The effect of dayak ginger (*Zingiber Officinale Roscoe*) extraction in ginger cookies in reducing emesis gravidarum severity among pregnant women

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Abstract

One of the discomforts during pregnancy is nausea and vomiting, known as emesis gravidarum. Ginger cookies, as a Complementary Alternative Medicine (CAM), are often consumed by pregnant women to alleviate nausea. The purpose of this study was to investigate the effect of ginger cookies on pregnant women experiencing emesis gravidarum. This research was conducted as a Randomized Control Trial (RCT), following the CONSORT Guidelines. The study involved 59 pregnant women with a gestational age ranging from 6 to 16 weeks who were experiencing nausea and vomiting. The subjects were selected using random sampling. The intervention involved providing ginger cookies for a duration of 3 weeks. The severity of emesis gravidarum was assessed using the Pregnancy Unique Quantification of Emesis and Nausea (PUQE) questionnaire. Data analysis was carried out using an Independent Sample t-test. The results revealed a significant difference in the average severity of hyperemesis between the treatment and control groups ($p<0.001$), indicating a significant difference in emesis gravidarum severity between the intervention and control groups. In conclusion, ginger cookies have been shown to reduce the severity of emesis gravidarum. They can be considered as an adjunct in providing behavioral education to pregnant women to prevent emesis gravidarum.

Introduction

Pregnant women commonly experience symptoms of nausea and vomiting. These symptoms typically begin in the first week of pregnancy and gradually decrease by the end of the first trimester.[1,2] Studies have shown that between 50-90% of pregnant women experience nausea and vomiting during the first trimester, and approximately 25% of these women may require time off from work due to the severity of these symptoms.[3–5] Nausea and vomiting are prevalent complaints during the early stages of pregnancy. Given the potential harmful side effects that conventional medications may have on the unborn fetus, many expectant mothers opt not to use them, leaving them to cope with these burdensome symptoms. This condition, often referred to as morning sickness (though it can occur at any time of the day or night), is officially known as Nausea and Vomiting of Pregnancy (NVP) and affects roughly 80-90% of pregnant women to varying degrees.[6,7]

NVP is more commonly observed in primigravida women. Several risk factors have been identified, including a history of using estrogen-based medications that may induce nausea, motion sickness, or migraines. Other risk factors for NVP include multiple pregnancies, inadequate use of multivitamins before concep-

tion, individuals with acid reflux, and women who have previously had a hydatidiform mole. Pregnant women have a higher risk experienced NVP.[8,9] The precise underlying causes of NVP are still not fully understood. However, hormonal changes, such as an increase in serum human chorionic gonadotropin, as well as psychological factors and the stress response, are believed to play a role. Delayed or irregular gastric motility has also been proposed as a potential cause of NVP.[10]

Healthcare providers offer a wide range of treatments for nausea and vomiting experienced by pregnant women during pregnancy. These treatments include counseling, pharmacological options, and non-pharmacological interventions. Among the recommended non-pharmacological treatments, the consumption of processed ginger in various forms such as cakes, drinks, sweets, and aromatherapy is suggested. Numerous studies have provided evidence of the efficacy of ginger-based products in reducing nausea and vomiting in pregnant women. For instance, a study conducted by Herni in 2019 found that ginger aromatherapy had a positive effect on reducing nausea and vomiting in pregnant women.[1]

Ginger is the rhizome of the ginger plant which has a distinctive taste, aroma, and is delicious, so it is liked by many people.[11–14] Ginger contains *Astsiri Zingiberene* (Zingiroan) oil, zingiberol, bisabilene, curcumin, gingerol, vitamin A and bitter resin that can block serotonin, a neurotransmitter that is synthesize on serotonergic neuron in the central nervous system and enterochromaffin cells in the digestive tract so that it is believed to be able to provide a feeling of comfort in the stomach so as to overcome nausea and vomiting.[15–17] The advantage of ginger is its oil content essential oils that have a refreshing effect and block the gag reflex, gingerols can improve blood circulation and nerves work well. The fragrant aroma of ginger is produced by essential oils and oleoresin causing a spicy taste that warms the body. This is supported by research conducted by the University of Myland Medical Center, explained that by consuming 1 gram of ginger extract every day during pregnancy is a safe and effective way to reduce the usual nausea and vomiting feel in the morning.[18]

