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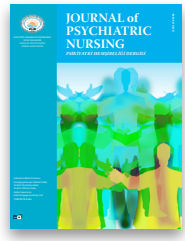

Original Article

Relationship between nutritional literacy and depression status among COVID-19 survivors: A cross-sectional study

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Abstract

Objectives: The COVID-19 pandemic has affected everyone's mental health as well as their physical health. The aim of this study was to examine the impact of nutritional literacy on depression status among COVID-19 survivors.

Methods: A cross-sectional study was conducted on COVID-19 survivors in East Kalimantan, Indonesia, from March to June 2022. According to the sample size, a total of 567 participants were selected. To assess depression status, participants completed the Depression, Anxiety, and Stress Scale—21 Items (DASS-21) questionnaire, with each category consisting of 7 questions. The participants' nutritional literacy status was tested using the Short Food Literacy Questionnaire (SFLQ), which consists of 16 questions.

Results: Most of the participants were women (71.8%) and had undergraduate education (44.3%). The literacy status of most participants was in the good category (53.6%). Regarding depression status, the majority did not experience depression (72.8%), followed by mild depression (8.5%), moderate depression (11.8%), severe depression (6%), and extremely severe depression (6%). The results of the bivariate test analysis showed a significant correlation between nutritional literacy and depression status (p=0.000, r=-0.236).

Conclusion: Nutritional literacy has a significant impact on depression status in COVID-19 survivors. Good nutritional literacy can reduce depression status and vice versa.

Keywords: COVID-19; depression; Indonesia; mental health; survivors

At the end of 2019, the world was faced with the COVID-19 pandemic, which started in Hubei Province, China. At the beginning of January 2020, the World Health Organization (WHO) announced that this pandemic was an international public health emergency.[1] WHO stated that more than 400 million cases of COVID-19 occurred worldwide, and 6 million of them were reported to have died.[2]

The COVID-19 pandemic, which has been ongoing since 2020, has had a substantial impact on global mental health, with prevalence rates of depression and anxiety increasing dramatically across diverse populations.[3] However, mental health impacts during pandemics are not a novel phenomenon. The Ebola outbreak in West Africa (2014–2016) demonstrated high prevalence rates of mental health disorders, with 48% of the population experiencing anxiety-depression symptoms and 76% showing PTSD symptoms.[4] Recent studies on Ebola survivors revealed that 3.9% experienced major depression and 12% developed substance use disorders, significantly exceeding regional baseline rates.[5]

The SARS pandemic (2002–2003) and similar MERS-CoV outbreaks produced comparable psychological impacts, albeit with more geographically limited scope compared to COVID-19.[6] Comparative analysis across respiratory pandemics indicates that despite pathogen variation, psychological

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responses among populations demonstrate consistent patterns, including increased stress, anxiety, and depressive disorders.[7]

Beyond mental health impacts, pandemics have significantly altered nutritional behaviors and dietary patterns within communities. Contemporary research demonstrates that during the COVID-19 pandemic, fundamental changes occurred in lifestyle and dietary patterns, with significant variations across different populations and cultures.[8] Cross-cultural studies indicate that nutritional responses to pandemics are heavily influenced by sociodemographic, economic, and local cultural factors.[9]

The COVID-19 pandemic has impacted many aspects of life, including public health and the economy.[10] Lockdown policies, restrictions on activities outside the home, and quarantine for COVID-19 sufferers were efforts to reduce the spread of COVID-19 in every country. The impact of this situation on people included the emergence of psychological problems due to uncertain changes in circumstances, feelings of loneliness, and fear of infection.[11] The psychological impact experienced during the pandemic gradually affected individuals' mental health.[12]

