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Effectiveness of the combination of ginger-lemongrass beverage and the mother baby-care method on the increase of CD4/CD8 ratio and mental health status in postpartum mother

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ABSTRACT

Background: *The postpartum period requires comprehensive and integrated attention to maternal wellbeing, encompassing both physiological and psychological dimensions. During this critical phase, modulation of the immune system plays an essential role in maintaining the balance of CD4/CD8 ratio, which reflects immune competence, while the prevelance of postpartum mental health problems has been reported to reach up to thirty percent. Natural functional beverages, such as ginger-lemongrass formulations containing whilst postpartum mental health problem prevalence reaches thirty percent. Ginger-lemongrass beverage containing phenolic compounds at a concentration of 267,37 mgGAE/100g and antioxidant activity with an IC50 value of 20ppm, demonstrates promising immunomodulatory and protective potential.*
Objectives: *The objective of this study was to analyze the effectiveness of a combined intervention consisting standardized ginger-lemongrass beverage and the MotherBaby-Care method in increasing CD4/CD8 ratio and improving the mental health status of postpartum Mothers.*
Methods: *This research employed a true experimental design with pretest-posttest control group approach involving forty postpartum mothers who were randomly assigned into four groups : control, ginger-lemongrass beverage only, Motherbaby-Care only and a combination of both interventions. The interventions were administered over a fourteen-day period. Immune status was assessed by measuring the CD4/CD8 ratio using flowcytometry, while mental health status was evaluated using the Self Reporting Questionnaire-20 (SRQ-20).*
Results: *The result showed that the combination group demonstrated the highest increase in CD4/CD8 ratio (1.748), compared to the MotherBaby-Care (1.328), the ginger-lemongrass (1.206) and control (1.006). Furthermore, the Proportion of mothers without mental health problems increased from seventy percent to ninety percent (p=0.031).*
Conclusions:*The conclusion of this study is the combination of standardized ginger-lemongrass beverage and the MotherBaby-Care method effectively enhanced immune*

balance and improved mental health status among postpartum mothers, indocating a superior synergistic effect compared to single interventions.

KEYWORD: *cd4/cd8 ratio; ginger-lemongrass beverage; mental health; motherbaby-care; postpartum mothers*

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INTRODUCTION

The postpartum period does have a critical phase that needs comprehensive attention to maternal well-being by both physiological and psychological perspectives. The puerperium, that lasts for forty-two days after delivery, demands substantial maternal bodily adaptation, in the process of that the immune system have complex modulation to return to a homeostatic state. Drastic hormonal have in the process of the transition by pregnancy to the postpartum period affect the balance of the immune system, as reflected in the dynamics of lymphocyte population, particularly T helper (CD4) cells and cytotoxic T (CD8) cells The CD4/CD8 ratio have as an crucial parameter for assessing immune status, by an optimal ratio reflecting a balanced bodily defense function. Recent studies have identified a close connection among immune system alterations and mental health conditions in the process of the postpartum period, where immune dysfunction may have to the high prevalence of depression and anxiety among postpartum mother(1). Nevertheless, most existing studies continue to examine immunological and mental health aspect separately and the association between objective immunological parameters, such as the CD4/CD8 ratio and maternal mental health status during the postpartum period has not yet benn comprehensively explored.

Mental health issues among postpartum mothers have become a global concern, by a continuously increasing prevalence. Comprehensive analyses have that postpartum depression have approximately 17.22 percent of the maternal population worldwide (2). Recent data by 2025 have that postpartum depression have 10 to 20 percent of women after childbirth. Clinical manifestations have prolonged feelings of sadness, excessive anxiety, sleep disturbances, loss of appetite, and reduced ability to care for the infant. Literature have that approximately 50 percent of mothers experiencing postpartum depression remain undiagnosed, highlighting the need for a holistic approach that simultaneously have the mother's physical and psychological conditions (3). This conditon underscores the need for a holistic approach that does not focus solely

on psychological aspects but also considers biological factors, particularly immune system alterations occurring during the postpartum period, which have rarely been incorporated into the evaluation of maternal mental health interventions.

