



Knowledge Regarding Coronavirus Disease-19 Related to Nutritional Practices in Residents of Medan City, Indonesia

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Abstract

BACKGROUND: The coronavirus disease 2019 (COVID-19) is a new type of disease, which has never been identified in humans. Some of the primary symptoms are associated with acute respiratory disorders, namely, fever, cough, and shortness of breath. A person's nutritional status affects the risk of infection and the clinical course of COVID-19. Knowledge is an important domain for the formation of a person's behavior, because actions based on knowledge are more important than actions or behaviors that are not based on knowledge.

AIM: This study aims to determine the relationship between the level of knowledge about COVID-19 and the balanced nutritional behavior of the people of Medan City.

METHODS: This was a descriptive analytical study, with a cross-sectional research design. The study samples consisted of Medan City residents, who met the inclusion and exclusion criteria based on the convenient sampling method. The primary data in this study were drawn from a research questionnaire, which was filled out online.

RESULTS: From 200 of the research samples analyzed, 88% had a good level of knowledge towards COVID-19, 59% had a good level of nutrition practices. There was no significant difference between mean score and results for knowledge of COVID-19 and nutritional practices based on certain demographic characteristics. The relationship analysis showed $p = 0.22$; prevalence ratio = 2.711; and confidence interval 95% = 1.123–6.541 with a correlation value of 0.161.

CONCLUSIONS: There was a weak positive relationship between knowledge regarding COVID-19 and nutritional practices in residents of Medan City, Indonesia.

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Introduction

In early 2020, the world was shocked by the outbreak of a new type of pneumonia, which started in Wuhan, Hubei Province, and then spread rapidly to more than 190 countries and territories [1]. The World Health Organization (WHO) declared that the world entered a global emergency after the outbreak on January 31, 2020 [2].

This outbreak began in December 2019, when a mysterious pneumonia case was first reported in Wuhan, Hubei Province. The source of the transmission of this case is still uncertain, but the first case was linked to a fish market in Wuhan between December 18, 2019, and December 29, 2019 [3]. The first two cases of coronavirus disease-2019 (COVID-19) in Indonesia were reported on March 2, 2020, and the number of infections and deaths has continued to increase until now [1].

The samples studied showed the etiology of the new coronavirus. Initially, the disease was temporarily

named the 2019 novel coronavirus (2019-nCoV). Then, the WHO announced a new name on February 11, 2020, that is, the COVID-19, based on the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) (WHO, 2020). COVID-19 is a disease caused by a ribonucleic acid virus, namely, SARS-CoV-2, with a particle size of 120–160 nm [4]. The SARS-CoV-2 sequence has similarities with the coronavirus isolated in bats, so the hypothesis of Riedel *et al.* is that SARS-CoV-2 originated from bats, which then mutated and infected humans [5]. Common signs and symptoms of COVID-19 infection include acute respiratory symptoms, such as fever, cough, and shortness of breath. In severe cases of COVID-19, it can cause pneumonia, acute respiratory syndrome, kidney failure, and even death [6].

Many efforts had been made in the literature to determine how the body's resistance to respiratory infections could be improved. Some of them were quitting smoking and alcohol consumption, improving sleep quality, and taking supplements [1]. Macro, micro, and phytonutrients in foods, especially colorful fruits

and vegetables, generally promote a healthy immune response [7]. Diet and nutrition always influence the competence of the immune system and determine the risk and severity of infection. There is a two-way relationship between diet, nutrition, infection, and immunity. A person's nutritional status affects their risk of infection and the clinical course of COVID-19. Therefore, the maintenance of a healthy macro and micronutrient status is an important preventive measure for COVID-19. When a person's nutritional status is improved, either through diet modification or nutritional supplementation, it is very important to determine the clinical course of COVID-19, especially in malnourished individuals [8]. Given the role nutritional status plays in a person's immunity, the evaluation of individual nutrition may be important for preparing a person for the COVID-19 pandemic. Besides, knowledge about COVID-19 is very important. If knowledge about COVID-19 is inadequate, preventing the transmission of the disease will be difficult, and the probability that a person will experience COVID-19 infection will be increased. Based on those reasons, we decided to do this research, the aim of this study was to find relationship among all parameters that affecting nutritional practice. Thus, in this study, whether there is was a relationship between knowledge regarding COVID-19 and nutritional practices in residents of Medan city, Indonesia, which was investigated.