Mental health problems that occurred during the COVID-19 pandemic are a concern for further study. Research conducted in China on the psychological effects of COVID-19 on the general public and health workers during the lockdown reported that 25% of the general public experienced anxiety and 28% experienced depression.[11] Psychological problems due to COVID-19 were also observed in Europe. A study in the United Kingdom showed a high incidence of mental disorders (52%) and insomnia (28%).[13] Studies in several developing countries, including the Southeast Asia region, also revealed an increase in the prevalence of mental health problems in the community.[14] The incidence of anxiety (55.1%) and depression (59.2%) was reported in the general population of Malaysia.[15] Meanwhile, studies in Indonesia showed that the incidence of depression in the general public was 67%.[16] A meta-analysis of community-based research found that the prevalence of depression increased sevenfold during the COVID-19 pandemic compared to pre-pandemic levels, and this represents a critical issue that must be addressed to improve community welfare.[17]

The COVID-19 pandemic, especially the lockdown situation, has been known to cause changes in people's mental health, lifestyle, and dietary habits. Literacy factors regarding health, diet, and lifestyle play an important role in mitigating the negative impacts of the COVID-19 pandemic.[18] Maintaining a good diet reduces the risk of developing mental health disorders.[19] Literacy regarding diet or nutrition, including the ability to plan, select, and prepare food, has changed during the COVID-19 pandemic. Information about healthy food literacy is mostly obtained through online media.[20] Most people at that time planned the type of food they would consume based on a predetermined nutritional panel, choosing healthy and quality food, and preparing it by cooking their own meals.[21,22] Several studies show that nutritional literacy is associated with improved mental health status during the COVID-19 pandemic.[23,24]

What is presently known on this subject?

- The COVID-19 pandemic that has occurred worldwide has impacted every aspect of life, including the economy and public health. It affects not only physical health but also the mental health of both healthy and infected individuals.

What does this article add to the existing knowledge?

- This study underscores the significance of enhancing nutritional knowledge, even under restricted conditions, by utilizing social media platforms to educate individuals on making informed choices regarding food selection and preparation. Good nutritional knowledge and information can prevent deficiencies that lead to nutrient insufficiency, while unhealthy diets may cause emotional problems, depression, and cognitive decline.

What are the implications for practice?

- Health promotion and education should be carried out by governments and health service facilities. A multidisciplinary approach in the fields of nursing and health is highly recommended to reduce the negative impact on people's mental health.

East Kalimantan Province ranked fifth in Indonesia in 2021 in terms of confirmed COVID-19 cases among residents. The lack of proper monitoring of population movement and the absence of self-quarantine measures, particularly among workers in the oil, natural gas, and mining industries scattered across the region, are believed to have contributed to this situation. Given the vast geography of the region and the conditions of those living in interior regions, border areas, and areas divided by rivers and forests, it is possible that people's conditions during the COVID-19 pandemic worsened due to a lack of information and support from medical professionals. Consequently, governmental responses to the pandemic involved implementing restrictions on community activities, leading to notable changes in people's daily routines. These changes included reduced physical activity and increased consumption of unhealthy food items.

The adoption of unhealthy eating habits and sedentary lifestyles during the pandemic restrictions may serve as risk factors for depression. This is compounded by the ongoing uncertainty surrounding the pandemic, which could result in long-term stressors leading to depressive disorders. Research conducted by Hertanto et al.[25] indicated that a significant proportion of respondents (42%) who consumed traditional foods such as rice, meat, fish, and vegetables were less likely to experience depression compared to those consuming processed foods such as noodles, bread, and frozen meals, who showed a higher tendency towards depression. Embracing a healthy diet is crucial in mitigating depression risks, highlighting the importance of nutritional management amid the COVID-19 crisis.