Based on a preliminary study conducted by the Dayak community, it is believed that consuming Dayak ginger in pregnant women can overcome nausea and dizziness and can unleash the delivery process. The Dayak tribe consumes ginger as ginger cookies is Complementary Alternative Medicine (CAM) by means of a ginger concoction which is added with aromatic ginger and brown sugar as herbal medicine and is drunk by pregnant women because the extract is believed to be efficacious. Short interviews were conducted with several pregnant women, the results were 60% of pregnant women using ginger as a solution to overcome nausea and vomiting and 40% of pregnant women wanted processed ginger to be in the form of food, it could be cakes, sweets or candy. Based on this background, this study aimed to evaluate the effect of extraction of dayak ginger (*Zingiber Officinale Roscoe*) in ginger cookies in pregnant women with emesis gravidarum.

Materials and Methods

Study design and sample

The research was conducted using a quantitative method, specifically a Randomized Control Trial (RCT), and was registered in an RCT database. The study focused on assessing the severity of emesis gravidarum in pregnant women residing in Tarakan city. The sampling technique employed was in accordance with the Consolidated Standards of Reporting Trials (CONSORT) guidelines, taking into consideration specific inclusion and exclusion criteria. Inclusion criteria comprised pregnant women in their gestational age of 6-16 weeks experiencing nausea and vomiting, while exclusion criteria included individuals with a history of hyperemesis gravidarum and those who had given birth. A total of 60 patients participated in the research between April and August 2022. These subjects were then randomly divided into two groups, with each group consisting of 30 respondents (Figure 1).

Variables and instruments

The independent variable in this study was the administration of ginger cookies, while the dependent variable was the severity of emesis gravidarum. Emesis gravidarum was assessed using the Pregnancy Unique Quantification of Emesis and Nausea (PUQE) questionnaire. The PUQE scoring system is employed to measure the severity of nausea and vomiting during pregnancy within a 12-hour period, hence referred to as Pregnancy Unique Quantification of Emesis and Nausea (PUQE)-12 hour. It's worth noting that in 2009, Ebrahimi, Mastepe, Bournissen, and Koren modified PUQE-12 to PUQE-24. PUQE-24 serves as a scoring system designed to evaluate the severity of nausea and vomiting within a 24-hour timeframe. Each patient's PUQE score was computed based on three criteria used to assess the severity of nausea and vomiting during pregnancy: the number of hours of feeling nauseated, the number of episodes of vomiting, and the number of episodes of dry vomiting experienced in the preceding 24 hours. In this study, validity and reliability testing of the PUQE instrument was not conducted since it is considered the gold standard for measuring emesis gravidarum severity. The PUQE score is calculated by summing the scores for each of the three criteria and can range from a minimum of 1 to a maximum of 15.[19] To assess the severity of nausea and vomiting, the scores from column 1 to column 3 are added together. If the total score is 6, it is categorized as mild, while a total score between 7 and 12 is considered moderate. If the total score reaches 13 or higher, it is classified as severe.[20]

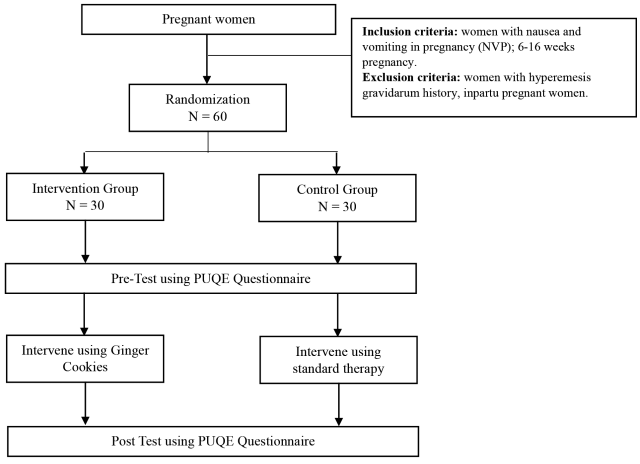

Figure 1. Research flow.