The use of herbal plants as complementary therapy has received substantial attention in efforts to have postpartum maternal health (4). Red ginger (Zingiber officinale) and lemongrass (Cymbopogon citratus) are spices by a strong scientific evidence base regarding their pharmacological effects. Phytochemical characterization have that the ginger-lemongrass combination have comprehensive bioactive compounds, comprising total phenols 267.37 mg GAE/100 g, flavonoids 11.468 mg QE/100 g, terpenoids 19,875.461 mg ME/100 g, tannins 426.38 mg TAE/100 g, and saponins 1.340 mg DE/100 g, by antioxidant activity reaching an IC50 of 20 ppm, having a very strong capacity to neutralize free radicals. The bioactive components in ginger, particularly gingerol, have been shown to have anti-inflammatory activity by the inhibition of signaling pathways involved in cytokine production modulation. A literature review of 109 randomized clinical trials have that ginger supplementation have beneficial effects, comprising immunomodulatory activity that can have adaptive immune responses (5). Terpenoids at high concentrations have a role in stimulating T helper cell proliferation, whilst saponins exert an adjuvant effect that have adaptive immune responses. The synergistic combination of these bioactive compounds positions standardized ginger-lemongrass beverages as a potential candidate for improving immune status by the havement of the CD4/CD8 ratio (6). However, most herbal studie in postpartum mothers have focused on general anti-inflammatory or antioxidant effects without specifically evaluating the impact of the ginger-lemongrass combination on adaptive immune balance, particularly the CD4/CD8 ratio. Consequently, empirical evidence regarding the effectiveness of standardized ginger-lemongrass beverager on immunological in postpartum mothers remains limited.

The MotherBaby-Care (MB-C) method is a care model that integrates educational and empowerment aspects to promote maternal independence in caring for herself and her infant. Through the provision of emotional support, facilitation of mother-infant bonding and practical education related to neonatal care and maternal health. Athough this psychosocial approach has benn shown to improve postpartum maternal mental well-being, research combining the MotherBaby-Care method with herbal-based immunomodulatory interventions within an integrated biopsychosocial framework remains scarce. To date, few enterventional studies have simultaneously evaluated the effects of combining ginger-lemongrass herbal

therapy and the MotherBaby-Care method on objecytive immunological parameters, such us the CD4/CD8 ratio and maternal mental health status during ther early postpartum period. The objective of this study is to have the effect of the combined intervention of ginger-lemongrass beverage and the MB-C method on immunological parameters, measured by the CD4/CD8 ratio, as well as on maternal mental health status in the process of the two-week postpartum period (7). This study is expected to contribute to the development of an evidence-based postpartum care model by integrating herbal-based complementary therapy by a cost-effective and easily implementable psychosocial approach.

MATERIALS AND METHODS

This study have a true experimental design by a pretest-posttest control group pattern, allowing the researchers to systematically measure the impact of the intervention by comparison of condition before and after treatment across different groups. This approach was chosen for its ability to have confounding variables and minimize selection bias by randomization, thereby enabling the causal connection among the intervention and the outcome to be evaluated by high internal validity. The study was conducted in the Semarang City area over a three-month period in 2025, involving two community health centers that have the criteria for accessibility and facility feasibility for data collection, namely PKM Gunungpati and PKM Bangetayu (8). The study participants were postpartum mothers who have the inclusion criteria, comparising being of healthy reproductive age among twenty and thirty-five years, having had a normal delivery, being inside of the third to seventeen day postpartum, willing to voluntarily sign informed consent, having a healthy, normally born infant devoid of abnormalities, and having no history of major cognitive or psychiatric disorders that could have the validity of measurements (9).

The sampling technique have purposive sampling, based on specific criteria relevant to the research objectives. This non-probability approach have for the selection of participants according to preheated characteristics to ensure group homogeneity and the relevance of the data collected to the research questions (10). This method was chosen due to its effectiveness in experimental research have strict control over subject variables, as recommended in recent quantitative research methodology guidelines emphasizing the importance of aligning sample characteristics by the study design (11). The total sample of the study comprised forty postpartum mothers, evenly divided into four groups by ten respondents per group: the control group, that have standard postpartum care; the first treatment group, that received standard postpartum care plus ginger-lemongrass beverage; the second treatment group, that

received standard postpartum care plus the MotherBaby-Care method; and the third treatment group, that received the full combination of standard postpartum care, ginger-lemongrass beverage, and the MotherBaby-Care method (2). This proportional group allocation have to facilitate valid comparative analysis among the different intervention modalities (12).