Increasing nutritional literacy within the community is essential in addressing potential depressive symptoms during

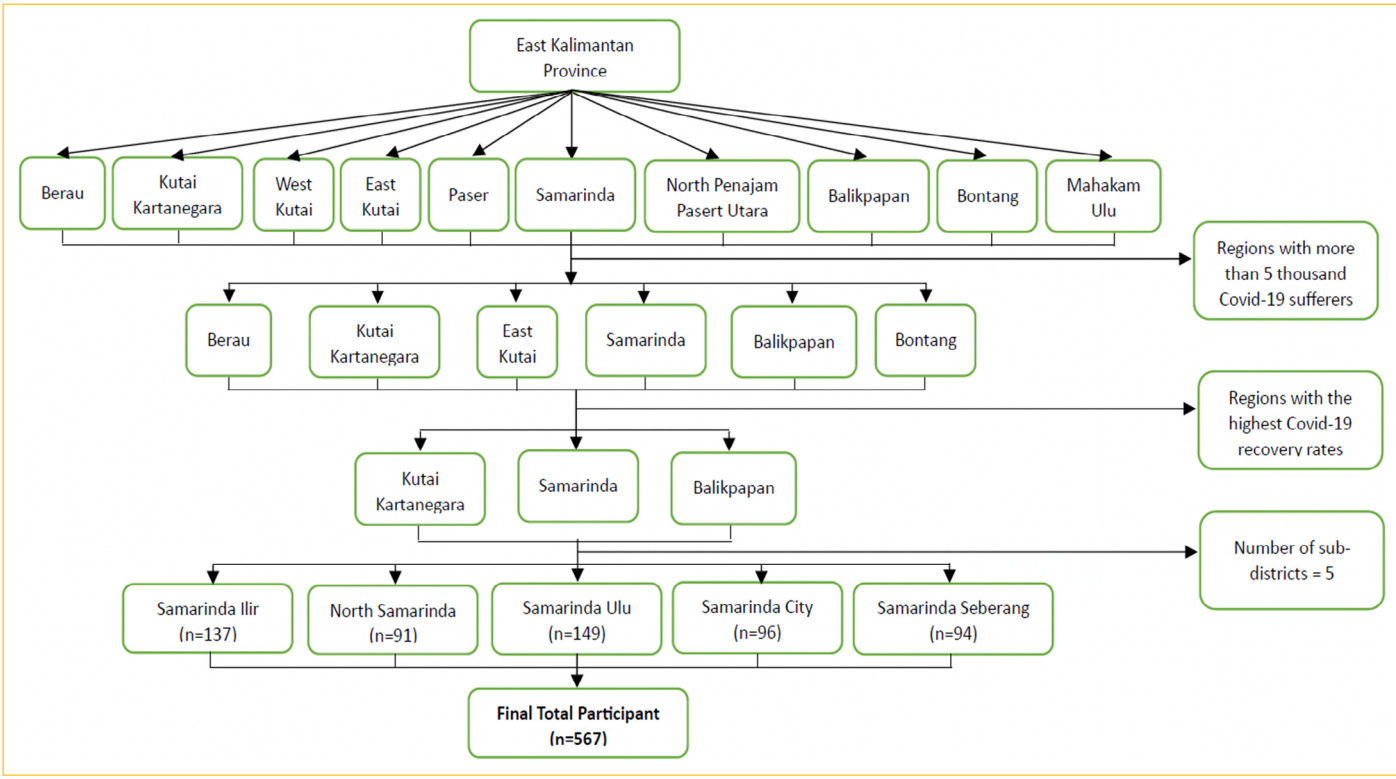

Figure 1. Flowchart of participant selection in East Kalimantan Province.

the pandemic. This study underscores the significance of enhancing nutritional knowledge, even under restricted conditions, by utilizing social media platforms to educate individuals on making informed choices regarding food selection and preparation. The aim of this study was to examine the impact of nutritional literacy on depression status among COVID-19 survivors.

Materials and Method

Study Design and Participants

This was a quantitative, descriptive, and cross-sectional study conducted on a population with post-COVID-19 in Samarinda, East Kalimantan Province, Indonesia, from March to June 2022. Figure 1 displays the screening process for the population of COVID-19 cases in East Kalimantan. The sampling method used was purposive sampling with established inclusion criteria for respondents. Participants involved in this study were: 1) 18 years old or older, 2) individuals who had recovered from COVID-19 and had previously been infected without symptoms or with mild symptoms while self-isolating at home, and 3) able to read and respond to questionnaires. Participants with critical illness were excluded.

