Journal of Health and Nutrition Research
Vol. 4, No. 3, 2025, pg. 1322-1333, https://doi.org/10.56303/jhnresearch.v4i3.786
Journal homepage: https://journalmpci.com/index.php/jhnr/index

e-ISSN: **2829-9760**

The Effect of a Fruit-Based Antioxidant Intervention on Depressive and Anxiety Symptoms in Postpartum Mothers: A Quasi-Experimental Study

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ORIGINAL ARTICLES

Submitted: 5 September 2025

Accepted: 25 October 2025

Keywords:
Fruit consumption, Depression, Anxiety, Postpartum mothers

ABSTRACT

Depression and anxiety are common mental health issues affecting an 300 million people globally, with up to 13% of postpartum mothers experiencing depression and 19,8% with higher risks. These conditions can negatively impact both mother and child. The intake of natural antioxidants found in fruits has the potential to reduce these symptoms. This study aimed to analyze the effect of fruit consumption as a natural source of antioxidants on symptoms of depression and anxiety in postpartum mothers with children aged 1–12 months. The study was conducted from June-July 2024 in Bojong Rawalumbu, Bekasi City, using a quasi-experimental design with 64 respondents (28 in the treatment group and 29 in the control group completing the study). The treatment group received fruit interventions for 21 days, while the control group received no intervention. Depression symptoms were measured using the Edinburgh Postnatal Depression Scale (EPDS), anxiety levels were measured using the State-Trait Anxiety Inventory (STAI), and fruit consumption compliance was monitored using a provided form. The results showed a reduction in the mean depression score (difference of 2.00) and anxiety score (difference of 4.18) in the treatment group ($p = 0.0001$ for both). In conclusion, adequate fruit consumption may reduce symptoms of depression and anxiety in postpartum mothers with children aged 1–12 months.

Key Messages:

- Regular fruit consumption over a 21-day period significantly reduced symptoms of depression and anxiety among postpartum mothers. This finding highlights the effectiveness of a natural, food-based intervention as a non-pharmacological strategy to support maternal mental health.
- This study emphasizes the importance of early postpartum nutritional interventions. Targeting mothers with infants aged 1–12 months, the research demonstrates the potential of dietary antioxidants to improve psychological well-being during a critical period for both mother and child.

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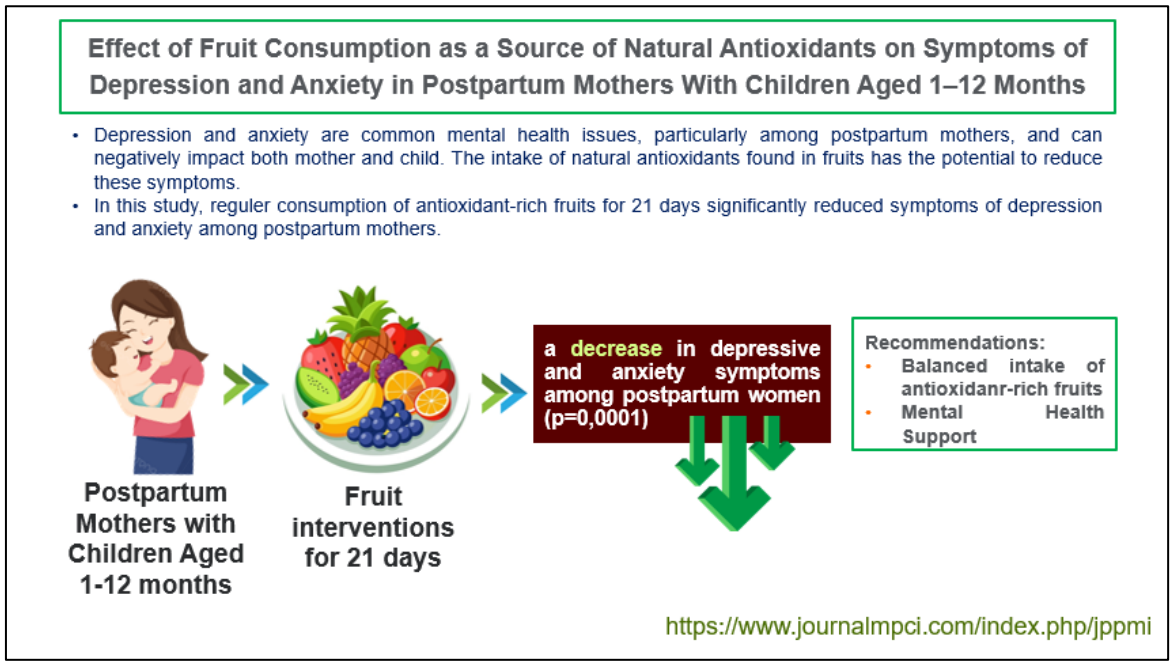
GRAPHICAL ABSTRACT



