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PREVALENCE AND ASSOCIATED RISK FACTORS OF GESTATIONAL DIABETES MELLITUS AMONG PREGNANT WOMEN ATTENDING HAYATABAD MEDICAL COMPLEX, PESHAWAR

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Abstract

Background: *Gestational diabetes mellitus (GDM) is a significant persistent illness that has detrimental effects on both the mother and the foetus. In nations such as Pakistan, where healthcare resources and knowledge are constrained, the increasing incidence of gestational diabetes mellitus (GDM) presents considerable health hazards.*

Aims: *This study aimed to determine the frequency and risk factor associated with GDM among pregnant women at Hayatabad Medical Complex, Peshawar, Pakistan.*

Material and Methods: *A total of 152 pregnant women diagnosed with GDM were enrolled using a non-probability convenience sampling technique. Data were collected via a structured questionnaire addressing demographic information and knowledge related to GDM. Data analysis was performed using SPSS version 22.*

Results: *The study recruited 152 pregnant women overall with a 100% response rate. With a higher proportion of diagnosis occurring in the second trimesters (50.7%), and third trimesters (24.3%), gestational diabetes mellitus (GDM) was 49.3% prevalent. Women between 25 and 30 years had the largest age distribution of GDM cases—38.2%; followed by 31–36 years—29.6%; and 37–42 years—32.2%. Although early statistical analysis did not demonstrate a significant link ($p = 1.00$), a noteworthy fraction of participants—76.3%—said their family history of diabetes was positive. Body mass index (BMI) analysis showed that 45.4% of GDM sufferers had a normal BMI; 27.6% were overweight; and 27% were obese. Between BMI category and GDM diagnosis, chi-square analysis revealed no statistically significant correlation ($p > 0.05$). Age groups similarly showed no appreciable correlation with GDM status ($p > 0.05$). Apart from that, 37.5% of subjects had raised readings whereas 59.9% had normal blood pressure before pregnancy. Just 1.3% of respondents said they smoked.*

Conclusion: *GDM is an escalating global health concern, with maternal obesity, family history of diabetes, advanced age, and poor diet among the main risk factors. Early screening and diagnosis are critical to safeguarding maternal and fetal health.*

Keywords: *Descriptive Gestational Diabetes Mellitus (GDM), Pregnancy complications, Peshawar, Trimester-specific diagnosis*

INTRODUCTION

Gestational diabetes mellitus (GDM) is a prevalent complication of pregnancy characterized by placental hormones that disrupt insulin utilization, resulting in the accumulation of glucose in the bloodstream rather than its absorption by cells. Risk factors encompass obesity, Westernized dietary patterns, micronutrient deficiencies, advanced maternal age, and a familial predisposition to insulin resistance or diabetes (1). Gestational Diabetes Mellitus (GDM), also known as gestational diabetes, is a notable obstetric complication marked by increased blood glucose levels during pregnancy. It presents significant dangers to both maternal and fetal health. The syndrome generally arises from insulin resistance and hormonal changes during pregnancy, however its precise etiology remains unclear (2, 3). Worldwide,

hyperglycemia in pregnancy impacts over 15% of expectant mothers, with a significant rise in gestational diabetes mellitus (GDM) seen in nations like China, where prevalence escalated from 4.3% in 2009 to 17.5% in 2015. Reports reveal notably elevated rates across South Asia, underscoring the need for comprehensive control efforts (4).

In 2017, the global prevalence of hyperglycemia during pregnancy was estimated at 16.2%, with 86.4% of cases due to gestational diabetes mellitus (GDM). In the United States, 6–9% of pregnancies are affected by gestational diabetes mellitus (GDM), whereas 1–2% includes pre-existing diabetes. The prevalence of diabetes in pregnancy has increased in recent years (5).