The sample size in this study was calculated using G*Power with an effect size=0.15, an alpha level=0.05, and a power level=0.95. From the results of these calculations, a sample size of 567 participants was obtained.

Instruments

This research used a self-administered online survey distributed to participants in the Indonesian language using the Google Form platform. Two questionnaires were used: one for nutritional literacy and one for depression. The nutritional literacy questionnaire used the Short Food Literacy Questionnaire (SFLQ) for Adults.[26] The depression questionnaire used the Depression, Anxiety, and Stress Scale—21 Items (DASS-21).[27] The DASS-21 questionnaire referred to a version previously translated by other researchers. Meanwhile, the SFLQ was initially translated into Indonesian and then back-translated into English by different translators; both versions were compared and found to be similar. Experts in the field, including two nutrition academics, reviewed the instrument for face and content validity, and changes were made.

The first stage involved collecting demographic data, including gender, education level, religion, and marital status.

The second stage involved collecting data using the questionnaires.

The Depression Questionnaire

The Depression, Anxiety, and Stress Scale—21 Items (DASS-21) questionnaire was utilized in the depression assessment. This seven-item questionnaire was developed to evaluate emotional states associated with stress, anxiety, and depression. An assigned value of 0 signifies that the assertion "does

not pertain to me in any way"; a value of 1 signifies that the assertion "applies to me to a certain extent, or to some degree"; a value of 2 signifies that the assertion "applies to me to some extent, or significantly"; and a value of 3 signifies that the assertion "strongly applies to me." Four categories were used to classify the participants' levels of depression: normal, mild, moderate, severe, and extremely severe.

The Nutritional Literacy Questionnaire

The nutritional literacy questionnaire used the Short Food Literacy Questionnaire (SFLQ). This questionnaire consists of 12 questions. Participants' responses were measured using a Likert scale consisting of four- and five-point options: very bad to very good (1–4), strongly disagree to strongly agree (1–4), very bad to very good (1–5), very difficult to very easy (1–4), and never to always (1–5). The food literacy level of the participants was interpreted as good nutritional literacy if the nutritional literacy score was equal to or higher than the median, and poor nutritional literacy if the score was less than the median.

Data Collection

Data were collected via Google Form, which included the DASS-21 questionnaire and the SFLQ questionnaire. To ensure validity, several provisions were implemented in the Google Form: 1) each participant could only use one ID to access the form; 2) submission was only possible if all questions were answered. The finalized Google Form was then distributed by the researchers through a shared link in existing WhatsApp group media. Each WhatsApp group contained a minimum of 50 members. To meet the minimum sample size, data collection was carried out until the final dataset reached 567 participants.

Statistical Analysis

Data were analyzed using SPSS version 26.0. Data are presented in tables. Descriptive statistics were reported as mean and standard deviation (SD), whereas frequency and percentage were used for categorical variables. To examine the relationship between food literacy and depression status, a bivariate analysis was performed using the Spearman rank test. A two-tailed difference of $p<0.05$ was considered statistically significant, and the r value was used to assess the strength of correlation between variables.

Ethical Considerations

This research was approved by the Ethics Committee (approval number: 09/KEPK-FK/II/2022, approval date: 2 February 2022). All participants were informed that no private data would be collected, and research procedures followed strict rules to ensure confidentiality and anonymity. All procedures were carried out in accordance with the ethical standards of the Declaration of Helsinki.