All group received standard postpartum care in accordance with maternal health service guidelines at primary healthcare facilities. Standard care included physical examinations of the mpther, such as monitoring vital signs, uterine involution, lochia, and perineal wound condition, monitoring lactation and breastfeeding, basic nutritional counseling, and general education regarding postpartum danger signs and newborn care. This standard postpartum care was clinical and preventive in nature, with healthcare provider interactions typically limited to scheduled visits or routine services at healthcare facilities.

The ginger-lemongrass beverage intervention was administered in the form of a ready-to-brew powder standardized by a composition of two grams of red ginger and 0.3 grams of lemongrass per serving, consumed once daily at the same time each morning for fourteen consecutive days (13). The herbal raw materials were sourced by Semarang Regency and processed have a top-down method to produce a single-serving packaged product that is practical and dose-controlled. Respondents in this group were asked to complete daily forms and submit consumption documentation to the researchers to have adherence to the intervention protocol (14). Meanwhilst, the MotherBaby-Care method was implemented by structured home visits conducted three times on the first, seventh, and fourteenth days of the intervention, in the process of that trained healthcare personnel have comprehensive education on maternal and infant self-care, facilitated maternal-infant bonding, and offered psychosocial support tailored to the individual needs of the respondents. This approach have empowering mothers to have independence in performing their new parental role whilst simultaneously attending to physical and mental health aspects.

In the groups receiving the MotherBaby-Care method, standard postpartum care was strengthened and expanded through a structured educational, empowerment, and psychosocial approach. During MB-C implementation, mothers received systematic emotional support, facilitated mother–infant bonding through direct education and practice, and practical instruction on postpartum self-care, breastfeeding, and infant care tailored to individual needs. Thus, MB-C extended beyond physical health monitoring to address psychological and behavioral aspects of maternal role adaptation. The distinction between standard postpartum care and the MotherBaby-Care method in

this study was determined based on several key indicators, including the intensity and form of interaction between healthcare providers and mothers, the level of emotional and psychosocial support provided, facilitation of mother–infant bonding, and enhancement of maternal independence in performing self-care and infant care. These indicators served as the basis for differentiating the contribution of standard care and the added value of the MotherBaby-Care method and were used as an evaluative framework to assess the intervention's effects on study outcomes, including maternal mental health status and immunological status as measured by the CD4/CD8 ratio.

Outcome variables were measured at two time points: the baseline measurement on the third day postpartum before the intervention commenced, and the final measurement on the seventeenth day postpartum after fourteen days of intervention. Immunological parameters, specifically the CD4/CD8 ratio, were have by venous blood samples utilizing flow cytometry at the accredited IBL Laboratory. This technique was selected due to its high precision and sensitivity in measuring T lymphocyte subset proportions compared to alternative methods. Mental health status was evaluated utilizing the twenty-item version of the Self Reporting Questionnaire (SRQ) 20-item version developed by the World Health Organization (WHO), which has been widely used as a screening tool for common mental disorders, including in postpartum populations. The SRQ-20 instrument used in this study underwent validity and reliability testing (15). Validity testing included content and construct validity assessment based on expert judgment and reference to previous validation studies conducted in Indonesia. Each item was considered valid if it met the established item–total correlation criteria. Reliability testing was performed to assess internal consistency using Cronbach's alpha, with a value of ≥ 0.70 indicating good reliability.

The results demonstrated that all questionnaire items were valid and reliable, confirming the instrument's suitability for measuring postpartum maternal mental health status. Mental health status was determined based on the total SRQ-20 score using an established cut-off score to classify respondents as having or not having mental health problems. Additional demographic data collected have age, educational level, parity status, and other relevant sociodemographic characteristics for stratified analysis.

Data analysis was conducted utilizing SPSS for Windows by a series of parametric and non-parametric tests according to data distribution. The Shapiro-Wilk test was applied to have the assumption of normal distribution for continuous data. Changes inside of the same group among pretest and posttest were compared utilizing the Paired Sample

t-Test, whilst differences among treatment groups were have utilizing One-Way ANOVA followed by the Tukey HSD post hoc test to identify substantially different group pairs. Binary logistic regression analysis was employed to have the effect of treatment group variables on the dichotomous outcome of mental health status. The statistical significance level was set at alpha 0.05 for all hypothesis testing.