The recurrence rate of gestational diabetes mellitus fluctuates significantly, from 30% to 84%, depending upon demographic factors and the diagnostic criteria used (6). Moreover, gestational diabetes mellitus (GDM) is a substantial predictor of subsequent metabolic problems, with over 50% of afflicted women progressing to type 2 diabetes within ten years (7). Multiple risk factors, such as advanced mother age, familial diabetes history, obesity, tobacco use, and ethnic origin, have been linked to heightened susceptibility to gestational diabetes mellitus (8). Recent results indicate a possible role of genetic predisposition and environmental factors, including endocrine-disrupting chemicals, in the onset of gestational diabetes mellitus (GDM), hence requiring a multidisciplinary strategy for its prevention and treatment (9).

Recent research underscores the significance of lifestyle and nutritional variables as critical drivers of gestational diabetes mellitus (GDM) risk during both pre-pregnancy and post-pregnancy phases (10, 11). Numerous international studies have recognized maternal obesity, polycystic ovarian syndrome, corticosteroid administration, and hypertension as substantial factors leading to detrimental maternal and foetal outcomes, such as preeclampsia, infections, caesarean sections, macrosomia, and congenital anomalies (12). In light of these results, there is an imperative need for early identification, lifestyle adjustment, and enhanced prenatal treatment to alleviate long-term maternal and newborn problems linked to gestational diabetes mellitus (GDM) (13).

Genetic susceptibility significantly influences the development of gestational diabetes mellitus, as shown by family clustering studies (14, 15). Alongside genetic predisposition, increasing maternal age, especially after 25 years, is acknowledged as a significant risk factor (16). Women with a history of gestational diabetes mellitus are at an increased risk of having hypertension and cardiovascular problems in later life (17). The etiology of gestational diabetes mellitus (GDM) is closely associated with insulin resistance, where normal insulin levels do not provoke a sufficient cellular response, requiring compensatory hyperinsulinemia. The metabolic disruptions encountered during pregnancy considerably impact mother and foetal health, underscoring the need of focused management (18).

The American Diabetes Association advises screening for gestational diabetes mellitus (GDM) around 24–28 weeks of gestation utilizing either a one-step (75-g oral glucose tolerance test) or a two-step (50-g glucose load followed by a 100-g oral glucose tolerance test if necessary) approach. The diagnostic thresholds for the one-step approach are fasting plasma glucose ≥92 mg/dL, 1-hour glucose ≥180 mg/dL, and 2-hour glucose ≥153 mg/dL. The two-step technique confirms gestational diabetes mellitus (GDM) with fasting glucose levels ≥95 mg/dL, 1-hour glucose levels ≥180 mg/dL, 2-hour glucose levels ≥155 mg/dL, or 3-hour glucose levels ≥140 mg/dL. The American Congress of Obstetricians and Gynaecologists (ACOG) recommends thresholds of 135–140 mg/dL for the two-step approach (19).

Dietary management and regular screening are essential elements in the prevention and treatment of gestational diabetes mellitus (20). the national institutes of health (NIH) advises screening from the 24th to 28th weeks of gestation, with supplementary criteria suggested by the American diabetes association (ada) to enhance diagnosis accuracy. The worldwide diversity in gestational diabetes mellitus prevalence, especially the elevated rates in urban vs rural populations, highlights the need for standardized diagnostic criteria (21). Maternal hyperglycemia, even at levels below diabetic thresholds, is linked to negative foetal outcomes, such as macrosomia and an elevated long-term risk of type 2 diabetes (22). This research is to

ascertain the prevalence of gestational diabetes mellitus (GDM) and to investigate its related risk factors among pregnant women at Hayatabad Medical Complex.

MATERIALS AND METHODS

This descriptive cross-sectional study was performed at Hayatabad Medical Complex in Peshawar for a duration of six months. A total of 152 pregnant women attending the Gynaecology Department were recruited by non-probability convenience sampling. Gestational diabetes mellitus (GDM) was diagnosed based on the criteria established by the American Diabetes Association (ADA), utilizing the oral glucose tolerance test (OGTT). A diagnosis was confirmed if any of the following values were fulfilled or exceeded: fasting plasma glucose ≥92 mg/dL, 1-hour ≥180 mg/dL, or 2-hour ≥153 mg/dL. Body mass index (BMI) was categorized as follows: normal (18.5–24.9 kg/m²), overweight (25.0–29.9 kg/m²), and obese (≥30.0 kg/m²), based on World Health Organization (WHO) standards (23).

