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DYSPEPSIA IN PREGNANT WOMEN: INFLUENCE OF METABOLIC FACTORS AND EVALUATION OF SAFE THERAPEUTIC APPROACHES

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Abstract
Dyspepsia is one of the most common gastrointestinal complaints encountered during pregnancy, arising from a complex interplay of hormonal, mechanical, and metabolic changes that significantly affect maternal comfort and quality of life. Despite its high prevalence, management remains challenging due to limitations in pharmacological options that are safe for the developing foetus. This study aimed to evaluate the role of sociodemographic characteristics, anthropometric indices, and biochemical parameters in dyspepsia among pregnant women, and to assess the effectiveness of safe therapeutic interventions. A prospective observational study was conducted at the polyclinic of Tashkent State Medical University, including 43 pregnant women presenting with dyspeptic symptoms. Data collected included age, trimester, body mass index (BMI), fasting blood glucose, triglycerides, and glycated hemoglobin (HbA1c). Symptom severity was assessed using a standardized 10-point scoring system before and after 14 days of treatment. The results demonstrated that dyspepsia severity increased with advancing gestational age, particularly in the third trimester. Dimethicone-based therapy showed the greatest improvement in symptoms, with a mean reduction of 3.4 ± 0.8 ($p < 0.001$), while metabolic supportive therapy demonstrated moderate improvement (2.7 ± 0.7, $p = 0.002$). Significant negative correlations were observed between BMI ($r = -0.46$), HbA1c ($r = -0.49$), triglycerides ($r = -0.43$),

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and treatment response. These findings indicate that metabolic burden adversely affects therapeutic outcomes. The study highlights the importance of a personalized and safe approach to dyspepsia management in pregnancy, integrating metabolic evaluation with targeted symptomatic therapy.

Keywords: Dyspepsia; pregnancy; body mass index; HbA1c, triglycerides; dimethicone; metabolic disorders.

Introduction

Dyspepsia is a prevalent gastrointestinal disorder during pregnancy, affecting a substantial proportion of women across all trimesters. It is characterized by symptoms such as epigastric discomfort, bloating, early satiety, nausea, and postprandial fullness. These symptoms significantly impair quality of life, dietary intake, and overall maternal well-being. The prevalence of dyspepsia during pregnancy ranges between 40% and 80%, depending on the population studied, with higher rates observed in urban settings due to lifestyle and dietary factors [1,4]. In regions such as Uzbekistan, the increasing prevalence of obesity and metabolic disorders among women of reproductive age has contributed to the rising burden of dyspeptic symptoms during pregnancy. The pathophysiology of dyspepsia in pregnancy is multifactorial, involving hormonal, mechanical and metabolic mechanisms. Elevated progesterone levels exert a relaxing effect on smooth muscle, resulting in decreased gastrointestinal motility and delayed gastric emptying [1,6]. This leads to prolonged gastric retention, contributing to bloating and early satiety. Additionally, reduced lower oesophageal sphincter tone increases the likelihood of gastroesophageal reflux [6]. As pregnancy progresses, the enlarging uterus exerts mechanical pressure on abdominal organs, further impairing gastric emptying and increasing intra-abdominal pressure. These effects are most pronounced in the third trimester, where dyspeptic symptoms are typically more severe and persistent [2]. Metabolic changes during

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pregnancy also play a critical role. Physiological insulin resistance ensures adequate glucose supply to the foetus; however, exaggerated responses may lead to elevated fasting glucose and HbA1c levels [2,3]. These metabolic disturbances impair autonomic regulation of the gastrointestinal tract, contributing to delayed gastric emptying and dysmotility. Hypertriglyceridemia further contributes to systemic inflammation and increased gastric sensitivity [3]. Body mass index (BMI) is another important determinant. Overweight and obese women are more likely to experience severe symptoms due to increased intra-abdominal pressure and metabolic dysregulation [4]. Sedentary lifestyle and dietary habits, particularly high intake of fatty and spicy foods, further exacerbate symptoms. Management of dyspepsia during pregnancy is challenging due to limitations on pharmacotherapy. Safe and effective treatment options are essential. Dimethicone-based therapies are widely regarded as safe due to their lack of systemic absorption and ability to reduce gas-related symptoms [5]. Metabolic supportive therapies, such as xylitol-based formulations, may improve metabolic parameters and indirectly enhance gastrointestinal function. However, certain drugs such as doxycycline are contraindicated due to adverse fetal effects, including impaired bone and dental development [3]. Given this complex interplay of factors, comprehensive evaluation of both clinical and metabolic determinants is essential. This study aims to analyze the relationship between sociodemographic, anthropometric, and biochemical parameters and treatment outcomes in pregnant women with dyspepsia.

