Prevalence of Abnormal Glucose Challenge Test and Oral Glucose Tolerance Test in Pregnancy

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ABSTRACT

Introduction

Gestational Diabetes is one of the most prevalent endocrine disorders during pregnancy; associated with adverse maternal and fetal outcome. So, screening is mandatory for timely diagnosis and management. The main objective of this research is to find the prevalence of abnormal glucose challenge test and oral glucose tolerance test in pregnancy.

Methods

A cross-sectional study was conducted among 480 antenatal women of 24-28 weeks gestation at College of Medical Science-Teaching Hospital Bharatpur, Nepal from Jan-Dec 2020 after ethical approval from COMS-IRC.

Results

Gestational diabetes mellitus was most common in women of age group 20-30 years (62.06%). Higher percent of women with gestational diabetes were Multigravida (75.86%), high body mass index (p-value: 0.01). Fifty eight percent women with gestational diabetes had statistically significant family history of diabetes in first degree relatives (p-value 0.036). In our study, prevalence of impaired glucose challenge test was 60 (12.5%) and that of gestational diabetes mellitus was 29 (6.04%).

Conclusions

The prevalence of gestational diabetes mellitus is high with multiparity, family history of diabetes and obesity. The test is easy, cheap, feasible and patient friendly method for screening gestational diabetes mellitus.

Keywords: glucose challenge test; gestational diabetes mellitus; oral glucose tolerance test; prevalence; risk factors; screening.

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INTRODUCTION

Gestational Diabetes is the most prevalent endocrine disorders during pregnancy & its prevalence is in rising fashion; affecting older, obese women in 2nd trimester in developing countries creating socioeconomic & medical burden. Gestational diabetes mellitus (GDM) is defined as any severity of glucose intolerance with onset or 1st recognition during pregnancy, excluding overt diabetes of early pregnancy.[1] GDM is characterized by pancreatic beta-cell dysfunction, returns to normal glucose tolerance after delivery, but few are at increased risk of diabetes later in life.[2] Globally, the prevalence of GDM ranges from 1%-28% and 2.5% in Nepal. [3] Insulin sensitivity is one of the important metabolic adaptations, whose sensitivity shift according to requirement over course of pregnancy.4 During 2nd & 3rd trimester insulin resistance increases by placental hormones leading to significant maternal and fetal morbidities.5 The effect of screening and timely clinical management of GDM has been proved to improve both maternal and fetal outcome.6 The objective of this research is to find out the prevalence of abnormal glucose challenge test and oral glucose tolerance test in pregnant lady attending Antenatal care (ANC) visit at college of medical sciences teaching hospital.

METHODS

An analytical cross sectional study was conducted in the department of Obstetrics and Gynecology, College of Medical Sciences, Bharatpur, Chitwan Nepal from 1st January 2020 to 31st December 2020. Ethical approval was taken from Institutional review committee of College of Medical Sciences (COMSTHIRC-2019/153). Inform and written consent was taken from all the patients before data collection. All singleton pregnancy visiting antenatal clinic between gestational age of 24-28 weeks. Were included in this research. Patients with multiple pregnancy, women with overt diabetes before pregnancy were excluded from this research. First 1 hour glucose challenge test (GCT) after taking 50gm of glucose and for those with impaired GCT, 3 hours OGTT was done to confirm the diagnosis. Those patients with GCT value more than 200mg/dl were already diagnosed as GDM. The purpose of this study was to find out the prevalence of GDM (Carpenter and Coustan method), among pregnant women coming for Antenatal care visit (ANC) at College of Medical Sciences Teaching Hospital (COMS-TH) Bharatpur, Chitwan, fulfilling the study criteria and to evaluate the risk factors of GDM. Our study variables were age, gravidity, BMI, past history (pre-eclampsia, GDM, large or small for gestational age baby, Stillbirth, congenital anomaly, operative interventions). All data were plotted in SPSS 24 and analyzed. A chi-square test ($\chi2$ test) was any statistical hypothesis test wherein the sampling distribution of the test statistic is a chi-squared distribution when the null hypothesis is true. Unpaired proportions were compared by Chi-square test or Fischer's exact test, as appropriate. P-value ≤ 0.05 was considered for statistically significant.

RESULTS

This table shows the sociodemographic characteristics of the patients. Regarding the age 28.3% women were more than 30years of age, 60% of them were multi gravida, 21.4% had more than one times abortion, 51.66% had over weight and obesity (Table 1).

