

The Effectiveness of Peppermint Aromatherapy for Nausea and Vomiting in Pregnant Women in the First Trimester

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ABSTRACT

Introduction: Nausea and vomiting (emesis gravidarum) are common symptoms during the first trimester of pregnancy due to hormonal changes, particularly increased levels of human chorionic gonadotropin (hCG), estrogen, and progesterone. These symptoms may interfere with daily activities, reduce nutritional intake, and impair maternal quality of life. Peppermint aromatherapy, which contains menthol with antiemetic and relaxing properties, is a potential non-pharmacological intervention. This study aimed to evaluate the effect of peppermint aromatherapy on nausea and vomiting among first-trimester pregnant women

Methods: A quasi-experimental pretest–posttest control group design was employed involving 30 participants, equally assigned to intervention and control groups. Nausea and vomiting were assessed before and after the intervention using a standardized measurement scale. Data were analyzed using the Wilcoxon signed-rank test and Mann–Whitney U test.

Results: The intervention group showed a significant reduction in mean nausea and vomiting scores from 2.13 to 1.07 ($p = 0.001$), whereas the control group showed no significant change (2.07 to 1.93; $p = 0.414$). A significant difference was also observed between groups ($Z = -3.089$; $p = 0.002$).

Conclusion: Peppermint aromatherapy effectively reduced nausea and vomiting in first-trimester pregnant women and may serve as a safe complementary therapy.

Keywords: *emesis gravidarum; nausea and vomiting; peppermint aromatherapy; pregnant women*

INTRODUCTION

Pregnancy is a physiological process characterized by various hormonal, physical, and psychological changes in the mother. One of the most common complaints in the first trimester is nausea and vomiting or emesis gravidarum. This condition is caused by an increase in Human Chorionic Gonadotropin (hCG), estrogen, and progesterone, which affect the digestive system as well as the vomiting center in the brain (Artamevia & Soimah, 2023). Although often considered a physiological complaint, emesis gravidarum can interfere with daily activities, decrease nutrient intake, and, if severe, develop into hyperemesis gravidarum, which is at risk of causing dehydration, electrolyte disorders, and

complications in the mother and fetus (Mursyida et al., 2023).

Nausea and vomiting that occur in the first trimester can occur continuously, resulting in dehydration. Vomiting that occurs more than ten times a day and occurs during the last 20 weeks of pregnancy will continue to become hyperemesis gravidarum, which causes the mother's body to become weak and poses a risk to the health of the fetus (Rahmawati & Aisyah, 2025).

Complications of hyperemesis gravidarum can be categorized into three main groups. Pregnancy-related complications include malnutrition, anemia, hyponatremia, Wernicke's encephalopathy, renal failure, central pontine myelinolysis, stroke, cerebral artery vasospasm, seizures, coagulopathy, hypoglycemia, rupture or

perforation of the esophagus, liver disease, jaundice, pancreatitis, deep vein thrombosis, pulmonary embolism, pneumothorax, pneumomediastinum, rhabdomyolysis, vitamin K deficiency, spleen avulsion, depression, and post-traumatic stress disorder. Central nutrition-related complications include sepsis, fungemia, tamponade, local infections, venous thrombosis, placental fat infiltration, and transaminitis. Baby-related complications include low birth weight, small for gestational age, and preterm birth before 37 weeks (Gerede et al., 2025).

Globally, about 70–80% of pregnant women experience nausea and vomiting in the first trimester of pregnancy. The World Health Organization (WHO) also mentions that the occurrence of emesis gravidarum occurs in most pregnancies of varying severity, and about 12.5% can progress to a more severe condition (Juwita & KS, 2024). The prevalence of hyperemesis gravidarum varies globally, with reported figures of 3.6% in Malaysia and East Asia, 4.4% in Ethiopia, 10.8% in China, and 0.3% in Sweden (Seid et al., 2024).

In Indonesia, the incidence rate of emesis gravidarum is still quite high, with around 24.7% of 2,203 pregnant women in Indonesia experiencing it, and in general the prevalence is reported to reach 50–75% in the first trimester of pregnancy (Farikha et al., 2023). In addition, the incidence of nausea and vomiting in pregnancy occurs more in primigravida (60–80%) than in multigravida (40–60%), so the factor of pregnancy experience is one of the important determinants (Puspitaningrum et al., 2023). In Riau Islands Province in 2023, the number of pregnant women was recorded at 54,035, with the second most in Tanjungpinang City, which was 3,581 pregnant women (Riau Islands Provincial Health Office, 2023). The incidence rate of emesis gravidarum reaches 12%, indicating the need for special attention to the health of pregnant women in this area (Mulyati et al., 2025).

