

The Relationship Between Polyunsaturated Fatty Acid (PUFA) Intake and Cognitive Function in Psychiatric Patients with Depressive Disorders

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ABSTRACT

Keywords:

Depression;
PUFA;
MoCa- Ina

Disturbance depressive is a mental health disorder that is often associated with cognitive decline. Nutrition, particularly *polyunsaturated fatty acid (PUFA)* intake, is thought to play a role in maintaining brain health and cognitive function. However, evidence of a link between PUFA intake and cognitive function as measured by the *Montreal Cognitive Assessment (MoCA)*, *Indonesian version (MoCA-Ina)*, in patients with *depressive disorders* remains limited. This study aims to evaluate the relationship between *PUFA* intake and cognitive function in psychiatric patients with *depressive disorders*. This was an analytical study using secondary data from patients with *depressive disorders* at Dr. Kariadi General Hospital, Diponegoro National Hospital, Banyumanik Hospital 1, and Elisabeth Hospital Semarang from May 2022 to 2023. The study included patients aged 18–60 years who were diagnosed with *depressive disorders*, had completed the *Food Frequency Questionnaire (FFQ)* and *MoCA-Ina* assessments, and had no serious physical illness or *metabolic syndrome*. The analysis used the Spearman correlation test to assess the relationship between *PUFA* intake and cognitive function, as well as the Mann–Whitney test for comparisons based on *PUFA* intake categories. A total of 30 patients with *depressive disorders* were included, of whom 83.3% were female, with a mean age of 26.03 years. The mean *PUFA* intake was 6.31 grams, and the mean *MoCA-Ina* score was 27.67. The Spearman test showed no significant association between *PUFA* intake and cognitive function ($p = 0.790$). There was no significant relationship between *PUFA* intake and cognitive function in patients with *depressive disorders*.

INTRODUCTION

Disturbance depressive is a wrong term; the correct concept is depressive disorder, which is one of the most common mental health conditions worldwide and has a significant impact on the quality of life of affected individuals. In addition to affective symptoms such as depressed mood and anhedonia, patients with depression often experience declines in cognitive function, including attention, memory, executive function, and information processing speed. Cognitive disturbances can persist even after mood symptoms improve, contributing to decreased productivity and overall quality of life (Deane et al., 2021; Dyal et al., 2022; Pan et al., 2019; Thapar et al., 2022).

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Nutritional factors have been widely investigated in relation to mental health, including the role of polyunsaturated fatty acid (PUFA) intake in brain function. PUFAs, specifically omega-3 fatty acids such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), have anti-inflammatory effects, modulate neurotransmitters, and contribute to the integrity of neuronal cell membranes (Appleton et al., 2021; Cohen Kadosh et al., 2021; Firth et al., 2019; Li et al., 2020; Roberts et al., 2022). Several studies have shown that PUFA supplementation can improve depressive symptoms and support cognitive function. However, evidence supporting a direct link between PUFA intake and cognitive function in patients with depressive disorders in the Indonesian population remains limited (Bafkar et al., 2024; Cheng et al., 2025; Okereke et al., 2021; Wu et al., 2024).

The omega-3 PUFAs, EPA, and DHA are major dietary components extensively studied for their psychiatric effects, due to the therapeutic potential of their bioactive derivatives (Liao et al., 2021). Although EPA and DHA exhibit different biological effects, there is a strong basis supporting their anxiolytic and antidepressant potential, including modulation of neuronal membrane properties, receptor expression, neurotransmission, antioxidant and anti-inflammatory activities, pro-resolution effects, and increased neuroplasticity and neuroprotection (Wolters et al., 2021). These properties may help maintain brain homeostasis, which in turn is related to mood regulation, highlighting the importance of understanding the role of omega-3 PUFAs in mental health (Puri et al., 2023; Xu et al., 2024).

Docosapentaenoic acid (DPA_n-3), another omega-3 fatty acid, is gaining recognition as a key bioactive molecule involved in neuroinflammation and mental health outcomes. In animal models, DPA_n-3 supplementation has been shown to reduce depressive-like symptoms, while prospective human studies suggest that higher dietary DPA_n-3 intake is associated with a reduced risk of major depressive disorder (Delpech et al., 2020; Gui et al., 2024; Melo et al., 2019).

