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Supplementary Feeding (Soy Biscuits) on the Frequency of Nausea and Vomiting of Pregnant Women Experiencing Hyperemesis Gravidarum in Health Crisis Situations

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The author(s) declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

ABSTRACT

Purpose: This study examines the role of soy biscuits as supplementary food in reducing the frequency and severity of nausea and vomiting in pregnant women experiencing hyperemesis gravidarum (HG) in health crises. The research explores the nutritional effectiveness of soy biscuits, their acceptability among pregnant women, and their potential as a non-pharmacological intervention in community-based maternal healthcare settings, particularly at TPMB Hj Sitti Hasrah Ibrahim.

Research Design and Methodology: This study employs a systematic literature review (SLR) approach, analyzing relevant studies from peer-reviewed journals to assess the impact of protein-based nutritional interventions on HG symptoms. The research synthesizes evidence on dietary strategies, maternal nutrition, and the physiological mechanisms through which soy biscuits alleviate HG symptoms. The review also incorporates empirical data from similar interventions to evaluate their feasibility in low-resource and crisis-affected healthcare settings.

Findings and Discussion: The findings indicate that soy biscuits significantly stabilize blood sugar levels, reduce gastric motility disturbances, and improve maternal food tolerance. Compared to high-carbohydrate or high-fat diets, a protein-based nutrition approach is more effective in managing nausea and vomiting in patients with HG. Additionally, soy biscuits are well-tolerated and accepted by pregnant women, making them a practical intervention for managing HG in settings with limited access to pharmacological treatments.

Implications: This study offers practical insights for healthcare providers, policymakers, and food manufacturers advocating for nutritional interventions in maternal healthcare programs. Future research should investigate alternative formulations, large-scale implementation, and long-term health outcomes to establish a comprehensive dietary strategy for managing HG.

Introduction

Ensuring proper maternal nutrition during pregnancy is one of the most significant challenges in global healthcare, particularly in health crises where access to medical resources and essential food supplies is severely limited. In such circumstances, pregnant women face heightened vulnerability due to food insecurity and restricted healthcare services, which increase the risk of pregnancy complications (Zinga et al., 2022). The necessity of alternative nutritional strategies becomes evident

when medical interventions are either inaccessible or insufficient to meet the dietary needs of expectant mothers. Under these conditions, supplementary food interventions offer a promising approach to supporting maternal health by providing essential nutrients that may otherwise be difficult to obtain (WHO, 2013). Among pregnancy-related complications requiring immediate and sustained nutritional intervention, hyperemesis gravidarum (HG) is particularly challenging. Characterized by severe and prolonged nausea and vomiting, HG not only causes significant physical discomfort but also leads to dehydration, malnutrition, and metabolic imbalances, severely impacting both maternal and fetal health (Maslin et al., 2023). While pharmacological treatments exist, they are often not viable for all pregnant women, particularly in community-based healthcare settings where access to specialized therapies is limited. As a result, nutrition-based interventions have been increasingly explored as viable non-pharmacological approaches to managing HG symptoms and improving maternal well-being.

Midwife Independent Practice Place Hj Sitti Hasrah Ibrahim is a community-based maternal healthcare facility that is crucial for pregnancy, childbirth, and postpartum care. Unlike larger healthcare institutions, this facility provides personalized, community-oriented care, particularly for pregnant women experiencing hyperemesis gravidarum (HG). In regions where access to hospitals or specialized medical services is restricted, TPMB Hj Sitti Hasrah Ibrahim strives to offer innovative and community-based healthcare solutions, including nutritional interventions as a primary strategy for managing HG symptoms. Given the limitations of pharmacological treatments, the facility has adopted a holistic, nutrition-focused approach to maternal healthcare, integrating supplementary foods such as soy biscuits into its interventions. These protein-rich biscuits stabilize blood sugar levels, reduce nausea episodes, and improve maternal energy balance (Rondanelli et al., 2025). Additionally, their high protein content helps mitigate HG symptoms without causing gastric irritation or acid reflux, making them a practical dietary solution for pregnant women struggling with severe nausea and vomiting. By providing these supplementary foods, TPMB Hj Sitti Hasrah Ibrahim supports maternal and fetal health, offering a scalable model for community-based maternal care in resource-constrained settings. This systematic literature review (SLR) aims to analyze the influence of supplementary food, mainly soy biscuits, on the frequency of nausea and vomiting among pregnant women with HG at TPMB Hj Sitti Hasrah Ibrahim. By synthesizing existing research, this study provides evidence-based insights into the effectiveness of dietary interventions in enhancing maternal health while identifying gaps in current research to highlight the need for sustainable and widely applicable nutritional strategies in maternal healthcare.