INTRODUCTION

Depression and anxiety disorders are common mental health issues encountered within the general population (1). The World Health Organization in 2015 estimated that approximately 300 million people suffer from depression, with nearly all cases accompanied by anxiety disorders. In Southeast Asian countries, particularly Indonesia, report high prevalence rates, with 9.1 million cases of depression (3.7%) and an anxiety disorder prevalence of 3.3% of the total population. The Indonesian Ministry of Health (2) predicts that these numbers will continue to rise and peak by 2030, which may lead to decreased productivity and pose a long-term burden on the country.

Mental health problems, especially depression and anxiety, are more common among women than men. Globally, 4.6% of women are more likely to experience depression than 2.6% of men (1). WHO data further indicate that approximately 10% of pregnant women and 13% of postpartum mothers experience depression (3), with higher risks in developing countries—15.6% during pregnancy and 19.8% postpartum (4). Mental health disorders in postpartum mothers have serious risks to mothers, including suicidal ideation or thoughts of harming their baby. Affected mothers often exhibit a lack of positive responses toward their babies, such as eye contact, physical gestures, or emotional expressions (5). These maternal conditions may result in developmental delays in infants across cognitive, psychological, neurological, and motor domains, and babies can also be more fussy in response to the desire to get their mother's attention (6)

Several factors are known to influence postpartum depression and anxiety, including maternal age at marriage and pregnancy, unplanned pregnancies, parity, education, complications during childbirth, social support, socioeconomic status, employment, and dietary patterns (7–12). Mental health disorders such as depression and anxiety are closely linked to neurotransmitters, including norepinephrine, dopamine, and serotonin (13). The conversion of dopamine can be converted into naroadrenaline which requires antioxidants such as vitamin C, which is abundantly found in fruits and vegetables (14). In addition, oxidative stress has been increasingly recognized as a key pathophysiological mechanism underlying depression and anxiety, as excessive free radical production can disrupt neurotransmitter balance and neuronal signaling. Therefore, antioxidants may play a crucial role in restoring redox balance and supporting optimal brain function. Fruits and vegetables are key sources of natural antioxidants, serving as external contributors to non-enzymatic antioxidant defenses (15).