Table 1. Socio-demographic characteristics of the participants (n=567)

Characteristics	n	%
Sex		
Male	160	28.2
Female	407	71.8
Education		
Elementary School	13	2.3
Junior High School	18	3.2
Senior High School	53	9.3
Diploma	201	35.4
Bachelor	251	44.3
Profession	7	1.2
Magister	23	4.1
Doctor	1	0.2
Religion		
Moslem	508	89.6
Protestan	43	7.6
Chatolic	14	2.5
Hindu	2	0.4
Marriage status		
Single	219	38.6
Married	345	60.8
Widowed	3	0.5
Age, mean±SD, min-max	32.16±9.385 18–64	

SD: Standard deviation

Results

Demographic Characteristics of the Participants

A total of 567 participants were included in this study. Based on Table 1, the socio-demographic characteristics of the participants showed that the majority were female (n=407, 71.8%), with the highest level of education being a bachelor's degree (n=251, 44.3%). Most of the participants were Muslim (n=508, 89.6%), and their marital status was married (n=345, 60.8%). The average age of participants was 32 years, with the lowest age being 18 years and the highest age being 64 years.

Analysis of Univariate Data on Nutritional Literacy and Depression Status of Participants

Based on Table 2, in terms of nutritional literacy, 57% of participants agreed that they could find information about healthy nutrition if they had any questions. Participants were also good (53.6%) at understanding nutritional information using various sources, including nutrition information leaflets, TV or radio programs on nutrition, and oral recommendations. Regarding the food pyramid, participants stated that they were quite familiar with it (44.8%). With respect

Table 2. Description of the short food literacy questionnaire (SFLQ) results

No	Questions	Options															
		1=strongly disagree		2= don't agree		3= agree		4= strongly agree						SD	Mean	Total	
		n	%	n	%	n	%	n	%								
1	When faced with inquiries regarding healthy nutrition, I am aware of the resources available to me for obtaining information on this subject.	0	0.0	40	7.1	326	57.5	201	35.4					0.587	3.28	567	
No	**Questions**	**1= very bad**		**2= bad**		**3= fair**		**4=good**		**5=very good**				**SD**	**Mean**	**Total**	
		n	%	n	%	n	%	n	%	n	%						
2	How proficient is one's comprehension of various nutritional information sources typically encountered? a. Leaflets providing nutritional information. b. Details on food labels c. Television or radio broadcasts focusing on nutrition d. Verbal guidance on nutrition delivered by experts e. Recommendations on nutrition from acquaintances or family members.	0	0.0	0	0.0	135	23.8	304	53.6	128	22.6			0.682	3.99	567	
3	How well acquainted are you with the Food Pyramid of the Ministry of Health in Indonesia?	2	0.4	9	1.6	254	44.8	241	42.5	61	10.8			0.711	3.62	567	
No	**Questions**	**1=strongly disagree**		**2= don't agree**		**3= agree**		**4= strongly agree**						**SD**	**Mean**	**Total**	
		n	%	n	%	n	%	n	%								
4	I am familiar with the official recommendations from the Ministry of Health in Indonesia regarding the consumption of fruits and vegetables.	3	0.5	87	15.3	416	73.4	61	10.8					0.529	2.94	567	
5	I am familiar with the guidelines provided by the Ministry of Health in Indonesia regarding the recommended consumption of salt.	10	1.8	81	14.3	407	71.8	69	12.2					0.577	2.84	567	
No	**Questions**	**1= very hard**		**2=hard**		**3=easy**		**4=very easy**						**SD**	**Mean**	**Total**	
		n	%	n	%	n	%	n	%								
6	Consider a typical day: to what extent do you encounter challenges in preparing a nutritionally balanced meal in the comfort of your own home?	11	1.9	74	13.1	365	64.4	117	20.6					0.643	3.04	567	

Table 2. Cont.

