covid-19 information from social media (72.4%), while relatively few access information through mainstream media and health authorities. In contrast, postgraduate respondents utilize social media (44.7%), mainstream media (23.4%), and health authorities (17.02%). The results of the study also indicate that family and friends, as well as health

authorities, are not preferred sources of information regarding Covid-19 for the respondents, as very few individuals provided responses in this section.

Table 5: Sources of Covid-19 Information Received by Respondents.

Characteristics of Coffee Shop Respondents	Respondent Choice (%)				
	(1)	(2)	(3)	(4)	(5)
<b>Gender</b>					
Male (n = 553)	463 (67.7)	106 (15.5)	59 (8.6)	46 (6.7)	10 (1.5)
Famale (n = 276)	240 (75.0)	34 (10.6)	19 (6.0)	24 (7.5)	3 (0.9)
<b>Age group</b>					
17 – 25 (n = 622)	543 (73.6)	87 (11.8)	49 (6.6)	50 (6.8)	9 (1.2)
26 – 45 (n = 174)	138 (62.2)	40 (18.0)	25 (11.2)	15 (6.8)	4 (1.8)
> 45 (n = 33)	22 (50.0)	13 (29.5)	4 (9.1)	5 (11.4)	—
<b>Levels of Education</b>					
Senior high school (n = 177)	143 (67.8)	30 (14.2)	18 (8.5)	16 (7.6)	4 (1.9)
Undergraduate & Diploma (n = 613)	530 (72.4)	97 (13.3)	49 (6.7)	49 (6.7)	7 (1.0)
Postgraduate (n = 27)	21 (44.7)	11 (23.4)	8 (17.0)	5 (10.6)	2 (4.3)
Others (n = 12)	9 (64.3)	2 (14.3)	3 (21.4)	—	—
<b>Employment</b>					
Student (n = 483)	423 (74.3)	66 (11.6)	34 (6.0)	41 (7.2)	5 (0.9)
Government employee (n = 41)	31 (58.5)	13 (24.5)	5 (9.4)	4 (7.6)	—
Private employee (n = 55)	42 (54.5)	15 (19.5)	12 (15.6)	5 (6.5)	3 (3.9)
Contract employees (n = 65)	54 (69.2)	11 (14.1)	8 (10.3)	4 (5.1)	1 (1.3)
Self-employed (n = 111)	92 (67.2)	23 (16.8)	11 (8.0)	9 (6.6)	2 (1.5)
Others (n = 74)	61 (67.8)	12 (13.3)	8 (8.9)	7 (7.8)	2 (2.2)

Source: Own elaboration. Notes: **(1)** Social media (Youtube, Facebook, Instagram, WhatApps and TikTok); **(2)** Mainstream media (television, radio, printed newspapers/news portals); **(3)** Health Authorities (the WHO website, health workers and government websites); **(4)** Family/friends and the surrounding community; **(5)** Others such as scientific journals. \_\_\_No respondents provided an answer.

#### *Demographic Characteristics with Covid-19 Information, Knowledge and Protective Behavior*

Based on the results of the analysis presented in Table 6, several factors are identified as predictors of an increase in the behavior of accepting Covid-19 risk information, knowledge, and protective behaviors against Covid-19. Significant differences were observed within each group of coffee shop visitors, with significance values of  $P < 0.05$ ,  $P < 0.01$ , and  $P < 0.001$ . For instance, women demonstrated significantly higher scores in receiving information, possessing knowledge, and exhibiting protective behaviors related to Covid-19

compared to men. Individuals over 45 years old also scored highly, indicating a greater implementation of protective behaviors than other age groups. Additional predictors include those working as civil servants, who exhibited considerable knowledge and implemented effective protective behaviors concerning Covid-19. Notably, individuals who seldom visit coffee shops are influenced by information asserting that Covid-19 is real, poses a serious threat, and has a high transmission rate. Furthermore, those who frequently receive information about Covid-19 demonstrate higher levels of knowledge and protective behaviors than those who visit coffee shops rarely or only occasionally.

Table 6: Differences between demographic characteristics with Risk Information, Knowledge and Protective Behavior related to Covid-19.