https://doi.org/10.56303/jhnresearch.v4i3.786

Several studies have identified vitamins A, C, E, and polyphenolic compounds as major non-enzymatic antioxidants present in fruits. These antioxidants offer protective effects against depression, anxiety, and other mental health conditions (16). Prospective cohort studies also demonstrate the preventive role of fruit and vegetable consumption on depression (17,18). Additional research supports the association between fruit and vegetable intake and improved mental health outcomes, including reduced depression and anxiety (19–21). A study by Barfoot et al. (2021) found reduced anxiety levels among postpartum mothers who underwent a flavonoid-rich diet intervention for two weeks. This finding is supported by a study involving university students aged 19–27 who consumed fresh apples and bananas as daily snacks for 10 days, resulting in reduced fatigue, depression, anxiety, and cognitive impairments compared to those who consumed chocolate wafers and potato chips (21). Fresh fruits and vegetables contain natural antioxidants such as vitamins A, C, E, flavonoids, and other phenolic compounds (23–26). The WHO recommends a daily intake of 400 grams of fruits and vegetables, consisting of 250 grams of vegetables and 150 grams of fruit, equivalent to three medium-sized bananas, three medium-sized oranges, or one and a half servings of sliced papaya. According to the Pedoman Gizi Seimbang (PGS), adults are advised to consume 400–600 grams of fruits and vegetables daily. Individuals are considered to meet fruit intake requirements if they consume 2–3 servings per day, or the equivalent of 100–150 grams of fruit (27).

Based on previous studies, the consumption of fruit as a natural source of antioxidants has proven to be effective in preventing and alleviating symptoms of depression and anxiety disorders. However, research on the impact of fruit-based interventions on mental health remains limited in Indonesia, particularly studies focusing on postpartum mothers. A preliminary survey conducted by the researchers in a local *posyandu* (integrated health post) in Bojong Rawalumbu screened 10 postpartum mothers, of whom 3 exhibited symptoms of depression accompanied by anxiety disorders, and 1 showed symptoms of anxiety without depression. These findings prompted the researchers to investigate the effects of fruit consumption as a natural antioxidant source on depressive and anxiety symptoms among postpartum mothers.

METHODS

This study used a quasi-experimental design, specifically a one-group pre-test and post-test design with a control group, which involves testing a single group in its entirety (28). The study was conducted among postpartum mothers with children aged 1–12 months residing in the Bojong Rawalumbu, Bekasi City, West Java, Indonesia, who gave birth or received postpartum care at independent midwifery practices or attended Posyandu (integrated health service posts) within the study area. The duration of this study form June-July 2024. Sample selection was based on hypothesis testing for the mean difference between two populations. The sample size calculation formula is applicable (28):

$$n = 2\left[\frac{(1{,}96 - 1{,}28)\ 5{,}2}{(21{,}6)}\right]^2$$

$$n = 26$$

Description:

n : Sample size in each group

S_d : Standardized deviation of the two groups (5,2) (29)

Z_α : Type 1 error value 5% (Zα = 5% is 1,96)

Z_β : Type 2 error value 10% (Zβ = 10% is 1,28)

x^1-x^2 : Clinical judgement (21,8)

Based on the sample size calculation, this study anticipated potential dropouts or non-compliant subjects during the study. Therefore, an additional 20% was added to the calculated sample of 26 subjects, resulting in a total of 32 participants for both the treatment and control groups. The sampling method employed was non-probability sampling using purposive sampling based on predetermined inclusion and exclusion criteria. The inclusion criteria for this study were postpartum mothers with children aged 1–12 months, mothers experiencing symptoms of depression, mothers experiencing anxiety disorders, and

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those willing to participate in the study. The exclusion criteria included mothers currently taking antidepressant or sedative medications, those experiencing diarrhea, those allergic to fruit, and active smokers. Eligible participants were then randomly assigned to either the treatment or control group to ensure comparable baseline characteristics and minimize allocation bias. A pretest was conducted for both groups prior to the intervention. The treatment group received a daily fruit intake intervention based on the types listed in Table 1, consisting of two portions per day (100 grams per portion) for 21 days. The control group did not receive any intervention or specific instructions. A posttest was conducted for both groups after the intervention period.

As presented in Table 1, the selected fruits were chosen based on their higher nutritional content compared to other fruits but also for their cultural acceptability, affordability, and seasonal availability within the local context. Each portion (100 grams) of the selected fruits was ensured to contain key vitamins and compounds with antioxidant properties, including vitamins A, C, E, and flavonoids. The daily fruit intake of 200 grams adhered to the Ministry of Health's dietary recommendation for adult fruit consumption, which is a minimum of 150 grams per day (27). In addition, previous studies have shown that consuming 120–200 grams of fruit per day can have a positive effect on reducing symptoms of depression and anxiety (22,29,30).