Materials and Methods

Across-sectional study was conducted between June 2020 and July 2020. The data were collected online, because it was not feasible to do an offline survey. This research was conducted on residents of Medan City, which consists of 21 subdistricts that had been included in the COVID-19 red zone since June 5, 2020. The population of Medan City, based on a 2018 report, is 2,264,145 people. The data in the present study were collected from a total of 210 questionnaires. A total of 10 samples from outside the city of Medan were excluded, so the analysis consisted of 200 research samples from Medan City.

The data used in this study were primary data obtained directly by the researcher. The primary data were obtained from people by having them fill out the research questionnaire. A Google Forms was used to collect the data, and the questionnaire was distributed using WhatsApp, Line, and Direct Message Instagram. People who were living in Medan, were aged 18–35 years, understood the use of Google Forms, and were willing to fill out the questionnaire were directed to open the Google Forms link provided and fill out the questionnaire. Research samples outside Medan City would be excluded from this study.

The questionnaire used was taken from previous researches [9], [10] and COVID-19 guideline in Indonesia [11], but only the knowledge variable was used. The questionnaire was translated, and a validity test was conducted using product moment correlation techniques (significance < 0.05). The reliability was also tested using Cronbach's α (Cronbach α = 0.769). For the data analysis, each correct answer was given a value of 1, while an incorrect answer was given a value of 0. To assess nutritional behavior, the questionnaire used was taken from previous research on balanced nutrition. The questionnaire consisted of 13 questions, with 1 question excluded. The assessment of nutritional behavior consisted of a score of 4 = often, a score of 3 = sometimes, a score of 2 = rarely, and a score of 1 = never. From the data collection results, a 75% score was considered good, 56–74% was considered satisfactory, and <55% was considered poor.

We used the SPSS program (version 24; SPSS Inc., Chicago, IL, USA) to perform the analysis. The descriptive analysis was reported as the frequency, percentage, and mean scores. The knowledge scores and practices of different persons, according to the demographic characteristics, were compared using an independent samples t-test, one-way analysis of variance, Mann–Whitney U-test, and Kruskal–Wallis test.

To determine differences in the level of knowledge of COVID-19 and nutritional behavior based on demographic characteristics, the Chi-square test and Fisher's exact test were used. To show the relationship between knowledge and attitudes, the Chi-squared test was used. Linear regression analysis was applied with an odds ratio and 95% confidence interval (CI) to find possible determinants of good knowledge regarding COVID-19 and health practice. $p < 0.05$ was considered statistically significant in all tests.

Results

The data in the present study were collected from a total of 210 questionnaires. A total of 10 samples from outside the city of Medan were excluded, so the analysis consisted of 200 research samples from Medan City. In this final sample, there were 128 women (64%) and 172 people (86%) aged 18–25 years old, with an average age of 21.98 years. Most of the research samples were from residents of Medan Kota, and the highest education level was senior high school. The characteristics of the respondents are shown in Table 1.

More than 90% of the respondents had a good understanding of the following points relating to COVID-19: COVID-19 is a disease caused by a virus (97.5%); transmission of COVID-19 can occur through

Table 1: Demographic characteristic of the respondents

Characteristics	Frequency, n (%)
Gender	
Male	72 (36)
Female	128 (64)
Age group (years)	
18–25	172 (86)
26–35	28 (14)
Subdistrict	
Medan Amplas-Medan Denai	73 (36.5)
Medan Helvetia-Medan Perjuangan	79 (39.5)
Medan Petisah-Medan Tuntungan	48 (24)
Education	
Senior high school	142 (71)
College/university	58 (29)
Occupation	
Unemployed	49 (24.5)
Entrepreneur	14 (7)
Public servant	4 (2)
Private employees	63 (31.5)
Student	56 (28)
Teacher	11 (5.5)
Others	2 (1.0)
Income	
Low	87 (43.5)
Middle	33 (16.5)
High	37 (18.5)
Very high	43 (21.5)
Source of COVID-19 information	
Journal/articles and case report	3 (1.5)
Local government	3 (1.5)
Mass media	59 (19.5)
Social media	113 (56.5)
Parents/friends/relatives	18 (9)
Local health workers/expert visits	4 (2)

COVID: Coronavirus disease.

close contact (95.5%) and respiratory droplets (99%); there are greater risk factors associated with elderly individuals (94%); fever, cough, sore throat, and shortness of breath are symptoms that can be found in COVID-19 (94.5%); infection can be prevented through washing hands and using face masks (98.5%); infection can be prevented by avoiding traveling to crowded places (98%); children and young adults need to be involved in the prevention of COVID-19 (91%); and infection can be effectively prevented through isolation (96.5%) and the isolation of COVID-19 contacts (97.5%) (Table 2).