No	Questions	Options										SD	Mean	Total
		1= never		2= seldom		3=sometimes		4=often		5=always				
		n	%	n	%	n	%	n	%	n	%			
7	In previous instances, how frequently were you capable of providing assistance to your family members or acquaintances when they sought clarification on matters related to nutrition?	18	3.2	66	11.6	274	48.3	180	31.7	29	5.1	0.842	3.24	567
No	**Questions**	**1= very bad**		**2= bad**		**3= fai r**		**4=good**		**5=very good**		**SD**	**Mean**	**Total**
		n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**			
8	There is a lot of information available on healthy nutrition today. How well do you manage to choose the information relevant to you?	2	0.4	50	8.8	441	77.8	77	13.1	0	0.0	0.482	3.02	
No	**Questions**	**1=very difficult**		**2=difficult**		**3=easy**		**4=very easy**				**SD**	**Mean**	**Total**
		n	**%**	**n**	**%**	**n**	**%**	**n**	**%**					
9	How easy is it for you to judge if media information on nutritional issues can be trusted?	0	0.0	60	10.6	422	74.4	85	15.0			0.504	3.04	567
No	**Questions**	**1= very hard**		**2=hard**		**3=easy**		**4=very easy**				**SD**	**Mean**	**Total**
		n	**%**	**n**	**%**	**n**	**%**	**n**	**%**					
10	Commercials often relate foods with health. How easy is it for you to judge if the presented associations are appropriate or not?	1	0.2	94	16.6	395	69.7	77	13.6			0.555	2.94	567
11	How simple is it for individuals to assess the relevance of a particular food item in promoting a nutritious dietary regimen?	2	0.4	96	16.9	406	71.6	63	11.1			0.539	2.93	567
12	How feasible is it for individuals to assess the enduring effects of their dietary patterns on their overall health?	3	0.5	113	19.9	395	69.7	56	9.9			0.554	2.89	567

SD: Standard deviation.

Table 3. Description of depression status using DASS-21

No	Statement	Options								SD	Mean	Total
		0=Did not apply to me at all		1= Applied to me to some degree, or some of the time		2= Applied to me to a considerable degre or a good part of time		3= Applied to me every much or most of the time				
		n	%	n	%	n	%	n	%			
1	I couldn't seem to experience any positive feeling at all	475	48.5	221	39.0	63	11.1	8	1.4	0.731	0.65	567
2	I found it difficult to work up the initiative to do things	255	45.0	236	41.6	69	12.2	7	1.2	0.728	0.70	567
3	I felt that I had nothing to look forward to	407	71.8	111	19.6	41	7.2	8	1.4	0.683	0.38	567
4	I felt down-hearted and blue	381	67.2	133	23.5	43	7.6	10	1.8	0.710	0.44	567
5	I was unable to become enthusiastic about anything	319	56.3	187	33.0	58	10.2	3	0.5	0.696	0.55	567
6	I felt I wasn't worth much as a person	450	79.4	86	15.2	24	4.2	7	1.2	0.598	0.27	567
7	I felt that life was meaningless	459	81.0	76	13.4	26	4.6	6	1.1	0.589	0.26	567

DASS-21: The Depression, Anxiety, and Stress Scale—21 Items; SD: Standard deviation.

to recommendations for fruit and vegetable consumption, most respondents agreed that they knew this (71.8%).

Participants reported that there is quite a lot of information available about healthy nutrition today. They stated that they were fairly able (77.8%) to manage information that was relevant to them. Additionally, participants stated that they could easily assess the reliability of information sources (74.4%) and evaluate whether certain foods were related to a healthy diet (71.6%).

Table 3 shows the questionnaire statements regarding participants' depression status. The analysis revealed that over 50% of participants reported that they did not experience the symptoms related to depression. A total of 48.5% of participants stated that "not being able to feel positive feelings" did not occur to them. Similarly, 45% stated that "difficulty in taking initiative" did not occur to them. Moreover, participants reported not experiencing feelings of sadness (67.2%), lack of enthusiasm (56.3%), lack of self-worth (79.4%), and feeling that life had no meaning (81.0%).

Table 4 shows the statistical analysis of participants' depression status. The majority did not experience depression (n=418, 72.8%), while 48 participants (8.5%) were in the mild depression category, 67 (11.8%) in the moderate category, 34 (6.0%) in the severe category, and 5 (0.9%) in the extremely severe depression category. Furthermore, Table 4 also displays the nutritional literacy status of participants: 299 (52.7%) had good nutritional literacy, and 268 (47.3%) had poor nutritional literacy.