The fruit intervention for the treatment group was carried out over a period of 21 days. The quality of the fruits was strictly maintained through procedures such as washing under running water, using clean utensils, ensuring food handlers maintained proper hygiene and sanitation, storing the fruits in tightly sealed food containers, and refrigerating at a temperature between 0–10°C for no longer than one day. During distribution, fruits were transported in cooler bags to preserve their freshness and quality.

Table 1. The Intervention Fruit Selection

Type of fruit (100 g)	Nutrition Facts			
	Vit.A (µg)	Vit.C (mg)	Vit.E (mg)	Flavonoid (mg QE)
Day 1, 8 and 15				
Papaya (100 g)	135	78	1	-
Grapes (100 g)	-	44	-	163
Total	135	122	1	163
Day 2, 9 and 16				
Guava (100 g)	79	184	-	-
Grapes (100 g)	-	44	-	163
Total	79	228	-	163
Day 3, 10 and 17				
Papaya (100 g)	135	78	1	-
Strawberry (100 g)	8	82	-	180
Total	143	160	1	180
Day 4, 11 and 18				
Guava (100 g)	79	184	-	-
Orange (100 g)	8	49	-	200
Total	87	236	-	200
Day 5, 12 and 19				
Starfruit (100 g)	37	35	-	-
Orange (100 g)	8	49	-	200
Total	45	84	-	200
Day 6, 13 and 20				
Starfruit (100 g)	37	35	-	-
Strawberry (100 g)	8	82	-	180
Total	45	117	-	180
Day 7, 14 and 21				
Guava (100 g)	79	184	-	-
Orange (100 g)	8	49	-	200
Total	87	236	-	200

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Postpartum depression symptoms were measured using the Edinburgh Postnatal Depression Scale (EPDS) questionnaire, administered both before and after the intervention. The EPDS consists of 10 items with a maximum score of 30. A score of ≥10 indicates a potential risk of depression. Questions 1, 2, and 4 are scored 0–3 in ascending order from the top box, while questions 3 and 5 to 10 are reverse-scored (3–0), also in order from the top. Score interpretation is as follows: 0–9: normal, 10–15: mild depression, 16–19: mild-to-moderate depression, 20–29: moderate-to-severe depression, and 30: severe depression (31).

Anxiety levels were assessed using the State-Trait Anxiety Inventory (STAI) questionnaire, also administered before and after the intervention. The STAI comprises 40 questions with a scoring range of 20–80 for each state. For statements indicating anxiety, scores range from 1 to 4, while reverse scoring (4 to 1) is applied to items indicating the absence of anxiety (32). The STAI score categories are 20–29: no anxiety, 30–37: mild anxiety, 38–44: moderate anxiety, and 45–80: severe anxiety (33). Fruit consumption compliance in the intervention group was monitored using a daily log sheet documenting the intake of fruit over the 21-day intervention period.

Data were analyzed using SPSS software. Univariate analysis was used to describe the distribution of variables using percentages or proportions. Normality testing was conducted prior to bivariate analysis to determine the appropriate statistical test. Bivariate analysis was used to analyze differences before and after the depression and anxiety symptom scores using the paired t-test if data were normally distributed, while the Wilcoxon signed-rank test used for non-normally distributed data. To evaluate differences in mean scores between the treatment and control groups, an independent t-test was used for normally distributed data, and the Mann-Whitney U test was applied for non-normally distributed data.

CODE OF HEALTH ETHICS

This study has been approved by the Ethics Committee of Esa Unggul University under approval number 0924-08.137/DPKE-KEP/FINAL-EA/UEU/VIII/2024

RESULTS

Respondent Characteristics

The respondent characteristics in this study were assessed based on child's age (in months), maternal parity status, maternal employment, maternal education, and economic status.

