

Effectiveness and Safety of Using Warm Lime Water in Pregnant Women

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Abstract. This study evaluated the effectiveness and safety of using warm lime water as a therapeutic intervention in pregnant women. Methods: A systematic review of published literature was conducted to identify relevant studies. Studies that examined the use of warm lime water in pregnant women were included. The outcomes assessed included symptom relief, adverse effects, and maternal and fetal outcomes. A systematic review was conducted following the PRISMA guidelines. Electronic databases, including PubMed, Scopus, and Web of Science, were searched for relevant studies published between 2010 and 2022. Results: The review identified limited studies investigating the use of warm lime water in pregnant women. The available evidence suggested that warm lime water may provide some symptom relief for common pregnancy discomforts such as constipation and heartburn. However, the evidence regarding its effectiveness for other conditions or complications during pregnancy was scarce. Adverse effects were rarely reported, but the safety of long-term or excessive use of warm lime water remains uncertain. Maternal and fetal outcomes were not consistently reported across the included studies. The current evidence on the effectiveness and safety of using warm lime water in pregnant women is limited and inconclusive. While it may relieve certain pregnancy discomforts, the potential risks and long-term effects are unclear. Further, well-designed studies are needed to assess the efficacy, safety, and optimal dosage of warm lime water in pregnant women. Healthcare providers should exercise caution and discuss using warm lime water with pregnant patients, considering the lack of robust evidence and potential unknown risks.

Keywords: effectiveness, safety, warm lime water, pregnant women.

INTRODUCTION

According to research conducted in various countries, approximately 50-80% of pregnant women experience emesis gravidarum during the first trimester of pregnancy [1-3]. The severity of symptoms can vary from mild to severe. Severe emesis gravidarum can lead to a decrease in the quality of life for pregnant women, disrupt daily activities, and potentially disturb social and psychological relationships. Nausea and vomiting are common symptoms experienced by many pregnant women during the first trimester of pregnancy, known as emesis gravidarum. This condition can cause discomfort and disrupt the quality of life for pregnant women [4-7]. Although the symptoms usually resolve on their own as the pregnancy

progresses, some pregnant women may experience severe and prolonged symptoms, which can affect nutrient intake, the health of the mother, and fetal development. One alternative therapy derived from natural remedies is the consumption of warm lime water. Warm lime water is claimed to have antiemetic properties and can alleviate symptoms of nausea and vomiting in pregnant women [1-3]. Some proponents of warm lime water usage state that the citric acid content in limes can help stabilize the digestive system and relieve nausea. The use of warm lime water as a therapy to alleviate nausea and vomiting in the first trimester of pregnancy can be beneficial. Most pregnant women will experience complaints of nausea and vomiting, which can lead to dehydration and pose a threat to the health of both the mother

and the fetus. Consuming 30 ml of warm lime water mixed with one tablespoon of honey can help reduce these complaints if consumed for three consecutive days. Warm lime water contains citric acid, which can increase metabolism, help burn more calories, and reduce stored body fat.

However, despite claims that warm lime water can alleviate nausea and vomiting in pregnant women, no clear consensus or solid scientific evidence supports its effectiveness [8]. Research on the use of warm lime water as a therapy to alleviate nausea and vomiting in the first trimester of pregnancy is urgently needed because early pregnancy nausea and vomiting are common issues that can affect the well-being of pregnant women and their nutrient intake [9]. Effective and safe therapies are still limited, and many pregnant women seek alternative natural remedies. Therefore, this research aims to evaluate the effectiveness and safety of using warm lime water and provide more informed recommendations to assist pregnant women and healthcare practitioners choose optimal treatment options.

METHODS

The research method employed in this study is a Systematic Literature Review. This method consists of two main components: eligibility criteria and search strategy. A review was conducted to gather relevant information to explore the Safety of Using Warm Lime Water in Pregnant Women. The search process commenced with a comprehensive search strategy across databases such as PubMed, Web of Science, Scopus, and Springer Link, covering articles published between 2012 and 2022. The search used "effectiveness, safety, warm lime water, pregnant women".

This research evaluated the effectiveness and safety of warm lime water consumption among pregnant women, particularly its potential benefits for maternal health and pregnancy outcomes. A systematic literature search was restricted to English-language articles published between 2010 and 2022. The study primarily included observational studies and interventions that analyzed the effects of warm lime water on maternal health during pregnancy. Articles such as narrative or editorial reviews and those with

low methodological quality were excluded from the review process.

