

GINGER-LEMON-HONEY PLUS VITAMIN B6 FOR NAUSEA AND VOMITING IN FIRST-TRIMESTER PREGNANCY: A THREE-GROUP QUASI- EXPERIMENTAL STUDY

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ABSTRACT

Nausea and vomiting are common symptoms experienced by pregnant women during the first trimester, primarily associated with hormonal and physiological changes. Ginger, lemon, honey, and vitamin B6 have been widely used as complementary approaches to alleviate pregnancy-related nausea and vomiting. This study aimed to evaluate and compare the effectiveness of three interventions: ginger-lemon-honey, ginger-lemon-honey combined with vitamin B6, and vitamin B6 alone in reducing nausea and vomiting among pregnant women with *emesis gravidarum*. A quasi-experimental study with a three-group pretest-posttest design was conducted among 45 first-trimester pregnant women experiencing nausea and vomiting. Participants were selected using purposive sampling and allocated into three intervention groups: ginger-lemon-honey, ginger-lemon-honey plus vitamin B6, and vitamin B6 alone. Nausea and vomiting severity was assessed before and after the intervention using the Pregnancy-Unique Quantification of Emesis (PUQE-24) scale. Data were analyzed using univariate analysis, one-way ANOVA, and ANCOVA to evaluate differences between groups after adjustment for baseline scores. All three intervention groups demonstrated a significant reduction in nausea and vomiting following the intervention ($p < 0.001$). The ginger-lemon-honey plus vitamin B6 group showed the lowest adjusted mean PUQE-24 score of 6.002 (95% CI [5.4–6.5]), followed by the ginger-lemon-honey group with an adjusted mean of 7.590 (95% CI [7.0–8.1]), and the vitamin B6 group with an adjusted mean of 9.342 (95% CI [8.8–9.8]). These findings indicate that the combined ginger-lemon-honey and vitamin B6 intervention resulted in the lowest adjusted PUQE-24 score compared with either intervention alone. The combination of ginger, lemon, honey, and vitamin B6 was more effective in reducing nausea and vomiting among first-trimester pregnant women with *emesis gravidarum* than ginger-lemon-honey or vitamin B6 alone. This combined intervention may provide a comprehensive complementary approach through mechanisms involving gastrointestinal, neurological, psychological, and metabolic pathways.

ABSTRAK

Kata Kunci:

Kehamilan;
Mual dan muntah; Emesis
gravidarum; Jahe; Lemon;
Madu; Vitamin B6

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Mual dan muntah merupakan gejala umum yang dialami ibu hamil pada trimester pertama, terutama terkait dengan perubahan hormonal dan fisiologis. Jahe-lemon-madu dan vitamin B6 telah banyak digunakan sebagai pendekatan komplementer untuk meredakan mual dan muntah akibat kehamilan. Penelitian ini bertujuan untuk mengevaluasi dan membandingkan efektivitas tiga intervensi jahe-lemon-madu, jahe-lemon-madu yang dikombinasikan dengan vitamin B6, serta vitamin B6 saja dalam mengurangi mual dan muntah pada ibu hamil dengan emesis gravidarum. Studi kuasi-eksperimental dengan desain pretest-posttest tiga kelompok dilakukan terhadap 45 ibu hamil trimester pertama yang mengalami mual dan muntah. Sampel dipilih menggunakan teknik purposive sampling dan dibagi ke dalam tiga kelompok intervensi: jahe-lemon-madu, jahe-lemon-madu ditambah vitamin B6, dan vitamin B6 saja. Tingkat keparahan mual dan muntah dinilai sebelum dan sesudah intervensi menggunakan skala Pregnancy-Unique Quantification of Emesis (PUQE-24). Data dianalisis menggunakan analisis univariat, one-way ANOVA, dan ANCOVA untuk mengevaluasi perbedaan antar-kelompok setelah penyesuaian terhadap skor awal. Ketiga kelompok intervensi menunjukkan penurunan mual dan muntah yang signifikan setelah intervensi ($p < 0,001$). Kelompok jahe-lemon-madu ditambah

vitamin B6 menunjukkan skor rata-rata PUQE-24 yang disesuaikan paling rendah, yaitu 6,002 (95% CI [5,4-6,5]), diikuti oleh kelompok jahe-lemon-madu dengan rata-rata yang disesuaikan sebesar 7,590 (95% CI [7,0-8,1]), dan kelompok vitamin B6 dengan rata-rata yang disesuaikan sebesar 9,342 (95% CI [8,8-9,8]). Temuan ini menunjukkan bahwa intervensi kombinasi jahe-lemon-madu dan vitamin B6 menghasilkan penurunan mual dan muntah terbesar dibandingkan dengan intervensi tunggal mana pun. Kombinasi jahe, lemon, madu, dan vitamin B6 lebih efektif dalam mengurangi mual dan muntah pada ibu hamil trimester pertama dengan emesis gravidarum dibandingkan penggunaan jahe-lemon-madu atau vitamin B6 saja. Intervensi kombinasi ini dapat memberikan pendekatan komplementer yang komprehensif melalui mekanisme yang melibatkan jalur gastrointestinal, neurologis, psikologis, dan metabolik.