Relevance

Dyspepsia in pregnancy is frequently under-recognized despite its high prevalence and significant impact on maternal health and quality of life. The condition often remains inadequately managed due to concerns regarding the safety of pharmacological treatments during pregnancy. This study is clinically relevant as it integrates metabolic, anthropometric, and clinical factors to provide

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a more comprehensive understanding of dyspepsia in pregnancy. By highlighting the influence of metabolic abnormalities on symptom severity and treatment response, the study emphasizes the importance of a personalized and mechanism-based approach to management. Furthermore, the findings are particularly applicable to outpatient clinical settings, where rapid, safe, and effective symptom control is essential, and where metabolic disorders are increasingly prevalent among pregnant women.

Materials and Methods

This prospective observational study was conducted at the polyclinic of Tashkent State Medical University over a three-month period. Patients were not randomised, and treatment was based on routine clinical practice. A total of 43 pregnant women aged 18–40 years presenting with dyspeptic symptoms were included. Participants were categorized according to trimester, with 12 patients in the first trimester, 15 in the second trimester, and 16 in the third trimester. Sociodemographic data and obstetric history were collected through structured interviews. Anthropometric measurements were obtained using standardized techniques, and BMI was calculated. Biochemical parameters, including fasting blood glucose, triglycerides, and HbA1c, were measured following overnight fasting. Dyspeptic symptoms were assessed using a standardized 10-point scoring system before and after 14 days of treatment. Patients received dimethicone-based therapy for symptomatic relief, and metabolic supportive therapy was administered to those with abnormal biochemical parameters. Statistical analysis included paired t-tests, ANOVA for trimester comparison, and Pearson correlation coefficients, with significance set at $p < 0.05$. Data were analyzed using SPSS version 25.0. A p-value < 0.05 was considered statistically significant.

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Therapeutic Interventions and Pharmacological Basis

All enrolled patients received treatment according to standard clinical practice while strictly adhering to safety considerations in pregnancy. The primary symptomatic therapy used in this study was **dimethicone (simethicone), a non-systemically absorbed antiflatulent agent**, which is widely regarded as safe during pregnancy due to its lack of systemic bioavailability and absence of placental transfer. The mechanism of action of dimethicone involves reduction of surface tension of gas bubbles within the gastrointestinal tract, leading to coalescence of smaller bubbles into larger ones that can be more easily expelled through belching or flatulence. This process directly alleviates bloating and abdominal distension, which are among the most prominent symptoms of dyspepsia in pregnant women, particularly in the presence of progesterone-induced hypomotility. In addition to symptomatic therapy, **metabolic supportive treatment using xylitol-based formulations** was administered to patients demonstrating biochemical abnormalities such as elevated fasting glucose, triglycerides, or glycated hemoglobin. Xylitol is a polyol metabolised primarily in the liver through insulin-independent pathways, contributing to stabilisation of energy metabolism without significantly increasing glycemic load. By improving metabolic balance and reducing fluctuations in glucose and lipid metabolism, xylitol-based therapy indirectly supports gastrointestinal motility and autonomic regulation, thereby contributing to symptom improvement in patients with metabolically driven dyspepsia. It is important to note that **doxycycline, a tetracycline-class antibiotic commonly used for infection-related gastrointestinal conditions, was not administered to pregnant patients in this study** due to its well-established contraindication in pregnancy. Doxycycline exerts its antimicrobial effect by binding to the 30S ribosomal subunit of bacteria, inhibiting protein synthesis; however, it also chelates calcium ions, leading to deposition in fetal bones and teeth, which may result in impaired skeletal development and permanent dental discolouration. Therefore, although it may be

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used in non-pregnant populations for dyspepsia associated with infectious etiologies, it was excluded from therapeutic use in this study to ensure fetal safety.

Ethical considerations:
This study was observational and conducted as part of routine clinical practice. No experimental interventions were performed. Patient confidentiality was maintained, and all data were anonymized.