In terms of nutritional practices, some Medan residents often pay attention to body weight (21.5%); eat a variety of foods (30.5%); eat 3 times a day (52.5%); eat fruit (13, 5%) and vegetables (24%) properly; consume animal protein (29%); consume protein properly (33.5%); reduce their consumption of sweet, salty, and fatty foods (19.5%); drink eight glasses of water a day (58.5%); read food packaging labels (45.5%); wash hands before eating (74.5%); and do physical activities (18.5%). These results can be found in Table 3.

There was no significant difference between the respondents in the mean score for knowledge of COVID-19 and nutritional practices based on certain demographic characteristics (Table 4).

In addition, there was no significant difference between the respondents based on other demographic characteristics in the level of knowledge and behavior, except for education, with a knowledge score of $p = 0.033$ (Table 5). An analysis was conducted using the Spearman's rho test. A relationship between education and knowledge toward COVID-19 was shown, with a

Table 2: Knowledge regarding COVID-19 questionnaire

No.	Questions (Answer)	Correct answer, n (%)	Wrong answer, n (%)
1.	COVID-19 is a disease caused by a viral infection (True)	195 (97.5)	5 (2.5)
2.	COVID-19 can be transmitted through close contact with an infected individual (True)	191 (95.5)	9 (4.5)
3.	COVID-19 can spread through respiratory droplets from infected individuals (True)	198 (99)	2 (1)
4.	Not everyone with COVID-19 has severe symptoms. In elderly individuals, the risk of having severe symptoms is higher (True)	188 (94)	12 (6)
5.	Fever, cough, sore throat, and shortness of breath are symptoms that can be found in COVID-19 (True)	189 (94.5)	11 (5.5)
6.	The main symptoms of COVID-19 are fever, diarrhea, and skin rashes (False)	95 (47.5)	105 (52.5)
7.	Antibiotics are the main (first line) treatment for COVID-19 (False)	54 (27)	146 (73)
8.	Supportive treatment (giving fluids, ventilator, close monitoring of the patient, etc.) can help COVID-19 patients recover (True)	154 (77)	46 (23)
9.	Washing hands with soap and water and using a face mask can help prevent the transmission of COVID-19 (True)	197 (98.5)	3 (1.5)
10.	Children and young adults do not need to be involved in the prevention of COVID-19 transmission (False)	182 (91)	18 (9)
11.	To prevent the transmission of COVID-19, traveling to crowded places, such as malls and public transportation, must be avoided (True)	196 (98)	4 (2)
12.	Individuals who have had contact with COVID-19 positive patients must be isolated in an appropriate place immediately. In general, the length of isolation should be 14 days (True)	195 (97.5)	5 (2.5)
13.	Isolation and treatment of COVID-19 patients is an effective way to reduce the spread of the virus (True)	193 (96.5)	7 (3.5)

COVID: Coronavirus disease.

significance value of 0.016 ($p < 0.05$) with a correlation value of 0.171.

The relationship between knowledge of COVID-19 and nutritional practices has $p = 0.022$. Because $p < 0.05$, the hypothesis that there is a relationship between the level of knowledge about COVID-19 and nutritional practices in the general public in Medan City is accepted. Furthermore, the results of the linear regression test showed that an increase of 1% in knowledge increases the value for behavior associated with balanced nutrition by 0.244 (Table 6). An analysis was conducted using the Spearman's rho test. A relationship between knowledge towards COVID-19 and nutrition practices was shown, with a significance value of 0.022 ($p < 0.05$) with a correlation value of 0.161.

Discussion

As of September 2020, COVID-19 cases are still increasing and continue to be a significant concern in public health. Knowledge regarding COVID-19 is an important factor for the formation of individual nutritional practices. When nutritional status is improved, it is very important to determine the clinical course of COVID-19.