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INTRODUCTION

Nausea and vomiting of pregnancy (NVP) is the most common issue faced by pregnant women, particularly during the first trimester. NVP is generally characterized by nausea with or without vomiting occurring during pregnancy, and it can affect a woman's daily activities, dietary intake, quality of life, and psychological well-being (Fejzo et al., 2019). This condition must be distinguished from hyperemesis gravidarum (HG), a more severe form characterized by persistent vomiting accompanied by impaired oral intake, dehydration, electrolyte imbalances, and/or weight loss (Austin et al., 2019).

Epidemiologically, nausea and vomiting of pregnancy (NVP) is a common condition affecting up to 70–80% of pregnant women, whereas hyperemesis gravidarum (HG) is reported to occur in 0.3–10.8% of pregnant women (Liu et al., 2022). NVP typically begins between 6 and 8 weeks of gestation and generally resolves by 16–20 weeks of gestation (Fejzo et al., 2019). Pathophysiologically, NVP arises from multifactorial causes. Several studies indicate a link involving human chorionic gonadotropin (hCG) and estrogen levels (Kasande et al., 2017). Additionally, there is a potential association between the symptoms experienced and maternal adaptation to paternal antigens present in the fetoplacental complex. Factors related to the digestive system, such as gastric neuromuscular dysfunction, may also influence the occurrence of nausea and vomiting during pregnancy (Fejzo et al., 2019).

The reported prevalence of hyperemesis gravidarum (HG) varies considerably across populations, partly because of differences in diagnostic criteria and study populations. Current evidence estimates that hyperemesis gravidarum affects approximately 0.3–3% of pregnancies worldwide, with an estimated global prevalence of around 1.1% (Vinnars et al., 2024). Population-based studies have also demonstrated substantial ethnic and geographic variation in the incidence of hyperemesis gravidarum, ranging from approximately 0.3% to 10.8% across different populations worldwide (Liu et al., 2022).

In Indonesia, several studies have reported that approximately 50%–75% of pregnant women experience nausea and vomiting during the first trimester (Indah et al., 2023). Although nausea and vomiting are often considered a normal condition, if not properly managed, they can negatively impact a woman's overall well-being, daily functioning, and quality of life (De Bonis et al., 2025). This issue affects the mother's health and can also interfere with the growth and development of the fetus, potentially leading to low birth weight (Gu et al., 2021).

Treatment for nausea and vomiting associated with pregnancy depends on the severity of the symptoms. Managing nausea and vomiting during pregnancy may involve both medical and non-medical strategies. A well-known medical option is taking vitamin B6 (pyridoxine), which is essential for protein metabolism. In cases involving severe nausea and vomiting, pregnant women can often relieve their symptoms by taking vitamin B6 (Jayawardena et al., 2023). Several studies indicate that vitamin B6 is effective in reducing the frequency of nausea and vomiting, making it a recommended first-line therapy. However, the use of vitamin B6 as monotherapy has limitations because it acts primarily on neurological pathways and may not address other factors such as gastrointestinal disturbances and psychological aspects (Calderón-Ospina & Nava-Mesa, 2020).

At the same time, non-pharmacological symptom management includes the use of natural remedies such as ginger, peppermint, lemon, and honey to help relieve nausea and vomiting in pregnant women, as these options are generally safe and readily available (Fitri & Yuliaswati, 2023). Ginger (*Zingiber officinale*) is a plant whose underground stem is used both as a flavoring agent and as a therapeutic agent. Ginger rhizomes contain essential oils and oleoresins ranging from 1% to 4%. Ginger's unique aroma and flavor stem from its essential oils and non-volatile phenolic compounds, which impart a spicy taste. Ginger's primary therapeutic effects derive from gingerol and shogaol, which are byproducts of gingerol dehydration (Lete & Allué, 2016). In addition to its ability to prevent nausea, ginger and its components act on the peripheral parts of the digestive tract, enhancing gastric tone and motility due to their anticholinergic and antiserotonergic properties (Firouzbakht et al., 2014). In line with the results of a study conducted by (Pebriantny & Sitonga, 2021) in Indonesia, ginger tea was found to be effective in reducing nausea and vomiting in first-trimester pregnant women ($p < 0.012$).

In addition to ginger, lemon is also used as a complementary therapy. A mixture of lemon juice and honey can alleviate nausea, as honey activates prostaglandin pathways that influence cyclooxygenase I and II; meanwhile, various studies and systematic reviews indicate that ginger can help reduce the severity of nausea and vomiting during pregnancy (Chandra & Galaupa, 2022). However, heterogeneity regarding dosage, dosage forms, duration of administration, and study population characteristics has resulted in a lack of uniformity across study findings. Thus, while ginger possesses a stronger evidence base than some other complementary agents, further research is still needed to determine the most effective formulations and combinations.