Results
The present study included 43 pregnant women presenting with dyspeptic symptoms at the polyclinic of Tashkent State Medical University. The analysis revealed that dyspepsia was distributed across all trimesters, with a progressive increase in severity observed as gestational age advanced. The mean age of the study population was 28.9 ± 5.4 years, with the majority of patients falling within the 25–35-year age group. A sedentary lifestyle was reported in a significant proportion of patients, which appeared to contribute to both metabolic disturbances and gastrointestinal symptoms. As shown in (**Table 1)**, the distribution of patients according to trimester demonstrated that the highest proportion of dyspeptic cases occurred in the third trimester (37.2%), followed by the second trimester (34.9%) and first trimester (27.9%). This finding suggests a strong association between advancing gestational age and increased symptom burden. The body mass index distribution is presented in (**Table 2)**, which indicates that a majority of patients were either overweight (41.9%) or obese (25.6%), with only 32.6% falling within the normal BMI range. The mean BMI of the study population was 27.6 ± 3.5 kg/m², reflecting a predominance of overweight status among the participants. Biochemical parameters are summarized in (**Table 3**), which reveals a high prevalence of metabolic abnormalities among the study population. Hypertriglyceridemia was the most common finding (46.5%), followed by elevated HbA1c levels (41.9%) and

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fasting glucose levels (39.5%). These findings indicate a substantial burden of metabolic dysregulation in pregnant women with dyspepsia. As illustrated in (**Table 4)**, symptom severity increased progressively with gestational age, with mean scores rising from 6.8 ± 1.2 in the first trimester to 7.5 ± 1.0 in the third trimester. This trend reflects the cumulative impact of hormonal and mechanical factors on gastrointestinal function during pregnancy. Treatment effectiveness is demonstrated in (**Table 5)**, where dimethicone-based therapy resulted in the most significant reduction in symptom scores, decreasing from 7.3 ± 1.1 to 3.9 ± 1.0 (mean reduction 3.4, $p < 0.001$). Metabolic supportive therapy also produced a statistically significant improvement, with scores decreasing from 7.1 ± 1.2 to 4.4 ± 1.0 (mean reduction 2.7, $p = 0.002$), particularly in patients with underlying metabolic abnormalities. Correlation analysis presented in **Table 6** revealed significant negative relationships between metabolic parameters and treatment response. Higher BMI ($r = -0.46$, $p = 0.004$), fasting glucose ($r = -0.39$, $p = 0.012$), triglycerides ($r = -0.43$, $p = 0.008$), and HbA1c ($r = -0.49$, $p = 0.003$) were associated with reduced symptom improvement, indicating that increased metabolic burden adversely affects therapeutic outcomes. Overall, these findings demonstrate that dyspepsia severity increases with advancing gestational age and is significantly influenced by metabolic factors, with higher BMI and biochemical abnormalities associated with poorer treatment response.

Table 1: Trimester-wise Distribution of Patients (n=43)

Trimester	Frequency	Percentage (%)
First	12	27.9
Second	15	34.9
Third	16	37.2

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Table 2: BMI distribution among pregnant women (n=43)

BMI Category	Frequency	Percentage (%)
Normal	14	32.6
Overweight	18	41.9
Obese	11	25.6

Table 3: Biochemical parameters (n=43)

Parameter	Mean± SD	Elevated (%)
Fasting glucose (mmol/L)	6.4 ± 1.3 mmol/L	39.5
Triglycerides (mmol/L)	2.3 ± 0.6 mmol/L	46.5
HbA1c (%)	6.6 ± 1.0%	41.9

Table 4: Symptom severity by trimester (pre-treatment scores) (n=43)

Trimester	Mean Symptom Score (0-10)
First	6.8 ± 1.2
Second	7.2 ± 1.1
Third	7.5 ± 1.0

Table 5: Treatment Effectiveness (Symptom Reduction After 14 days) (n=43)

Medication	Pre-treatment score	Post-treatment score	Reduction	p-value
Dimethicone based therapy	7.3± 1.1	3.9±1.0	3.4	<0.001
Metabolic supportive therapy	7.1± 1.2	4.4±1.0	2.7	0.002

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Table 6: Correlation between Metabolic Parameters and Symptom Improvement (n=43)

Variable	r-value	p-value
BMI vs symptom reduction	-0.46	0.004
Fasting glucose vs improvement	-0.39	0.012
Triglycerides vs improvement	-0.43	0.008
HbA1c vs improvement	-0.49	0.003