This study have ethical clearance from the Health Research Ethics Committee of Ngudi Waluyo University under approval number 625/KEP/EC/UNW/2025 and welfare of research subjects in accordance by the principles of biomedical research ethics. The ginger-lemongrass beverage have in this study underwent standardization and phytochemical characterization at the Chemical and Biological Analysis Laboratory of CV. Cendekia Nanotech Hutama (CNH), Semarang.

RESULT AND DISCUSSION

Demographic Characteristics of Study Respondents

This study involved forty postpartum mothers who have the inclusion criteria and completed all measurement procedures according to the protocol. The age distribution of respondents ranged by twenty to thirty-five years, by the highest concentration in the twenty-six to twenty-nine-year age group, comprising 52.5 percent of the total participants. The educational profile was dominated by high school graduates at 67.5 percent, followed by Diploma 3 holders at 20 percent and bachelor's degree holders at 12.5 percent. Parity distribution have a predominance of primiparas at 65 percent, whilst multiparas accounted for 35 percent (**Table 1**). The study have that educational interventions based on Meleis' transition theory have parental self-efficacy scores and the proportion of exclusive breastfeeding among postpartum mothers (16).

Table 1. Distribution of respondents' demographic characteristics (N=40)

Characteristic	Category	N	%
Age	20-25 years	5	12.5
	26-29 years	21	52.5
	30-35 years	14	35
Education	High School	27	67.5
	Diploma 3	8	20
	Bachelor's Degree	5	67.5
Parity	Primipara	26	65
	Multipara	14	35

Respondents were proportionally allocated into four treatment groups, by ten participants per group. Baseline mental health status, assessed utilizing the Self Reporting Questionnaire 20 (SRQ-20), have that 70 percent of respondents did not experience mental health problems, whilst 30 percent have signs of psychological issues. This study have that structured theory-based psychoeducational and mindfulness interventions were effective in reducing the risk of postpartum depression(17).

Effect of the Intervention on the Increase of the CD4/CD8 Ratio

Analysis of immunological parameters utilizing flow cytometry have a substantial change among pre- and post-intervention measurements. Based on **Table 2** the mean CD4/CD8 ratio at baseline was 1.030 by a standard deviation of 0.040, that increased to 1.322 by a standard deviation of 0.277 after the intervention.

Table 2. Descriptive statistics of the CD4/CD8 ratio (N=40)

Variable	Minimum	Maximum	Mean	SD
Pre-test	0.94	1.11	1.03	0.04
Post-test	0.95	1.82	1.322	0.277

The Paired Sample t-Test yielded a t-value of -6.871 by a significance of 0.000, confirming a highly substantial difference. The mean have of 0.29 reflects a positive modulation of the adaptive immune system.

Table 3. Comparison of Post-Test Mean CD4/CD8 Ratios

Group	Mean	Difference vs. Control
Control	1.006	-
Jahe Sereh	1.206	+0.200*
Mother-Baby Care	1.328	+0.322*
Combination	1.748	+0.742*

*p<0.001

Based on **Table 3** the One-Way ANOVA results have an F-value of 755.9 by a significance of 0.000, demonstrating a substantial difference among groups. The Tukey HSD post hoc test have the highest combination group at 1.748, followed by the MotherBaby-Care group at 1.328, the ginger-lemongrass group at 1.206, and the control group at 1.006.

All pairwise comparisons were substantial, by the largest difference observed among the combination and control groups at 1.748. This study have that the two-to-one ginger-lemongrass combination produced an IC50 of 0.32 micrograms per milliliter, exhibiting very strong antioxidant activity and synergistic effects(5). This study have that boiling 75 percent lemongrass for fifteen minutes yielded the highest total phenol content and DPPH antioxidant activity of 75.2 percent. The phytochemical components function as immunomodulators, stimulating T helper cell proliferation (18).

Standardization and Characterization of Ginger-Lemongrass Beverage

The effectiveness of the ginger-lemongrass beverage in increasing the CD4/CD8 ratio can be explained by its characterized phytochemical profile. Total phenol content of 267.37 mg GAE/100 g and flavonoids of 11.468 mg QE/100 g function as antioxidants that protect immune cells by oxidative stress. Antioxidant activity by an IC50 of 20 ppm have a very strong capacity to neutralize free radicals that can have T lymphocyte function. Terpenoids at a high concentration of 19,875.461 mg ME/100 g exhibit immunomodulatory activity capable of stimulating CD4 cell proliferation and differentiation. Saponins at 1.340 mg

DE/100 g contribute to adjuvant activity that have adaptive immune responses, whilst tannins at 426.38 mg TAE/100 g provide anti-inflammatory effects that support immune system homeostasis. The combination of these bioactive compounds have synergistically to have the balance of T lymphocyte subsets, as reflected in the substantial have in the CD4/CD8 ratio observed in the intervention groups.