The management of emesis gravidarum can be carried out pharmacologically or non-

pharmacologically. However, many pregnant women avoid using the drug due to concerns about side effects on the fetus, so complementary therapy is the preferred alternative. One of the widely used nonpharmacological therapies is peppermint aromatherapy. The menthol and menthone content in peppermint has a relaxing effect on the muscles of the digestive tract, helps reduce gastric spasms, and provides a calming effect that can reduce nausea (Farida & Sudarso, 2025).

Physiologically, the smell of inhaled peppermint stimulates the olfactory system, which is connected to the limbic system in the brain, so that it can affect emotions, comfort, and the body's response to nausea. This effect helps to reduce the intensity of nausea and vomiting in pregnant women in the first trimester (Yuliani et al., 2023).

Some previous studies have also shown that peppermint aromatherapy is effective in reducing nausea and vomiting in pregnant women. The results showed a significant decrease in the level of emesis gravidarum after the administration of peppermint aromatherapy compared to the non-intervention group. This reinforces that peppermint can be used as a complementary therapy that is safe, inexpensive, and easy to apply in primary health facilities (Aryasih et al., 2022; Mulyati et al., 2025; Rishel et al., 2024).

Although the effectiveness of peppermint aromatherapy has been extensively researched in various regions of Indonesia, most studies have been conducted on urban populations with homogeneous environmental characteristics. No study that specifically explored the effectiveness of this intervention in pregnant women in coastal areas such as Tanjungpinang City. Pregnant women in this region have exposure to the coastal environment and high consumption patterns of seafood, which clinically is often the main trigger for exacerbations of nausea and vomiting due to strong fishy smells. Therefore, this study has a novelty in testing whether peppermint aromatherapy can construct a relaxation effect that is strong enough to block specific nausea

stimulation triggered by environmental factors and local eating culture in Tanjungpinang City.

Based on preliminary data obtained by researchers from January to July 2024. There were 103 pregnant women in the first trimester who checked themselves at 3 Midwifery Independent Practices in Tanjungpinang City. Of the 103 pregnant women, 65 pregnant women in the first trimester experienced nausea and vomiting (around 63%). Midwives have a very important role in providing care to pregnant women, in this case, how to overcome nausea and vomiting so as not to cause worse conditions. This study aims to determine the effectiveness of peppermint aromatherapy on the incidence of nausea and vomiting in pregnant women in the first trimester.

METHOD

Study Design

This study is a quasi-experimental research with a two-group pre-test and post-test design. Sampling was done using accidental sampling techniques. This research was conducted at the Midwife's Independent Practice in Tanjungpinang City in January–March 2025.

Setting & Participants

The population in this study was all pregnant women in the 1st trimester who experienced nausea and vomiting. The number of samples was selected by determining a minimum number of experimental samples, namely 30 respondents (15 control samples and 15 intervention samples) in accordance with previous research (Kholifa et al., 2023).

Variables & Measurement

Measurement of the intensity of nausea and vomiting using the 24-hour Pregnancy-Unique

Quantification of Emesis (PUQE-24) Scale instrument. Questionnaires were given to respondents before the intervention and after the intervention was carried out in each group (peppermint and control).

Aromatherapy was given by dropping 3 drops of tissue into the air to be inhaled at a distance of 5cm from the nose and at chin level, by taking a long breath 2-3 times/minute for 10 minutes. After collecting data for 7 days, the next step is to calculate the results of the research carried out. Aromatherapy was given to each respondent at 5 ml, adjusted for 7 days of intervention with 3 doses per day; in each dose, 3 drops of aromatherapy were given. For the control group, only do 2-3 deep breath withdrawals/minute without aromatherapy in 10 minutes, do 3 times every day for 7 days.

