

Original Research Article

Prevalence and risk factors associated with gestational diabetes mellitus in urbanised villages of East Delhi

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ABSTRACT

Background: Gestational diabetes mellitus (GDM) is caused by an inability to increase insulin secretion in response to the insulin resistance experienced during pregnancy. This transient hyperglycemia poses immediate health-risks for the baby and long-term in the mother. Thus, GDM offers an experimental opportunity to study strategies for diabetes management.

Methods: A cross-sectional study of two urbanized villages in East Delhi was performed over 1.5 years. 290 subjects with >12 weeks gestation, who were residents of the villages for at least 6 months, were enrolled. Detailed demographic and medical history with laboratory findings were collected and glucose challenge test (GCT) and Oral glucose tolerance test (OGTT) were used for screening and diagnosis of GDM.

Results: Prevalence of GDM was found to be 9.1% in urbanized villages. High gravida (OR:2.97; 95% CI:1.24-7.12; $p<0.014$), longer duration of stay at the present residence (OR:2.48; 95% CI:1.05-5.84; $p<0.037$) and the presence of a family history of diabetes (OR:3.93; 95% CI:1.54-10.02; $p<0.04$) were found to be significantly associated with the chance of developing GDM in regression analysis. Pregnant women located in urban India for more than three years were 2.48 times more likely to have GDM as compared to those who were residing for lesser duration.

Conclusions: As more women reside in urban localities and experience childbearing at a higher age, burden of diabetes mellitus in the community increases. This rising prevalence indicates importance of prevalence studies in a changing Indian geography.

Keywords: GDM, Insulin resistance, Pregnancy hyperglycemia, GCT, OGTT

INTRODUCTION

Diabetes represents a spectrum of metabolic disorders, characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both.¹ A subtype, called GDM, defined as carbohydrate intolerance with recognition or onset during pregnancy occurs in 7% of the pregnancies worldwide, affecting 60 million women annually.² Certain ethnic groups are seen

to be more susceptible to gestational diabetes. An inability to increase insulin secretion in response to the insulin resistance experienced during pregnancy leads to gestational diabetes mellitus. Hyperglycemia usually disappears after the baby is born, but is associated with immediate health risks for the baby, and may be associated with long-term health implications to both the mother and the child.^{3,4}

GDM provides an opportunity for the development, testing and implementation of clinical guidelines for

diabetes prevention. If appropriate action taken within particular time limit and ensuring adequate nutrition may prevent, the vicious cycle of transmitting glucose intolerance from one generation to another.⁵

There is a wide variation in diagnostic criteria of GDM. The American diabetes association (ADA) recommends a two-step procedure for screening and diagnosis of diabetes in selective population. While universal screening for GDM detects more cases and improves maternal and offspring prognosis. In the country like India, screening is essential in all pregnant women as an Indian woman has an eleven-fold increased risk of developing glucose intolerance during pregnancy compared to a Caucasian woman.⁶ The OGTT recommended by the world health organization (WHO) for diagnosis of GDM is simple.⁷ Though it has a drawback that pregnant women will have to come in fasting state for the testing. This makes universal screening for GDM difficult in our socio-medical context, where antenatal coverage has blind spots in implementation.

Developing countries like India are still struggling with poverty related health problems. In this scenario, diseases like gestational diabetes mellitus do not get the attention that they need. Identification of potentially alterable risk factors that put women at risk for the development of GDM is important for developing strategies for its prevention. It is the need of hour to address the magnitude and the risk factors of GDM.

Studies in the general population have shown an increase in prevalence of diabetes with rapid urbanization. Very little data is available from Delhi with regard to the prevalence of GDM. This paper assesses the prevalence and a few risk factors associated with GDM.

METHODS

The study, designed to be a cross sectional study, was conducted in two urbanized villages of East Delhi, which also serve as the Urban health training centers of the department of community medicine, UCMS and GTB hospital over a period of 1.5 years (November 2012-April 2014). Sample size was calculated using the prevalence of GDM to be 13% as found in a study previously done by Seshihah et al, and with a precision of 4% and a 95% CI, it came out to be 282.⁵ A total of 290 subjects were enrolled into the study. Women who were residents of the villages for 6 months and had a gestation of more than 12 weeks were considered eligible for the study, whereas those pregnant women, who had been diagnosed with diabetes prior to the pregnancy, were on steroids or other hormonal supplements or were known to be very ill were excluded. Systematic random sampling was performed to enroll every second pregnant woman from amongst the eligible pregnant women attending the antenatal clinics at the urban health training centers. Demographic data and relevant information pertaining to diabetes, such as

family history of diabetes, medical and obstetric history and information regarding knowledge of diabetes mellitus was collected using a pre-tested semi-structured questionnaire. Anthropometric data was collected prior to conducting GCT in the study subject. Standardized calibrated instruments were used for the purpose of measuring weight, height, blood pressure and capillary glucose level.