Unlike ginger, evidence regarding lemon and honey as interventions for nausea and vomiting of pregnancy (NVP) remains relatively limited. The use of lemon is largely based on the experiences and preferences of pregnant women, particularly regarding its aroma or the consumption of lemon-based drinks, yet clinical evidence concerning its antiemetic effectiveness and mechanisms is not as robust as that for ginger. Community service findings regarding the use of pomelo and lemon to alleviate nausea and vomiting in pregnant women showed a reduction in affected individuals from 16 (80%) to 2 (10%) (Mutiah et al., 2021). Similarly, while honey possesses nutritional value and can serve as an ingredient in beverage formulations, evidence that it independently exerts an antiemetic effect on NVP remains limited. Honey contains numerous essential minerals required for physical health; it can support immunity and well-being during pregnancy while providing significant nutritional value for the developing fetus (Chandra & Galaupa, 2022). Honey contains vitamin B6 also known as pyridoxine (0.024 mg) which functions as a receptor inhibitor that helps alleviate nausea (Setyowati, 2019).

The research gap primarily lies in the limited evidence regarding the effectiveness of a combination of ginger, lemon, and honey with vitamin B6 compared to each intervention used in isolation. Previous studies have predominantly evaluated ginger or vitamin B6 as single interventions, whereas evidence concerning the combination of these complementary ingredients with vitamin B6 in pregnant women with nausea and vomiting of pregnancy (NVP) remains limited. Furthermore, few studies have directly compared the ginger-lemon-honey plus vitamin B6 combination, ginger-lemon-honey alone, and vitamin B6 alone using a three-group design that measures the severity of nausea and vomiting before and after the intervention. Yet, such a comparison is crucial for determining whether the addition of ginger-lemon-honey offers added benefits compared to vitamin B6 alone or ginger-lemon-honey alone.

A combined approach using ginger, lemon, honey, and vitamin B6 warrants investigation, given the distinct characteristics of each intervention component. Ginger is supported by evidence regarding its anti-emetic effects and its impact on the gastrointestinal system (Tiani et al., 2024). While vitamin B6 has been utilized in the management of pregnancy-related nausea (Sharifzadeh et al., 2018). Lemon contributes through its sensory characteristics specifically its aroma and taste (Lin et al., 2025). Whereas honey serves as a supporting ingredient in the formulation while also providing an energy source (Ilia et al., 2021).

A preliminary study conducted at the Perak Community Health Center in Jombang Regency in February 2026 further underscores the relevance of this research. Among the 20 pregnant women observed, 12 (60%) were in their first trimester and 8 (40%) were in their second trimester. Fifteen women (75%) reported concerns regarding nausea and vomiting, as well as a reluctance to take prescribed medications. Interviews also revealed that some women used pharmacological agents, such

as metoclopramide, to manage these symptoms. These findings indicate a need for intervention options that are acceptable to pregnant women as complementary therapies. Consequently, the researcher aims to analyze the effectiveness of a ginger-lemon-honey and vitamin B6 combination compared to ginger-lemon-honey alone and vitamin B6 alone in reducing nausea and vomiting among first-trimester pregnant women suffering from *emesis gravidarum* at the Perak Community Health Center, Jombang Regency, Indonesia.

METHOD

Type of Research

This study used a quasi-experimental, three-group pretest-posttest design to evaluate and compare the effectiveness of ginger-lemon-honey, ginger-lemon-honey combined with vitamin B6, and vitamin B6 alone in reducing nausea and vomiting among first-trimester pregnant women. The primary outcome was the change in nausea and vomiting severity measured using the Pregnancy-Unique Quantification of Emesis (PUQE-24) score from baseline to the prespecified post-intervention assessment.

Place and Time of Research

The study was conducted at Puskesmas Perak, Jombang Regency, East Java, Indonesia, from March to April 2026.

Population and Sample

Participants were pregnant women in the first trimester who experienced nausea and vomiting during pregnancy and met the predefined eligibility criteria. The inclusion criteria were: (1) pregnant women in the first trimester; (2) experiencing nausea and/or vomiting related to pregnancy; (3) having a predefined PUQE-24 score within the eligibility range; (4) willing to participate in the study and complete the intervention; and (5) able to consume the intervention orally. The exclusion criteria were: (1) diagnosed hyperemesis gravidarum requiring medical treatment or hospitalization; (2) pregnancy complications requiring immediate clinical management; (3) known allergy or intolerance to ginger, lemon, honey, or vitamin B6; (4) gastrointestinal or other medical conditions that could independently cause nausea and vomiting; and (5) current use of other antiemetic interventions outside the study protocol.

The sample size was determined a priori using G*Power version 3.1.9.7 for a one-way analysis of variance (ANOVA) with fixed effects and an omnibus test. The calculation was based on an alpha level of 0.05, a statistical power of 80% ($1-\beta = 0.80$), three study groups, and an anticipated large effect size (Cohen's $f \approx 0.48-0.50$), based on the expected magnitude of the intervention effect from previous evidence and/or preliminary findings. The calculation indicated that approximately 42 participants were required to achieve 80% statistical power. To ensure equal allocation across the three study groups and to provide a small margin for potential loss to follow-up or incomplete data, the final sample size was increased to 45 participants, allowing for an even distribution of 15 participants per group.