Table 2. Respondent Charateristics

Respondent Characteristics	n = 64	
	n	%
Child's age (in months)		
1-4	26	40.7
5-8	26	40.7
9-12	12	18.6
Parity		
1	26	40.6
2	22	34.4
3	11	17.2
4	5	7.8
Maternal employment		
Housewife	62	96.9
Entrepreneur	2	3.1
Maternal education		
Elementary school	2	3.1
Junior high school	13	20.3
Senior high school	46	71.9
Bachelor's Degree	3	4.7
Economic status		
< Regional Minimum Wage	59	92.2
> Regional Minimum Wage	5	7.8

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Table 2 shows that the respondents had children aged between 1 to 12 months. The age groups of 1–4 months and 5–8 months had the same number of children, with 26 in each group (40.7%). Respondents in this study had parity ranging from 1 to 4, with the highest frequency found in mothers with one child (parity 1), totaling 26 mothers (40.6%), and the lowest in mothers with four children (parity 4), with only 5 mothers (7.8%). Nearly all respondents were housewives, with 62 mothers (96.9%) identifying as such, while only 2 mothers (3.1%) were self-employed. In terms of educational background, the majority of respondents had completed senior high school (SMA), accounting for 46 mothers (71.9%), while only 3 mothers (4.7%) had attained higher education (Bachelor's/Diploma). Regarding economic status, almost all respondents had a family income below the Regional Minimum Wage (RMW), with 59 families (92.2%) earning below the RMW and only 5 families (7.8%) earning above it.

Frequency Distribution of the Research Groups

The research groups were divided into two: the control group, which serves as a comparator and received no intervention, and the treatment group, which receives the intervention according to the research protocol.

Table 3. Frequency Distribution of The Research Groups

Groups	*Pretest*		*Posttest*		*Drop Out*	
	n	%	n	%	n	%
Control	32	100	29	90.6	3	9.4
Treatment	32	100	28	87.5	4	12.5

Based on Table 3, the total sample before the intervention was 64 individuals. There was a change in the sample size before and after the intervention. In the control group, before the intervention, there were 32 (100%) samples, which decreased to 29 (90.6%) after the intervention, with a total dropout of 3 (9.4%) samples. Meanwhile, in the treatment group, before the intervention, there were 32 (100%) samples, which decreased to 28 (87.5%) after the intervention, with a total dropout of 4 samples. (12.5%).

Intervention Compliance

As shown in Table 4, compliance was analyzed among participants who completed the intervention period (n = 28). Participants who dropped out (n = 4) were excluded from this analysis due to incomplete data on fruit intake during the 21-day period. Based on Table 4, the average compliance of the samples during the intervention was 99.62% ± 0.44, with a minimum value of 98.57% and a maximum value of 100%. The compliance rate of the participants during the intervention was very high, demonstrating a strong adherence to the intervention protocol

Table 4. Intervention Compliance

Indicator	Treatment group
	n = 28
Mean	99.62
Std. Deviation	0.44
Minimum	98.57
Maximum	100

The Effect of Fruit Consumption on Depression and Anxiety Symptom Scores

Table 5 shows that in the treatment group, there was a decrease in the average depression symptom score from before to after the intervention. The average depression symptom score at the pretest was 16.22±3.20 and decreased to 14.25±2.25 at the posttest, with a minimum score of 11 and a maximum score of 22 at the pretest, while the posttest had a minimum score of 10 and a maximum score of 19. Meanwhile, in the control group, there was an increase in the average depression symptom score at the posttest compared to the pretest. The average depression symptom score at the pretest was 15.94±3.39 and increased to 16.55±2.76 at the posttest, with a minimum score of 11 and a maximum score of 23 at the pretest, and a minimum score of 12 and a maximum score of 23 at the posttest. The minimum value of 11 in both the pretest of the treatment and control groups indicates that all samples experienced depression

https://doi.org/10.56303/jhnresearch.v4i3.786

symptoms. The average score limit for depressive symptoms using the EPDS questionnaire in postpartum mothers is ≥10, indicating that the sample exhibited depression symptoms (31). This is in accordance with one of the inclusion criteria set prior to the study, which required respondents to have a risk of depression.