In randomized controlled trials (RCTs), omega-3 PUFA regimens containing $\geq 50\%$ DHA have been shown to be ineffective in treating depression. DHA may not improve depressive symptoms and could inhibit the antidepressant effects of EPA by slowing its conversion into active metabolites. In contrast, meta-analyses have demonstrated that EPA-enriched regimens ($\geq 60\%$ of total EPA+DHA, doses 0.2–2.2 g higher than DHA) are effective for primary depression. Additionally, some studies suggest anxiolytic effects at doses ≥ 2 g omega-3 PUFAs with EPA proportions $\leq 60\%$, but not at EPA proportions $\geq 60\%$. These findings should be interpreted with caution, as they include both placebo-controlled and non-placebo-controlled studies, as well as a retracted pilot study. Current systematic reviews and meta-analyses are evaluating the optimal EPA:DHA ratio and dosage for antidepressant and anxiolytic effects.

The urgency of this research stems from multiple converging factors. Depressive disorders are highly prevalent in Indonesia, with growing recognition of the burden of cognitive dysfunction on patient outcomes and quality of life. The availability of validated assessment tools, such as the Montreal Cognitive Assessment Indonesian version (MoCA-Indo), allows for systematic evaluation of cognitive function in Indonesian psychiatric populations. Increased interest in nutritional psychiatry and the potential for dietary interventions to complement standard treatments offers opportunities for more comprehensive management strategies. Understanding whether PUFA intake relates to cognitive function in patients with depression

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could inform dietary recommendations and identify subgroups that may benefit from supplementation. Establishing baseline data in the Indonesian population is essential for developing culturally appropriate interventions and clinical guidelines.

The MoCA-Ina is a locally validated screening tool for assessing mild cognitive impairment in various populations, including the elderly and patients with neuropsychiatric disorders. It evaluates key cognitive domains such as attention, memory, executive function, language, visuospatial skills, and orientation. Previous research in Indonesia has shown that the MoCA-Ina has good sensitivity and specificity for detecting cognitive decline, including among individuals with mood disorders.

With increasing attention to the cognitive dimensions of depressive disorders, the MoCA-Ina has become a relevant instrument for evaluating the impact of biological and psychological factors, as well as lifestyle, on cognitive function. One factor that has been widely investigated is nutrition, particularly the intake of omega-3 PUFAs such as EPA and DHA, in supporting brain health. Several international studies have demonstrated that higher PUFA intake, through diet or supplementation, correlates with higher MoCA scores in both general and psychiatric populations. Observational and interventional studies indicate that individuals with higher omega-3 intake perform better in domains such as working memory, processing speed, and executive function, which are assessed by the MoCA.

A study in elderly Korean patients reported significant improvements in MoCA scores following DHA and EPA supplementation for 12 weeks. Similarly, a study in Japan found positive associations between blood PUFA levels and cognitive performance measured by the MoCA. Although evidence in Indonesia remains limited, the MoCA-Ina provides an opportunity to evaluate this relationship locally. Therefore, this study aims to assess whether there is a relationship between PUFA intake, as measured by the Food Frequency Questionnaire (FFQ), and cognitive function, as assessed by the MoCA-Ina, in patients with depressive disorders. Understanding this relationship is crucial for exploring the potential of nutrition as a modifiable factor in managing cognitive impairment associated with depression, particularly in the Indonesian context.

This study aims to evaluate whether PUFA intake, assessed through the FFQ, is associated with cognitive function measured using the Indonesian version of the MoCA (MoCA-Ina) in patients with depressive disorders.