Characteristics of Coffee Shop Respondents	Groups	Covid-19 Risk Information		Knowledge		Protective Behavior	
		Mean (SD)	P value	Mean (SD)	P value	Mean (SD)	P value
Gender	Male (n = 553)	3.92 (0.86)	0.000***	3.94 (0.84)	0.000***	3.81 (0.88)	0.000***
	Famale (n = 276)	4.22 (0.73)		4.25 (0.72)		4.22 (0.72)	
Age group	17 – 25 (n = 622)	4.04 (0.84)	0.008**	4.07 (0.81)	0.000***	3.94 (0.87)	0.002**
	26 – 45 (n = 174)	3.90 (0.81)		3.89 (0.83)		3.89 (0.79)	
	> 45 (n = 33)	4.27 (0.68)		4.38 (0.64)		4.36 (0.77)	
Levels of Education	Senior high school (n = 177)	3.84 (0.90)	0.001**	3.88 (0,86)	0.010	3.91 (0.89)	0.503
	Undergraduate & Diploma (n = 613)	4.08 (0.80)		4.09 (0.79)		3.97 (0.85)	
	Postgraduate (n = 27)	4.19 (0.62)		4.23 (0.76)		3.96 (0.88)	
	Others (n = 12)	3.31 (1.20)		3.72 (1.00)		3.70 (0.70)	
Employment	Student (n = 483)	4.09 (0.83)	0.003**	4.11 (0.79)	0.009**	3.97 (0.87)	0.022*
	Government employee (n = 41)	4.12 (0.70)		4.25 (0.73)		4.24 (0.78)	
	Private employee (n = 55)	4.08 (0.83)		4.02 (0.84)		4.02 (0.78)	
	Contract employees (n = 65)	3.89 (0.94)		3.93 (0.85)		3.91 (0.77)	

Covid-19 information acceptance rate	Self-employed (n = 111)	3.88 (0.76)	0.000***	3.85 (0.89)	0.000***	3.82 (0.94)	0.001**
	Others (n = 74)	3.82 (0.88)		3.95 (0.82)		3.84 (0.75)	
	Rarely (n = 27)	3.72 (0.79)		3.52 (0.93)		3.53 (1.09)	
	Sometimes (n = 86)	3.86 (0.74)		3.85 (0.77)		3.69 (0.90)	
	Often (n = 279)	4.01 (0.79)		4.00 (0.80)		3.90 (0.84)	
Frequency of respondents visiting coffee shops during Covid-19	Always (n = 437)	4.08 (0.87)	0.000***	4.15 (0.80)	0.000***	4.06 (0.82)	0.000***
	Rarely (n = 171)	4.25 (0.76)		4.28 (0.73)		4.28 (0.75)	
	Sometimes (n = 244)	4.03 (0.81)		4.08 (0.77)		4.00 (0.76)	
	Often (n = 207)	4.06 (0.76)		4.05 (0.77)		3.98 (0.80)	
	Always (n = 207)	3.78 (0.92)		3.80 (0.90)		3.58 (0.97)	

Source: Own elaboration. Notes: Kruskal-Wallis analysis; Significant value \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$

The Kruskal-Wallis analysis revealed significant differences in Covid-19 risk information ( $p < 0.05$ ), knowledge ( $p < 0.01$ ), and protective behavior ( $p < 0.001$ ) across gender, age, and employment status groups (Table 6). These findings support Hypothesis 1 (H1), which posited that demographic characteristics and frequency of coffee shop visits significantly influence the level of Covid-19-related information, knowledge, and protective behaviors.

#### *Information Sources and Respondent Demographics in Relation to Protective Behavior*

Table 7 presents the results of the multivariate logistic regression analysis. It was found that information sources from health authorities (such as government websites, the WHO, or healthcare professionals) had a significant influence on the increase in protective behavior against Covid-19, with an Odds Ratio (OR) = 1.694, 95% CI = 1.009–2.846, and  $p = 0.046$ . This indicates that respondents who obtained information from authoritative sources were 1.7 times more likely to exhibit protective behavior compared to those who did not use these sources. In addition, respondents who cited “other” sources (e.g., scientific journals) also showed a higher tendency to engage in protective behavior (OR = 3.577,  $p = 0.046$ ), although this group represented a smaller portion of the population.