Data Collection

The intervention was administered twice daily in the morning and evening for four consecutive days, with relatively consistent intervals between doses each day. For the ginger-lemon-honey group, each dose consisted of 10 g of fresh ginger, 5 mL of lemon juice, 10 g of honey, and 150 mL of boiled water. In the group receiving the combination of ginger-lemon-honey and vitamin B6, each dose comprised the same ginger-lemon-honey mixture plus 25 mg of vitamin B6. Meanwhile, the active comparator group received 25 mg of vitamin B6 with 150 mL of boiled water. All interventions were administered twice daily for four consecutive days.

The ginger used consisted of fresh, high-quality rhizomes; these were washed under running water, peeled, and weighed to 10 g per dose. The ginger was then grated or crushed and extracted using 150 mL of warm boiled water. After straining the mixture, 10 g of honey and 5 mL of lemon juice were added. The honey and lemon were added after the heating process to preserve the ingredients' properties and avoid overheating. The preparation was served fresh and consumed immediately after being made.

Researchers used an intervention administration log to record the date, time of administration, dosage, consumption adherence, and any instances of vomiting following administration. Respondents were asked to consume the entire preparation and to note any vomiting, gastrointestinal discomfort, or other complaints. Researchers monitored adherence daily throughout the four-day intervention period by visiting respondents' homes or contacting them via phone calls, text messages, or WhatsApp to confirm consumption.

A respondent was classified as a dropout if they withdrew from the study, were unable to complete the four-day intervention, failed to receive the intervention according to the prescribed schedule, developed a condition requiring discontinuation of the intervention, or did not complete the posttest assessment. The reason and timing of withdrawal were documented for each respondent.

Each respondent received a total of eight intervention doses over the course of the study. Thus, the total exposure per respondent over four days was 80 g of fresh ginger, 40 mL of lemon juice, and 80 g of honey for both the ginger-lemon-honey group and the ginger-lemon-honey plus vitamin B6 group; additionally, the ginger-lemon-honey plus vitamin B6 group received a total of 200 mg of vitamin B6. The active comparator group (vitamin B6) received a total of 200 mg of vitamin B6 during the intervention period.

Data Analysis and Processing

Statistical analyses were performed using IBM SPSS Statistics version 31.0. The analysis was conducted according to a prespecified statistical analysis plan and included univariate, bivariate, and multivariable analyses. All statistical tests were two-sided, and a p -value <0.05 was considered statistically significant. Univariate analysis was conducted to describe the characteristics of the participants and the distribution of the study variables in each intervention group. Categorical variables, including maternal age, gestational age category, parity, education, and other relevant baseline characteristics, were presented as frequencies and percentages.

Bivariate analysis was performed to evaluate differences in respondent characteristics and outcome variables between the three intervention groups. For continuous variables, one-way analysis of variance (one-way ANOVA) was used to compare the three intervention groups when the assumptions of normality and homogeneity of variance were satisfied. The Levene test was used to assess homogeneity of variance. When these assumptions were not satisfied, the Kruskal-Wallis test was used as a non-parametric alternative.

An analysis of covariance (ANCOVA) was performed as the primary adjusted between-group analysis to determine whether the post-intervention nausea and vomiting scores differed among the three intervention groups after controlling for baseline pretest scores. The dependent variable was the posttest nausea and vomiting score, the independent variable was intervention group, and the pretest nausea and vomiting score was included as a continuous covariate.

Ethical Considerations

This study obtained an ethics approval letter (No. 0598-KEPKSHJ) from the Health Research Ethics Committee (KEPK) at Husada Jombang College of Health Sciences, Indonesia. Furthermore, the mothers agreed to participate in this study. Respondents were provided with detailed information, and informed consent was obtained before the intervention began. The mothers were informed of their right to withdraw from the study at any time and were assured that their personal data would remain confidential.

RESULT

Respondent Characteristics

The participants in this study were all pregnant women who had undergone prenatal checkups at the Perak Community Health Center in Jombang Regency. The study sample consisted of 45 pregnant women in their first trimester, divided into three comparison groups: intervention group A received a decoction of ginger, lemon, and honey; group B received a decoction of ginger, lemon, and honey plus vitamin B6; and the control group (intervention group C) received vitamin B6 alone. The characteristics of the respondents are shown in the table below.

Table 1.
Frequency Distribution of Respondent Characteristics (n = 45).

Characteristics	Treatment Group					
	Ginger-Lemon-Honey		Ginger-Lemon-Honey + Vitamin B6		Vitamin B6	
	f	%	f	%	f	%
Age						
<20 age	3	20.0	4	26.67	3	20.0
20-35 age	9	60.0	11	73.33	10	66.67
>35 age	3	20.0			2	13.33
Education						
Elementary Education	4	26.67	10	66.67	3	20.0
Junior High School	10	66.67	4	26.67	7	46.67
High School			1	6.67	4	26.67
Associate's Degree	1	6.67				
Bachelor's Degree					1	6.67
Employment						
Employed	9	60.0	3	20.0	3	20.0
Unemployed	6	40.0	12	80.0	12	80.0
Gravidity						
Primigravida	6	40.0	4	26.67	2	13.33
Multigravida	9	60.0	11	73.33	13	86.67
History of Nausea and Vomiting						
Yes	11	73.33	9	60.0	8	53.33
No	4	26.67	6	40.0	7	46.67
Total	15	100%	15	100%	15	100%