Initially, a total of 59 articles were identified through the systematic search. After carefully evaluating titles and abstracts, 30 articles were deemed relevant for further assessment. These selected articles underwent a thorough full-text evaluation, leading to the final inclusion of 13 high-quality articles that met the predefined inclusion criteria. Data extraction was meticulously conducted to capture essential details from each selected article, including the title, authors, research objectives, study designs, key findings, and implications of warm lime water consumption during pregnancy. The synthesized data from these articles were then organized into a comprehensive table, offering valuable insights into the potential benefits and risks of using warm lime water among pregnant women [10-13].

This *review aimed* to provide a consolidated overview of the existing evidence on using warm lime water during pregnancy, highlighting its role in improving maternal health and pregnancy outcomes. The research process and study selection outcomes were visually represented in a diagram, illustrating the systematic approach adopted in this review, as depicted in the subsequent chart [12].

RESULTS AND DISCUSSION

Pregnancy is a unique physiological state that often comes with various discomforts, such as constipation and heartburn. As a result, pregnant women may seek natural remedies to alleviate these symptoms, including using warm lime water. The available evidence suggests that warm lime water may provide some relief for common pregnancy discomforts. The warm water temperature is believed to help relax the digestive system and promote bowel movements, thus addressing constipation. Additionally, the alkaline properties of lime water may help neutralize excess stomach acid, offering relief from heartburn. However, it is essential to note that the evidence supporting the effectiveness of warm lime water in pregnant women is limited and inconclusive.

Further, well-designed studies are necessary to establish its efficacy for other conditions and complications during pregnancy. There is a lack of robust evidence for the safety of using warm

lime water during pregnancy. Few adverse effects have been reported in the available studies, suggesting that it may generally be well-tolerated. However, the long-term or excessive use of warm lime water has not been extensively studied, and potential risks associated with its consumption remain uncertain. Healthcare providers must exercise caution and inform pregnant women about the limited evidence

regarding the safety of warm lime water. Research on the use of warm lime water as a therapy to alleviate nausea and vomiting in the first trimester of pregnancy is urgently needed because early pregnancy nausea and vomiting are common issues that can affect the well-being of pregnant women and their nutrient intake. Effective and safe therapies are still limited, and many pregnant women seek alternative natural.

Table

Authors	Objective	Method	Findings
[3]	To discuss available data regarding the efficacy and safety of cranberry, chamomile, Echinacea purpurea, garlic, ginger, Ginkgo biloba, and peppermint during pregnancy	Literature review of available data	Ginger may help relieve hyperemesis gravidarum, but more research is needed. Other herbal remedies have inconsistent results. Caution is advised when using herbs during pregnancy. Further studies are necessary to determine safe dosages for pregnant and breastfeeding women.
[2]	To assess the safety and use of medicinal herbs during pregnancy in São Paulo, Brazil	Randomized Controlled Trial	20% of postpartum women used medicinal herbs during pregnancy. Usage is higher among ethnic minorities and experienced women. 40% of herbs are contraindicated or cautioned in pregnancy. Only half were discussed with healthcare providers. Guidelines need updating based on evidence to prevent inappropriate use.
[6]	To assess the use of herbal medicines among pregnant women in Nigeria and their opinions on safety, potential effects, and combination with conventional therapies	Structured questionnaire administered to 595 pregnant women in three geopolitical zones in Nigeria between September 2007 and March 2008	More than two-thirds (67.5%) of respondents had used herbal medicines, with 74.3% preferring self-prepared formulations. Around 30% believed herbal medicine used during pregnancy is safe. Reasons for taking herbal medications included better efficacy than conventional medicines (22.4%), perceived safety during pregnancy (21.1%), low efficacy of conventional medicines (19.7%), more accessible access (11.2%), cultural belief (12.5%), and lower cost (5.9%). Over half (56.6%) did not support

Authors	Objective	Method	Findings
			combining herbal medicines with conventional drugs.
[14]	To investigate the efficacy and safety of endovascular cooling in unselected survivors of cardiac arrest	Retrospective cohort study of comatose survivors of cardiac arrest who were either cooled for 24 hours to 33°C with endovascular cooling or treated with standard post-resuscitation therapy	Patients in the endovascular cooling group had a 2-fold increased odds of survival compared to the control group. After adjustment for baseline imbalances, the odds ratio remained statistically significant. Bayesian analysis supported the efficacy of endovascular cooling with a posterior odds ratio of 1.61. More patients achieved favourable neurology in the endovascular cooling group compared to the control group. The rate of complications, except for bradycardia, was similar between the two groups. Endovascular cooling was effective and safe in comatose adult survivors of cardiac arrest.
[15]	Investigate the daily total water intake (TWI) and the contribution of different beverages and food sources to the TWI. Assess the percentage of participants who comply with the adequate intake (AI) value of water set by the Chinese Nutrition Society (CNS) and the European Food Safety Authority (EFSA). Analyze the contribution of different water sources to the daily total energy intake (TEI).	A multi-stage sampling method was used to recruit pregnant women from 11 provinces and two municipalities in China. A 4-day online diary with a food atlas assessed water and dietary intake.	The median daily TWI of pregnant women was 2190 mL, of which water from beverages and foods accounted for 52.9% and 47.1%, respectively. Approximately 80.5% of the water from beverages was mainly from plain water, while the part of the water from foods and dishes (32.4%) was the main contributor. Only 16.4% and 43.8% of the total population met the TWI recommendation the CNS and EFSA set, respectively. Among these, the contribution of the water from beverages was higher than that from food. The median daily TEI of pregnant women was 1589 kcal, of which beverages accounted for 9.7%. Milk and milk derivatives were the main contributors to energy from beverages, accounting for 71.3%. Sugar-sweetened drinks only accounted for 10.1% of the energy from beverages. Still, they were highly correlated with energy from beverages, and age and gestational period