Analysis of the Correlation Between Nutritional Literacy and Participants' Depression Status

Table 5 shows that there is a significant relationship between nutritional literacy and depression status (p=0.000). To examine the direction of the relationship, a Spearman rank correlation analysis was conducted, which yielded a negative correlation (r=-0.322). These results indicate that the better the nutritional literacy status, the less severe the depression status, and vice versa.

Discussion

The purpose of this study was to examine the relationship between nutritional literacy and depression status among COVID-19 survivors. The current study found that nutritional literacy and depression have a strong association. Furthermore, the study revealed a negative correlation, indicating that the higher participants' nutritional literacy, the lower their depression level. Other research has shown that the higher the food literacy score during the COVID-19 pandemic, the greater the likelihood of maintaining a stable or better mental health state.[18,23] Previous research also stated that nutritional literacy can be used as an independent predictor of a person's mental health status during the COVID-19 pandemic.[23]

Nutritional literacy relates to an individual's capacity to make appropriate food decisions and balance food needs using available resources. To lower the risk of depression and enhance clinical therapy, an approach is required that incor-

Table 4. Analysis of univariate variable of depression status dan nutritional literacy

No	Option	Normal		Mild		Moderate severe		Severe		Extremely		SD	Mean
		n	%	n	%	n	%	n	%	n	%		
1	Level of depression	413	72.8	48	8.5	67	11.8	34	6.0	5	0.9	0.976	1.54
	Option	**Good**		**Poor**								**SD**	**Mean**
		n	%	n	%								
2	Level of nutritional literacy	299	52.7	268	47.3							0.247	1.07

SD: Standard deviation.

porates information about dietary patterns, specific types of food, and the basic mechanisms of nutrition in the body.[28] In the Integrated Health Literacy Model, it is stated that the core of food literacy is health literacy.[29]

Food intake and exercise are regarded as the keys to a healthy lifestyle. Healthy food intake is influenced by a variety of factors, including sociodemographics, clinical conditions, and behavior. As a result, these findings provide critical information for governments and organizations to create strategic nutritional support programs to combat the pandemic and its psychological consequences, especially in circumstances of lockdown or home confinement caused by COVID-19 to prevent viral infections.[30]

These findings align with emerging evidence from various pandemic contexts and provide important insights for future public health preparedness. The negative correlation between nutritional literacy and psychological distress observed in our study is consistent with patterns documented across various infectious disease outbreaks, suggesting universal protective mechanisms that transcend specific pathogen characteristics.

During the 2014–2016 Ebola outbreak in West Africa, communities demonstrated varying levels of psychological resilience, with health education and community preparedness playing crucial roles in mental health outcomes.[31] The devastating nature of Ebola and its high mortality rates created unique psychological stressors, yet populations with better health system support and community interventions showed improved coping mechanisms during the crisis.[32] Similarly, during the 2003 SARS epidemic, studies revealed that individuals with better health literacy and coping strategies reported lower levels of psychological distress during quarantine periods.[33] The SARS coronavirus created social isolation conditions that highlighted the importance of health knowledge and self-efficacy in maintaining mental health during infectious disease outbreaks.[34]

Based on our results and evidence from previous pandemics, several nutritional behaviors emerge as critical for maintaining

Table 5. Bivariate analysis of nutritional literacy and depression status

Variable	Depression status		
	n	r	p
Nutritional literacy	567	-0.322	0.00*

*: Statistically Significant p<0.00. n: Total of Participants; r: Correlation test; p: Significance value.

mental health during health emergencies. Dietary changes can improve mental and cognitive health. Healthy eating habits and adequate nutrient intake can prevent and treat depression. Micronutrient deficiency, metabolic syndrome, and unhealthy diet are associated with depression. Vitamin C and vitamin D intake can have positive effects on depression symptoms.[35] Increased intake of non-refined grains and vegetables may help prevent or alleviate depression and anxiety. Non-refined grains, vegetables, and alcohol consumption are linked to depression and anxiety.[36,37] Fruit consumption is associated with a lower risk of developing depression. Green foods, yellow vegetables, and fresh fruit are particularly beneficial to mental health.[38–40] Adherence to the Mediterranean-style diet is linked to reduced depression symptoms. A Mediterranean diet rich in plant-based foods has been related to a lower risk of depression. The overall effect of diet is significant for mental health.[35,36]