Subjects who had capillary blood glucose of more than 140 mg/dl were called for OGTT the next day, which was conducted at the respective health center under strict asepsis.

Subjects were classified as non-diabetic or to be suffering from GDM according to WHO criteria, wherein subjects who were diagnosed with diabetes mellitus or impaired glucose tolerance (IGT) were taken to be suffering from GDM.¹

Data was entered in MS excel spreadsheet and analyzed with help of SPSS 17 software.

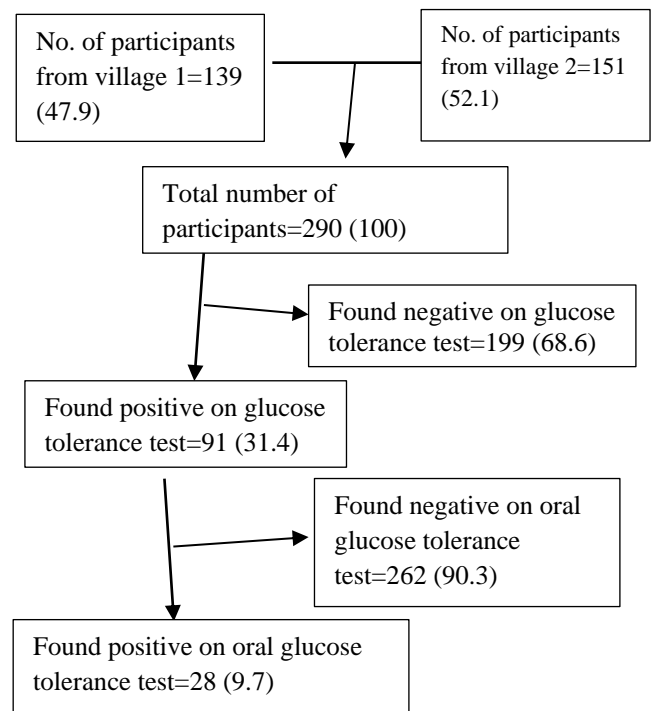


Figure 1: Distribution of study participants (n=290).

RESULTS

Most of the subjects interviewed (Table 1) were from 20 to 24 years age group (150, 51.7%), literate (198, 68.3%), and home-makers (272, 93.8%). Out of 290 participants, 151 (52.1%) were from Gazipur village and 139 (47.9%) from Dallupura village. Most of the husbands of the participants were literate (256, 88.3%), and were employed in unskilled jobs or semi-skilled jobs (215, 74.2%). Most of the households had a monthly income of Rs. 5000 to Rs. 10,000 per month (244, 84.1%).

Table 1: Distribution of study participants according to age, place of residence, duration of stay and occupation.

Variable	Frequency	Percentage (%)
Age group (year)		
≤19	14	4.8
20-24	150 (51.7)	51.7
25-29	102 (35.2)	35.2
≥30	24 (8.3)	8.3
Total	290	100
Place of residence		
Gazipur	151	52.1
Dallupura	139	47.9
Total	290	100
Duration of stay (year)		
<3	219	75.5
>3	71	24.5
Total	290	100
Occupation		
House wife	272	93.8
Labourer	11	3.8
Semi-skilled worker	06	2.1
Skilled worker	1	0.3
Total	290	100

Table 2: Distribution of study participants according to gravida, parity, past history of abortion, macrosomia and family history of DM.

Variable	Frequency	Percentage (%)
Gravida		
1	89	30.68
2	97	33.44
≥3	104	35.86
Total	290	100
Parity		
0	103	35.51
1	113	38.96
≥2	74	25.51
Total	290	100
Past history of abortion		
Yes	65	22.4
No	225	77.6
Total	290	100
Family history of diabetes		
Yes	37	12.8
No	253	87.2
Total	290	100
Past history of macrosomia		
Yes	31	10.7
No	259	89.3
Total	290	100

Most of the study participants had a gestational age of less than 20 weeks (114, 39.3%) and primipara (113,

39%). 65 of the study participants (22.3%) had a history of abortion. 31 who were multipara, had a history of macrosomia while 37 (12.8%) of the participants had a history of diabetes in the family as shown in table 2.87 (30%) of the participants were either overweight, or frankly obese.