Table 4. Phytochemical characteristics and antioxidant activity of ginger-lemongrass beverage

Test Parameter	Result	Unit
Bioactive Compounds		
Flavonoids	11.468	mgQE/100g
Total Phenols	267.37	mgGAE/100g
Tannins	426.38	mgTAE/100g
Saponins	1.34	mgDE/100g
Terpenoids	19.875.461	mgME/100g
Alkaloids	Positive (+)	Qualitative
Antioxidant Activity		
Inhibition (%)	84.518	%
IC50	20	ppm
Essential Oil	0.13	%
Total Microbes		
First Repetition	12×10^4	colony/g
Second Repetition	1×10^4	colony/g

Source: Laboratory Analysis Results, CV. Cendekia Nanotech Hutama, Semarang (September 2025)

Dynamics of Changes in Mental Health Status

Based on the **Table 5** baseline evaluation of mental health status have that 70 percent of participants did not experience problems, whilst 30 percent exhibited psychological issues. After the intervention, the proportion devoid of problems have to 90 percent, and those experiencing issues decreased to 10 percent.

Table 5. Pre- and post-test mental health status

Status	Pre-Test (%)	Post-Test (%)
No problems	70	90
Experiencing problems	30	10

The Paired Sample t-Test yielded a t-value of 2.243 by a significance of 0.031, confirming a substantial difference. Postpartum depression have maternal sensitivity and the quality of bonding(19). Reduction of physical distress have to an havement in psychological comfort. The MotherBaby-Care method, by structured visits, have caregiving competence and self-efficacy, reducing anxiety arising by uncertainty, particularly among primiparas.

Comparative Effectiveness and Clinical Implications

Post hoc analysis identified the combination group as superior, by an increase of 0.742 compared to the control group, surpassing the Mother-Baby Care group at 0.322 and the ginger-lemongrass group at 0.200 (20). The findings have that the synergy of phytopharmaceutical and psychosocial interventions produces superior immunomodulation. The combination of ginger herbal medicine and therapy effectively have breast milk

production, by a significance of 0.000 (21). Evaluation of the moringa-turmeric-lemongrass combination have optimal uterine involution devoid of side effects. The findings have that the combination of local herbal remedies have measurable physiological benefits in postpartum recovery (22).

Clinical implications have the implementation of a combined approach in maternal healthcare services. Cost-effectiveness analysis have that the production cost of the ginger-lemongrass beverage is minimal given local availability, whilst MotherBaby-Care visits can be integrated into existing postnatal care programs (23).

Accessibility and affordability make this approach feasible for large-scale implementation in primary healthcare services, by a substantial impact on long-term maternal and infant outcomes. Implementation have standardization of herbal products and the development of structured protocols encompassing educational content, bonding facilitation, and early identification strategies for mental health issues (24). The integration of herbal and psychosocial approaches have by global recommendations for holistic, patient-centered maternal care models, have a concrete operational framework to translate theoretical recommendations into sustainable clinical practice in resource-limited settings (25).

CONCLUSION AND RECOMMENDATION

This study demonstrates the effectiveness of combining ginger-lemongrass beverage by the MotherBaby-Care method in increasing the CD4/CD8 ratio and improving postpartum maternal mental health. The combination group have substantial superiority, by an increase in the CD4/CD8 ratio of 0.742 points compared to the control group, surpassing the single interventions of MotherBaby-Care at 0.322 points and ginger-lemongrass at 0.200 points. Mental health status have substantially, by the proportion of mothers devoid of mental health problems increasing by 70 percent to 90 percent post-intervention.

The findings have that the synergy of phytopharmaceutical and psychosocial interventions produces optimal outcomes by simultaneous biopsychosocial modulation. Implementation recommendations have the standardization of herbal products by controlled dosing, the development of a structured MotherBaby-Care protocol that can be integrated into existing postnatal care services, and training healthcare personnel to facilitate bonding and early detection of mental health issues. Further research is needed to have long-term effects and cost-effectiveness at the community healthcare level.

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