Study procedure

The initial research step involved conducting a patient-related needs assessment to determine the number of samples required to ensure representativeness. The patient carries out a general assessment at the public healthcare center to be confirmed as the suitable criteria. Before giving the intervention, the patient had signed the consent and done the randomization. The interventions for each group with sufficient details to allow replication, including how and when they were administered. Then given the intervention in accordance with the group (intervention or control). The intervention group was given the Ginger Cookies twice a day at 07.00 and 19.00 WITA (Middle Indonesian Time), while the control group was given intervention in accordance with the Public Healthcare Center Standard Operating Procedure (SOP) which is providing the B6 Vitamin as a therapy for NVP once a day. The treatment was carried out for 3 weeks. Before and after the treatment, respondents from both groups were assessed for their NVP rate by using the PUQE questionnaire.

Data analysis

The researchers conducted a bivariate test to determine the difference in emesis gravidarum rates before and after treatment in both groups. Prior to this, they performed tests to check for data normality and homogeneity. The results of the data normality test for both groups indicated that the data was not normally distributed. The pretest p-value was 0.000, which is greater than 0.05, while the posttest p-value was 0.000, which is less than 0.05. To compare the two treatment groups, it was essential to test for homogeneity using the Levene Test. The p-value for the pretest was 0.554, and the p-value for the posttest was less than 0.001, which is less than 0.05, indicating that the data was homogeneous. Based on these results, a parametric test (independent t-test) was used for both groups.

Ethics approval

This research has received an ethical approval with ID No. 08/KEPK-FIKES UBT/V/2022. Respondents are voluntary and have the right to resign at any time without further explanation. All prospective respondents in this study were given comprehensive information regarding the research implementation process and signed the informed consent. All information collected is confidential and is not disclosed to anyone other than the researcher.

Results

Table 1 showed that the research subjects were dominated by 10 people (16.9%) with 6 weeks gestation age, 9 weeks gestation (15.3%), 7 weeks gestation (13.9%), 9, 11 and 12 weeks of gestation were 7 people (11.9%), 13 weeks of gestation were 6 people (10.2%), and 8 weeks of gestation (8.5%). All study subjects (59 people) experienced nausea and vomiting (100%).

Table 2 showed that a decrease in the mean emesis gravidarum severity of the intervention group higher than the control group.

Table 3 showed that in the intervention group there was a mean in the severity of emesis gravidarum (5.33) and no increase in the severity of emesis gravidarum (3.17), So it can be concluded that there is a significant difference in the effect of giving Ginger Cookies on the severity of emesis gravidarum with a p-value of <0.001.

Table 1. Characteristics of respondents.

Characteristics	n	%	Control	Intervention	p
Number of research subjects	59	100	30	29	<0.001
Gestational age					
6 weeks	10	16.9	6	4	0.612
7 weeks	8	13.9	4	4	
8 weeks	5	8.5	1	4	
9 weeks	7	11.9	3	4	
10 weeks	9	15.3	5	4	
11 weeks	7	11.9	3	4	
12 weeks	7	11.9	3	4	
13 weeks	6	10.2	5	1	
Complaints of nausea and vomiting					
Yes	59	100	30	29	
Not	0	0			
Total	59	100			

Table 2. The severity of emesis gravidarum in both groups.

	Variable	N	Mean difference	95% Confidence Interval of the difference
Emesis gravidarum	Intervention group	29	2.161	1.395±2.926
	Control group	30	2.161	1.395 ± 2.927

Table 3. Differences in emesis gravidarum severity before and after treatment.

Variable	Group	n	Mean	p
Emesis gravidarum	Intervention group	29	5.33	0.000*
	Control group	30	3.17	0.000*

