

Prevalence of Gestational Diabetes Mellitus among Pregnant Women Undergoing Oral Glucose Tolerance Test (OGTT) at Chitwan Medical College and Teaching Hospital

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ARTICLE INFO

Article history:

Received: 01 May 2022

Revised: 17 June 2022

Accepted: 29 June 2022

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Citation:

Kafle D, Gupta BK, Timalisina S, Mandal F. Prevalence of Gestational Diabetes Mellitus among Pregnant Women Undergoing Oral Glucose Tolerance Test (OGTT) at Chitwan Medical College and Teaching Hospital. *MedS. J. Med. Sci.* 2022;2(3):24-27.

ABSTRACT

INTRODUCTION: Gestational Diabetes Mellitus (GDM) is defined as glucose intolerance of variable severity in which spontaneous hyperglycemia develops during pregnancy. GDM is affecting approximately 14% of pregnancies worldwide, representing approximately 18 million births annually. GDM increases the risk of adverse maternal and perinatal outcome and also increases risk of future diabetes to the mother and their child. **MATERIALS AND METHODS:** The cross-sectional study was carried out over 8 months in 149 pregnant subjects of gestation period between 24 and 28 at Chitwan Medical College Teaching Hospital (CMCTH). All pregnant women were considered for 50gm Glucose Tolerance Test (GCT). Those pregnant subjects with GCT \geq 140mg% only undergo 100 gm Oral Glucose Tolerance Test (OGTT) & plasma glucose were estimated at the interval of 0,1,2 and 3 hours respectively. The GDM was diagnosed after performing OGTT based on Carpenter-Coustan Criteria. **RESULTS:** In our study from 149 study population, the frequency of normal & abnormal GCT in pregnant women was 111(74.50%) & 38(25.50%) respectively. Out of 149 subjects only 38 pregnant women have abnormal GCT in which only 23 have done OGTT test. Among 23 subjects the presence of GDM was found in 9 subjects with 39.10% whereas GDM was not found in 14 subjects with 60.9%. The prevalence of GDM among 149 populations was found to be 9 which is 6.04%. **CONCLUSIONS:** The prevalence of GDM among 149 populations was found to be 6.04%. The real burden, risk factors, and potential preventative interventions of gestational diabetes mellitus must also be measured in large observational studies for finding the correlation to assess the severity of the disease.

Keywords: Carpenter-Coustan Criteria, Gestational Diabetes, Oral Glucose Tolerance Test.

INTRODUCTION

Gestational diabetes mellitus (GDM) is a common pregnancy complication, in which spontaneous hyperglycemia develops during pregnancy [1]. GDM is affecting approximately 14% of pregnancies worldwide, representing approximately 18 million births annually [2]. The risk factors of GDM include, overweight/obesity, diet, micronutrient deficiencies, advanced maternal age with a family history of insulin resistance and diabetes. GDM increases the risk of adverse maternal and perinatal outcome and also increases risk of future diabetes to the mother and their child [3]. The major morbidities associated with infants of diabetic mothers include respiratory distress, growth restriction, polycythemia, hypoglycemia, hypocalcemia, and hypomagnesemia, and congenital malformations [4]. Perinatal outcomes

associated with poor glycemic control in mothers are associated with as high as 42.9% mortality [5]. The prevalence of GDM is rising globally and if left untreated, the condition is associated with an increased risk of fetal and maternal complications such as preeclampsia and large-for-gestational age (LGA) infants [6,7]. The study was aimed to assess the prevalence of gestational diabetes mellitus in pregnant women attending Chitwan Medical College and Teaching Hospital.

MATERIALS AND METHODS

Study design and setting

The cross-sectional study was carried out from October 2021 to April 2022 at Chitwan Medical College Teaching Hospital (CMCTH), at Department of Biochemistry in collaboration with

Department of obstetrics and Gynecology of CMCTH. The data was collected from Chitwan Medical College Teaching Hospital (CMCTH) for this research work.

Participants and procedure

Total number of experimental subjects included were 149 pregnant women. All pregnant women of gestation period between 26 and 28 weeks were considered for 50gm Glucose Tolerance Test (GCT). Those pregnant subjects with $GCT \geq 140\text{mg}\%$, then undergo 100 gm Oral Glucose Tolerance Test (OGTT) & plasma glucose were estimated at the interval of 0,1,2 and 3 hours respectively. The GDM was diagnosed based on Carpenter-Coustan Criteria. According to Carpenter-Coustan Criteria for non-gestational diabetic subjects blood glucose levels of different intervals are i.e FPG = 95 mg/dl, 1 hour post prandial glucose = 180 mg/dl, 2 hour post prandial glucose = 155 mg/dl and 3 hour post prandial glucose = 140 mg/dl. If any two blood glucose values meet or exceeds in pregnant woman undergoing OGTT in 26th to 28th week of gestation period is considered Gestational Diabetes.