Among the control variables, gender showed a significant effect, where female respondents were 2.9 times more likely to exhibit protective behavior compared to male respondents (OR = 2.889,  $p < 0.001$ ). Similarly,

older age was associated with increased protective behavior (OR = 1.504,  $p = 0.008$ ). These findings suggest that credible and authoritative information sources, such as health authorities and scientific publications, are significant predictors of public protective behavior during the Covid-19 pandemic. This highlights the importance of information quality and trust in shaping public behavior.

Although social media and mainstream media were among the most frequently used sources, neither showed a significant effect. This may be due to the lack of information filtering, the spread of misinformation, or lower levels of trust in these media platforms. The analysis also revealed that being female and of older age were important factors influencing protective behavior, which is consistent with previous studies indicating that women tend to be more cautious regarding health risks. Overall, the logistic regression results reinforce the critical role of trusted information sources in enhancing protective behaviors against Covid-19.

Table 7: Information Sources and Respondent Demographics in Relation to Protective Behavior.

Variables	B (Coefficient)	S.E. (Standard Error)	OR (Odds Ratio)	95% CI for OR		P value
				Lower	Upper	
Constant	-4.794	1.492	0.008	-	-	0.001**
<b>Independent Variables</b>						
Social Media	-0.286	0.244	0.752	0.466	1.213	0.242
Mainstream Media	-0.152	0.237	0.859	0.540	1.367	0.521
Health Authorities	0.527	0.265	1.694	1.009	2.846	0.046*
Family/Friends	0.424	0.274	1.528	0.892	2.617	0.122
Other Sources	1.274	0.639	3.577	1.023	12.507	0.046*
<b>Control Variables</b>						
Gender	1.061	0.180	2.889	2.029	4.114	0.000***
Age	0.408	0.155	1.504	1.110	2.037	0.008**
Education Level	-0.057	0.144	0.944	0.712	1.254	0.692

Source: Own elaboration. Note: Significant values \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$

The results of the multivariate logistic regression analysis (Table 7) show that information sources from health authorities (OR = 1.694;  $p = 0.046$ ) and other scientific sources (OR = 3.577;  $p = 0.046$ ) significantly influence the increase in protective behavior. In contrast, social media and mainstream media did not show a significant effect. These findings support Hypothesis 2, that trusted sources of information significantly increase the likelihood of individuals adopting protective behaviors, after controlling for demographic variables.

## Discussion

The Covid-19 pandemic has significantly impacted various aspects of social life, including in Banda Aceh, where the culture of drinking coffee at coffee shops is an integral part of daily activities. The city is widely known as the “city of a thousand coffee shops” (Zulfikar & Auliansyah, 2020), signifying that these establishments are not merely consumption spaces but also function as informal public arenas for information exchange, discussion, and opinion formation (Taqwadin et al., 2019; Hafasnuddin et al., 2019). However, during a pandemic, such environments carry a high risk of virus transmission, particularly when health protocols are not strictly enforced.

This study found that the frequency of visits to coffee shops decreased during the pandemic. Before Covid-19, 35.6% of respondents reported frequent visits, whereas during the pandemic, this figure declined to 25%. This reduction reflects a growing awareness of the risk of transmission, although it was not always followed by consistent protective behaviors. Most respondents demonstrated a high level of knowledge about Covid-19, including transmission through droplets and physical contact, as indicated by a relatively high average knowledge score ( $4.07 \pm 0.95$ ). Knowledge is a critical component in the development of protective responses, as outlined in the Protection Motivation Theory (PMT) (Rogers, 1975).

These findings are consistent with previous studies. Alves et al. (2021) in Cabo Verde found a positive correlation between high knowledge levels and adherence to health protocols. Similar conclusions were drawn during the H1N1 pandemic (Tooher et al., 2013; van der Weerd et al., 2011; Klemm et al., 2014), where higher risk perception increased the motivation for protective actions. In the context of Aceh, Chavarría et al. (2021) also demonstrated that understanding Covid-19 led to more preventive behaviors. However, they also highlighted a knowledge-behavior gap—awareness does not always translate into appropriate action. This gap is better explained through the coping appraisal dimension of PMT, wherein perceived response efficacy and self-efficacy are key determinants of whether individuals engage in protective behavior.