*Independent t test

Discussion

The purpose of this study was to determine the Effect of ginger cookies among pregnant women with emesis gravidarum. The results showed that the majority of respondents were dominated by the age of 6 weeks of pregnancy as many as 14 people (23.7 %). The onset of symptoms of nausea or vomiting started on day 32 to day 57 of the First Day of Last Menstruation (LMP) or from 5 to 8 weeks.[21] Other studies have also shown that nausea and vomiting in pregnant women begins between the 4th and 7th week, peaks around the 9th week, and slowly disappears by the 20th week in 90% of pregnant women.[22] A study describing the onset and natural history nausea and vomiting by asking pregnant women to be present when they first thought they were pregnant, reported starting to experience symptoms at a median of day 57 (week 8) of LMP. In the study 58 (16%) women from the 363 study population reported onset of symptoms between them up to 14 days earlier (6th week).[23] The results of this study indicate that all respondents (100%) experienced NVP. Nausea and vomiting are common experiences that affect 70-80% of all pregnant women. In a Canadian study, 74% of pregnant women reported a severity of nausea and vomiting and an additional 350,000 women were affected each year. Although most women with nausea and vomiting of pregnancy have symptoms that are limited to the first trimester, a minority of women have a prolonged course of illness with symptoms that extend into delivery.[9,21,24] Although the cause of nausea and vomiting is still largely unknown, it is thought to be multifactorial with genetic elements in its etiology such as changes in the gastrointestinal system and gastric neuromuscular dysfunction, the relationship between Human Chorionic Gonadotropin (HCG) and estrogen. In addition, higher rates of nausea were found in women whose mothers had problems with nausea during pregnancy.[18,25] Other studies have shown that there is a very close relationship between the onset of symptoms of nausea and vomiting and the onset of pregnancy as measured from the date of ovulation.[21] Women with severe nausea and vomiting during pregnancy will develop hyperemesis gravidarum (HG), an entity distinct from NVP. which if left untreated can cause significant maternal and fetal morbidity.[24] Symptoms of nausea and vomiting can be controlled in primary care with dietary advice and medication. However it should be diagnosed only at onset in the first trimester and after other causes of vomiting have been excluded.[26] Ginger (*Zingiber officinale*) is a member of the Zingiberaceae family that grows in Asia and the tropics and is one of the most important and widely consumed herbs worldwide. Cultivated for consumption by underground stems (rhizomes), ginger has been used since antiquity both as a spice and as a herbal remedy to treat various digestive ailments, such as nausea, vomiting (emesis), diarrhea, and dyspepsia, as well as a variety of ailments, including arthritis, muscle pain, and fever.[27] Ginger is considered a safe herb for human consumption.[28] The long history of medicinal use in humans has prompted ongoing clinical trials to scientifically assess the effectiveness of ginger as an adjuvant or complementary therapy and alternative medicine (Complementary Alternative Medicine (CAM) in some of the most studied indications related to nausea and vomiting including NVP).[29]

The research showed that there was an effect of giving ginger cookies on the severity of emesis gravidarum. This study is in line with Basirat's (2009) research on giving ginger cookies to pregnant women with NVP. The results showed that pregnant women in the ginger cookie group experienced a decrease in complaints of nausea and vomiting symptoms and a decrease in the number of vomiting compared to the control group who were given placebo biscuits.[30] Red ginger which in North Kalimantan is known as Dayak ginger, its rhizome is red and smaller than small white ginger. Red ginger is always harvested when it is old. It is small layered rhizome, sharp and the aroma is suitable for making a medicinal herbs. The characteristic are light orange to red in color with a diameter of 4.20-4.26 cm; height and length of the rhizome is 5.26-10.40 and 12.33-12.60; light green leaves; reddish green stems with essential oil content of 2.58-3.90%.[31] The characteristic of ginger are due to the presence of essential oils and ginger oleoresin. The essential oil makes the ginger aroma and oleoresin makes the ginger spicy taste. The essential oil can be obtained by steam distillation of dried ginger rhizome.[32]

Ginger rhizome contains a wide variety of biologically active secondary metabolites. The rhizome consists of 1-4% essential oil and oleoresin. The distinctive smell and taste of ginger is caused by its volatile oil and nonvolatile phenolic compounds which have pungent properties.[33] Essential oils (steam extraction) mainly consist of sequiterpene hydrocarbons, especially zingiberol which gives the characteristic aroma of ginger. The non-volatile phenolic phytochemicals of ginger consist of gingerol, shogaol, paradol, and zingerone, and more than 30 gingerol-related compounds can be fractionated from raw ginger.[34] Gingerols correspond to a series of chemical homologues distinguished by the length of their unbranched alkyl chain (n6-n12). Of all the gingerols, 6-gingerol is the most abundant and well-researched ginger phytochemical. The main pharmacological activity of ginger is closely related to gingerol and shogaol which are the dehydration products of gingerol. Gingerol is the main component in fresh ginger rhizome, whereas shogaol, especially 6-shogaol is the most abundant polyphenol constituent of dried ginger.[35]