Table 5. The Effect of Fruit Consumption on Depression and Anxiety Symptoms

Variable		Mean ± SD	Min-Max	*p-value*
Depression				
Treatment Group	*Pretest*	16.25±3.23	11-12	
	Posttest	14.25±2.25	10-19	0.0001*
	Difference	2.00±1.91		
Control Group	Pretest	15.97±3.51	11-23	
	Posttest	16.55±2.76	12-23	0.199
	Difference	-0.59±2.40		
Anxiety				
Treatment Group	*Pretest*	47.04±4.86	40-56	
	Posttest	42.86±3.62	34-50	0.0001*
	Difference	4.18±3.40		
Control Group	*Pretest*	47.76±4.95	40-56	
	Posttest	48.14±3.96	42-56	0.530
	Difference	-0.38±3.21		

In the treatment group, the average anxiety score decreased from the pretest to the posttest, with the pretest anxiety score being 47.22±4.93 and the posttest score being 42.86±3.62. The pretest had a minimum score of 40 and a maximum score of 56, while the posttest had a minimum score of 34 and a maximum score of 50. In the control group, the average anxiety score increased at the posttest, with the pretest anxiety score being 47.66±4.76 and the posttest score being 48.14±3.96. The pretest had a minimum score of 40 and a maximum score of 56, while the posttest had a minimum score of 42 and a maximum score of 56. The minimum value of 40 in the pretest for both the treatment and control groups indicates that all samples experienced anxiety. The anxiety score ranges using the STAI questionnaire are as follows: 20–29 indicates no anxiety, 30–37 indicates mild anxiety, 38–44 indicates moderate anxiety, and 45–80 indicates severe anxiety (33).

Table 5 shows that the average depression symptom score in the treatment group at pretest was 16.25±3.23, which decreased by an estimated difference of 2.00 points at posttest to 14.25±2.25. The p-value obtained was 0.0001, which is less than α (0.05), meaning that the null hypothesis (Ho) is rejected. This indicates a significant difference in the depression symptom scores before and after the intervention (fruit consumption), with a decrease in the average depression symptom score after the fruit intervention. In contrast, the control group showed an increase in depression scores from pretest to posttest, with an average score of 15.97±3.51 at pretest, increasing to 16.55±2.76 at posttest, showing a difference of 0.59 points. The p-value was 0.199, which is greater than α (0.05), indicating that the result was statistically insignificant, meaning there was no significant difference in the depression scores before and after the intervention in the control group.

DISCUSSION

The selected child age range (1–12 months) aligns with the statement by Barrio (2016), which suggests that symptoms of postpartum depression may emerge within 4 weeks to 6 months after childbirth, and in some cases, persist for up to a year (34). Another theory suggests that the postpartum period marks a transitional phase in a woman's mental health as she adapts to her new maternal role. This transition is considered a critical period referred to as the Letting-Go phase, typically occurring two to four weeks postpartum, during which the mother begins to fully assume her new role. Not all postpartum mothers adapt successfully during this phase, which can result in prolonged emotional distress manifested as sadness, mood swings, anxiety, panic, irritability, fatigue, and depressive symptoms such as insomnia and loss of appetite. This transition can trigger various psychological responses, ranging from emotional reactions to clinical symptoms of depression and anxiety (35).