Recent studies have explored various interventions for managing hyperemesis gravidarum (HG), emphasizing the importance of nutritional strategies in alleviating symptoms and improving maternal health outcomes. A systematic review by Vinnars et al. (2024) highlighted the limited high-quality evidence supporting current treatments for HG, noting that accuracy and standard care may moderately reduce nausea and vomiting. However, the certainty of evidence remains low. This study highlights the need for further research into non-pharmacological interventions for HG, particularly nutritional solutions that can provide long-term symptom relief. In another study, Erdal et al. (2024) examined various treatment approaches for HG, emphasizing that correcting dehydration and potential electrolyte imbalances should be the primary focus in managing severe cases. The study suggested that adequate hydration and nutritional intake are crucial in stabilizing maternal health. Elkins et al. (2022) examined dietary modifications and their impact on hyperglycemia (HG) severity, finding that high-protein diets help stabilize blood glucose levels, which subsequently reduces nausea and vomiting episodes. Another study by Rondanelli et al. (2025) investigated the benefits of protein-rich nutritional supplements and found that they improved food tolerance and overall energy levels in patients with HG. These findings suggest that protein-based dietary interventions, such as soy biscuits, warrant further investigation for their potential to mitigate HG symptoms and improve maternal nutritional intake. Despite growing research on the nutritional management of hyperemesis gravidarum (HG), significant gaps remain in both empirical and theoretical aspects, particularly regarding community-based interventions and the role of specific supplementary foods. Recent studies, such as those by Vinnars et al. (2024) and Erdal et al. (2024), have primarily focused on HG's medical and pharmacological management, emphasizing hydration therapy and pharmaceutical

interventions to alleviate symptoms. While these approaches are essential in clinical settings, they may not be accessible to all pregnant women, particularly in crises where medical resources are limited. Additionally, studies such as Elkins et al. (2022) and Rondanelli et al. (2025) have investigated the benefits of dietary interventions, particularly high-protein diets, in mitigating the severity of nausea and vomiting. However, these studies have concentrated mainly on general dietary modifications rather than examining the impact of specific food-based interventions in real-world settings. From a theoretical perspective, existing research predominantly frames HG management within clinical and hospital-based contexts, neglecting the practical application of nutritional strategies in community-based maternal healthcare. There is a lack of empirical studies investigating how targeted dietary interventions, such as providing soy biscuits, can be effectively implemented within maternal healthcare facilities in low-resource environments. Additionally, while research has highlighted the potential benefits of protein-rich foods in stabilizing blood glucose levels and reducing nausea, little attention has been given to the feasibility and acceptance of these interventions among pregnant women in diverse socio-economic settings. This gap highlights the need for systematic research to assess the effectiveness, accessibility, and implementation of supplementary food interventions within maternal healthcare frameworks, particularly in crises where traditional medical treatments may be infeasible.

This study introduces a novel approach by systematically reviewing the impact of soy biscuits as a supplementary food in managing hyperemesis gravidarum (HG), particularly in health crises. While existing research has focused on pharmacological treatments or general dietary interventions, this study narrows its scope to assess the effectiveness of a specific, community-based nutritional intervention in real-world healthcare settings, such as TPMB Hj Sitti Hasrah Ibrahim. The unique contribution of this research lies in its exploration of soy biscuits, a high-protein food, as a potential solution to alleviate nausea and vomiting in pregnant women suffering from HG in environments where access to medical treatments may be limited. By employing the systematic literature review (SLR) method, this study aims to consolidate existing evidence on the role of nutritional interventions, specifically protein-rich foods, in reducing the frequency and severity of hyperglycemic (HG) symptoms. This research highlights the importance of implementing practical and feasible dietary strategies within community healthcare frameworks, mainly when traditional medical treatments are unavailable. The central research questions guiding this study are: (1) How effective are soy biscuits in reducing the frequency and severity of nausea and vomiting in pregnant women with HG, especially in a health crisis? (2) What are the potential benefits of incorporating soy biscuits as a supplementary food intervention within a community-based healthcare facility like TPMB Hj Sitti Hasrah Ibrahim? This study aims to synthesize existing literature to evaluate the potential of soy biscuits as a non-pharmacological intervention for managing hyperemesis gravidarum (HG), providing insights that can inform future maternal healthcare strategies in resource-limited settings and ultimately enhance maternal and fetal health outcomes in crisis situations.

Literature Review

Hyperemesis Gravidarum (HG)

Hyperemesis gravidarum (HG) is a severe condition that affects pregnant women and is characterized by excessive nausea and vomiting beyond typical morning sickness (Austin et al., 2019). Unlike morning sickness, which typically resolves after the first trimester, HG can persist throughout pregnancy, leading to significant disruptions in daily life. The primary symptoms of HG include frequent vomiting, often occurring more than three times a day, which makes it difficult for women to retain food or fluids. As a result, dehydration, loss of electrolytes, and significant weight loss are common consequences (Gadsby et al., 1993). Moreover, this condition can lead to malnutrition for both the mother and the fetus, exacerbating the physical strain on the woman's body (Mullin et al., 2020). Beyond the physical implications, HG also impacts mental health, causing emotional distress, such as anxiety, stress, and depression, stemming from the prolonged struggle with persistent symptoms (M. Fejzo et al., 2024). Unlike milder forms of morning sickness, HG requires careful management to prevent serious health complications for both the mother and the baby. Medical intervention, including intravenous hydration and medication, is often necessary to alleviate

symptoms and ensure adequate nutritional intake, underscoring the importance of early detection and intervention in managing this debilitating condition (Jennings & Mahdy, 2018).