For OGTT after 100 g glucose load, 10ml of blood sample was drawn from anticubital vein at the interval of 0,1,2 and 3 hours respectively. The blood sample was collected in plain, fluoride and EDTA vacutainers. The blood sample was centrifuged for 10 min. at 3000 rpm at room temp. The serum was stored at 4°C for blood sugar estimations at the interval of 0,1,2 and 3 hours respectively. The participants included were reproductive age from 22 to 40 years pregnant woman of 24 and 28 weeks of gestation. The participants excluded were significant maternal diseases like connective tissue diseases, endocrine diseases, asthma, chronic liver disease etc. and Frank diabetes (Diabetes prior to pregnancy).

Statistical analysis and data management

Statistical analysis was done via SPSS software version 22. Descriptive statistics were computed. Mean and standard deviation were presented for normally distributed continuous data whereas median and range were presented for non-normally distributed data. Frequencies and percentage were presented for categorical data. Normality test was assessed through Shapiro Wilk Test at 5% level of significance.

Ethical considerations

The ethical committee of CMC (CMC-IRC/078/079-118) has approved this research work. Informed consent from the participants were taken and confidentiality was maintained.

RESULTS

In our study from 149 study population, the frequency of normal & abnormal GCT in pregnant women was 111(74.50%) & 38(25.50%) respectively (Figure 1).

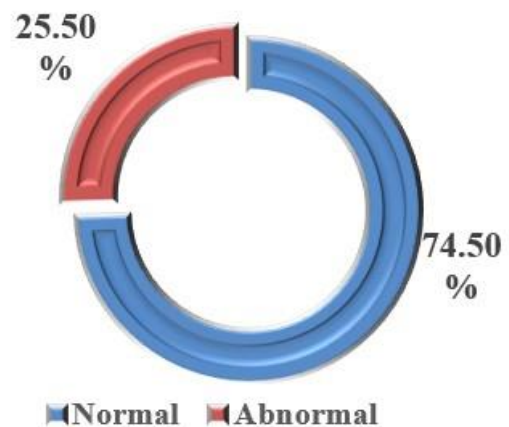


Figure 1| Frequency of normal & abnormal GCT among pregnant women

The pregnant woman fasting blood glucose in GCT was found 152 mg/dl which was highly significant as compared to OGTT test done in 0,1,2 and 3 hours respectively (Table 1).

Table 1| Descriptive Analysis on Glucose Tolerance Test Among Pregnant Women attending CMCTH (n=149)

Test	Mean \pm SD	Min/Max	Normality test
GCT (mg/dl)	152 (22)**	141/301	Not normal
FBG (mg/dl)	86.7 \pm 5.7	78/96	Normal
OGT1 Hrs (mg/dl)	173.3 \pm 33.6	122/228	Normal
OGT2 Hrs (mg/dl)	142.3 \pm 27.7	89/184	Normal
OGT3 Hrs (mg/dl)	100 \pm 29.6	43/152	Normal

** Denotes Median (IQR), SD denotes standard deviation

We found 38 pregnant subjects OGTT positive as compared to the normal pregnant woman which was highly significant in the age group of less than 25 years (Table 2).

Table 2 Association of GCT Status with Independent Variables among Pregnant Women (n=149)			
Variable	GCT status		Chi-square (P-value)
	Normal (%)	Abnormal (%)	
Body Mass Index			
Normal	29(72.5)	11(27.5)	0.735
Others	82(75.2)	27(24.8)	
Age group			
≤25 year	48(82.2)	9(15.8)	0.032**
Above 25 year	63(68.5)	29(31.5)	
Parity			
Primiparous	35(67.3)	17(32.7)	0.140
Others	76(78.4)	21(21.6)	
History of past illness			
Yes	9(52.9)	8(47.1)	0.030**
No	102(77.3)	30(22.7)	
History of diabetes			
Yes	38(77.6)	11(22.4)	0.549
No	73(73.0)	27(27.0)	

** Significant Association

Among 149 study population, only 23 have done OGTT in which fasting mean blood glucose in 22 subjects with 95.70% was normal & 1 subject with 4.30% was abnormal, OGTT after 1hrs. was normal in 12 subjects with 52.20% & 11 subjects with 47.80% was abnormal, after 2hrs. OGTT was normal in 15 subjects with 65.20% & 8 subjects with 34.80% was abnormal and after 3hrs. OGTT was normal in 21 subjects with 91.30% & 2 subjects with 8.70% was abnormal respectively (Table 3).