Source: Primary Data, 2026

Based on Table 1 above, it is evident that the ginger-lemon-honey plus vitamin B6 intervention group had the highest number of respondents in the 20–35 age range, namely 11 people (73.33%). The ginger-lemon-honey only intervention group had the highest number of respondents with a junior high school education, namely 10 people (66.67%), while the ginger-lemon-honey plus vitamin B6 group had the highest number with an elementary school education, namely 10 people (66.67%). Regarding employment status, the vitamin B6 only intervention group and the ginger-lemon-honey plus vitamin B6 group had more unemployed individuals, namely 12 people (80.0%). Multigravida status was most prevalent in the vitamin B6-only intervention group, totaling 13 women (86.67%). Meanwhile, the group that received only ginger-lemon-honey showed a higher proportion of respondents with a history of nausea and vomiting in previous pregnancies, totaling 11 women (73.33%).

Bivariate Analysis

The data obtained were primary data on an interval scale; therefore, a quantitative analysis was conducted using a one-way ANOVA. Table 2 above shows that the p-value for the group that received only the ginger-lemon-honey intervention was 0.134, while for the group that received ginger-lemon-honey plus vitamin B6 it was 0.155, and for the group that received only vitamin B6 it was 0.218. All of these p-values were greater than 0.05, indicating that the data did not significantly deviate from a normal distribution.

Table 2.
Results of the Data Normality Test

Group	Shapiro-Wilk		
	Statistic	df	Sig.
Ginger-Lemon-Honey	0.910	15	0.134
Ginger-Lemon-Honey +Vitamin B6	0.914	15	0.155
Vitamin B6	0.924	15	0.218

Source: Primary Data, 2026

Table 3.
Results of the Data Homogeneity Test

Levene Statistic	df1	df2	Sig.
1.945	2	42	0.156

Source: Primary Data, 2026

To assess the homogeneity of the data in this study, Levene's test was used, as shown in Table 3 above. The results indicate a p-value of $0.156 > 0.05$, meaning that the variances among the three intervention groups (the ginger-lemon-honey intervention group, the ginger-lemon-honey plus vitamin B6 group, and the vitamin B6-only group) were homogeneous.

Table 4.
Results of Hypothesis Testing Using One-Way ANOVA

Results of Hypothesis Testing Using One-way ANOVA								
Intervention Group	n	Mean	SD	SE	Mean Difference	95% CI	Value	Effect Size
pretest Ginger-Lemon-Honey	15	8.93	0.62	0.535	2.33	−3.48 to −1.18	< 0.001	η² = 0,489 (48.9%)
posttest Ginger-Lemon-Honey		6.60						
pretest Ginger-Lemon-Honey + Vitamin B6	15	11,6	1.19	0.535	4.87	−6.02 to −3.72	< 0.001	
posttest Ginger-Lemon-Honey + Vitamin B6		6.73						
pretest Vitamin B6	15	10.8	1.44	0.535	1.20	−4.01 to −1.71	< 0.001	
posttest Vitamin B6		9.60						

Source: Primary Data, 2026

Table 4 above shows a decrease in nausea and vomiting scores across all groups following the intervention. In the ginger-lemon-honey group, the mean score prior to the intervention was 8.93 (SD = 0.62), decreasing to 6.60 afterward. The mean change was 2.33, indicating a reduction in nausea and vomiting scores following the ginger-lemon-honey intervention. This difference was statistically significant ($p < 0.001$), with a 95% confidence interval (CI) of -3.48 to -1.18.

In the ginger, lemon, and honey plus vitamin B6 group, the mean score dropped from 11.60 (SD = 1.19) before the intervention to 6.73 afterward. The mean change was 4.87, representing a greater reduction in nausea and vomiting scores compared to the ginger-lemon-honey group. This difference was statistically significant ($p < 0.001$), with a 95% CI of -6.02 to -3.72.

In the vitamin B6 group, the mean score was 10.80 (SD = 1.44) before the intervention and 9.60 afterward. Based on these means, there was a score reduction of 1.20 points following vitamin B6 administration. This difference was statistically significant ($p < 0.001$), with a 95% CI of -4.01 to -1.71.

Overall, all three groups demonstrated a decrease in nausea and vomiting scores following the intervention. The ginger, lemon, and honey plus vitamin B6 group showed the largest mean reduction (4.87) compared to the ginger-lemon-honey and vitamin B6 groups. These findings indicate that the

combination of ginger, lemon, honey, and vitamin B6 was associated with a greater reduction in the intensity of nausea and vomiting in pregnant women than the single interventions.

The overall effect of intervention was statistically significant, with a large effect size ($\eta^2 = 0.489$), indicating that approximately 48.9% of the variance in the outcome was attributable to differences between intervention groups.