Data Collection

To ensure internal validity and ensure that all respondents carried out procedures according to clinical protocols for 7 days, the researcher implemented a multi-layered control system. First, respondents were provided with a Daily Compliance Sheet to record the time, duration, and frequency of interventions independently. Second, the researcher implemented a WhatsApp-based reminder system, which was carried out twice a day, where respondents were required to send documentary evidence in the form of photos while inhaling.

Data Analysis

The statistical analysis methods used are the Wilcoxon Rank Test and the Mann-Whitney Test. If Sig < 0.05, H0 is rejected, meaning that there is a difference between variables.

RESULTS

Table 1. Frequency distribution of respondent characteristics (n=30)

Respondent Characteristics	Intervention Groups		Control Group	
	n	%	n	%
Age				
<20 years	2	13.3	1	6.7
20 – 35 years	8	53.3	10	66.6
>35 years	5	33.3	4	26.7
Education				
SD	0	0.0	1	6.7
SMP	2	13.3	2	13.3
SMA	10	66.7	8	53.3
PT	3	20.0	4	26.7
Pregnant women				
1	5	33.3	4	26.7
2	4	26.7	5	33.3
3	5	33.3	5	33.3
4	1	6.7	1	6.7

Based on Table 1, the age distribution of respondents in the intervention group was mostly in the age range of 20–35 years, namely 8 people (53.3%), followed by 5 people (33.3%) >35 years, and 2 people (13.3%) <20 years. In the control group, the majority of respondents were also in the age range of 20–35 years, namely 10 people (66.6%), then 4 people >35 years old (26.7%), and 1 person <20 years old (6.7%).

At the level of education, in the intervention group, most of the respondents had a high school education, namely 10 people (66.7%), followed by universities as many as 3 people (20.0%), junior high school as many as 2 people (13.3%), and no respondents had an elementary education. In the control group, the majority of respondents also had a high school education, namely 8 people (53.3%), followed by universities as many as 4 people (26.7%), junior high school as many as 2 people (13.3%), and elementary school as many as 1 person (6.7%).

Based on gravida, in the intervention group most of the respondents were gravida 1 and gravida 3, each as many as 5 people (33.3%), followed by gravida 2 as many as 4 people (26.7%), and gravida 4 as many as 1 person

(6.7%). Meanwhile, in the control group, the majority of respondents were gravida 2 and gravida 3, each as many as 5 people (33.3%), followed by gravida 1 as many as 4 people (26.7%), and gravida 4 as many as 1 person (6.7%).

In general, the characteristics of respondents in the intervention group and the control group were relatively similar, with the majority of respondents being of reproductive age (20–35 years), having a high school education, and having a history of pregnancy between 1 and 3 times.

Based on Table 2, the rate of nausea and vomiting in pregnant women in the first trimester before being given intervention in the intervention group was mostly in the medium category, namely 7 respondents (46.7%). Furthermore, the heavy category was 5 respondents (33.3%), and the light category was 3 respondents (20.0%). In the control group, most of the respondents also experienced moderate category vomiting nausea, which was as many as 6 respondents (40.0%). The heavy category was experienced by 5 respondents (33.3%), while the light category was experienced by 4 respondents (26.7%).

These results showed that before the intervention, both in the intervention group and in the control group, the majority of respondents

experienced nausea and vomiting with a moderate level. In addition, the proportion of respondents who experienced severe nausea and vomiting in both groups was the same, which was 33.3%. This

condition indicates that the rate of initial nausea and vomiting in both groups was relatively comparable before the study treatment.

Table 2. Overview of the Level of Nausea and Vomiting in Pregnant Women in the First Trimester Before and After Intervention (n=30)

Variabel	Intervention Groups		Control Group	
	n	%	n	%
Nausea and vomiting before the intervention				
Lightweight	3	20.0	4	26.7
Medium	7	46.7	6	40.0
Weight	5	33.3	5	33.3
Nausea and vomiting after the intervention				
Lightweight	12	80.0	5	33.3
Medium	2	13.3	6	40.0
Weight	1	6.7	4	26.7

Table 3, the level of nausea and vomiting in pregnant women in the first trimester after being given the intervention shows that most of the respondents in the intervention group were in the mild category, namely as many as 12 respondents (80.0%). Meanwhile, as many as 2 respondents (13.3%) experienced moderate category nausea and 1 respondent (6.7%) experienced severe category vomiting nausea. In the control group, most of the respondents experienced moderate category nausea and vomiting, which was as many as 6 respondents (40.0%). Respondents with the light category amounted to 5 people (33.3%), while the heavy category was 4 people (26.7%).