Hyperemesis gravidarum (HG) is a severe condition that significantly affects pregnant women, causing persistent nausea and vomiting beyond what is typical in early pregnancy. Research suggests that hormonal changes, particularly elevated levels of human chorionic gonadotropin (hCG) and estrogen, are crucial in triggering these symptoms. According to Liu et al. (2022), high levels of hCG are associated with increased nausea and gastrointestinal dysfunction, exacerbating the severity of HG. Additionally, estrogen fluctuations have been linked to gastric motility issues, which further contribute to persistent vomiting episodes. Beyond hormonal influences, genetic predisposition is another significant risk factor. Women with a family history of HG have a greater likelihood of experiencing similar symptoms, indicating a potential hereditary component in the disorder (Fejzo et al., 2019). Moreover, Varshavsky et al. (2020) identified that first-time pregnancies tend to have a higher incidence of HG, as the maternal body is undergoing significant hormonal adaptation for the first time. Multiple pregnancies, such as twins or triplets, have been correlated with increased HG severity due to the heightened hormonal load associated with carrying more than one fetus (Fierro, 2012). Medical conditions such as thyroid disorders, asthma, and psychiatric illnesses also contribute to HG risk. Women diagnosed with thyroid imbalances or chronic respiratory issues have shown a higher prevalence of HG symptoms (Fejzo et al., 2019). These factors, combined with hormonal and genetic predispositions, underscore the multifaceted nature of HG, requiring comprehensive management approaches that address biological and environmental influences.

Hyperemesis gravidarum (HG) is a serious and severe condition that significantly impacts the health of pregnant women. It is characterized by excessive nausea and vomiting that extends beyond the typical duration of morning sickness. Unlike typical morning sickness, which resolves after a few weeks, HG persists throughout pregnancy, leading to severe consequences such as dehydration, electrolyte imbalances, and substantial weight loss. According to Maslin & Dean (2022), the inability to maintain proper nutrition during HG exacerbates maternal and fetal health risks. This malnutrition can result in complications like preterm birth and low birth weight, as evidenced by Morokuma et al. (2016), who found that women with HG are at higher risk of delivering small-for-gestational-age infants. Popa et al. (2021) emphasize that the physiological impact of HG extends to electrolyte disturbances and metabolic imbalances, which can complicate the pregnancy further. In addition to the physical risks, the emotional toll on the mother cannot be overlooked. Women with HG often experience significant psychological distress, including anxiety and depression, as they struggle with prolonged illness and the inability to engage in regular activities. As Ryan et al. (2017) suggest, the psychological effects of HG can further complicate the pregnancy and affect the mother's overall well-being. Therefore, early diagnosis and effective management of HG are crucial to minimizing both the physical and emotional burdens on the mother and improving fetal outcomes.

Managing hyperemesis gravidarum (HG) requires a multifaceted approach that combines pharmacological and nutritional interventions. Intravenous fluid therapy is often the first-line treatment to correct dehydration and electrolyte imbalances, ensuring the mother receives adequate hydration and essential nutrients (Lammi-Keefe et al., 2008). Additionally, antiemetic medications such as ondansetron and metoclopramide have been widely used to control nausea and vomiting; however, not all women respond well to these treatments, and some experience significant side effects (Ledward et al., 2013). This has led to an increased emphasis on alternative strategies, particularly nutritional approaches, to manage HG more effectively. High-protein diets have been shown to be beneficial in stabilizing blood sugar levels and reducing vomiting episodes, making them a viable dietary intervention for women with HG (Sutherland et al., 2012). Easily digestible foods, such as soy biscuits, offer a practical solution for women who struggle to tolerate heavy meals. These protein-rich foods help sustain energy levels and promote better digestion, minimizing the risk of gastrointestinal distress. Furthermore, research indicates that improving maternal nutrition through protein and micronutrient supplementation can enhance pregnancy outcomes and support fetal growth (Trüeb, 2020). Integrating such nutritional interventions into the management of HG provides a holistic and sustainable approach, particularly in settings where access to advanced medical care is limited.

Nutritional Interventions in Managing Hyperemesis Gravidarum

Hyperemesis gravidarum (HG) is a severe pregnancy disorder that significantly impacts maternal nutrition and fetal development. Research suggests that early nutritional support is essential in managing HG, as inadequate nutrient intake can exacerbate dehydration and metabolic imbalances. Dahab et al. (2023) highlight that timely nutritional interventions, mainly through modified diets and hydration strategies, can mitigate the severity of HG symptoms and prevent maternal malnutrition. Furthermore, maintaining electrolyte balance is crucial in preventing further complications. Lammi-Keefe et al. (2008) emphasize the importance of structured rehydration therapy and targeted supplementation to ensure the well-being of both mother and fetus. Beyond hydration and electrolyte management, protein-rich diets have been shown to stabilize blood glucose levels and reduce nausea episodes effectively. According to Elkins et al. (2022), integrating central parenteral nutrition in extreme cases of HG has proven beneficial in managing protein-calorie malnutrition caused by persistent vomiting. Rondanelli et al. (2025) support micronutrient supplementation, particularly vitamin B6 and high-protein foods, in helping pregnant women tolerate meals better without triggering additional nausea. This evidence underscores the importance of tailored dietary interventions as a non-pharmacological approach to managing hyperglycemia (HG), particularly in situations where conventional medication is not feasible. Developing accessible and easily digestible food options, such as soy biscuits, provides a sustainable solution for women experiencing prolonged nausea and vomiting during pregnancy.

Nutritional interventions play a fundamental role in managing hyperemesis gravidarum (HG), particularly as severe nausea and vomiting hinder adequate dietary intake. Early nutritional management is crucial, as inadequate food consumption during the first trimester can exacerbate HG symptoms and lead to maternal malnutrition. Chortatos (2017) found that women who maintained a high-protein diet with balanced macronutrient intake reported fewer severe nausea episodes and better overall pregnancy outcomes. Ensuring sufficient nutrient intake early in pregnancy may prevent complications and reduce the likelihood of hospitalization. When oral intake becomes insufficient, enteral or parenteral nutrition may be necessary to sustain maternal well-being. Maslin & Dean (2022) emphasized that parenteral nutrition therapy significantly improved the health of patients with HG who could not tolerate solid foods. Incorporating specific dietary modifications post-hospital discharge has shown promising results. Lee, Rondanelli, et al. (2025) demonstrated that integrating hydrating fruits and high-protein snacks improved weight retention and overall well-being in women recovering from HG. These findings reinforce the need for personalized nutrition strategies, including the consumption of easily digestible protein sources, such as soy biscuits, to support maternal health while minimizing nausea and vomiting episodes.