GDM was diagnosed in 28 (9.7%) of all the pregnant women screened using the OGTT while 91 (31.37%) were found to be positive for screening by glucose challenge test as shown in Figure 1.

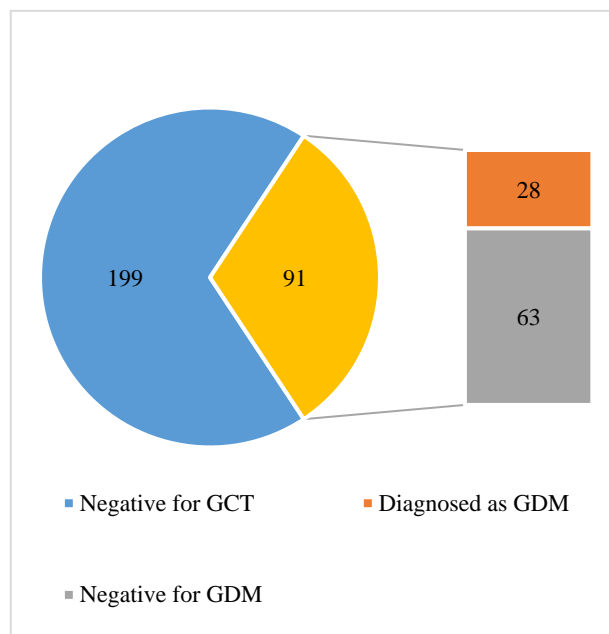


Figure 2: Prevalence of GDM.

Univariate analysis revealed that GDM was significantly associated with increasing age ($p=0.009$), longer duration of residence at the place of stay ($p=0.001$), increased gravida ($p=0.003$), increasing parity ($p=0.035$), a past history of abortion ($p=0.006$), presence of a family history of diabetes ($p=0.001$), and increased BMI of the participant ($p<0.001$). GDM was not found to be significantly associated with the educational status or occupation of either the husband or the woman herself. The results of univariate analysis are depicted in Table 3.

Logistic regression was performed with presence of gestational diabetes mellitus as the outcome variable, and all factors found to be significantly associated with the outcome ($p<0.05$) as the independent variable. Results are depicted in the Table 4.

High gravida (more than or equal to 3), longer duration of stay at the present residence (more than 3 years) and the presence of a family history of diabetes were found to be significantly associated with the chance of developing gestational diabetes mellitus.

Table 3: Univariate analysis of factors found associated with GDM (n=290).

Variables		Total (%) (n=290)	No. GDM (%) (n=28)	P value
Age (years)	≤24	102 (35.2)	10 (35.7)	0.009
	25-29	164 (56.5)	12 (42.8)	
	≥30	24 (8.3)	6 (21.5)	
Duration of stay (years)	≤3	219 (75.5)	14 (50)	0.001
	>3	71 (24.5)	14 (50)	
Gravida	1	89 (30)	3 (10.7)	0.003
	2	97 (34.1)	5 (17.8)	
	≥3	104 (35.9)	20 (78.5)	
Parity	0	103 (35.5)	4 (14.3)	0.035
	1	113 (39.0)	13 (46.4)	
	≥2	74 (25.5)	11 (39.3)	
History of abortion	Yes	225 (77.6)	16 (57.1)	0.006
	No	65 (22.4)	12 (42.9)	
Family history of diabetes	Yes	37 (12.8)	19 (67.9)	0.001
	No	253 (87.2)	9 (32.1)	
History of macrosomia	Yes	31 (10.7)	20 (71.4)	0.001
	No	259 (89.3)	8 (28.6)	
BMI (kg/m ²)	<18.5	32 (11.0)	1 (3.5)	0.000
	18.5-24.9	171 (59.0)	5 (17.9)	
	25-29.9	68 (23.4)	15 (53.6)	
	≥30	19 (6.6)	7 (25.0)	
Total		290	28	

Table 4: Risk factors associated with GDM: logistic regression analysis (n=290).