These results showed a difference in the distribution of nausea and vomiting rates between the intervention group and the control group after treatment was given. In the intervention group, there was an increase in the number of respondents in the light category to 80.0%, accompanied by a decrease in the number of respondents in the medium and severe categories. On the other hand, in the control group, the majority of respondents were still in the medium and severe categories. These findings indicate that the interventions provided have the potential to help reduce the rate of nausea and vomiting in pregnant women in the first trimester.

Table 3. Effect of Peppermint Aromatherapy (Intervention and Control Group) on Nausea and Vomiting in Pregnant Women in the First Trimester with the Wilcoxon Test (n=30)

Pregnant Women in the First Trimester with the Whisker Test (n=30)				
Variabel	Intervention with Peppermint Aromatherapy			
	n	Mean	SD	p Value
Intervention Groups				
Nausea Vomiting (Before)	15	2.13	0.743	0.001
Nausea and vomiting (after)		1.07	0.458	
Kelompok Kontrol				
Nausea Vomiting (Before)	15	2.07	0.799	0.414
Nausea and vomiting (after)		1.93	0.799	

Based on Table 3, the results of the measurement of the level of nausea and vomiting in the intervention group before being given peppermint aromatherapy showed a mean value of 2.13 with a standard deviation (SD) of 0.743. After being given peppermint aromatherapy, the mean value of nausea and vomiting decreased to 1.07 with a standard deviation (SD) of 0.458. The results of the *Wilcoxon* test showed a p-value of 0.001. The value is smaller than the set significance level ($\alpha = 0.05$), so H_0 is rejected, and H_1 is accepted. Thus, it can be concluded that there is a significant effect of the administration of peppermint aromatherapy in reducing the rate of nausea and vomiting in pregnant women in the first trimester of pregnancy. These results indicate that peppermint aromatherapy is effective in helping to reduce nausea and vomiting complaints in pregnant women in the first trimester.

The results of the measurement of the level of nausea and vomiting in the control group before the intervention showed a mean value of 2.07 with a standard deviation (SD) of 0.799. After re-measurement, the average value of the nausea and

vomiting rate became 1.93 with a standard deviation (SD) of 0.799. The results of the *Wilcoxon* test showed a p-value of 0.414. The value is greater than the established significance level ($\alpha = 0.05$), so H_0 is accepted, and H_1 is rejected. Thus, it can be concluded that there was no significant change or effect on the rate of nausea and vomiting in pregnant women in the first trimester in the control group. Despite the decrease in the average score from 2.07 to 1.93, the decrease is not statistically significant. These results suggest that, without the administration of peppermint aromatherapy, the level of nausea and vomiting experienced by respondents was less likely to change significantly during the study period.

Overall, these results differed from the intervention group that showed a significant reduction in the rate of nausea and vomiting after being given peppermint aromatherapy. Therefore, peppermint aromatherapy can be considered to have a role in helping to reduce nausea and vomiting complaints in pregnant women in the first trimester.

Table 4. Effect of Intervention Without Peppermint Aromatherapy on Nausea and Vomiting in Pregnant Women with the Mann-Whitney Test (n=30)

Groups	Nausea Vomiting					
	n	Mean Rank	Sum of Ranks	Z	r	p Value
Intervention	15	11.07	166.00	-3.089	0.56	0.002
Control	15	19.93	299.00			

Based on Table 4, the results of the Mann-Whitney test showed that the intervention group had a mean rank of 11.07 with a sum of ranks of 166.00, while the control group had a mean rank of 19.93 with a sum of ranks of 299.00. The statistical value of the test obtained was $Z = -3.089$ with p-value = 0.002.

The p-value of 0.002 is smaller than the established significance level ($\alpha = 0.05$), so H_0 is rejected, and H_1 is accepted. Thus, it can be concluded that there was a significant difference in the rate of nausea and vomiting between the

intervention group and the control group after treatment was given.