Discussion

This study provides a comprehensive evaluation of dyspepsia in pregnancy, highlighting the interplay between hormonal, mechanical, metabolic, and pharmacological factors influencing symptom development and treatment response. The progressive increase in dyspeptic symptoms across trimesters, with peak severity in the third trimester, aligns with established physiological mechanisms. Elevated progesterone levels reduce gastrointestinal motility and delay gastric emptying, while mechanical compression from the enlarging uterus further exacerbates symptoms [1,2,6]. These combined effects explain the higher symptom burden observed in later pregnancy. Anthropometric factors, particularly BMI, were found to significantly influence both symptom severity and treatment outcomes. These findings are consistent with previous studies conducted in similar populations [3,4]. The high prevalence of overweight and obesity in this study reflects global trends and contributes to increased intra-abdominal pressure, impaired gastric motility, and altered gastrointestinal physiology [4]. Additionally, adipose tissue functions as an endocrine organ, releasing inflammatory mediators that may further affect gastrointestinal sensitivity. The observed negative correlation between BMI and symptom improvement underscores the importance of weight-aware management strategies during pregnancy. Metabolic factors also played a critical role.

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Pregnancy-induced insulin resistance, when exaggerated, leads to hyperglycemia and elevated HbA1c levels, which impair autonomic regulation of gastric motility [2,3]. The strong negative correlation between HbA1c and treatment response suggests that chronic glycemic dysregulation significantly reduces therapeutic effectiveness. Similarly, elevated triglyceride levels contribute to systemic inflammation and gastrointestinal dysfunction [3]. Similar metabolic associations have been reported in previous obstetric studies. Pharmacological findings in this study emphasize the importance of mechanism-based therapy. Dimethicone-based therapy demonstrated the most significant improvement in symptoms, particularly bloating and abdominal discomfort. Its mechanism—reducing surface tension of gas bubbles—directly targets one of the primary contributors to dyspepsia in pregnancy [5]. Its lack of systemic absorption ensures safety for both mother and foetus, making it an ideal first-line agent. Metabolic supportive therapy using xylitol-based formulations showed moderate but meaningful improvement, particularly in patients with biochemical abnormalities. Unlike dimethicone, xylitol acts indirectly by stabilizing metabolic parameters through insulin-independent pathways, thereby improving gastrointestinal function over time. This explains its slower but sustained therapeutic effect. The exclusion of doxycycline from treatment is clinically significant. Although effective in non-pregnant populations, its ability to cross the placenta and chelate calcium can lead to fetal skeletal abnormalities and dental discolouration [3]. This reinforces the importance of strict adherence to safety guidelines in pregnancy. Overall, the findings support a multidimensional approach to dyspepsia management in pregnancy. Combining safe symptomatic therapy with metabolic correction offers optimal outcomes. Early identification and management of metabolic abnormalities may also reduce the risk of complications such as gestational diabetes, improving both maternal and fetal prognosis.

Conclusion

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Dyspepsia in pregnancy is a complex and multifactorial condition arising from the combined effects of hormonal changes, mechanical factors and metabolic disturbances. The severity of symptoms increases progressively with advancing gestational age, with the third trimester representing the period of greatest clinical burden. Anthropometric factors, particularly elevated body mass index, play a significant role in both the development and persistence of dyspeptic symptoms, while biochemical abnormalities such as elevated HbA1c, fasting glucose, and triglycerides further exacerbate gastrointestinal dysfunction and reduce responsiveness to treatment. The findings of this study demonstrate that dimethicone-based therapy is the most effective and safest option for rapid symptomatic relief, owing to its localized mechanism of action and lack of systemic absorption. Metabolic supportive therapy using xylitol-based formulations provides additional benefit, particularly in patients with underlying metabolic abnormalities, by improving metabolic stability and indirectly enhancing gastrointestinal function. The exclusion of doxycycline from treatment in pregnant patients reinforces the importance of adhering to safety guidelines and avoiding medications with known teratogenic potential. Overall, the study highlights the importance of a personalized and mechanism-based approach to dyspepsia management in pregnancy, integrating clinical evaluation with anthropometric and biochemical assessment to guide therapeutic decisions. Such an approach not only improves symptom control but also promotes maternal and fetal well-being, making it an essential component of modern obstetric care.

Conflict of Interest

The authors declare no conflict of interest.

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