A key finding of this study is that not all sources of information contribute equally to knowledge formation or protective behavior. A majority of respondents relied on social media as their primary source of information—67.7% among males and 75% among females. Despite its popularity, social media exposure showed no statistically significant association with protective behavior. This indicates a disconnect between the frequency of access and the quality of the information received. Although easily accessible, social media often lacks the accuracy and credibility necessary to drive behavioral change.

The phenomenon of infodemic—a surge in misinformation during a health crisis—has been widely discussed in the literature. Naeem and Bhatti (2020), Islam et al. (2020), and Chou & Budenz (2020) all identified social media as a major channel for the spread of hoaxes, conspiracy theories, and misleading narratives. These findings reinforce the argument that the intensity of information exposure does not equate to the validity or influence of the content on behavior. Prianto et al. (2020) also noted that the Indonesian government faced substantial challenges in combating misinformation on digital platforms.

In contrast, authoritative and scientifically grounded sources, such as the Ministry of Health, the WHO, healthcare professionals, and scientific journals, demonstrated a positive correlation with protective behavior. Logistic regression analysis revealed that respondents who accessed credible sources were 1.7 times more likely to adhere to health protocols (OR = 1.694; 95% CI = 1.009–2.846;  $p = 0.046$ ). Access to scientific journals further increased the odds ratio to 3.577 ( $p = 0.046$ ). These results underscore that the credibility of a source is more critical than the frequency or intensity of exposure.

This study reinforces findings from earlier research, including those by Yang et al. (2020), Verma et al. (2022), Maykrantz et al. (2021), and Figueiras et al. (2021), which reported that trust in health institutions, physicians, and government media positively influenced protective behaviors. A longitudinal study by Okada et al. (2023) even suggested that trust in recovered Covid-19 patients and medical professionals had a stronger effect on behavior than trust in government. Conversely, other studies such as Badman et al. (2022) and Saechang et al. (2021) found that, in certain contexts, trust in government was negatively correlated with compliance to health protocols. This suggests that while government-issued information is official, public perceptions of its credibility remain a critical factor.

In the Aceh context, several local studies provide further insight into this dynamic. Research by Adamy & Rani (2022) showed that the public in Aceh expressed dissatisfaction with the local government's pandemic response, particularly in early detection and communication efforts. This supports the present study's finding that low trust in government can undermine the effectiveness of risk communication, pushing communities to seek information from alternative, informal sources.

Conversely, local actors such as *ulama dayah* (Islamic clerics in traditional boarding schools) and Islamic educational institutions hold strategic positions in shaping public behavior. Studies by Putra et al. (2022) and Muntasir et al. (2024) emphasized that these religious figures not only serve as communicators of public health messages but also act as agents of social discipline and psychological support. Putra et al. (2021) also noted that government communication strategies involving religious institutions were more effective in increasing public awareness. This aligns with WHO (2022) recommendation for community-based risk communication, which encourages engagement with local actors to develop and disseminate culturally contextualized messages.

In this study, coffee shops emerged as important social hubs where Covid-19 information was not only received but also debated and reinterpreted. As such, these informal spaces can either facilitate or hinder effective communication depending on the actors involved. Adaptive risk communication strategies must take these informal spaces into account. Community-based interventions that involve coffee shop owners, regular patrons, or respected local figures may be more effective in reaching segments of the population who are less responsive to formal governmental or mainstream media communication.

Another significant finding of this study is the influence of demographic factors on protective behavior. Women were found to be significantly more compliant with health protocols than men, with an odds ratio of nearly three (OR = 2.889;  $p < 0.001$ ). This is consistent with Karasneh (2021), who found that women are generally more responsive to health-related issues. Additionally, individuals aged 45 and older demonstrated higher levels of knowledge and protective behavior (OR = 1,504,  $p = 0,008$ ). Azlan et al. (2020) also observed that older age groups tend to have greater risk perception, which leads to more consistent adherence to health recommendations.