Furthermore, the results of the effect size analysis produced a value of $r = 0.56$, which is included in the category of a large effect. This clinically proves that the administration of peppermint aromatherapy for 7 days has a much stronger and superior efficacy in reducing nausea and vomiting in pregnant women in the first trimester compared to the control group that only received standard obstetric care

The lower mean rank values in the intervention group indicated that the rate of nausea and vomiting in the group receiving peppermint aromatherapy tended to be lower than in the control group. These results indicate that the administration of peppermint aromatherapy is effective in reducing the level of nausea and vomiting in pregnant women in the first trimester.

Based on the results of the Mann–Whitney test, it can be concluded that there is a significant effect of peppermint aromatherapy on the reduction of nausea and vomiting in pregnant women in the first trimester compared to the group that did not receive peppermint aromatherapy.

DISCUSSION

Homogeneity of Respondent Characteristics

The results of the research were that the majority of respondents in the intervention group (53.3%) and the control group (66.6%) were in the age range of 20–35 years. This age range is a healthy reproductive age, so that physiologically the mother's body is more prepared to face pregnancy than the age of <20 years or >35 years (Sagita & Sofiyanti, 2025). In terms of education, most of the respondents had a high school education, namely 66.7% in the intervention group and 53.3% in the control group. Education level can affect the mother's ability to receive health information and implement efforts to manage nausea and vomiting during pregnancy (Tiwi & Perwitasari, 2025).

Based on parity, most of the respondents were gravida 1–3. Primigravida are known to experience nausea and vomiting more often because they have not had the experience of adaptation to hormonal changes during pregnancy. This is in line with the theory that increased Human Chorionic Gonadotropin (hCG), estrogen, and progesterone hormones in early pregnancy are the main factors in the occurrence of emesis gravidarum (Geni et al., 2023). These symptoms

of nausea are generally reported to be more intense in the morning, but can also occur at any time of the day and night. These symptoms occur approximately 6 weeks after the first day of the last menstrual period (HPHT) and last for approximately 10 weeks (Trimester et al., 2022). The relatively balanced characteristics between the intervention and control groups showed that both groups had sufficiently homogeneous initial conditions that it was feasible to compare them in the study.

Pre-test Equivalence

Prior to treatment, most of the respondents in the intervention group were in the category of moderate nausea and vomiting (46.7%), as well as in the control group, which reached 40.0%. In addition, the proportion of respondents in the weight category in both groups was the same, at 33.3%.

The similarity in the distribution of emesis levels prior to this treatment indicates that the initial conditions of the two groups were of relatively equal severity. This equivalence is important in quasi-experimental design to minimize selection bias, so that the post-intervention score changes are more likely to be associated with peppermint aromatherapy exposure than with clinical differences in the first place.

Nausea and vomiting in the first trimester are common conditions due to an increase in hCG and estrogen hormones that affect the vomiting center in the brain and slow down gastric emptying. Most of the first trimester experience nausea and vomiting complaints of varying severity (Joulacera et al., 2018).

Analysis of changes after intervention

After the administration of peppermint aromatherapy, the intervention group showed an increase in the number of respondents in the mild category from 20.0% to 80.0%. In contrast, the weight category decreased from 33.3% to 6.7%. In

the control group, the changes that occurred were not too large.

These results show that the administration of peppermint aromatherapy has the potential to positively reduce the rate of nausea and vomiting in pregnant women in the first trimester. The main ingredients of peppermint, in the form of menthol and menthone, are known to have antispasmodic effects on the digestive tract, provide a sensation of relaxation, and help reduce the stimulation of the nausea center (Yuliani et al., 2023).

The results of the analysis of the Wilcoxon statistical test in the intervention group indicated a significant tendency to reduce nausea and vomiting after the administration of peppermint aromatherapy. The results of this study are in line with a study by Neneng Winengsih et al., which found that the PUQE score in the peppermint aromatherapy group decreased significantly from an average of 10.56 to 5.33 after the intervention, with the results of the statistical test showing $p < 0.001$. The study concluded that peppermint aromatherapy was effective in reducing the frequency and intensity of nausea and vomiting in pregnant women in the first trimester (Winengsih et al., 2025).

Another study by Putu Elsa Yuliani also showed that peppermint aromatherapy inhalation can reduce nausea and vomiting in pregnant women in the first trimester through the effect of relaxation and inhibition of gastrointestinal muscle contraction. Physiologically, the aroma of peppermint inhaled will stimulate the limbic system through the olfactory nerve, resulting in a sense of comfort and lowering the nausea response. In addition, the menthol in peppermint has an antiemetic effect that helps reduce the stimulus of vomiting (Yuliani et al., 2023).