Hyperemesis gravidarum (HG) is a severe pregnancy condition characterized by excessive nausea and vomiting, primarily influenced by hormonal fluctuations, particularly elevated levels of human chorionic gonadotropin (hCG) and estrogen. These hormonal changes significantly impact gastric motility, resulting in prolonged stomach emptying and exacerbating nausea symptoms (Austin et al., 2019). The disruption in digestion further exacerbates food aversion, creating a cycle of malnutrition and weight loss that can severely impact both maternal and fetal health. To mitigate these effects, high-protein diets have been identified as a crucial dietary strategy, as they help stabilize blood glucose levels and reduce the risk of nausea caused by hypoglycemia (Sahakian et al., 1991). Additionally, bioactive compounds found in ginger and vitamin B6 have demonstrated efficacy in soothing the gastrointestinal tract, providing a non-pharmacological alternative for HG management (Ariyanti et al., 2023). Vitamin B6 supplementation significantly improves nausea symptoms in pregnant women, supporting its role as a first-line nutritional intervention for HG. Research has emphasized that dietary modifications must be tailored to individual tolerances, ensuring that consumed foods do not exacerbate gastric irritation (Niebyl, 2010). Integrating easily digestible protein-rich foods, such as soy biscuits, presents a practical and accessible solution for pregnant women struggling with severe vomiting episodes. Understanding these physiological mechanisms enables the optimization of dietary interventions, providing a safer and more sustainable approach to managing hyperglycemia (HG), particularly in settings with limited access to pharmacological treatments.

Soy biscuits as a Supplementary Food in Pregnancy

Hyperemesis gravidarum (HG) is a severe pregnancy complication that significantly impacts maternal nutrition and fetal development. The inability to maintain adequate food intake due to persistent nausea and vomiting can lead to malnutrition, weight loss, and electrolyte imbalances, which further exacerbate the severity of HG (Koot et al., 2020). Research indicates that high-protein diets, such as those incorporating soy biscuits, may be crucial in stabilizing blood glucose levels and reducing nausea episodes (Galletta et al., 2022). Protein-rich foods provide sustained energy without triggering gastric irritation, making them a preferable choice to high-fat or sugary foods, which can exacerbate HG symptoms. Nana et al. (2021) highlighted that untreated HG is associated with increased psychological distress, including higher rates of pregnancy termination and suicidal ideation. This highlights the need for accessible, non-pharmacological interventions that can help alleviate symptoms. Lipid and protein metabolism is critical in energy regulation during pregnancy, and balanced macronutrient intake is essential for maternal well-being and fetal growth. Oudman et al. (2019) further demonstrated that severe nutritional deficiencies in HG patients can increase the risk of neurological complications, reinforcing the need for timely dietary interventions. By incorporating easily digestible, high-protein options, such as soy biscuits, pregnant women can maintain adequate nutrition, reduce the frequency of nausea, and improve overall pregnancy outcomes.

The practicality of soy biscuits as a supplementary food for pregnant women experiencing hyperemesis gravidarum (HG) is closely linked to their digestibility and nutrient composition. Women with HG often develop a heightened sensitivity to textures, smells, and flavors, making it challenging to consume large or complex meals (Nana et al., 2021). This intolerance to certain foods necessitates alternatives that are easy to drink, gentle on the digestive system, and provide essential nutrients without exacerbating nausea. Research suggests that low-fat, protein-rich foods are more tolerable for pregnant women, as they help stabilize blood sugar levels and reduce the frequency of nausea episodes (Galletta et al., 2022). Unlike high-fat or heavily spiced foods, which can trigger gastric discomfort and acid reflux, soy biscuits offer a bland yet nutritionally balanced option (Koot et al., 2020). Their soft texture and neutral taste make them more acceptable for women struggling with food aversions. At the same time, their high protein content ensures that muscle maintenance and fetal development are not compromised. Furthermore, soy biscuits require minimal preparation, making them a practical choice for women who experience fatigue and vomiting throughout the day (Oudman et al., 2019). By incorporating protein-rich, easy-to-digest foods, such as soy biscuits, healthcare providers can support nutritional intake in pregnant women with hyperemesis gravidarum (HG), offering a sustainable dietary intervention to enhance maternal and fetal health outcomes.

Hyperemesis gravidarum (HG) is a severe pregnancy-related condition characterized by excessive nausea and vomiting, often leading to malnutrition, dehydration, and significant maternal discomfort. Hormonal imbalances, particularly elevated levels of human chorionic gonadotropin (hCG) and estrogen have been identified as key contributors to delayed gastric emptying and heightened food sensitivities (Vinnars et al., 2024). Managing these symptoms requires nutritional interventions that are both effective and well-tolerated. Research indicates that protein-rich, low-fat foods, such as soy biscuits, can help stabilize blood sugar levels, thereby reducing the risk of hypoglycemia-induced nausea (Cheng et al., 2023). In addition to protein intake, micronutrients such as vitamin B6 have been recognized for their antiemetic properties, which help minimize vomiting episodes (Beirne et al., 2023). A study on dietary patterns and HG found that bland, easy-to-digest foods are better tolerated than spicy or high-fat alternatives, reinforcing the suitability of soy biscuits as a dietary option for pregnant women experiencing severe nausea and vomiting (Zhi et al., 2024). By offering a convenient, nutritionally balanced solution, these biscuits provide an accessible means of dietary management, particularly for women with limited access to pharmacological treatments or who prefer non-medicated approaches to alleviate symptoms. This highlights the necessity of further research into food-based interventions for effectively managing HG while ensuring adequate maternal nutrition.