Due to its antiemetic properties, ginger (and its constituents) acts peripherally in the gastrointestinal tract by increasing gastric tone and motility due to its anticholinergic and anti-serotonergic properties.[36,37] It is also reported to increase gastric emptying.[38] This combination of functions explains ginger's widely accepted ability to relieve symptoms of functional gastrointestinal disorders, such as dyspepsia, abdominal pain, and nausea that are often associated with decreased gastric motility.[29,32] The dose of ginger that is 250 mg of dry ginger used four times a day can be used to reduce nausea and vomiting in pregnancy.[39] Nutrition recommendations during pregnancy are the same as normal healthy diet recommendations, pregnant women who meet balanced nutrition are not advised to consume high doses of vitamins and minerals, ginger biscuits in pregnant women can reduce nausea and vomiting in pregnancy.[39]

In most cases, nausea and vomiting in pregnant women is a condition that does not require special medical treatment. However, pregnant women can do some way like eat snacks first, such as biscuits, when you wake up or before getting out of bed; eat in small portions, but more often; avoid spicy and fatty foods; drink more water; avoid caffeinated drinks; taking pregnancy supplements right before bed if pregnant women feel nauseous after taking these supplements; adequate rest needs, because lack of rest can also trigger nausea and vomiting; breathe fresh air and calm the mind; loosen the bra and always wear comfortable clothes; avoid using air fresheners that smell pungent; inhale fruity scents, such as lemon, orange, or mint.[40] Doctors will provide vitamin B6 supplements and anti-nausea drugs that are safe for pregnant women. In this study, a p-value of 0.000 was obtained so that there was an effect of standard therapy on the severity of emesis gravidarum. B6 is a water-soluble vitamin that is an important coenzyme for the metabolism of amino acids, lipids and carbohydrates.

B6 significantly reduced the severity of NVP symptoms in women with moderate or severe nausea and vomiting, when compared with the placebo group.[41] Vitamin B6 supplementation on the severity of nausea and vomiting experience these symptoms. Vitamin B6 supplementation significantly increased plasma vitamin B6 concentrations. There was also a significantly lower decrease in PUQE scores and an increase in vitamin B6 levels and a greater concentration of vitamin B6 to plasma protein concentration ratio.[42]

Ginger is an herbal medicine that is easily found in tropical areas such as Indonesia and has a pharmacological mechanism. However, it should be used for special indications as well as consideration of contraindications and side effects. Ginger consumption in women who wish to use herbal remedies for NVP has been reported to be effective compared to placebo.[42] In this study, a p-value of 0.000 was obtained so that there was a difference in the effect of Ginger Cookies and Standard Therapy on the severity of emesis gravidarum. This is in line with the research by Sharifzadeh (2017) which compared the use of ginger, vitamin B6, and a placebo, explaining that ginger and vitamin B6 can significantly reduce the severity of all Rhodes questionnaire items; however, placebo was only significantly effective on nausea frequency, vomiting intensity, and vomiting frequency.[18] Ginger was more effective than placebo for the treatment of mild to moderate NVP and was comparable to vitamin B6 as standard treatment for NVP. Ensiyeh's study (2009) compared ginger and vitamin B6 treatment without a placebo control as measured using the VAS (Visual Analog Scale) to determine the severity of NVP. They concluded that ginger was more effective than pyridoxine (vitamin B6) for reducing the severity of nausea, but was the same as pyridoxine for reducing the frequency of nausea and vomiting.[43] According to previous studies regarding the administration of ginger and vitamin B6 to pregnant women with nausea and vomiting, it seems that ginger is a safe and effective drug in NVP, and is comparable to or even better than vitamin B6, for some symptoms of NVP, however, further research should be conducted to find the highest effectiveness, dose, patient selection according to the severity of each NVP symptom, use of ginger for more severe cases of NVP.[42]

Conclusions

This study concludes that Ginger Cookies has a significant influence on the emesis gravidarum severity in pregnant women, especially in their first and early mid-trimester. This study identified that ginger cookies reduced the severity of emesis gravidarum compared to pregnant women who were given the standard therapy. This study recommends that Ginger Cookies is an alternative intervention for pregnant women who experience the emesis gravidarum. Future research is expected to be able to use larger samples with other types made from ginger.

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