In the control group, although there was a slight decrease in the mean score, the results of the Wilcoxon test showed no statistically significant difference. The minor decline seems to reflect more of the mother's natural physiological adaptation to pregnancy, rest fluctuations, or other subjective psychological factors over time. The

absence of significant results in this control group reinforces indications that sharper clinical changes in the intervention group are closely associated with exposure to peppermint aromatherapy, and not simply the effects of maturation.

Comparative Analysis Between Groups

Comparative analysis using the Mann–Whitney test yielded a statistical value of $Z = -3.089$ with a significance of $p = 0.002$ ($p < 0.05$). In addition, the mean rank value of the intervention group (11.07) was recorded substantially lower than that of the control group (19.93). Using the effect size approach, the Z value produced an index of $r = 0.56$, which, based on Cohen's criteria, is included in the category of large effect. These statistics show that after a period of 7 days, there was a marked difference in the level of emesis between the two groups, with the group receiving peppermint aromatherapy tending to have a milder severity.

This value shows that after treatment is given, there is a significant difference between the two groups. A lower mean rank indicates a lower rate of nausea and vomiting. Thus, the group that received peppermint aromatherapy had a milder rate of nausea and vomiting than the group that did not receive aromatherapy. These findings are supported by pre-experimental research conducted in Bali in 2022, which showed a significant difference between before and after treatment with peppermint aromatherapy ($p < 0.001$) (Aryasih et al., 2022).

Controlled clinical research by Narges Joulaeeraad also reported that peppermint aromatherapy provides an improvement in symptoms of nausea and vomiting in pregnancy through the relaxation mechanism and antiemetic effects of peppermint essential oil. However, the magnitude of the effect can be influenced by the individual condition and the severity of the symptoms (Joulaeeraad et al., 2018).

The authors are aware that this study uses a quasi-experimental design with a limited sample size ($n=30$). Therefore, the results of this study cannot be generalized absolutely as a single causal

relationship. Researchers did not fully control confounding variables such as daily nutritional intake, psychological stress levels, and respondents' absolute adherence when inhaling aromatherapy at home without 24-hour direct supervision. The results of this study should be interpreted as an early indication that supports the effectiveness of peppermint aromatherapy in obstetric care in coastal areas.

Recommendations For Future Research

Future research should employ multicenter randomized controlled trials with larger sample sizes to confirm the efficacy and safety of peppermint aromatherapy across diverse populations of pregnant women. Studies with extended follow-up are recommended to assess the long-term effects of the intervention on maternal well-being, nutritional status, quality of life, and pregnancy outcomes. Future investigations should also determine the optimal concentration, frequency, duration, and delivery method of peppermint aromatherapy while controlling for potential confounding variables,

including gestational age, parity, baseline symptom severity, dietary intake, psychological factors, and concurrent treatments.

Furthermore, comparative effectiveness studies against other complementary therapies and conventional antiemetic treatments, as well as cost-effectiveness analyses, would provide stronger evidence to support the integration of peppermint aromatherapy into routine antenatal care.

CONCLUSION

This study demonstrated that peppermint aromatherapy was effective in reducing the severity of nausea and vomiting among first-trimester pregnant women. The findings support the use of peppermint aromatherapy as a safe, affordable, and practical non-pharmacological complementary intervention to help alleviate symptoms of emesis gravidarum. Integrating this intervention into routine antenatal care, accompanied by appropriate education on its use, may help improve maternal comfort and well-being during early pregnancy.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Authors' Contributions

S.A.R.: Conceptualization, methodology, investigation, formal analysis, writing original draft. **S.A.R.:** Supervision, validation, writing review and editing. **Y.T.:** Data curation, investigation, visualization, writing review and editing. All authors read and approved the final manuscript.

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Declaration of Generative AI Use

The authors used Grammarly solely to improve the grammar, spelling, punctuation, and readability of the manuscript. Grammarly was not used to generate scientific content, analyze data, interpret findings, or draw conclusions. The authors reviewed and approved all revisions and take full responsibility for the final content of the manuscript.

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