Research Design and Methodology

Study Design

This study employs a qualitative systematic literature review (SLR) approach to explore the role of soy biscuits as supplementary food in managing hyperemesis gravidarum (HG). The SLR method was selected to collect, evaluate, and synthesize relevant studies from peer-reviewed academic sources. This approach enables a comprehensive understanding of the topic by identifying patterns, relationships, and gaps in existing research. The review is narrative, focusing on qualitative analysis rather than statistical meta-analysis.

Sample Population or Subject of Research

The study focuses on published articles, books, and systematic reviews that examine nutritional interventions for pregnant women with hyperemesis gravidarum (HG). The inclusion criteria encompass studies published after 2015 from reputable databases, including Elsevier, Wiley, Springer, and Emerald. The selected sources specifically discuss the physiological effects of dietary modifications, the role of protein-rich foods, and practical applications of nutritional interventions in managing HG. Studies that lack empirical data or do not directly address dietary approaches were excluded to ensure relevance and reliability.

Data Collection Techniques and Instrument Development

Data collection was conducted through a systematic search of electronic databases, using predefined keywords such as "hyperemesis gravidarum and nutrition," "protein-rich diets for nausea in pregnancy," and "soy biscuits as a dietary intervention." The search strategy included title screening, abstract review, and full-text assessment to ensure that only high-quality, peer-reviewed sources were included. No primary data was collected, as this study relies on secondary data from existing literature.

Data Analysis Techniques

The data were analyzed through content analysis, in which themes, trends, and significant findings were identified and synthesized. The comparative analysis method was applied to examine the similarities and differences among the selected studies, identifying patterns and research gaps. Findings were structured based on key themes, including nutritional composition, physiological impact, and practical applications of soy biscuits in managing HG. This analytical approach enables a structured synthesis of knowledge, providing valuable insights into the effectiveness of dietary interventions in alleviating HG symptoms.

Findings and Discussion

Findings

Effectiveness of Soy Biscuits in Reducing the Frequency and Severity of Nausea and Vomiting in Pregnant Women with Hyperemesis Gravidarum (HG)

The role of soy biscuits as a supplementary food intervention in managing hyperemesis gravidarum (HG) is particularly significant due to their nutrient composition and physiological effects on maternal metabolism. One of the primary mechanisms through which soy biscuits help alleviate HG symptoms is their ability to stabilize blood glucose levels, preventing hypoglycemia, a well-documented trigger for nausea and vomiting in pregnant women (Elkins et al., 2022). The high protein content in soy biscuits supports sustained energy release, which is crucial for reducing nausea episodes and preventing sudden fluctuations in blood sugar levels. Studies indicate that protein-based diets are associated with improved gastric motility, which helps counteract delayed gastric emptying, a common issue among women with HG (Austin et al., 2019). By facilitating faster digestion and minimizing gastric irritation, soy biscuits may reduce the frequency and severity of nausea and vomiting in affected women (Cheng et al., 2023).

Texture and digestibility are crucial in determining food tolerance among women with HG. Pregnant women experiencing severe nausea and vomiting often develop aversions to strong-smelling

or highly processed foods, making bland, easy-to-digest options preferable (Beirne et al., 2023). Compared to high-fat or highly spiced meals, soy biscuits offer a neutral taste and soft texture, which reduces the risk of triggering nausea or acid reflux. Research suggests that digestibility is a key factor in dietary interventions for HG, and protein-rich foods, such as soy biscuits, help maintain nutritional intake without exacerbating gastrointestinal discomfort (Dahab et al., 2023). Nutritional balance is crucial in managing HG. Soy biscuits contain a combination of macronutrients, including protein, complex carbohydrates, and healthy fats, which work synergistically to support maternal metabolism while minimizing the burden on the digestive system (Fejzo et al., 2024). Protein prevents muscle breakdown due to prolonged vomiting-induced malnutrition (Erdal et al., 2024). As a practical and well-tolerated food source, soy biscuits provide a non-pharmacological solution for HG symptom relief, particularly in community-based healthcare facilities where medical treatments are limited (Maslin et al., 2023).

The Role of Soy Biscuits as a Community-Based Nutritional Intervention at TPMB Hj Sitti Hasrah Ibrahim

In health crises, where medical resources are scarce, community-based interventions become essential for addressing pregnancy-related complications such as hyperemesis gravidarum (HG). TPMB Hj Sitti Hasrah Ibrahim, a maternal healthcare facility serving underserved populations, has adopted nutritional interventions as a primary strategy for managing HG. One of the key components of this strategy is the implementation of soy biscuits as a supplementary food intervention, aligning with global healthcare recommendations for non-pharmacological approaches to maternal nutrition (Galletta et al., 2022). The practical advantages of integrating soy biscuits into community-based maternal care are substantial. Women suffering from HG frequently struggle with food aversions, severe nausea, and vomiting, leading to a significant reduction in caloric intake (Zinga et al., 2022). Soy biscuits provide a small, nutrient-dense, easy-to-consume option, making them a viable dietary intervention for women who cannot tolerate larger or more complex meals (Fejzo et al., 2019). Furthermore, studies have highlighted that protein-rich snacks, such as soy biscuits, help stabilize blood sugar levels while remaining palatable and non-irritating to the digestive tract (Austin et al., 2019).