Female respondents participated more readily in the research, with as many as 128 women volunteering for the questionnaire and only 72 male

Table 3: Nutritional practices results

No.	Question	Frequently, n (%)	Sometimes, n (%)	Rarely, n (%)	Never, n (%)
1.	In order to maintain a normal weight, I regularly pay attention to weight gain	43 (21.5)	86 (43)	46 (23)	25 (12.5)
2.	In order to achieve my ideal nutritional status, I consume a wide variety of foods	61 (30.5)	93 (46.5)	38 (19)	8 (4)
3.	To meet the nutritional needs for a day, I regularly eat 3 times a day	105 (52.5)	53 (26.5)	33 (16.5)	9 (4.5)
4.	I consume fruit at least 2 times a day	27 (13.5)	58 (29)	93 (46.5)	22 (11)
5.	I consume vegetables at least 3 times a day	48 (24)	77 (38.5)	54 (27)	21 (10.5)
6.	I consume animal protein and plant protein at least 2 times a day	67 (33.5)	84 (42)	41 (20.5)	8 (4)
7.	In order not to suffer from anemia, I consume animal protein	58 (29)	87 (43.5)	38 (19)	17 (8.5)
8.	I reduce the consumption of sweet, salty, and fatty foods	39 (19.5)	71 (35.5)	71 (35.5)	19 (9.5)
9.	I drink eight glasses of water a day	117 (58.5)	55 (27.5)	25 (12.5)	3 (1.5)
10.	I read the labels on food packaging before buying products	91 (45.5)	56 (28)	37 (18.5)	16 (8)
11.	Before eating and drinking, I wash my hands	149 (74.5)	39 (19.5)	12 (6)	0 (0)
12.	I do physical exercise or sports for at least 30 min a day	37 (18.5)	71 (35.5)	72 (36)	20 (10)

Table 4: Differences in the mean scores for COVID-19 knowledge and nutritional practices based on demographic characteristics

Variables	COVID-19 knowledge		Nutritional practices			
	Mean (SD)	p-value	Mean (SD)	p-value		
Gender						
Male	10.97 (1.80)	0.488	36.25 (4.70)	0.623		
Female	11.23 (1.26)		35.44 (5.78)			
Age (years)						
18–25	11.10 (1.54)	0.572	35.62 (5.49)	0.557		
26–35	11.32 (1.02)		36.43 (5.01)			
Subdistricts						
Medan Amplas–Medan Denai	10.96 (1.83)	0.609	36.01 (4.68)	0.057		
Medan Helvetia–Medan Perjuangan	11.29 (1.18)		36.42 (5.72)			
Medan Petisah–Medan Tuntungan	11.15 (1.32)		34.17 (5.73)			
Education						
Senior high school	11.23 (1.5)	0.124	35.49 (5.38)	0.243		
College/university	10.90 (1.41)		36.33 (5.51)			
Occupation						
Unemployed	11.20 (1.17)	0.682	35.61 (5.28)	0.268		
Entrepreneur	11.07 (1.07)		34.29 (5.33)			
Public servant	11.25 (1.50)		39.00 (0.00)			
Private employees	10.84 (1.92)		35.19 (5.16)			
Student	11.43 (1.14)		36.57 (5.44)			
Teacher	11.09 (1.86)		34.55 (7.05)			
Others	11.00 (1.48)		40.00 (8.72)			
Income						
Low	11.30 (1.17)		0.758		35.83 (5.48)	0.354
Middle	10.91 (2.28)	36.67 (5.48)				
High	11.16 (1.17)	36.03 (4.96)				
Very high	10.95 (1.51)	34.56 (5.57)				
Source of COVID-19 information						
Journal/articles and case report	12.67 (0.58)	0.073	37.67 ()	0.434		
Local government	11.67 (0.58)		38.00 (0.00)			
Mass media	11.24 (1.91)		36.22 (4.92)			
Social media	11.07 (1.22)		35.58 (5.84)			
Parents/friends/relatives	10.78 (1.40)		33.83 (4.85)			
Local health workers/expert visits	11.50 (1.48)		38.25 (2.06)			

COVID: Coronavirus disease.

respondents. The same result was found in several other studies [9], [10], [12], [13].