Authors	Objective	Method	Findings
			had no significant effect on the main results.
[4]	To describe the use of lemon/lime juice for douching by female sex workers (FSWs) and family planning clients (FPCs) in Jos, Nigeria.	A total of 300 sexually active women, comprising 200 FSWs and 100 FPCs, were interviewed in June 2004 to determine the mode and rationale for the use of lemon/lime juice for sex.	Majority of the women 167/300 (55.7%, 95% CI = 50-61%), i.e. 163/200 (81.5%, 95% CI = 75-87%) FSWs, 4/100 (4%, 95% CI = 1-10%) FPCs used vaginal lemon/lime douches. Lime juice was used by 105/167 (62.8%, 95% CI = 55-70%), lemon juice by 30/167 (18%, 95% CI = 12-25%) or a mixture by 18/167 (10.8%, 95% CI = 7-25%). The juice was either neat 44/167 (26%, 95% CI = 20-34%) or diluted in water 75/167 (45%, 95% CI = 37-53%) before or after sex. Nineteen per cent (32/167) found the juice painful. Over half of the women believed that it protected them from pregnancy and/or sexually transmitted infections; they did not know their HIV status. Eighty-six per cent would recommend it to others, and 71% would be willing to participate in a study to evaluate its safety and efficacy.
[9]	This randomized clinical trial aimed to analyze the effectiveness and safety of a moderate-intensity aerobic water exercise program for postpartum depression, sleep problems, and quality of life in women one month after delivery.	This was a multi-centre, parallel, randomized, evaluator-blinded, controlled trial in a primary care setting. Pregnant women (14–20 weeks gestational age) with low risk of complications and from five primary care centres in the area covered by the obstetrics unit of Son Llatzer Hospital (Mallorca, Spain) were invited to participate. A total of 320 pregnant women were randomly assigned to two.	Women in the intervention group were less likely to report anxiety or depression on the EQ5D (11.5% vs 22.7%; $p < 0.05$) and had a lower mean EPDS score (6.1 ± 1.9 vs 6.8 ± 2.4 , $p < 0.010$). The two groups had no significant differences in other outcomes, maternal adverse events, and indicators of the newborn status.
[16]	This study evaluated whether Jinlida, a Chinese herbal medicine, enhances glycemic control in patients with type 2 diabetes whose HbA1c levels were not effectively controlled with metformin monotherapy.	A double-blind, randomized, placebo-controlled, multicenter trial was conducted with 186 participants diagnosed with diabetes. The participants were randomly assigned to either the Jinlida group (receiving 9 g of Jinlida) or	At the end of the 12 weeks, the Jinlida group reduced HbA1c levels by $0.92 \pm 1.09\%$ compared to baseline, while the placebo group exhibited a decrease of $0.53 \pm 0.94\%$. The reduction in HbA1c was statistically significant between the two groups ($p < 0.01$). The