Data were gathered using a standardized questionnaire developed from Zahid Hussain et al. (2014)(24), which examined the prevalence and risk variables related to gestational diabetes mellitus (GDM). The tool had a pilot test prior to distribution to verify clarity and contextual relevance, and internal consistency reliability was verified using Cronbach's alpha. Participants granted written informed consent, and ethical approval was secured from the institutional review board. Confidentiality was maintained during the study.

Statistical analysis was conducted with SPSS version 22. Descriptive statistics, comprising frequencies and percentages, were employed to summarize the data. Graphs and tables, such as bar charts and pie charts, were employed to graphically convey the results.

RESULTS

This trial involved 152 patients, attaining a 100% response rate over six months. Table 1 reveals that n = 58 (38.2%) of the patients aged 25 to 30 had gestational diabetes mellitus; n = 45 (29.6%) aged 31 to 36 year also developed the condition; and n = 49 (32.2%) were aged 37 to 42. The data indicates that n = 75 (49.3%) have a prior diagnosis of gestational diabetes mellitus, whereas n = 77 (50.7%) do not, and n = 2 (1.3%) have utilized cigarettes or tobacco. Additionally, n=150 (98.7%) abstain from smoking or using tobacco products. table n = 116 (76.3%) of the patients had a familial history of diabetes. n = 36 (23.7%) do not have any family history of diabetes.

Table I. Distribution of study variables among pregnant women diagnosed with gestational diabetes mellitus (GDM) at Hayatabad Medical Complex, Peshawar (N = 152)

Study variable	Variable	Frequency (n)	Percent (%)
Age of GDM individual	25 to 30	58	38.2
	31 to 36	45	29.6
	37 to 42	49	32.2
Type of diabetes before pregnancy	Yes	58	38.2
	No	94	61.8
Have you had gestational diabetes?	Yes	75	49.3
	No	77	50.7
Use tobacco or cigarette	Yes	2	1.3
	No	150	98.7
Family history of diabetes	Yes	116	76.3
	No	36	23.7

In this study, we enrolled 152 patients with a 100% response rate over a 6-month period According to the table (2) below, n = 32 (21.1%) of the patient have GDM during the first trimester, n = 43 (28.3%) of the patient have GDM during the second trimester, and n = 77 (50.7%) of the patient have GDM during the third trimester, n = 69 (45.4%) shown in the Fig. 1 have a normal body mass index, n = 42 (27.6%) have an overweight body mass index, and n = 41 (27.0%) have an obesity body mass index, n = 35 patients, or 23% of the total, are working women. n=117 patients, or 77%, have a housewife. n = 38 (25% of the patients) have

gestational diabetes mellitus diagnosed during the first trimester, n = 77 (50.7%) of the patients have gestational diabetes mellitus diagnosed during the second trimester, and n=37 (24.3%) of the patients have gestational diabetes mellitus diagnosed during the third trimester, n=31 (20.4%) of the patients have used insulin before, and n=121 (79.6%) have not used insulin before. n=91 (59.9%) of the patients had normal blood pressure at their last visit before pregnancy. n=57 (37.5%) of the patients had high blood pressure at their last visit before pregnancy, while n=4 (2.6%) had low blood pressure at their last visit before pregnancy.