The number of respondents who had a low income is in line with the occupation of respondents, who were students or unemployed. Social media has an important role, if used responsibly and appropriately, in the rapid and effective dissemination of important information. As for sources of information about COVID-19, most were from social media and mass media. Thus, social media and mass media have an important role to play in spreading information about COVID-19 [9], [14], [15]. However, some studies found that social media can have some drawbacks. Among the drawbacks are the possibility that the information submitted is out-of-date, has never been expertly reviewed, is invalid or incorrect, does not apply to a particular environment, or is even fake [16], [17]. Thus, questions regarding the myths and perceptions of COVID-19 need to be measured as well.

Research on COVID-19 knowledge has been carried out several times, especially in Indonesia

[12], [13] and several other Asian countries, such as the Philippines, Saudi Arabia, China, Vietnam, and Pakistan [9], [10], [18], [19], [20]. Most respondents had a good level of knowledge. The results of this study are in line with those presented in the previous studies [9], [10]. Understanding of the treatment of COVID-19 is still lacking, even though the respondents had a good understanding of the transmission, symptoms, and prevention of COVID-19. There was a difference between this study and the research of Saefi *et al.* (2020). In that study, most of the respondents did not know that COVID-19 was caused by a coronavirus. However, in this study, the term used was “COVID-19 is caused by a virus.” This shows that using different terms can produce different results. Good knowledge might be related to demographic characteristics, but there was no significant difference in the mean score of knowledge and good knowledge based on demographic characteristics.

Besides, one study showed that gender, age, educational background, professional background, health status, and living environment, as well as the level of knowledge and attitudes of the community, could influence nutritional practices. Along with the development of technology, people could access information regarding nutritional practices through social media and mass media [21]. However, the results of this study indicate that there is no significant difference between nutritional practices and demographic characteristics.

During the COVID-19 pandemic, people could also change their nutritional practices, for example, they might increase their consumption of vegetables, fruit, and water and reduce their consumption of sugary drinks and snacks [21]. However, other studies found that the quarantine period might cause depression, stress, and anxiety disorders, which could trigger the consumption of high-sugar foods and reduce physical activity [22]. The quarantine period in Medan City was still ongoing in June 2020, and a new normal period was effective on July 1, 2020. A statement by Mattioli *et al.* (2020) stating that at the end of the quarantine period, the economic crisis could prolong or worsen this poor lifestyle and lead to an increased risk of cardiovascular disease.

In this study, people tended to have good nutritional practices. This result was not consistent with a previous study, which found that most samples had satisfactory nutritional practices [23]. The respondents

Table 5: Differences in results for COVID-19 knowledge and nutritional practices based on demographic characteristics