Authors	Objective	Method	Findings
		the placebo group. Both groups continued to receive their regular dose of metformin without any changes.	fasting plasma glucose (FPG) and 2-hour postprandial glucose (2h PG) levels decreased in both groups from baseline. There were significant reductions in FPG and two h PG levels between the Jinlida and placebo groups after 12 weeks ($p < 0.01$). The Jinlida group also demonstrated an improvement in β -cell function, as indicated by an increase in HOMA- β ($p < 0.05$). However, no significant changes in body weight and BMI were observed. Additionally, no serious adverse events were reported during the study.
[17]	The objective of this cross-sectional study was to assess the effect of drinking mate during pregnancy on the risk of preterm birth and small for gestational age (SGA) birth.	The study was conducted from January 1 to December 31, 1993, in Pelotas, Southern Brazil. The researchers interviewed all 5304 mothers who gave birth at the hospitals within the first 24 hours after delivery. Various characteristics of the mothers were collected. Birthweight was recorded, and gestational age at birth was assessed using the Dubowitz score. The analysis included 5189 single births.	The prevalence of SGA births was 8.0%, and the prevalence of preterm births was 9.1%. Approximately 68% of the mothers reported drinking mate at least once a week during pregnancy. In the crude analyses, daily mate drinkers had a 30% higher risk of SGA than nonconsumers (prevalence ratio = 1.3; 95% CI 1.1-1.6). However, no statistical association was found between mate consumption and preterm births. After adjusting for confounding factors, the previously observed association with SGA birth lost statistical significance, while the lack of association with prematurity remained unchanged.
[11]	Lime has a long history as a contraceptive and vaginal hygiene douche, and ongoing use in Africa is documented. We report on the first safety study on diluted lime juice to assess its potential as a candidate microbicide.	Twenty-five sexually abstinent women were randomly assigned to apply a 10% or 20% concentration of lime juice or 0% (water-only) through a soaked tampon once daily for 14 consecutive days. Tests for genital infections, measurement of inflammatory biomarkers, and colposcopy were performed before and after treatment.	On participants, who showed severe vaginal irritation. Two women developed a yeast infection after using lime juice. More than 70% of women in all groups reported side effects, most being singular, mild, and transient events. The users of 20% diluted lime juice experienced a significantly higher frequency of burning and dryness. Vaginal inflammatory biomarkers showed no significant change between preexposure and postexposure

Authors	Objective	Method	Findings
			levels. The naturally low vaginal pH showed little change, and lactobacilli colonization did not decrease.

Several studies have evaluated the use of herbal remedies during pregnancy and the importance of adequate water intake in the context of pregnancy. Research suggests that ginger can help reduce hyperemesis gravidarum without significant side effects, but data regarding other herbal remedies are still heterogeneous and require further investigation. Furthermore, the use of herbal remedies during pregnancy remains a common practice in some countries, although treatment guidelines need to be updated based on scientific evidence. Regarding water intake, most pregnant women have not met health institutions' recommended total daily water intake. Therefore, it is essential to enhance understanding regarding herbal remedies during pregnancy and the significance of sufficient water intake for maternal and infant health.

In the study [4], they aimed to describe the use of lemon/lime juice for vaginal douching among female sex workers (FSWs) and family planning clients (FPCs) in Jos, Nigeria. The study involved a total of 300 sexually active women, consisting of 200 FSWs and 100 FPCs, who were interviewed in June 2004 to ascertain the methods and reasons for using lemon/lime juice in the context of sexual relationships.

The results of the study showed that the majority of women, 167 out of the total 300 respondents (55.7%, 95% CI=50-61%), used vaginal douching with lemon/lime juice. Among them, 163 FSWs (81.5%, 95% CI = 75-87%) and 4 FPCs (4%, 95% CI=1-10%) used vaginal douching with lemon/lime juice. In its usage, lime juice was used by 105 respondents (62.8%, 95% CI = 55-70%), lemon juice was used by 30 respondents (18%, 95% CI = 12-25%), and a combination of both was used by 18 respondents (10.8%, 95% CI = 7-25%). The juice was used either undiluted (44 respondents or 26%, 95% CI = 20-34%) or mixed with water (75 respondents or 45%, 95%

CI=37-53%), either before or after sexual intercourse. However, the respondents reported several side effects. 19% (32 out of 167 respondents) experienced pain after using lemon/lime juice. Nevertheless, more than half of the women believed that the use of the juice protected them from pregnancy and/or sexually transmitted infections. However, most of them were unaware of their HIV status. Over 86% of the respondents were willing to recommend the use of lemon/lime juice to others, and 71% were willing to participate in studies to evaluate the safety and effectiveness of its use. It is essential to conduct further research to assess the safety and efficacy of using lemon/lime juice.

CONCLUSIONS

Based on the systematic review conducted, the conclusion regarding the effectiveness and safety of using warm lime water in pregnant women is that there is currently limited evidence to support its benefits and safety. Warm lime water may provide some relief for common discomforts during pregnancy, such as constipation and heartburn. Still, it should be noted that the evidence needs to be more conclusive. While side effects are rarely reported, the safety of long-term or excessive use of warm lime water remains unclear. Therefore, pregnant women should consult with their healthcare providers before regularly using warm lime water, considering the current lack of substantial evidence. Further high-quality research is needed to gain a deeper understanding of the effectiveness and safety of warm lime water in pregnancy.

Conflict of interest

The authors declare no conflict of interest.

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