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Prevalence of Gestational Diabetes Mellitus and Associated Risk Factors at a Tertiary Care Hospital in Karnataka

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Abstract

Context: Gestational Diabetes Mellitus is associated with an increased risk of maternal and foetal complications. Early diagnosis and management of GDM improves maternal and perinatal outcome; thereby preventing the long term risks of future diabetes in both the mother and her offspring. *Aims:* Our study was undertaken to determine the prevalence of gestational diabetes mellitus and associated risk factors in a tertiary care centre in Karnataka. *Settings and Design:* This was a prospective study carried out in a tertiary care teaching institute in Karnataka. *Material and Methods:* Eight thirty nine fasting pregnant women with 24-28 weeks of gestation underwent WHO-75 gram OGTT. Proforma with information on demographic characteristics, age, BMI, gravidity, past obstetrical history, past history of gestational diabetes, family history of diabetes was collected. *Statistical Analysis Used*: Descriptive and inferential statistical analysis. *Results:* GDM was diagnosed in 53 women. Age >25 years, BMI >25 kg/m^2, higher gravidity, family history of diabetes, past history of gestational diabetes, past history of intrauterine fetal demise and history of abortions were significantly associated with higher prevalence of GDM. *Conclusion:* Prevalence of GDM was 6.32% in our study. Appropriate interventions are required for control and risk factor modification.

Keywords: Age; BMI; Gravidity**.**

Key Message: Education regarding the diabetogenic potential of modifiable risk factors such as raised BMI is essential to prevent long term complications in both mother and offspring.

Introduction

Gestational Diabetes Mellitus is defined as carbohydrate intolerance of variable severity with recognition or onset during pregnancy [1]. It is estimated that about 4 million women are affected by GDM in India, at any given point of time [2]. Ethnically Indian women have highest propensity to develop GDM [3] . GDM shows a positive association with increasing maternal age, higher gravidity, increased BMI, past H/O Gestational Diabetes and family history of diabetes [4-7].The present study was undertaken to find the prevalence and risk factors associated with GDM in a tertiary care teaching institute in Karnataka, India.

Material and Methods

This study was carried out in a tertiary care teaching institute in Karnataka from November 2007 to October 2009. All women were informed about the nature of the study and informed consent taken. The inclusion criteria was pregnant women with gestational age between 24-28 weeks. Exclusion criteria was pregnant women with Pre-gestational diabetes.

A total of 839 pregnant women were screened for GDM. They underwent detailed clinical examination. Presence of risk factors was noted. Details of family history of diabetes, past history of Gestational diabetes mellitus, history of previous pregnancies, history of previous fetal losses and socio-economic status were obtained. Blood pressure measurement

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and the body mass index were recorded.

All 839 women were requested to have their regular diet for three days and observe overnight fast of 8-12 hours for the 75 gram oral glucose tolerance test (OGTT) recommended by WHO. Seventy five gram of glucose was dissolved in 200-400 ml of water and the patient was asked to drink it over a five minute period .Blood sample was drawn in the fasting state and 2 hours after ingestion of 75 gram glucose. A pregnant woman was diagnosed with Gestational diabetes mellitus if the Fasting plasma glucose ≥126 mg/dl, and/or 2 hours plasma glucose >140 mg/dl. The plasma glucose was estimated by glucose oxidation and per-oxidation (GOD-POD) method by Eco-Pak glucose kit.

Statistical Analysis

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance.

Chi-square / Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups. P value < 0.05 was considered to be statistically significant.

Statistical Software

The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1, Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data. Microsoft word and Excel have been used to generate graphs, tables etc.

Results

A total of 839 pregnant women with gestational weeks between 24-28 weeks were enrolled in our study. WHO-75 gram OGTT criteria was utilised to diagnose Gestational diabetes mellitus. Fifty three pregnant women had 2hr blood sugar ≥ 140mg/dl rendering them diabetics. The prevalence of GDM in our study was 6.32%. Only 1.2% (10/839) of pregnant women had FBS>126mg/dl.

Thirty three urban pregnant women accounted for 62.3% of GDM patients. Rural women comprised of 37.7% (20/53) of GDM patients. Prevalence of GDM in Rural and urban population was 4.96% (20/403) and 7.56%(33/436) respectively.

In our study, mean age of GDM patients was 23.71±3.88 years. The prevalence of GDM was 1.2%, 3.01%, 11.97% and 22.22% in age groups < 20 years, < 25 years, >25 years and >30 years respectively.

Mean BMI of GDM patients was 20.87±6.61 kg/m^2. BMI >25 kg/m^2 was observed in 43.39% (23/53) of our GDM patients; of which 9.4%(5/53) were obese and 34%(18/53) were overweight.

Amongst 53 GDM patients, 64.15%(34/53) were multigravidas as compared to 35.8%(19/53) primigravidas.