Table 1. Clinico-Sociodemographic characteristics of patients. (n = 60)	
Variables	**Impaird GCT Number (%)**
Age group (years)	
≤30	43(71.7)
> 30	17(28.3)
Parity	
Primi	24(40)
Multi	36(60)
Abortion history(n=14)	
One times	11(78.5)
More than one times	3(21.4)
BMI	
<24.9kg/m^2	13(48.33)
>25	47(51.66)
Past history	
Yes	20(33.3)
No	40(66.7)
Cesarean section	
Yes	14(23.33)
No	46(76.66)
Family history of DM	
Yes	26(43.33)
No	34(56.66)

In this study, among 60 women with impaired GCT, seven women had GCT value more than 200mg/dl and they are diagnosed as GDM and only 53 women underwent OGTT testing with 100gm glucose and total 29 women were finally diagnosed as GDM cases. OGT fasting blood glucose level shows median of 90 and IQR of 14.75 with minimum value 73mg/dl and maximum being 217.5 mg/dl. OGTT on first hour has Mean ± SD = 180.4 ± 26.6, OGTT on second hour has Mean ± SD = 144.4 ± 23.7, and OGTT on third hour has Mean ± SD = 107.7 ± 27.5 (Table 2).

Table 2. Descriptive measures of oral glucose test among pregnant women attending college of medical science teaching hospital Bharatpur. (n = 53)

Variables	Statistics	Min/Max
OGT fasting	Median/IQR = 90/14.75	73/217.5
OGT 1	Mean ± SD = 180.4 ± 26.6	108.3/235.5
OGT 2	Mean ± SD = 144.4 ± 23.7	91/203
OGT 3	Mean ± SD = 107.7 ± 27.5	50/200

This table shows the statistically significant association between parity, BMI and family history of DM (p-value< 0.05) (Table 3).

Variables	GDM		p-value
	Yes (%)	No (%)	
Age group (years)			
≤30	19(65.51)	24(77.41)	0.616
> 30	10(34.48)	7(22.58)	
Parity			
Primigravida	7(24.13)	17(70.83)	0.019
Multigravida	22(75.86)	14(38.88)	
Abortion history(n=14)			
One times	6(20.68)	5(16.12)	0.615
More than one times	2(6.89)	1(3.22)	
BMI			
<24.9kg/m^2	2(6.89)	11(35.48)	0.01[#]
>25	27(93.10)	20(64.51)	
Past history			
Yes	13(44.82)	7(22.58)	0.1
No	16(55.17)	24(77.41)	
Cesarean section			
Yes	8(27.58)	6(19.35)	0.519
No	21(72.41)	25(80.64)	
Family history of DM			
Yes	17(58.62)	9(29.03)	0.036[#]
No	12(41.37)	22(70.96)	

Table 3. Association between gestational diabetes mellitus and independent variables.
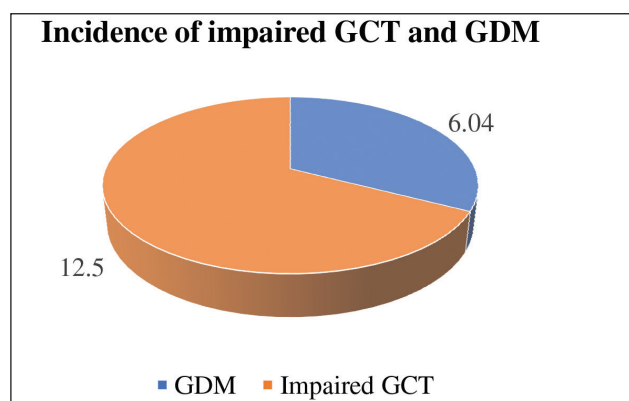

Figure 1. Incidence of impaired GCT and GDM among pregnant.

In this study, among 480 pregnant women attending ANC, 60 (12.5%) women had impaired GCT while, 29(6.04%) women were diagnosed to be cases of GDM after both GCT and OGTT testing (Figure 1).

In this study, the age of pregnant women ranged from 18-41 years. Mean±SD was 28.28±5.02 years. Most of the GDM cases were in the age group 20-30 years 18(62.06%)), followed by 31-40 years nine (31.03%)), one (3.44%) each of less than 30 years and more than 40 years of age (Figure 2).
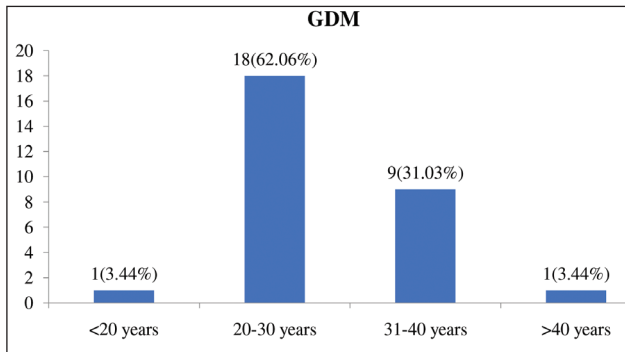
Figure 2. Distribution of Age group among GDM cases. (n=29)