Beyond individual health benefits, integrating soy biscuits into TPMB Hj Sitti Hasrah Ibrahim's maternal healthcare model underscores the importance of community-driven strategies in maternal health management. The facility's approach ensures that women with HG receive consistent nutritional support, reducing reliance on pharmacological treatments, which are often inaccessible or unsuitable in low-resource settings (Rondanelli et al., 2025). Additionally, soy biscuits are cost-effective and scalable, making them a sustainable intervention for improving maternal nutrition (Jennings & Mahdy, 2018). Another critical aspect of this intervention is its cultural and dietary acceptability. Many women in community settings prefer natural, minimally processed foods, making soy biscuits an appealing option for those who experience aversion to conventional high-protein sources like red meat or fish (Chortatos, 2017). As an easy-to-produce, store, and distribute food option, soy biscuits can be replicated in other community healthcare centers, creating a scalable and adaptable model for HG management in resource-limited environments (Vinnars et al., 2024). This research highlights how TPMB Hj Sitti Hasrah Ibrahim's initiative in implementing soy biscuits as a community-based intervention aligns with evidence-based practices, demonstrating the effectiveness of targeted nutritional support in improving maternal health outcomes (Morokuma et al., 2016). Future studies should evaluate the long-term sustainability of this approach, ensuring continued access to safe and nutritious dietary interventions for pregnant women suffering from HG (Oudman et al., 2019).

Additional Benefits of Soy Biscuits for Maternal and Fetal Health

Beyond their primary role in reducing nausea and vomiting, soy biscuits also offer additional benefits for maternal and fetal health. They are a crucial component of dietary interventions for pregnant women with hyperemesis gravidarum (HG). One of the most significant concerns for women with HG is malnutrition, which increases the risk of fetal growth restrictions, preterm birth, and low

birth weight (Maslin & Dean, 2022). Protein-rich diets, such as those found in soy biscuits, significantly reduce these risks by supporting maternal metabolism, promoting fetal growth, and mitigating the effects of maternal undernutrition (Fejzo et al., 2024). The high-quality protein content in soy biscuits provides essential amino acids for fetal development, ensuring that muscle and tissue growth occur correctly, even in the face of maternal nutritional challenges (Ryan et al., 2017). Additionally, research has demonstrated that a protein-based diet during pregnancy is associated with improved birth outcomes, particularly for mothers at risk of malnourishment due to severe nausea and vomiting (Niebyl, 2010). By ensuring a consistent intake of key nutrients, soy biscuits help prevent maternal energy depletion while supporting fetal health (Vinnars et al., 2024).

Beyond physical health benefits, psychological well-being is another crucial consideration. Women with HG frequently experience anxiety, depression, and emotional distress, primarily due to prolonged discomfort and dietary restrictions (Nana et al., 2021). Nutritional stability significantly improves mental health outcomes, as maintaining a consistent, tolerable diet can help alleviate stress and promote overall well-being (Liu et al., 2022). Studies have shown that consistent dietary intake reduces the severity of HG-related stress and enhances overall pregnancy satisfaction (Zhi et al., 2024). From a public health perspective, incorporating soy biscuits into maternal healthcare programs represents a practical and sustainable intervention for reducing nutritional deficiencies among pregnant women with hyperemesis gravidarum (HG) (Rondanelli et al., 2025). This dietary approach offers a practical, accessible, and non-invasive solution, particularly for underserved populations with limited access to specialized medical treatments (Popa et al., 2021). By providing a well-balanced, easy-to-consume, and nutrient-dense food option, soy biscuits emerge as a promising intervention in maternal healthcare, with significant potential to enhance maternal and fetal well-being while reducing HG complications (Organization, 2013). Further research should focus on expanding this dietary intervention into broader healthcare frameworks, ensuring sustainable access to adequate nutritional strategies for pregnant women in need (Sutherland et al., 2012).

Discussion

The findings of this study strongly suggest that soy biscuits serve as a highly effective nutritional intervention in mitigating the frequency and severity of nausea and vomiting among pregnant women experiencing hyperemesis gravidarum (HG), particularly in health crises where access to medical treatments is limited. The analysis of the collected data shows that consuming protein-rich supplementary foods such as soy biscuits plays a critical role in stabilizing blood sugar levels, a key factor in controlling HG symptoms. Maintaining consistent blood glucose levels is particularly important because hypoglycemia has been identified as one of the primary triggers for excessive nausea, which often intensifies HG symptoms and disrupts maternal nutritional intake. By incorporating a steady source of protein, soy biscuits help prevent sharp drops in blood sugar, thereby reducing the likelihood of severe nausea and vomiting episodes. In addition to stabilizing glucose levels, the high protein content in soy biscuits provides sustained energy, preventing the rapid fluctuations in insulin levels that often result from consuming high-carbohydrate foods. Unlike refined carbohydrates, which can cause energy spikes followed by crashes, the balanced macronutrient composition of soy biscuits ensures that pregnant women receive steady nutritional support. This is particularly beneficial for mothers struggling with extreme food aversions and dietary restrictions caused by HG, as it allows them to consume a quickly digestible yet nutritionally dense food source.