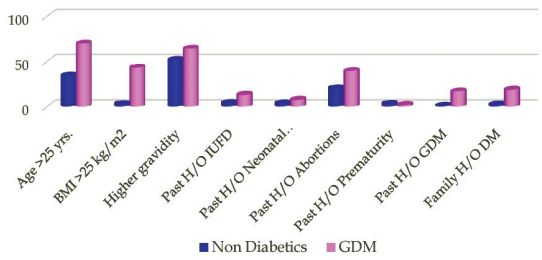
Past history of gestational diabetes mellitus was present in 17%(9/53) of diabetics in our study. Positive family history of diabetes mellitus prevailed in 18.9%(10/53) of the GDM women.

Previous history of intrauterine fetal demise was present in 13.2%(7/53) of GDM patients. Past history of neonatal deaths prevailed in 7.6%(4/53) of GDM patients. A total of 11(20.75%) GDM patients had previous history of foetal loss.Past history of abortions was observed in 39.62%(21/53) of GDM patients. Previous History of Preterm delivery was identified in 1.9% of GDM patients.

Table 1: Comparison of risk factors in GDM & Non diabetic population with P value

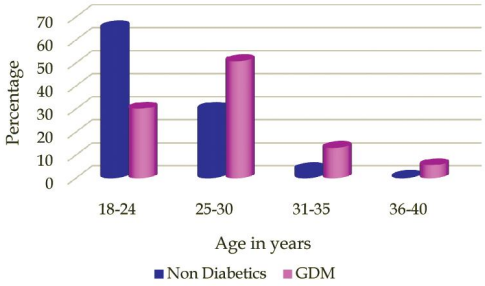
Risk Factors	Non-Diabetics (n=786) No. (%)	GDM (n=53) No. (%)	P value
Age >25 yrs.	272(34.6%)	37(69.81)	P<0.001
BMI >25 kg/m ^{2}	24(3.05%)	23(43.39)	P<0.001
Higher gravidity	408(51.9%)	34(64.15%)	P=0.005
Past H/O IUFD	34(4.3%)	07(13.2%)	P=0.004
Past H/O Neonatal death	31(3.9%)	04(7.6%)	P=0.204
Past H/O Abortions	162(20.6%)	21(39.62)	P<0.001
Past H/O Prematurity	27(3.4%)	01(1.9)	P=0.570
Past H/O GDM	08(1%)	09(17)	P<0.001
Family H/O DM	18(2.3%)	10(18.9)	P<0.001
Obesity	04(0.5%)	05(9.4)	

Risk Factors	Non Diabetics	GDM
Age >25 yrs.	34.6	69.81
BMI >25 kg/m2	3.05	43.39
Higher gravidity	51.9	64.15
Past H/O IUFD	4.3	13.2
Past H/O Neonatal death	3.9	7.6
Past H/O Abortions	20.6	39.62
Past H/O Prematurity	3.4	1.9
Past H/O GDM	1	17
Family H/O DM	2.3	18.9



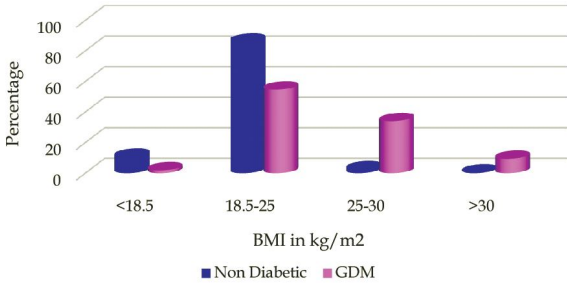
Graph 1: Comparison of risk factors in Non diabetic and GDM population

Age in years	Non Diabetics	GDM
18-24	65.39	30.18
25-30	30.1	50.9
31-35	3.94	13.2
36-40	0.5	5.66



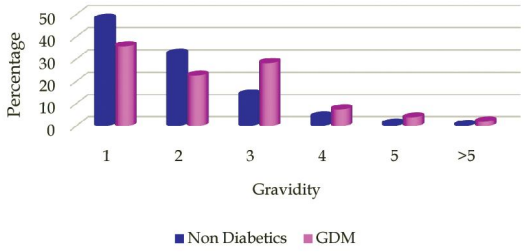
Graph 2: Prevalence of GDM by Age

BMI (kg/m2)	Non Diabetic	GDM
<18.5	10.8	1.9
18.5-25	86.1	54.7
25-30	2.5	34
>30	0.5	9.4



Graph 3: Prevalence of GDM by BMI

Gravidity	Non Diabetics	GDM
1	48.1	35.8
2	32.3	22.6
3	14	28.3
4	4.2	7.5
5	1	3.8
>5	0.4	1.9



Graph 4: Prevalence of GDM by Gravidity

Discussion

GDM is associated with an increased risk of complications for mother and child during pregnancy and birth[8].Gestational diabetes has serious, long-term consequences for both baby and mother, including a predisposition to obesity, metabolic syndrome, and diabetes later in life [9]. The risk of developing type 2 diabetes at 15 years of follow up is about 26% [10].