Table 5.
Results of the Post Hoc Test for Multiple Comparisons

Group	Group	Sig.	95% CI	
			Lower	Upper
Ginger-Lemon-Honey	Ginger-Lemon-Honey +vitamin B6	0.000	-1.47	1.20
	Vitamin B6	0.000	-4.33	-1.67
Ginger-Lemon-Honey +vitamin B6	Ginger-Lemon-Honey	0.000	-1.20	1.47
	Vitamin B6	0.000	-4.20	-1.53
Vitamin B6	Ginger-Lemon-Honey	0.000	1.67	4.33
	Ginger-Lemon-Honey +Vitamin B6	0.000	1.53	4.20

Source: Primary Data, 2026

Based on Table 5 above, the post hoc multiple-comparison analysis demonstrated statistically significant differences among the three intervention groups. A significant difference was observed between the ginger-lemon-honey group and the ginger-lemon-honey plus vitamin B6 group ($p < 0.001$). A statistically significant difference was also found between the ginger-lemon-honey group and the vitamin B6 group ($p < 0.001$). Furthermore, the comparison between the ginger-lemon-honey plus vitamin B6 group and the vitamin B6 group showed a statistically significant difference ($p < 0.001$).

These findings indicate that the treatment effects differed significantly across the three intervention groups. The significant differences involving the vitamin B6 group suggest that both ginger-lemon-honey alone and the combination of ginger-lemon-honey with vitamin B6 produced different outcomes compared with vitamin B6 alone. The significant difference between ginger-lemon-honey and the combined ginger-lemon-honey plus vitamin B6 regimen further indicates that the addition of vitamin B6 was associated with a different treatment response. Overall, the post hoc analysis indicates that all three intervention regimens differed significantly from one another with respect to the outcome measure.

Multivariate Analysis

The analysis of covariance (ANCOVA) for the three intervention groups aimed to compare the mean nausea and vomiting scores (PUQE scores or frequency) after the intervention (posttest) across the three groups, while controlling for the pre-intervention nausea and vomiting scores (pretest) as a covariate. Prior to conducting the ANCOVA analysis, a test of data homogeneity was performed, as shown in Table 6 below.

Table 6.
Results of the Data Homogeneity Test

Levene Statistic	df1	df2	Sig.
1.257	2	42	0.295

Source: Primary Data, 2026

To determine whether the data in this study are homogeneous, Levene's test was used, and the results are shown in Table 6. The p-value is $0.295 > 0.05$, indicating that the variances across groups are equal (the assumption of homogeneity is met).

Table 7.
Results of the Main ANCOVA Tests (Tests of Between-Subjects Effects)

	df	Mean Square	f	Sig.	Partial Eta Square
Pretest (Covariat)	1	51.7	55.3	0.001	0.574
Independent Variable	2	41.1	43.9	0.001	0.682

Source: Primary Data, 2026

Based on Table 7, the ANCOVA test indicates a significant effect of the covariate, with a p-value of $0.001 < 0.05$, indicating that baseline nausea and vomiting scores were significantly associated with posttest scores. In addition, after controlling for the pretest scores, the group effect showed a statistically significant difference in nausea and vomiting scores among the three groups, with a p-value of $0.001 < 0.05$. The partial eta-squared value of 0.682 indicates a large effect size, suggesting that the intervention group accounted for a substantial proportion of the variance in post-intervention nausea and vomiting scores after controlling for baseline scores.

Table 8.
Results of the Bonferroni Post Hoc Test

Pairwise Comparisons			
Group		Mean Difference	Sig.
Ginger-Lemon-Honey and +vitamin B6	Ginger-Lemon-Honey	1.588*	0.001
Ginger-Lemon-Honey and vitamin B6		-1.752*	0.001
Ginger-Lemon-Honey +vitamin B6 and Vitamin B6		-3.340*	0.001

Source: Primary Data, 2026

Table 8 shows the results of the pairwise comparisons between the intervention groups. Comparisons between the ginger-lemon-honey group and the ginger-lemon-honey plus vitamin B6 group ($p\text{-value} = 0.001 < 0.05$), the ginger-lemon-honey group and the vitamin B6 group ($p\text{-value} = 0.001 < 0.05$), and the ginger-lemon-honey plus vitamin B6 group and the vitamin B6 group ($p\text{-value} = 0.001 < 0.05$) all showed statistically significant differences in post-intervention nausea and vomiting scores. The largest adjusted mean difference was observed between the ginger-lemon-honey plus vitamin B6 group and the vitamin B6 group, with a mean difference of -3.340 .

Table 9.
Results of the Estimated Marginal Means Test

Intervensi	Mean	Std.Error	95% CI
Ginger-Lemon-Honey	7.590	0.283	7.018-8.161
Ginger-Lemon-Honey +Vitamin B6	6.002*	0.268	5.460-6.544
Vitamin B6	9.342	0.252	8.833-9.851

Source: Primary Data, 2026

Table 9 above shows that the lowest adjusted posttest mean score was found in the ginger-lemon-honey plus vitamin B6 combination intervention group, at 6.002, compared with groups 1 and 3. Therefore, the combination of ginger, lemon, honey, and vitamin B6 had the lowest adjusted posttest PUQE-24 score compared with vitamin B6 alone or ginger-lemon-honey alone. The second-lowest adjusted mean score was observed in the ginger-lemon-honey group, with a score of 7.590, followed by the vitamin B6 group, with a score of 9.342.