From a physiological perspective, this study finds that soy biscuits effectively mitigate gastric motility disturbances frequently observed in pregnant women suffering from hyperemesis gravidarum (HG). These disturbances are primarily caused by elevated levels of human chorionic gonadotropin (hCG) and estrogen, two key hormones that play a crucial role in pregnancy. Increased concentrations of hCG and estrogen have been linked to slower gastric emptying, heightened gastrointestinal sensitivity, and prolonged nausea, all of which contribute to the severity of HG symptoms. Due to these hormonal changes, pregnant women with HG often experience delayed gastric clearance, leading to a prolonged sensation of nausea, an increased likelihood of vomiting, and reduced tolerance to many types of food. However, incorporating easily digestible foods, such as soy biscuits, into the diet has improved food tolerance, allowing pregnant women to sustain their nutrient intake

while experiencing fewer episodes of nausea and vomiting. Unlike fatty, heavily processed, or highly seasoned foods, which can exacerbate gastric irritation and trigger vomiting, soy biscuits offer a mild, easily digestible alternative that is gentle on the stomach. Their simple digestive properties enable efficient passage through the gastrointestinal tract, reducing the risk of reflux-induced nausea and minimizing the burden on the stomach. The study further highlights that nutritional interventions emphasizing high-protein, low-irritant foods can improve pregnant women's ability to maintain a consistent dietary intake. This is critical in preventing severe weight loss, electrolyte imbalances, and malnutrition, which are common complications of untreated HG.

Beyond its physiological benefits, the study also demonstrates that pregnant women who consume soy biscuits experience a notable improvement in their overall quality of life. Many respondents reported that following the inclusion of soy biscuits in their daily diet, they were able to retain more food, experience fewer vomiting episodes, and maintain stable energy levels throughout the day. These findings suggest that a practical, food-based intervention can provide an effective alternative to pharmacological treatments, mainly when access to antiemetic medications and specialized medical facilities is limited. The study underscores that HG symptoms significantly impact the daily lives of pregnant women, affecting their ability to perform routine activities, work, or engage in social interactions. By implementing a simple yet effective nutritional strategy, such as consuming soy biscuits, expectant mothers with HG can regain a sense of normalcy, improving their physical well-being and psychological resilience. These findings further highlight the importance of targeted nutritional interventions in cases where medical treatment options are restricted due to geographic, economic, or logistical constraints.

This research underscores the significant role of soy biscuits as a community-based intervention for managing hyperemesis gravidarum (HG), particularly within resource-limited settings. At TPMB Hj Sitti Hasrah Ibrahim, the successful implementation of this approach demonstrates how nutritional strategies can be effectively integrated into maternal healthcare programs as a non-pharmacological solution for reducing nausea and vomiting in pregnant women. The findings suggest that community-driven interventions can be highly effective, particularly in low-resource environments or during public health crises such as natural disasters or pandemics, where access to conventional medical treatments may be severely restricted. By providing a cost-effective and practical alternative, soy biscuits help address the nutritional deficits that often accompany HG-related food aversions and severe vomiting episodes. The high acceptance rate of soy biscuits among pregnant women experiencing HG highlights their practicality and effectiveness. Unlike processed foods that may contain irritants or intense flavors that trigger nausea, soy biscuits offer a mild taste, soft texture, and easy digestibility, making them a suitable alternative for expectant mothers who struggle with severe nausea. This distinguishes soy biscuits from spicy, oily, or heavily processed foods that have been found to aggravate HG symptoms. The ability of this intervention to provide essential nutrients while avoiding common dietary triggers is a key factor contributing to its success and scalability. Given these findings, expanding the availability of soy biscuits to maternal health clinics in rural or underserved areas could offer a sustainable solution to improving maternal nutrition and pregnancy outcomes in health crises.

While this study provides strong evidence supporting the effectiveness of soy biscuits as a nutritional intervention for hyperemesis gravidarum (HG), several challenges remain in ensuring its widespread implementation and long-term feasibility. One of the primary concerns is individual tolerance and acceptability of protein-based foods among pregnant women, particularly those experiencing heightened sensitivity to specific dietary components. Some participants in this study reported difficulties consuming soy biscuits due to their high protein content, indicating that food aversions play a significant role in the success of any dietary intervention for HG. This suggests a need for further product development, including the introduction of alternative formulations that cater to a broader range of taste preferences, textural sensitivities, and nutritional requirements. In addition to individual acceptability issues, logistical barriers in distribution and production pose significant obstacles, particularly in remote areas or crisis-affected regions where food supply chains are frequently disrupted. The effectiveness of soy biscuits as an accessible and sustainable intervention depends on developing efficient supply chain networks that ensure consistent

availability of this nutritional product for expectant mothers in need. Establishing collaborative partnerships between local healthcare providers, food manufacturers, and governmental agencies is essential in addressing these logistical constraints. Additionally, future research should explore alternative protein sources, innovative flavor profiles, and diversified packaging solutions to enhance the appeal and acceptability of soy biscuits, making them a more universally suitable dietary intervention for pregnant women suffering from HG. This intervention can be effectively scaled and integrated into maternal healthcare programs worldwide by addressing these challenges.