The results of this study are consistent with previous studies. A reported study regarding nutrition literacy and mental health among university students in Pakistan showed that higher levels of nutrition literacy were associated with lower levels of depression.[41] In a study of Saudi people, 83% stated that the COVID-19 lockdown had a favorable impact on food literacy behavior ($p<0.05$), with varying effects on food consumption. Fruit intake increased ($Z=-3.330$, $p=0.001$), whereas processed meat and sweet drinks consumption decreased ($Z=-11.375$, $p<0.001$ and $Z=-2.403$, $p<0.05$, respectively). Side effects included decreased

vegetable consumption (Z=-3.447, p=0.001) and increased consumption of sugary foods (Z=-2.268, p<0.05).[21]

Do et al.[42] found that older persons with higher health literacy were less likely to be depressed and engaged in healthier practices among COVID-19 patients. The Mediterranean diet and other healthy eating habits may aid in the prevention and treatment of depression. This eating pattern emphasizes seafood, olive oil, vegetables, fruit, nuts, lean protein sources, whole grains, and vegetable oils, while limiting foods poor in nutrients and high in added sugars and saturated fats, such as sugar-sweetened beverages.[28] A study in China found that having good nutritional status combined with physical activity was associated with fewer depressive symptoms, and vice versa.[43]

Depression is a common mental health disorder marked by prolonged sadness. Diet is linked to depressive symptoms and depression. Nutrient deficiencies and unhealthy diets can lead to emotional distress, depression, and cognitive deterioration. Healthy eating habits and adequate nutrition can help prevent and treat depression. Dietary adjustments can reduce the prevalence of depressive illnesses.[35] Adolescence is a common starting point for mental health issues. Proper diet is critical for mental health in the early years.[44] A diet high in chocolate, confectionery, and butter, but lacking in vegetables and fruits, has been linked to an increased risk of depressive and anxious symptoms. Moderate consumption of meals and beverages may minimize the burden of mental illnesses. Some studies have examined the relationship between food patterns and depressive and anxious symptoms.[37] Higher intake of dietary added sugars is associated with an increased risk of incident depression, whereas higher intake of lactose, fiber, non-juice fruit, and vegetables is associated with lower risks of incident depression.[44]

Limitation

This study has several limitations that should be acknowledged. First, the cross-sectional design with self-assessment questionnaires may introduce reporting bias, as participants' responses could be influenced by social desirability or current emotional states. Second, the study's geographical restriction to Indonesia significantly limits generalizability. Indonesia's unique cultural characteristics (collectivist orientation, high religiosity, strong family support), specific pandemic policies, and healthcare system may produce psychological response patterns that differ from other countries. These contextual factors limit the applicability of findings to populations with different cultural backgrounds or healthcare systems. For future research, it is recommended to use qualitative studies or mixed-method approaches to obtain deeper findings and conduct cross-cultural replication studies to test the generalizability of these results across diverse geographical and cultural contexts.

Conclusion

This research shows that there is a weak but significant relationship between nutritional literacy and depression status in COVID-19 survivors. Nutritional literacy has been proven to be associated with depression status during the COVID-19 pandemic. From the direction of the relationship obtained, the better the nutritional literacy, the lower the depression status. Nutritional literacy is often considered trivial and assumed to have little connection with a person's mental health; however, this study demonstrates otherwise. These findings can serve as the basis for increasing public awareness of the importance of health literacy in reducing depression and promoting mental well-being.

Ethics Committee Approval: The study was approved by the Komisi Etik Penelitian Kesehatan Fakultas Kedokteran Universitas Mulawarman Ethics Committee (no: 09/KEPK-FK/II/2022, date: 02/02/2022).

Informed Consent: Informed consent was obtained from all participants.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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