DISCUSSION

The adjusted between-group analysis demonstrated statistically significant differences in nausea and vomiting outcomes among all three intervention groups. Bonferroni-adjusted pairwise comparisons showed a significant difference between the Ginger-Lemon-Honey group and the Ginger-Lemon-Honey plus Vitamin B6 group (mean difference = 1.588, $p < 0.001$). A significant difference was also observed between the Ginger-Lemon-Honey group and the Vitamin B6 group (mean difference = -1.752, $p < 0.001$), as well as between the Ginger-Lemon-Honey plus Vitamin B6 group and the Vitamin B6 group (mean difference = -3.340, $p < 0.001$).

Because higher nausea and vomiting scores indicate greater symptom severity, the direction of the adjusted mean differences suggests that the Ginger-Lemon-Honey plus Vitamin B6 group had a more favorable outcome than both the Ginger-Lemon-Honey and Vitamin B6 groups. The largest adjusted difference was observed between the Ginger-Lemon-Honey plus Vitamin B6 and Vitamin B6 groups (mean difference = -3.340, $p < 0.001$), indicating a greater reduction in symptom severity in the combined intervention group compared with Vitamin B6 alone. The difference between Ginger-Lemon-Honey and Vitamin B6 was also statistically significant (mean difference = -1.752, $p < 0.001$), indicating a more favorable outcome for the Ginger-Lemon-Honey group compared with Vitamin B6 alone.

The significant difference between the Ginger-Lemon-Honey and Ginger-Lemon-Honey plus Vitamin B6 groups (mean difference = 1.588, $p = 0.001$) indicates that the addition of Vitamin B6 was associated with a statistically significant difference in treatment response. Thus, the adjusted analysis provides evidence that the combined Ginger-Lemon-Honey plus Vitamin B6 intervention produced a different and more favorable outcome than either intervention alone.

The results of this study show that the average score for nausea and vomiting before vitamin B6 administration was 10.8, while the score after administration was 9.60. Vitamin B6 (pyridoxine) is a commonly used medical treatment as a primary intervention for managing nausea and vomiting during pregnancy. Its mechanism of action focuses on the central nervous system by regulating neurotransmitters such as serotonin and dopamine, thereby helping to stabilize the vomiting center in the brain. Several studies have shown that vitamin B6 is effective in reducing the frequency of nausea and vomiting, but the effect tends to be limited because it primarily affects neurological pathways. According to a study by [Jafari-Dehkordi et al., \(2017\)](#) highlighting a significant reduction in nausea and vomiting following vitamin B6 treatment, the recorded scores were 8.4 (± 1.8) and 7.7 (± 3.8), respectively ($p = 0.001$). A recent systematic review and meta-analysis ([Gaur et al., 2022](#)) showed that vitamin B6 is effective in relieving nausea and vomiting, although its effect was not statistically superior to that of ginger.

The group that consumed a combination of ginger, lemon, and honey showed better results than the group that took vitamin B6 alone, with an average pre-test score of 8.93 and a post-test score of 6.60. This suggests that herbal approaches may have broader efficacy in treating nausea and vomiting during pregnancy. Ginger acts as a natural antiemetic through its gingerol and shogaol content, which can improve gastric motility and inhibit the gag reflex ([Ariyanti et al., 2023](#)). Gingerol and shogaol compounds possess natural antiemetic effects through several mechanisms, including blocking serotonin (5-HT₃) receptors, accelerating gastric emptying, and reducing gastrointestinal spasms ([Dai et al., 2022](#)). The results of a study by [Nurmasyithah et al., \(2025\)](#) indicate that consuming a decoction of ginger, lemon, and honey for four days is effective in reducing nausea and vomiting in pregnant women, with an average score of 8.60 ($p < 0.001$) in the intervention group. At the same time, honey acts as an energy source and enhances the body's ability to fight illness, stimulates appetite, and consequently increases food intake ([Kumar et al., 2024](#)). The combination of these three ingredients produces effects that are not only physical but also mental and metabolic.

These findings are supported by a study by [Fazriah & Febriyani, \(2025\)](#), showing that boiled ginger mixed with lime juice and honey is effective in reducing the incidence of nausea and vomiting in pregnant women during the first trimester. Unlike pharmacological options such as vitamin B6 or various antiemetics, the combination of ginger, lemon, and honey offers benefits in terms of safety and fewer side effects. Consistent with the findings of ([Abidah et al., 2022](#)), the results indicate that ginger beverages administered to pregnant women in the first trimester can reduce hyperemesis gravidarum; the mean scores were 3.4375 in the intervention group and 2.2917 in the control group, with a p -

value=0.000. A separate study conducted by Fadla et al., (2026) also showed that ginger treatment effectively reduced the severity of nausea during the first trimester of pregnancy.