In our study, only 38 pregnant women have abnormal GCT in which only 23 have done OGTT test. Among 23 populations the presence of GDM was found in 9 subjects with 39.10% whereas GDM was not found in 14 subjects with 60.9%. The prevalence of GDM among 149 populations was found to be 9 which is 6.04%.

DISCUSSION

Gestational diabetes mellitus is one of the major public health issues in Asia. It is defined as any degree of hyperglycemia that occurs for the first time or is first detected during pregnancy. GDM is one of the leading causes of mortality and morbidity for both the mother and the infant worldwide.

In our study only 38 pregnant women have abnormal GCT in which only 23 have done OGTT test. The risk factors of GDM in these patients might be multiparity ≥ 2 , previous history of GDM, congenital anomalies, stillbirth, abortion, preterm delivery, macrosomia, having concurrent PIH, PCOS, age ≥ 25 , BMI ≥ 25 , and family history of diabetes might be the significant risk factors predictive of GDM in pregnancy.

Furthermore, low levels of physical activity increases the chances of developing GDM more than triple as compared to a high level of physical activity during pregnancy. A higher degree of exercise during pregnancy lowers blood sugar levels by reducing weight gain and improving insulin sensitivity [8]. Similarly, many women depend on the cereals food group during pregnancy so consumption of too many refined sugars and carbohydrates in their diets might be the cause for GDM in pregnancy [9].

The overall prevalence of GDM among 149 populations was found to be 9(6.04%). BMI is a commonly used method to measure the severity of obesity, which is one of the main factors of glucose tolerance in the development of diabetes and GDM. The prevalence of GDM was highest among Asian women with BMI ≥ 30 kg/m². Our studies were in consistent with Nilofer et al. 2012 [10] and Wahi et al. 2011 [11]. The prevalence of GDM in National Medical College Birgunj was 8.29% [12] whereas the prevalence was 4.8% with regard to Yadav et al 2013 [13].

Also, the patient with BMI > 25 had 27(24.8%) abnormal GCT and abnormal OGTT had 8(47.1%) which is inconsistent with Ray R et al. 1995 [14]. It might be because of pregnancy in younger age. There was no statistical significant between the raised GCT with respect to age, race and body mass index which was consistent with Wong L et al 2001 and Bhat RA et al. 2006 [15,16] but in our study there is statistical significant between the raised GCT with respect to age and history of past illness.

Table 3 Comparative Study of Blood Sugar Level between Normal and OGTT Patients of 1, 2, and 3 hours respectively				
Characteristics	OGTT			
	FBG	1hrs	2hrs	3hrs
Normal	22	12	15	21
Abnormal	1	11	8	2

When compared to women without depressive symptoms, those with prenatal depression had GDM that was four times greater. Depression before conception could increase the chance of GDM. Pregnancy depression, family history of diabetes, poor levels of physical activity, overweight or obese women, and insufficient nutritional diversification may all be risk factors for GDM [17]. Obesity, poor eating habits, and decreased physical activity are the risk factors of developing GDM which be might associated with low socioeconomic status and also attributed to geographical variation as well [18]. Due to logistical

and financial restrictions, there is not much information regarding GDM among Nepalese women population. However, since our study is a single centric study, it is recommended that our findings should be substantiated with more larger, multi-centric studies in the future.

CONCLUSIONS

The prevalence of GDM among 149 populations in this cross-sectional study was found to be 6.04%. Furthermore, the real burden, risk factors, and potential preventative interventions of gestational diabetes mellitus must also be measured in large observational studies conducted locally.

ADDITIONAL INFORMATION AND DECLARATIONS

Acknowledgements: Authors wish to thank all the participants for all their supports during this study.

Competing Interests: The authors declare no competing interests.

Funding: Self-funded

Author Contributions: Concept and design: D.K, S.T; Statistical analysis: D.K; Writing of the manuscript: D.K; B.G Data collection: B.G; Revision and editing: D.K; S.T; F.M; B.K. All authors have read and agreed with the contents of the final manuscript towards publication.

Data Availability: Data will be available upon request to corresponding authors after valid reason.

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