Table II. Distribution of clinical and demographic characteristics among pregnant women diagnosed with gestational diabetes mellitus (GDM) at Hayatabad Medical Complex, Peshawar (n = 152)

Study variable	Variable	Frequency (n)	Percent (%)
Duration of pregnancy [Trimester]	first trimester	32	21.1
	second trimester	43	28.3
	third trimester	77	50.7
Body mass index	normal	69	45.4
	over weight	42	27.6
	obesity	41	27.0
Occupational status	working women	35	23.0
	house women	117	77.0
Gestational diabetes mellitus diagnosed	during 1st trimester	38	25.0
	during 2nd trimester	77	50.7
Use insulin before	yes	31	20.4
	no	121	79.6
Blood pressure at last visit before pregnancy	normal	91	59.9
	high	57	37.5
	low	4	2.6

In this study, we enrolled 152 patients with a 100% response rate over a 6-month the Table III shows that N=31 (20.4%) of patients have GDM if this is their first pregnancy, n=47 (30.9%) if this is their second pregnancy, and n=74 (48.7%) if this is their other pregnancy. n=18 (11.8%) of the patients have allergies, while n=134 (88.2%) have no allergies. n=124 (81.6%) of the patients have jobs throughout pregnancy, whereas n = 28 (18.4%) of workers do not have jobs during pregnancy. n=82 (53.9%) of the patients have stress around pregnancy time, whereas n = 70 (46.1%) of the patients have no stress around pregnancy time. n=116 OR 76.3% of the patient have a lower or secondary education, n=5 or 3.3 percent of the patient have a diploma of the education, and n=31 or 20.4 percent of the patient have a graduate of the education.

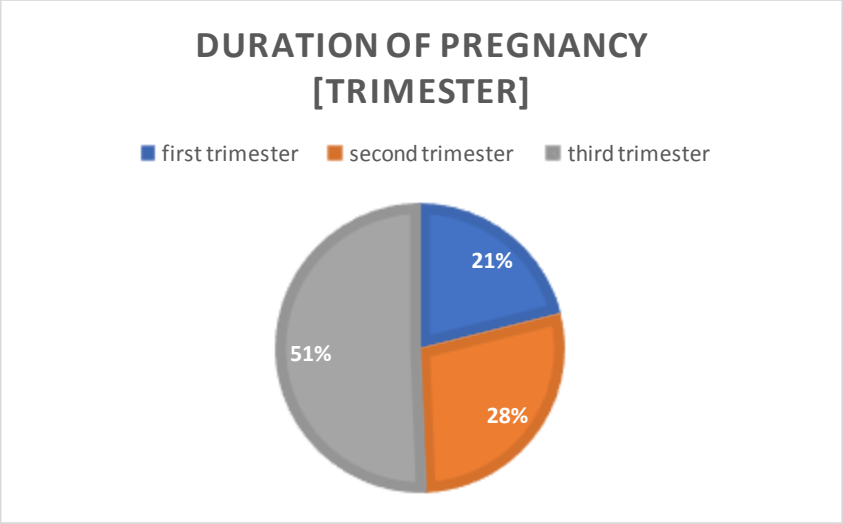

Fig. 1. Distribution of individual according to trimester

Table III. Distribution of obstetric history, allergy status, occupational factors, stress levels, and educational background among pregnant women diagnosed with gestational diabetes mellitus (GDM) at Hayatabad Medical Complex, Peshawar (n = 152)

Study variable	Variable	Frequency	Percent
In what pregnancy you have GDM	1st pregnancy	31	20.4
	2nd pregnancy	47	30.9
	Other	74	48.7
	Total	152	100.0
Do you have any allergies?	Yes	18	11.8
	No	134	88.2
	Total	152	100.0
Did you work around pregnancy time	Yes	124	81.6
	No	28	18.4
	Total	152	100.0
Were you stressful around pregnancy time	Yes	82	53.9
	No	70	46.1
	Total	152	100.0
Educational Level	Lower or Secondary	116	76.3
	Diploma	5	3.3
	Graduate	31	20.4
	Total	152	100.0

A chi-square test was employed for the statistical analysis of categorical variables to evaluate the relationships between certain risk factors and the occurrence of gestational diabetes mellitus (GDM). Despite a large incidence of familial diabetes history among patients (76.3%), chi-square analysis indicated no statistically significant correlation with GDM status ($\chi^2 = 0.00$, $p = 1.00$). No significant relationships were found between the diagnosis of gestational diabetes mellitus (GDM) and body mass index (BMI) categories or maternal age groups, with p-values above 0.05 in both instances.