Further analysis conducted using the Bonferroni post hoc test in this study showed that the comparison between the Jalema intervention group and the Jalema + vitamin B6 group did not reveal a statistically significant difference, with a p-value of 1.000, which is greater than 0.05. Recent meta-analyses have shown that ginger produces effects comparable to vitamin B6 in relieving nausea and vomiting during pregnancy (Hu et al, 2022). Theoretically, it can be stated that in the Jalema group, the positive effect may have been sufficiently large that the addition of vitamin B6 did not result in a statistically significant increase in that effect. Vitamin B6 affects the vomiting center in the central nervous system, whereas ginger also affects the neurotransmitter serotonin, which is associated with the vomiting reflex. Therefore, the effectiveness of vitamin B6 may be less apparent when combined with ginger, meaning that ginger may have masked some pathways that are also influenced by vitamin B6.

The group that received the Jalema + vitamin B6 combination had a pretest score of 11.6 and a posttest score of 6.73. The decrease in both the frequency and intensity of nausea and vomiting after using this combination indicates that a multimodal treatment integrating herbal and pharmaceutical methods may yield better outcomes for addressing nausea and vomiting in pregnancy. The primary benefit of blending ginger, lemon, honey, and vitamin B6 may lie in their complementary effects. Each component operates through distinct but potentially complementary mechanisms. Through this combination, the therapy may influence the digestive system, the nervous system, psychological aspects, and the body's metabolic state. The findings of this study align with the meta-analysis conducted by Gaur et al., (2022), which showed that both ginger and vitamin B6 are effective in alleviating nausea and vomiting during pregnancy. A recent systematic review and meta-analysis shows that ginger is safe and effective for alleviating nausea and vomiting in pregnancy (Tan et al., 2023). Moreover, comprehensive clinical experiences shared by pregnant women from different groups indicate that the combination of ginger and vitamin B6 provides more effective symptom relief than using vitamin B6 by itself (Hu et al., 2022).

Based on the results of the multivariate analysis in this study, it was found that the combination of ginger, lemon, honey, and vitamin B6 showed the lowest post-test (adjusted) mean score of 6.002, indicating that this combination was most effective in reducing nausea and vomiting in pregnant women, followed by the combination of ginger, lemon, and honey with a score of 7.590, while the combination of vitamin B6 alone showed the lowest effectiveness at 9.342. These results indicate that the more comprehensive the mechanisms of action of the intervention, the greater its potential effectiveness in reducing symptoms of nausea and vomiting during pregnancy. The combination of ginger, lemon, and honey showed better effectiveness than vitamin B6 alone, but was still below that of the complete combination with vitamin B6. These results indicate that herbal combinations possess a sufficiently strong ability to reduce nausea and vomiting. However, this combination may not include a neurological component because it lacks vitamin B6, which acts on neurological pathways involved in nausea and vomiting. Thus, its effectiveness remained lower than that of the complete combination group with ginger-lemon-honey plus vitamin B6. These results reinforce the hypothesis that nausea and vomiting during pregnancy may be a multifactorial condition requiring multidimensional treatment. Interventions capable of targeting more pathways associated with nausea and vomiting may yield more optimal results (Campbell et al., 2016).

In theory, the combination of ginger, lemon, honey, and vitamin B6 works because each component has distinct yet complementary active properties (synergistic effect). Ginger helps suppress the gag reflex and improve gastric motility; lemon may provide a relaxing effect and reduce the sensation of nausea; honey provides energy and may support the body's metabolism; and vitamin B6 helps regulate neurotransmitter pathways involved in nausea and vomiting. This combination may be an effective approach for alleviating nausea and vomiting during pregnancy, as it provides complementary effects that target multiple factors contributing to nausea and vomiting at the same time. This is consistent with research results by Dewi et al., (2024) indicating an average decrease in the intensity of hyperemesis gravidarum of 3.6 in the ginger + B6 group. In the group receiving only vitamin B6, the decrease was 1.26, while in the group taking only ginger, the decrease was 2.34. A study by Fazriah & Febriyani, (2025) demonstrated a decrease in the frequency of pregnancy related nausea by using boiled ginger and

lime juice, beginning from the initial appointment with acute pregnancy-related vomiting, which was then reduced to mild symptoms by the third visit.

CONCLUSION AND SUGGESTION

All three intervention regimens were associated with a reduction in the frequency and severity of nausea and vomiting during pregnancy. However, the magnitude of improvement varied across groups. Based on the adjusted inter-group analysis, the ginger-lemon-honey plus vitamin B6 regimen was associated with lower adjusted post-test PUQE scores compared to the ginger-lemon-honey-only or vitamin B6-only regimens within this study sample. These findings indicate that the combination regimen offers a potential advantage in alleviating nausea and vomiting symptoms compared to single-agent regimens.

However, this study has several limitations, including a quasi-experimental design, non-random allocation, a relatively small sample size, and a short intervention period (four days). Furthermore, comprehensive safety aspects were not evaluated. Therefore, further research, specifically randomized controlled trials with larger samples, longer follow-up periods, standardized intervention protocols, and comprehensive maternal and fetal safety assessments, is required to confirm the effectiveness and safety of the combination regimen.

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