Variable		OR (Adjusted)	95% CI		P value
			Upper	Lower	
Gravida	<3	1			0.014
	≥3	2.97	1.24	7.12	
Duration of stay (years)	≤3	1			0.037
	>3	2.48	1.05	5.84	
Family history of diabetes	No	1			0.004
	Yes	3.93	1.54	10.02	

DISCUSSION

In our study prevalence of GDM came out to be 9.1%. In Kalyani et al, GDM prevalence found out to be 8.33%.⁸ Seshiah et al reported a very high prevalence of 17.7% in the government maternity hospital in India.¹⁰ While in Sahu et al, they included 332 pregnant women where prevalence of GDM was 17.3%.¹¹ Balaji et al also found GDM prevalence of 13.4% in his study.¹² In Tamil Nadu, Karoline et al prevalence of GDM was 16.3%.¹³ In a systematic review and meta-analysis carried out by Lee et al 84 studies with STROBE score ≥14 were included where, The pooled prevalence of GDM in Asia was 11.5% (95% CI 10.9-12.1).¹⁴ The last three decades (1991-2020) in India, many studies have been published on the magnitude of GDM. The prevalence rates are variable in these studies ranging from 0.87 to 19.4%.⁸⁻¹⁴ Variable prevalence is attributed to different regions, different populations, and the different methodologies and hence strictly speaking, it is difficult to make a meaningful comparison. Despite this, there is no doubt

that the prevalence of GDM seems to have risen in India over time.

In addition to ethnicity, an increased prevalence of gestational diabetes mellitus seen in the urban population may be due to trend toward older maternal age, epidemic of obesity and diabetes, the decrease in physical activity and the adoption of modern lifestyles in developing countries, which may also account for the significant association of gestational diabetes mellitus in our study population. Our assertion that increasing urbanization led to an increased prevalence of gestational diabetes mellitus found resonance in a study conducted by Ebrahim et al.¹⁵

In addition, univariate analysis found that an increase in maternal age >25 years, was significantly associated with gestational diabetes mellitus (42.8) p<0.05, a finding corroborated by studies conducted in India as well as abroad. Balaji et al the mean maternal age of 1463 pregnant women was 23.60±3.32 years.¹² Similarly, the

mean age of pregnant women in the study by Badikillaya et al was 22.8 ± 3.2 years.¹⁶

Our study also finds significant association of increasing gravida with maximum number of diagnosed GDM having gravida of >3 (78.5%, $p < 0.05$). Similar result was found in Meena Rajput et al where women with gravida >3 had higher chances of having GDM.¹⁷ According to a study by Seshiah et al the prevalence proportion of GDM increased with gravid, from 18.1% (confidence limits 14.38-22.29%) in primigravida to 25.8% (confidence limits: 11.86-44.61%) for gravidas >4 .¹⁰

We also found that around 57.1% of women with GDM had family history of abortion, which was significant with $p < 0.05$. Similar result was found in metanalysis and systemic review carried out by Lee et al where prevalence of GDM was higher in women with past history of abortion (OR 2.25, 95% CI 1.54-3.29).¹³

Around 67.9% had family history of diabetes and 71.4% of women with GDM had history of macrosomia which were significant enough with $p < 0.05$. Family history of diabetes was significant on regression analysis also (OR: 3.93; CI: 1.54-10.02; $p < 0.05$). Basu and Rajeskar et al also found an association of GDM with family history of diabetes similar results were found in Nilofer and Rajput et al.¹⁷⁻²⁰

Significant association was found with increasing BMI and GDM in this study with BMI of 25-29.9 had highest incidence of GDM (53.6%) with $p < 0.05$. In Sharma et al, BMI >30 was observed in 30 (64%) GDM women and 130 (29.2%) NGT women.²¹ Lee et al found similar association with GDM and obesity (BMI ≥ 25 kg/m² (OR 3.27, 95% CI 2.81-3).¹³

Interestingly, no significant association with prevalence of GDM were observed in relation to educational status and occupational status of the study participant, contrary to findings seen in other studies.

Our study was limited by the time frame, and a longitudinal follow-up of the women diagnosed with gestational diabetes mellitus would have yielded interesting data about the development of type 2 diabetes mellitus in these women. On the contrary, using lab-based method for ascertaining the blood glucose levels from venous blood samples made our study much more sensitive and specific.

CONCLUSION

The present study showed a prevalence of GDM as 9.7% and prevalence of GCT as 31.7% among the pregnant women having pregnancy of more than 12 weeks belonging to urbanized villages of East Delhi. Prevalence was significantly higher in multigravida as compared to primigravida. The odds of having GDM were almost 3 times higher in multigravida as compared to primigravida

prevalence of GDM was also significantly associated with increasing age of study participants, past history of abortion, past history of macrosomic baby and parity. The prevalence of GDM is rising and it is important to diagnose it as early as possible to prevent the maternal and fetal complication occurring because of it. This rising prevalence call attention to the importance of carrying out prevalence studies in different regions of India to predict the exact prevalence of GDM in the country. Though GDM cannot be eradicated, we can definitely prevent its adverse effects on pregnancy outcome.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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