METHOD

This study was an analytical observational study with a cross-sectional design that used secondary data. The subjects were patients diagnosed with depressive disorders who underwent treatment or consultation at Dr. Kariadi General Hospital, Diponegoro National Hospital, Hospital Banyumanik 1, and Hospital Elizabeth Semarang during the period from May 2022 to May 2023. The study included patients aged 18–60 years with a diagnosis of depressive disorder who had completed the Food Frequency Questionnaire (FFQ) and the Montreal Cognitive Assessment Indonesian version (MoCA-Ina). Patients with severe physical illnesses or metabolic syndrome were excluded from the study. PUFA intake was evaluated using the FFQ and converted into grams. Cognitive function was measured using the MoCA-Ina, with a maximum score of 30; a score below 23 indicated cognitive impairment.

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1. Montreal Cognitive Assessment (MoCA)

The Montreal Cognitive Assessment (MoCA) is an assessment tool designed to detect cognitive disturbances in adult populations. The MoCA-Ina is a version adapted for the Indonesian context, taking cultural aspects into account. This tool aims to provide an accurate assessment of cognitive function in Indonesian individuals. The MoCA-Ina consists of 30 questions divided into several subtests, each measuring a different cognitive domain, including orientation, memory, attention and concentration, language and comprehension, and executive function. The maximum score on the MoCA-Ina is 30, with scores below 23 indicating cognitive impairment. The MoCA-Ina demonstrates good sensitivity, specificity, and reliability for detecting cognitive impairment in the Indonesian population. Previous studies have shown that the MoCA-Ina effectively distinguishes individuals with mild cognitive impairment from those with normal cognitive function.

2. Food Frequency Questionnaire (FFQ)

Food Frequency Questionnaires (FFQs) are commonly used tools to assess dietary intake. FFQs evaluate food consumption over the past month, categorizing foods based on their nutrient content. Intake is detailed in standard serving sizes, such as bowls or spoons. In semi-quantitative assessments, FFQs estimate the amount of nutrients consumed, such as grams of protein or PUFA.

Data were analyzed using SPSS software. The normality of the data distribution was tested with the Shapiro-Wilk test. The relationship between PUFA intake (in grams) and MoCA-Ina scores was analyzed using Spearman’s correlation test because the data were not normally distributed. To analyze differences in MoCA-Ina scores between high and low PUFA intake groups, the Mann-Whitney U test was applied. A p-value < 0.05 was considered statistically significant.

RESULT AND DISCUSSION

From secondary data obtained based on research participants regarding the relationship intake Polyunsaturated Fatty Acids (PUFA) to function cognitive on psychiatric patients with disturbance depressive Which done on May 2022–May 2023, obtained 30 people who met the inclusion and exclusion criteria. Subject demographic characteristics data are presented. on Table 1. Participants in study This consists of from 5 people (16.7%) men and 25 people (83.3%) Woman with average age 26.03 year. Part big Participants were unmarried (76.7%), the highest level of education was high school. and S1 (43.3% each), and the majority were unemployed (70.0%).

Table 1. Demographic Characteristics of Respondents (n = 30)

Variable	Frequency (N)	Percentage (%)	Mean ± Sd / Median (Min–Max)
Age (Years)	–	–	26.03 ± 7.03 Median: 23 (18–52)
Sex			
Male	5	16.7	–
Female	25	83.3	–
Marital Status			

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Single	23	76.7	–
Married	7	23.3	–
Education Level			
Senior High School (Sma)	13	43.3	–
Diploma (D3)	2	6.7	–
Bachelor (S1)	13	43.3	–
Master (S2)	2	6.7	–
Employment Status			
Working	9	30.0	–
Not Working	21	70.0	–

Based on the results of the normality test using the Kolmogorov-Smirnov and Shapiro-Wilk methods, it is known that the MoCA-Ina score data and PUFA intake are not normally distributed, with a Shapiro-Wilk significance value of 0.000 for the MoCA score. and 0.032 for PUFA intake ($p < 0.05$). Therefore, the correlation analysis was performed using the non-parametric Spearman test.

Table 2. Data Connection Intake Protein Based on FFQ And The relationship with Cognitive Impairment Based on MoCA-Ina

Variables	Mean ± Elementary School	p	r
PUFA score	10.89 ± 5.19	0.790	0.151
Function cognitive	28.23 ± 2.3		

The Spearman test showed that there was no significant relationship between PUFA intake and cognitive function scores (MoCA-Ina), with a correlation coefficient (r) of -0.051 and a significance value (p) of 0.790. This indicates that the variation intake PUFA No correlated in a way meaningful with change score MoCA-Ina in patients with depressive disorders.