https://doi.org/10.56303/jhnresearch.v4i3.786

Depression is a syndrome characterized by impaired human function, marked by clinical symptoms related to feelings of sadness, which can manifest differently in each individual (13,36). In this study, all postpartum mothers were at risk of experiencing depression. These findings are consistent with research by Latifah et al. (2021), which showed that the consumption of 200 g of fresh fruit daily for 2 weeks significantly reduced depression scores by 14.47% (29). Another study found that after a 10-day intervention with 100 students who received 2 servings of fresh fruit, there was a more significant reduction in depression scores compared to those who were given chocolate or chips. This study also reported a p-value < α (0.05) (21). Similarly, Bishwajit et al. (2017) found a relationship between fruit consumption and depression symptoms over more than one year, concluding that individuals who consumed more than 1.5 servings of fresh fruit had a 32% lower chance of experiencing depressive symptoms (AOR = 0.67; 95% CI = 0.44-1.30) (37).

Logistic regression analysis, with the general estimation equation proposed by Mihrshahi et al. (2015), showed a decrease in depression symptoms among women who consumed at least 2 servings of fruit per day (OR 0.86; 95% CI 0.79-0.95; P = 0.001) (38). Other studies have demonstrated that every 100-gram increase in fruit intake is associated with a 3% decrease in depression risk in cohort studies (RR = 0.97; 95% CI = 0.95-0.99) and a 5% decrease in cross-sectional studies (RR = 0.95; 95% CI = 0.91-0.98) (39). Fruits are food ingredients that are the best source of natural antioxidants, which can be consumed daily (40). Fruits contain natural antioxidant compounds, including vitamins A, B, C, E, and polyphenols, which are beneficial for both physical and mental functions. These compounds are powerful antioxidants that can prevent cytotoxicity caused by free radicals and oxidative stress, function as direct scavengers of reactive oxygen species (ROS), and regulate antioxidant enzyme activity (41). This study has shown that consuming fruits containing antioxidants can help protect the body from the effects of free radicals and prevent various diseases, including mental health conditions such as depression and anxiety (42).

Vitamin C is an enzymatic antioxidant that can prevent cognitive decline and mental disorders such as anxiety, hyperactivity, autism, bipolar disorder, depression, and schizophrenia. Studies have also shown that individuals with various mental disorders have lower levels of vitamin C intake (16). Due to its antioxidant properties, vitamin C acts as a cofactor for the enzyme dopamine β-hydroxylase (DBH) to convert dopamine into norepinephrine, which is an essential component in mood regulation (43). The largest polyphenolic compound found in fruits is flavonoids. When consumed orally, flavonoids modulate gut microbiota, affecting tryptophan levels and increasing serotonin synthesis, which helps improve depression (44,45). Flavonoids, abundant in fruits, vegetables, and tea, enhance the amount of blood flow to the central nervous system, improving brain function (30,46,47).

Anxiety can be described as a general feeling of fear, reflecting concerns about potential future dangers without a clear focus, whereas fear arises as a direct response to an immediate threat (48). Individuals experiencing depression often also suffer from anxiety disorders, as these two conditions are interconnected and frequently occur together, which is one of the characteristic symptoms of depression (49). In this study, all postpartum mothers experienced anxiety. Table 5 shows that the mean difference in the treatment group between anxiety scores from pretest to posttest decreased, with the average score decreasing from 47.04±4.86 to 42.86±3.62, an estimated difference of 4.18 points. The p-value obtained was 0.0001, which is less than α (0.05). Based on these results, there was a significant decrease in the average anxiety score before and after the fruit intervention. In contrast, the control group showed an increase in anxiety scores from pretest to posttest, with the average score increasing from 47.76±4.95 to 48.14±3.96, a difference of 0.38 points. The p-value was 0.530, which is greater than α (0.05), indicating that the results were statistically insignificant, meaning no significant difference in anxiety scores before and after the intervention in the control group.