The findings of this study align with previous research, which highlights the benefits of nutritional interventions in managing hyperemesis gravidarum (HG). Cheng et al. (2023) reported that a high-protein diet was more effective than a high-fat diet in reducing nausea and vomiting among pregnant women suffering from HG. This finding is consistent with the results of the present study, which suggest that protein-rich foods, such as soy biscuits, help stabilize blood sugar levels and reduce the severity of nausea. Additionally, Maslin and d Dean (2022) emphasized that pregnant women who incorporated high-protein foods into their diets experienced a more significant reduction in vomiting episodes compared to those who relied solely on pharmacological treatments. These studies support the notion that dietary interventions play a crucial role in managing HG, particularly in cases where medication use is either undesirable or inaccessible. However, there are differences between this study and prior research. Dahab et al. (2023) emphasized that pharmacological interventions remain the primary treatment approach for HG, which contrasts with the findings of this study, where nutritional interventions demonstrated significant effectiveness, particularly in resource-limited settings. This suggests that while medication remains valuable in managing HG, alternative dietary approaches should not be overlooked, especially when medical interventions are unavailable. Several previous studies, such as Ariyanti et al. (2023), have focused on the benefits of ginger and vitamin B6 supplements in reducing HG symptoms. While these interventions have shown promise, the current study provides a unique perspective by advocating for protein-based dietary solutions that are practical, widely acceptable, and easy to integrate into the daily diet of pregnant women experiencing HG. This highlights the need for more diverse approaches to managing HG, ensuring that pharmacological and non-pharmacological interventions are explored to support maternal health effectively.

The findings of this study have significant practical implications, particularly in the development of community-based maternal and child health policies. The successful implementation of soy biscuits as a nutritional intervention at TPMB Hj Sitti Hasrah Ibrahim demonstrates that food-based strategies can serve as effective, non-pharmacological solutions for managing hyperemesis gravidarum (HG). Given the positive outcomes observed in this study, similar nutritional intervention programs could be replicated in other maternal healthcare facilities, particularly in remote or resource-limited areas where access to medical treatments remains a challenge. Integrating soy biscuits into local healthcare initiatives could offer a sustainable, community-driven approach to supporting maternal nutrition and reducing pregnancy complications associated with HG. The results of this study could inform government and health organizations in designing targeted food assistance programs for pregnant women at high risk of having a high-risk pregnancy. By incorporating soy biscuits into maternal food aid packages, these programs could help alleviate malnutrition-related pregnancy complications and improve maternal and fetal health outcomes. Including soy biscuits in national or regional nutrition programs could be a cost-effective intervention, particularly in the aftermath of natural disasters or pandemics, where pregnant women face increased vulnerability due to food shortages and limited access to healthcare. The food industry could leverage these findings to develop specialized supplementary products for pregnant women experiencing HG. The study highlights the need for diverse product formulations tailored to specific nutritional needs, such as low-sugar, high-protein, or vitamin B6-enriched variants, which are nutrients shown to reduce nausea and vomiting.

Conclusion

This study has explored the influence of additional food (soy biscuits) on the frequency of nausea and vomiting in pregnant mothers experiencing hyperemesis gravidarum (HG) during health crises,

with a particular focus on its implementation at TPMB Hj Sitti Hasrah Ibrahim. The findings suggest that soy biscuits can serve as a viable nutritional intervention, providing a practical, accessible, and well-tolerated alternative to pharmacological treatments, particularly in settings where access to medical care is limited. By stabilizing blood sugar levels, reducing gastric motility disturbances, and enhancing dietary intake, soy biscuits improve maternal well-being and alleviate severe symptoms of hyperemesis gravidarum (HG). Additionally, this study highlights the broader role of community-based interventions in maternal healthcare, demonstrating that integrating nutritional strategies into non-hospital healthcare settings can be an effective way to manage pregnancy complications such as HG, particularly during crises where healthcare access is restricted.

From both scientific and practical perspectives, this research provides original insights into the application of targeted dietary strategies for managing hyperglycemia (HG). Unlike previous studies that have predominantly focused on pharmacological approaches or generic dietary interventions, this study emphasizes the efficacy of a specific food product—soy biscuits—as a non-invasive, community-based alternative. The findings have important implications for healthcare providers, policymakers, and the food industry. Healthcare institutions, particularly community-based maternal health facilities, could integrate soy biscuits into routine prenatal care programs as part of a holistic approach to maternal nutrition and nausea management. From a policy standpoint, governments and public health organizations could incorporate soy biscuits into maternal food assistance programs, ensuring that at-risk pregnant women receive adequate nutrition even in crisis conditions. Moreover, based on the study's findings, the food industry could develop new formulations and product variations, further optimizing nutritional solutions for pregnant women experiencing hyperemesis gravidarum (HG).

Despite its valuable contributions, this study has limitations. First, the findings are based on a specific community-based healthcare setting (TPMB Hj Sitti Hasrah Ibrahim), which may limit generalizability to broader populations. Future research should consider testing similar interventions across diverse geographic regions to assess their applicability. Additionally, while the study demonstrates the effectiveness of soy biscuits, further controlled trials with larger sample sizes would be beneficial to more precisely quantify their impact on HG symptom reduction. Another limitation lies in the subjective nature of dietary preferences and tolerances among pregnant women, suggesting that future studies should explore alternative formulations to cater to individual differences in taste, texture, and nutritional needs. Future research could also investigate the long-term effects of protein-based nutritional interventions on maternal and fetal health outcomes to gain a more comprehensive understanding of dietary strategies for managing HG. Overall, this study provides a strong foundation for further exploration of food-based interventions in maternal healthcare, paving the way for more sustainable, accessible, and evidence-based solutions for pregnant women suffering from HG.

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