Variables	COVID-19 knowledge, n (%)				Nutritional practices, n (%)			
	Good	Satisfactory	Poor	p-value	Good	Satisfactory	Poor	p-value
Gender								
Male	61 (30.5)	10 (5)	1 (0.5)	0.487	44 (22)	28 (14)	0 (0)	0.057
Female	115 (57.5)	12 (6)	1 (0.5)		74 (37)	45 (22.5)	9 (4.5)	
Age (years)								
18–25	150 (75)	20 (10)	2 (1)	0.812	100 (50)	63 (31.5)	9 (4.6)	0.603
26–35	26 (13)	2 (1)	0 (0)		18 (9)	10 (5)	0 (0)	
Sub-district								
Medan Amplas–Medan Denai	60 (30)	12 (6)	1 (0.5)	0.112	43 (21.5)	28 (14)	2 (1)	0.268
Medan Helvetia–Medan Perjuangan	74 (37)	4 (2)	1 (0.5)		52 (26)	23 (11.5)	4 (2)	
Medan Petisah–Medan Tuntungan	42 (21)	6 (3)	0 (0)		23 (11.5)	22 (11)	3 (1.5)	
Education								
Senior high school	130 (65)	11 (5.5)	1 (0.5)	0.033	80 (40)	55 (27.5)	7 (3.5)	0.526
College/university	46 (23)	11 (5.5)	1 (0.5)		38 (19)	18 (9)	2 (1)	
Occupation								
Unemployed	43 (21.5)	6 (3)	0 (0)	0.195	28 (14)	20 (10)	1 (0.5)	0.463
Entrepreneur	13 (6.5)	1 (0.5)	0 (0)		5 (2.5)	8 (4)	1 (0.5)	
Public servant	3 (1.5)	1 (0.5)	0 (0)		4 (2)	0 (0)	0 (0)	
Private employee	51 (25.5)	11 (5.5)	1 (0.5)		35 (17.5)	24 (12)	4 (2)	
Student	53 (26.5)	3 (1.5)	0 (0)		38 (19)	16 (8)	2 (1)	
Teacher	10 (5)	0 (0)	1 (0.5)		6 (3)	4 (2)	1 (0.5)	
Other	3 (1.5)	0 (0)	0 (0)		2 (1)	1 (0.5)	0 (0)	
Income								
Low	79 (39.5)	8 (4)	0 (0)	0.398	52 (26)	31 (15.5)	4 (2)	0.927
Middle	28 (14)	4 (2)	1 (0.5)		21 (10.5)	11 (5.5)	1 (0.5)	
High	34 (17)	3 (1.5)	0 (0)		23 (11.5)	13 (6.5)	1 (0.5)	
Very high	35 (17.5)	7 (3.5)	1 (0.5)		22 (11)	18 (9)	3 (1.5)	
Source of COVID-19 information								
Journal/articles and case report	3 (1.5)	0 (0)	0 (0)	0.613	2 (1)	1 (0.5)	0 (0)	0.195
Local government	3 (1.5)	0 (0)	0 (0)		3 (1.5)	0 (0)	0 (0)	
Mass media	53 (26.5)	5 (2.5)	1 (0.5)		34 (17)	24 (12)	1 (0.5)	
Social media	100 (50)	12 (6)	1 (0.5)		69 (34.5)	37 (18.5)	7 (3.5)	
Parents/friends/relatives	14 (7)	4 (2)	0 (0)		6 (3)	11 (5.5)	1 (0.5)	
Local health workers/expert visits	3 (1.5)	1 (0.5)	0 (0)		4 (2)	0 (0)	0 (0)	

COVID: Coronavirus disease.

Table 6: Relationship between COVID-19 knowledge and nutritional practices

COVID-19 knowledge	Nutritional practices			p-value	PR	95% CI	B
	Good, n (%)	Satisfactory-poor, n (%)	Total, n (%)				
Good	109 (54.4)	67 (33.5)	176 (88)	0.022	2.711	1.123–6.541	0.244
Satisfactory-poor	9 (4.5)	15 (7.5)	24 (12)				
Total	118 (59)	82 (41)	200 (100)				

COVID: Coronavirus disease, CI: Confidence interval.

paid the most attention to the importance of washing their hands, eating regularly 3 times a day, and drinking eight glasses of water a day. This might be due to the role of social media and mass media in disseminating information about the importance of hand washing and the existing lifestyle of the community. Physical activity also needs to be promoted in order to improve the body's immune condition [24].

This study has some limitations which were this study conducted in local area and the samples dominated by female gender. Several variables that were not included in the study may affect nutritional practices, namely, attitudes, perceptions, and beliefs. In addition, to determine whether the changes in nutritional practices were due to the changing circumstances, data on nutritional practices before and after the COVID-19 pandemic are needed.

Conclusions

The relationship between the level of knowledge about COVID-19 and nutritional practices was investigated in this study. In other words, people with proper knowledge about COVID-19 will do proper

nutrition practices according to the knowledge they have. The existence of this relationship also indicates that improved nutritional practices may lead to a stronger immune system and a reduced risk of chronic disease and other infectious diseases. However, the infection rate and mortality of COVID-19 have so far continued to increase in Medan. Public awareness about efforts to prevent the transmission of COVID-19 is also needed in addition to implementing good nutritional practices.

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Authors' Contributions

D.N.: Manuscript preparation, data analysis, and manuscript editing. D.K.S: Design, concepts,

clinical studies, and manuscript review. R.A.: Statistical analysis. W.A.: Literature search and manuscript editing.

Ethics Approval and Consent to Participate

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving research study participants were approved by the Universitas Sumatera Utara Ethical Committee, No. 103/KEP/USU/2020. Written and verbal informed consent was obtained from all subjects for this study. Verbal consent was witnessed and formally recorded. All participants were aware of the whole process in this study.

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