DISCUSSION

Cutaneous leishmaniasis continues to pose a significant challenge, especially when complicated by secondary bacterial infections. Our study confirms that secondary bacterial infections considerably diminish the therapeutic effectiveness of Glucantime, which is the first-line treatment for CL. Our results show a significant difference in treatment response between the two groups: 72% of culture-negative patients responded well to Glucantime, while only 37.7% of culture-positive patients exhibited complete healing. This finding underscores the adverse impact of bacterial colonization on lesion healing, consistent with earlier studies that have demonstrated a delay in healing when bacterial infections are present (15). The presence of bacterial infection, particularly Staphylococcus aureus, as the most commonly isolated pathogen, correlated with poorer outcomes, leading to prolonged lesion persistence and inflammation.

Our study's results also corroborate findings from various studies that suggest the detrimental effect of secondary bacterial infections on treatment outcomes. For example, in the study by Antonio et al. (2017), no significant difference was found between culture-positive and culture-negative patients, but this contrasts with our study where a clear difference in response to Glucantime was evident. This divergence could be due to variations in study design, the antibiotic pre-treatment in their cohort, or methodological differences in lesion assessment (16). In a similar vein, Sadeghian *et al.,* (2011) assessed the efficacy of systemic Glucantime in lesions complicated by bacterial infections. Among 38 culture-positive patients, 26 exhibited a poor response to treatment, whereas 43 of 123 culture-negative patients demonstrated a poor response (15). These results align closely with the findings of our study, indicating that bacterial infection significantly impacts treatment outcomes.

Similarly, Layegh *et al.,* (2015) conducted a study with 84 patients and observed no significant difference in the healing rates between culture-positive and culture-negative groups, which contrasts with our findings. This divergence may be attributed to differences in treatment protocols, such as the use of antibiotics (oral cephalexin) in their study, and sample size differences, which could affect statistical significance (17).

We also found polymicrobial infections, with S. aureus and E. coli being the most frequent isolates, suggesting that these patients may be exposed to unsanitary conditions that contribute to the high rate of bacterial co-infections. The presence of Escherichia coli, Enterococcus faecalis, and Enterobacter cloacae suggests possible fecal contamination, which aligns with previous literature indicating poor hygiene as a contributing factor to increased secondary bacterial infections (18-20).

The negative impact of bacterial infections on the therapeutic efficacy of Glucantime highlights the importance of considering secondary bacterial infections in the management of CL. The study strongly suggests that addressing bacterial co-infections with appropriate antibiotics before or in conjunction with antileishmanial therapy may enhance treatment outcomes and prevent complications related to poor healing.

CONCLUSION

Our study clearly demonstrates that secondary bacterial infections significantly impair the healing process and reduce the effectiveness of Glucantime in treating cutaneous leishmaniasis lesions. Patients with culture-negative lesions responded significantly better to Glucantime treatment than those with secondary bacterial infections, emphasizing the importance of managing bacterial infections in CL patients.

The findings suggest that a comprehensive treatment approach, which includes appropriate antimicrobial therapy for secondary bacterial infections, is essential before administering Glucantime. Proper wound care and infection prevention strategies should be integrated into the management plan for CL, especially in areas with poor hygiene. Moreover, a careful assessment of bacterial infections should be performed in CL lesions prior to starting antileishmanial treatment to optimize therapeutic outcomes and minimize the risk of developing drug resistance to Glucantime.

Given these results, it is essential for healthcare providers to consider both the parasitic infection and any potential bacterial co-infections in patients with CL to improve the overall treatment success and reduce the burden of the disease. Further studies exploring the role of antibiotic therapy in combination with antileishmanial drugs are warranted to enhance the efficacy of treatments for CL.

Authors' contribution:

IUH Conceptualization; ZK and MK Methodology; AN, SA Formal Analysis; AA and OK Writing Review & Editing

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