In this study of 29 women with GDM, two (6.89%) women had BMI <24.9kg/m², while 29(93.10%) had BMI > 25kg/m². In this study 93.10% with GDM women are overweight and obese (Figure 3).
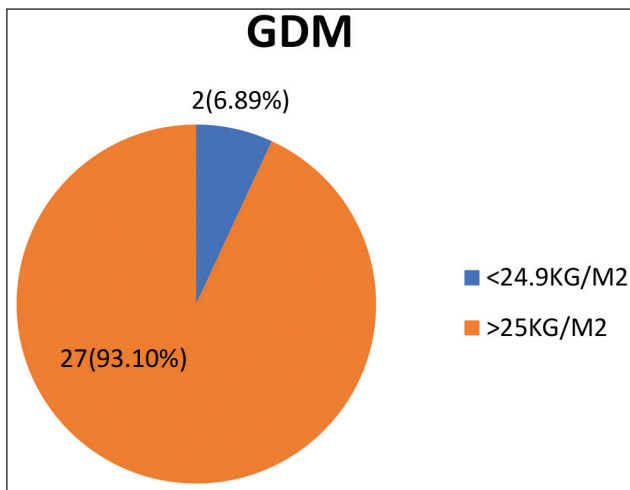

Figure 3. BMI of women diagnosed to have GDM (n=29).

DISCUSSION

Screening with GCT using 50gm glucose is easy, cost effective, patient friendly and is convenient. Test can be done irrespective of fasting state and time of a day and no complains about any adverse effect of test noted till now. Among 480 women 60 patients had impaired GCT and those with high GCT underwent OGTT, diagnosis of GDM made according to Carpenter and Coustan criteria, total of 29 patients were diagnosed as GDM patients. This makes the prevalence of

GDM to be 6.04%. According to World Health Organization, the prevalence of GDM is 2.5% in Nepal. In United States, prevalence of GDM ranges from 1.4%-14%, while Caucasians have highest prevalence of GDM ranging from 15-21%.[7]

Shrestha B et al. performed a hospital based cross-sectional study in a period of 1 year among 600 pregnant ladies at Nepal medical college teaching hospital and the prevalence of GDM was found to be 4.5%.[8] Prevalence of GDM can vary according to demographic region, race, ethnicity and use of different screening methods used. Our study has similar result regarding GDM is more common with increasing age (mean age 28.2±5.02 years) with studies by Agarwal et al[9] (28.2 years), Huang et al[10] (28.4 years). In our study, 75.86% were Multigravida showing GDM increased with parity similar to study conducted by Seshiah et al[7]. Yaping and collegues[11] in their study showed the risk of GDM was 2.318 times higher in women who had one previous miscarriage contrary to our study (OR = 2.318, $p < 0.05$),where abortion is not a statistically significant risk factor for GDM while in a study by Mghanga et al.[12], abortion was not the significant risk factor for GDM similar to our finding. Our study women were overweight and obese i.e. 27(93.10%) similar to the studies done by Agarwal et al[9] and Ghamri et al[13] where GDM is more prevalent in women with higher BMI. Also, in a study conducted in U.S by Chu, S.Y., Callaghan, W.M., Kim, S.Y. and et al[5] showed risk of developing GDM is 2, 4, and 8 times higher in women who are overweight, obese and severely obese women in comparison with normal weight pregnant women. The incidence of GDM was higher in women with family history of type-2 DM, statistically proven in our study (58.62%, p value of <0.01) were diagnosed to have GDM and studies by Di et al[14], which showed the strong correlation between GDM and family history

of DM-2. The fact that the hyperglycemia was linked with a genetic dysfunction of beta cell and familial predisposition to insulin secretary defects is justifiable in our study. Moreover, living standards and lifestyles of families are more likely similar resulting in sharing the related risk factors.

In our study among 29 women only eight (27.58%) women had history of cesarean section in past for obstetrical reasons such as, oligohydramnios, CPD, fetal distress and NPOL. Apart from history of past cesarean section 16(55.17%) of study population had no positive past history while remaining 13 (44.82%) had positive past history which includes, history of macrosomia, pre-eclampsia, shoulder dystocia, hypothyroidism and IUFD, relating similar to study by Reddy K and colleagues[15] [preeclampsia (15%), caesarean rate (62%) and neonatal NICU admission (76%)], Naylor et al.[16] found glucose intolerance in 14.5% of women who had adverse obstetric outcomes. Macrosomia complicates 20–30%[17] of pregnancies with GDM, but it was not statistically significant in our study. The reason might because of the low sample size or the study was done in the urban area where awareness and health facility is adequate and people are conscious regarding pregnancy and its possible complications.

CONCLUSIONS

The prevalence of gestational diabetes mellitus is 6.04% in our study. Most common risk factors for the development of gestational diabetes mellitus are increasing parity, high body mass index and history of type 2 diabetes mellitus in first degree relatives. The test is easy, cheap, feasible and patient friendly method for screening and diagnosing gestational diabetes mellitus.

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