This is consistent with study conducted by Barfoot et al. (2021), which examined the effects of a flavonoid-rich diet over 2 weeks in postpartum mothers consuming a source of flavonoid-rich foods, such as berries, oranges, grapes, tea, and coffee daily for two weeks (22). The treatment group showed a significant reduction in anxiety scores by 4.21, with a p-value < α 0.05. These findings suggest that regular flavonoid consumption can be beneficial for maternal anxiety and quality of life during the postpartum period. Another study by Putra (2018) showed that consuming 2 servings of fruit daily for 14 days

https://doi.org/10.56303/jhnresearch.v4i3.786

significantly reduced anxiety, with a value of (b = -7.77; p < 0.001) (50). Fruits contain antioxidants and various micronutrients such as vitamins A, C, E, and polyphenolic compounds that are beneficial for physical and mental functions (13). Several studies have indicated that the consumption of fruits and vegetables is also associated with symptoms of depression, anxiety, and other mental health issues (19–21). There is a role for antioxidants in anxiety disorders, as noted by Gautam et al. (2012), who observed that patients with anxiety disorders had significantly lower levels of vitamins A, C, and E compared to healthy controls (51). Furthermore, the study indicated that after providing a diet rich in these vitamins over 6 weeks, there was a significant reduction in anxiety scores (P < 0.001) and a significant increase in antioxidant levels in the blood (P < 0.05). Scapagnini et al. (2012) provided evidence of the role of various antioxidant nutrients, including vitamins C, E, and A, carotenoids, and polyphenols, in affecting mood, cognition, anxiety disorders, and depression through the prevention of oxidative damage to cell membranes or DNA in the central nervous system (CNS) or the enhancement of serotonin, dopamine, and glutathione levels, which seem to be modulated through antioxidant activity markers (52).

From a public health perspective, the findings of this study highlight the potential for integrating fruit consumption promotion into existing maternal and child health programs at the community level, such as *posyandu* and midwifery services. Nutritional counseling emphasizing the importance of daily fruit intake could be incorporated into routine postpartum education, especially for mothers identified as being at risk of depression and anxiety. This approach may provide a low-cost, accessible, and sustainable intervention that aligns with current national efforts to improve maternal mental health and overall nutritional status. Moreover, collaboration between nutritionists and midwives could strengthen community-based strategies in preventing postpartum mental health disorders through simple dietary modifications.

A limitation of this study is that while depression and anxiety symptom scores decreased, they did not reach the threshold for normal categories, indicating that the respondents still experienced symptoms of depression and anxiety. This suggests that other factors, such as behavior, social support, economic status, maternal age, parity, and type of childbirth, can influence depression and anxiety symptoms in postpartum mothers.

CONCLUSION

The study concluded that adequate fruit consumption can reduce symptoms of depression and anxiety in postpartum mothers with children aged 1 to 12 months. In light of these findings, it is recommended that postpartum mothers begin incorporating a daily intake of 200 grams of fruit as a natural source of antioxidants that support mental health, particularly in preventing or alleviating symptoms of depression and anxiety. This recommendation aligns with previous studies have shown that consuming 120–200 grams of fruit per day can have a positive effect on reducing symptoms of depression and anxiety. Furthermore, similar interventions should be implemented over a longer period and on a regular basis to achieve more optimal outcomes approaching the normal range. Future studies are encouraged to consider other contributing factors that may influence symptoms of depression and anxiety. Furthermore, extending the duration of similar interventions may help determine whether consistent fruit consumption can not only reduce symptoms but also enable participants to achieve scores within the normal, non-symptomatic range. Future studies are encouraged to explore longer-term interventions and consider other contributing factors that may influence postpartum mental health outcomes.

FUNDING

This research was funded by LPPM Esa Unggul under grant number 078/LPPM/KONTRAK-INT/PNT/XI/2024.

ACKNOWLEDGMENTS

The researcher sincerely thanks to all study participants for their time and valuable contributions to this research. Appreciation is also extended to all individuals and parties who have provided support, both directly and indirectly, which has enabled the successful completion of this study.

https://doi.org/10.56303/jhnresearch.v4i3.786

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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