Table 3. Data Connection Intake Protein Based on FFQ High-Low and its Relationship with Cognitive Disorders Based on MoCA-Ina

	Median PUFA	Amount	Mean	p-value	U
MoCA Score	Low	7	10.29	0.060	44.5
	Tall	23	17.09		
Total		30			

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Next, a Mann-Whitney test was conducted to assess differences in MoCA-Ina scores based on PUFA intake categories. low and high (based on median values). The mean MoCA rank score in the low PUFA group was 10.29 and in the high PUFA group was 17.09. The Mann-Whitney test showed that there was no significant difference between the cognitive function of patients with low PUFA intake compared to those with high PUFA intake. high ($U = 44.5$; $p = 0.060$)

Results study This show that No there is connection Which significant between PUFA intake and cognitive function in patients with depressive disorders. Although PUFAs have been associated with neuroprotective benefits and improved cognitive function in several studies, the results of this study do not support this hypothesis. One possible reason for the lack of association is that most of the subjects own score MoCA-Ina Which tall, so that variation score cognitive become limited. In addition, PUFA intake The FFQ-based dietary intake may have limitations in reporting accuracy. Other factors such as disease duration, current medications, general nutritional status, and other lifestyle habits, such as exercise or sleep, may also influence cognitive function but were not analyzed in this study. This study's strength is the use of valid, standardized instruments to assess dietary intake and cognitive function. However, limitations include the small sample size, the cross-sectional design that cannot demonstrate a causal relationship, and potential FFQ-completion bias. From data obtained from 30 respondents who met the inclusion and exclusion criteria, it was found that 83.3% of patients were female. This is consistent with various studies previously Which show that disturbance depressive more more often found in women than men, especially in the adult age group young. Age average participants is 26.03 year, Which Also in accordance with data Epidemiologically, depressive disorders often appear in early productive age.

This study aims to evaluate the relationship between polyunsaturated fatty acid intake and acids (PUFA) with function cognitive on patient disturbance depressive. PUFA, Omega-3s, in particular, have been extensively studied for their role in brain function and neuroprotection. However, analysis using the Spearman test showed no significant relationship between PUFA intake and and MoCA-Ina cognitive function scores, with a p value = 0.790 And coefficient correlation Which very weak (-0.051). Besides That, results test Mann-Whitney also showed that there was no significant difference between groups with low and high PUFA intake on cognitive function scores, although the p value = 0.060 was close to the significance limit.

Previous research has shown that PUFA can help improve cognitive function through its anti-inflammatory mechanisms and its role in nerve cell membranes. However, the results Which No significant in study This can caused by a number of factors. One limitation is the relatively small sample size, which limits statistical power to detect weak associations. Furthermore, other factors such as depression severity, duration of treatment, history of other medical conditions, and overall diet were not controlled for in this study, potentially confounding the results.

This study also had several other methodological limitations, such as not classifying the type or severity of depression in each subject and not evaluating the type and duration of therapy being administered. These factors could influence both nutritional intake and cognitive function in patients and should be considered in further research.

CONCLUSION

This study examined the relationship between polyunsaturated fatty acid (PUFA) intake and cognitive function in 30 patients with depressive disorders using the MoCA-Ina and FFQ. No statistically significant correlation was found between PUFA intake and MoCA-Ina scores ($r = -0.051$, $p = 0.790$), and comparison of high versus low PUFA intake groups showed a non-significant trend toward higher cognitive function in the high intake group ($p = 0.060$). Participants' mean cognitive function scores were high (27.67/30), with most performing in the normal range, limiting variability and the ability to detect associations. These results suggest that dietary PUFA intake may not be a primary determinant of cognitive performance in young adults with depressive disorders and preserved cognition. Future research should investigate larger, more diverse samples, including participants with greater cognitive variability, and consider longitudinal designs to clarify the potential role of PUFA in cognitive outcomes.

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