The practical implication of these findings is the necessity for tailored risk communication. Health messages should not adopt a one-size-fits-all approach. Segmentation based on age, gender, and social context is essential. Given the central role of coffee shops in Banda Aceh's social fabric, communication strategies must involve informal social spaces and trusted community figures. Moreover, improving information literacy should be prioritized. The public must be equipped with the skills to critically evaluate the validity of information, especially from social media. Governments and health institutions should collaborate with local leaders and community organizations to design interactive and accessible educational campaigns.

In conclusion, this study supports the Protection Motivation Theory framework, which highlights the importance of both threat appraisal and coping appraisal in shaping protective behavior. The findings demonstrate that source credibility significantly influences how individuals perceive risks and choose to act. Therefore, integrating credible and context-specific risk communication with a deep understanding of local social dynamics—such as the role of coffee shops—is crucial in promoting protective behavior, not only during this pandemic, but also in preparation for future public health emergencies.

## Conclusion

This study highlights the critical role of risk information in shaping knowledge and protective behaviors related to Covid-19 among coffee shop visitors in Banda Aceh. In a local context characterized by strong communal culture and frequent social interaction in semi-formal public spaces such as coffee shops, the dissemination of accurate information becomes particularly vital in efforts to control the pandemic. Our findings demonstrate a significant relationship between individuals' risk knowledge and their engagement in preventive behaviors, and further indicate that such knowledge is strongly influenced by the type and credibility of information sources accessed.

Information obtained from authoritative sources—such as government agencies, the WHO, and healthcare professionals—was statistically proven to have a positive impact on protective behavior. Based on multivariate logistic regression analysis, respondents who accessed information from authoritative sources were 1.7 times more likely to engage in protective behavior compared to those who did not (OR = 1.694; 95% CI = 1.009–2.846;  $p = 0.046$ ). Notably, although only a small proportion of respondents accessed scientific journals or other academic sources, this group exhibited even higher tendencies toward protective behavior (OR = 3.577;  $p = 0.046$ ), underscoring the crucial role of information quality in shaping public health behavior.

Conversely, social media and mainstream media such as television and online news portals—while being the most commonly used information channels—did not show a statistically significant effect on protective behavior ( $p > 0.05$ ). This suggests that the frequency of information exposure does not necessarily translate to behavioral change, particularly when the content consumed is not scientifically verified or is susceptible to misinformation. This phenomenon reinforces the need for greater oversight and curation of content on public information platforms, especially social media, which has become a prominent vector for the spread of hoaxes during the pandemic.

The study also emphasizes the influence of demographic factors, such as gender and age, on knowledge and protective behavior. Female respondents were nearly three times more likely to practice protective behavior compared to males (OR = 2.889;  $p < 0.001$ ), and individuals over the age of 45 demonstrated higher levels of both knowledge and protective behavior than their younger counterparts (OR = 1.504;  $p = 0.008$ ). These findings align with previous research indicating that women and older individuals tend to perceive higher risks and exhibit greater compliance with health protocols.

In the context of coffee shops as open social spaces with dense interaction, the dissemination of risk information must be tailored to the socio-cultural characteristics of the local community. Coffee shops in Banda Aceh are not merely places for beverage consumption but also serve as social forums with the potential to become transmission hotspots for communicable diseases. Therefore, risk communication

strategies should incorporate community-based approaches, involving coffee shop owners, local community leaders, and health volunteers to effectively reach grassroots populations through informal yet impactful channels.

Looking ahead, the success of risk communication in responding to pandemics or similar health crises will depend on the responsiveness of health authorities to emerging scientific evidence, timely information updates, and the delivery of messages that are contextualized, evidence-based, and accessible to the general public. Efforts to enhance public information literacy must also be prioritized, enabling individuals to critically assess and verify the accuracy of the information they encounter, particularly amid the influx of unvalidated content on social media platforms.

In conclusion, the findings of this study provide important insights for the development of more effective risk communication strategies in Indonesia, particularly in regions with strong traditions of social interaction such as Aceh. Utilizing credible communication channels, improving public health literacy, and adopting locally grounded approaches are essential to promoting sustainable behavioral change and controlling the spread of infectious diseases in the future.

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### **Conflict of Interest**

There are no conflicts of interest related to the research, writing, and publication of this paper.

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