GDM provides a unique model in which treatment for a medical condition acts as a prevention for another condition (future diabetes in the mother) and also as prevention for condition in another person (future diabetes in the unborn child) [11]. GDM, therefore is a perfect window of opportunity for prevention of diabetes.

In parallel with type 2 diabetes mellitus pandemic, the incidence of gestational diabetes mellitus has risen rapidly [12]. The prevalence of GDM has been reported variably from 1.4 to 14% worldwide and differently among racial and ethnic groups [13].The prevalence of GDM is high in the Indian population as compared to other populations of South East Asia [14]. The

prevalence of GDM in our study was 6.32%.This is comparable to 6%, 6.6%, 6.7%, 6.94% prevalence rates in studies by Nilofer [15] et al, Kalra [16] et al, Verma [4] et al and Wahi [13] et al respectively.

Apart from ethnicity, high prevalence rate of GDM in Indian population is due to trending towards older maternal age, decrease in physical activity, adoption of modern lifestyle, and increasing prevalence of obesity and diabetes [17].

GDM has been found to be more prevalent in urban areas than in rural areas [7,18]. In our study, prevalence of GDM in Rural and urban population was 4.96%(20/403) and 7.56%(33/436) respectively. Urban pregnant women accounted for 62.3%(33/53) of GDM patients. Rural women comprised of 37.7% (20/53) of GDM patients. Though GDM was more prevalent in urban population compared to rural population, it did not reach statistical significance in our study(P=0.121). Seshiah [6] et al described GDM prevalence of 9.9% and 17.8% in rural and urban areas respectively in a community based study in South India.

The prevalence of GDM increased significantly with age in our study. Prevalence of GDM was 1.2%, 3.01%, 11.97% and 22.22% in age groups <20 years, <25 years, >25 years and >30years respectively. This association is statistically significant with a P value<0.001. Rajput R [19] et al described GDM prevalence rate of 4.53% in age group< 25 years, comparable to 3.01% of our study. GDM prevalence in age group> 25 years was found to be 11.57%, 19.5% in studies by Rajput R [19] et al and Seshiah [20] et al respectively; which was similar to our study results. Age >30 years as a risk factor was found in 25%,32.1%, 34.8% of GDM patients in studies by Seshiah[20,5] et al and Rajput R [19] et al respectively concurring to our study findings. A high GDM Prevalence of 84.84% was found in age group >25 years in a study by Kalra P [16] et al in Western Rajasthan. Similarly Nilofer [15] et al described a prevalence of 77.7% in age group > 30 years.

GDM was found to be significantly higher in women with higher BMI in study by Chu SY et al [21]. BMI>25 kg/m^2 was recorded in 43.39 % of our GDM patients; amongst whom 9.4% were obese and 34% overweight .This trend of increasing prevalence with increasing BMI was found to be statistically significant, P<0.001.

Seshiah et al [6] & Rajput R [19] et al found that 28.4% & 22% of GDM patients were overweight respectively; which is in concurrence with our study. Kalra P [16] et al observed that 18.18% of women with GDM were obese which is comparable to 9.4% obese GDM women in our study.

Obesity as a risk factor was found in 25%, 33.3%, 50%, and 88% of GDM patients in studies by Das [22] et al, Seshiah [20] et al, Gomez [23] et al and Nilofer [15] et al respectively.

Amongst 53 GDM patients, 64.15% were Multigravidas as compared to 35.8% primigravidas, the prevalence being statistically significant, P=0.005.

The prevalence of GDM increased from 4.78% in primi gravida to 25% in Gravida >5 in our study. The prevalence of GDM in second, third and fourth gravida were 4.51%, 12%, and 10.81% respectively in our study. In our study, the prevalence of GDM in third gravida was 12% which is comparable to 16.9% and 18.2% in studies by Seshiah [20] et al and Rajput M [24] et al respectively. The prevalence of GDM in fifth gravida was 20% in our study comparable to 25.8% in a study by Seshiah [5] et al in 2004.

The recurrence risk of GDM with future pregnancies has been reported as high as 68% [25]. A significant association between history of GDM in previous pregnancy and development of GDM in index pregnancy was observed (P<0.001) in our study. Past history of gestational diabetes mellitus was present in 17% of diabetics in our study. This is in concurrence with rates of 12.12%, 11.1% and 10.9% of GDM patients with a past history of GDM in studies by Kalra [16] et al, Nilofer [15] et al and Murgia [26] et al respectively. Past history of GDM was present in 4.65% of GDM patients in a study by Rajput R [19] et al in Haryana.

Positive family history of diabetes mellitus was present in 18.9% of the GDM women .There was a significant association (P<0.001) between family history of diabetes mellitus and occurrence of GDM among pregnant women in our study. This is similar to findings of Seshiah [6] et al, Rajput R [19] et al, and Das [22] et al who report 19.2%, 16.3% and 14.3 % of diabetic pregnant women with positive family history of DM in their studies respectively.Kalra [16] et al & Nilofer [15] et al found that 33% and 77.7% of GDM patients had positive family history of DM respectively.

Detection and care of GDM is a public health priority as the still birth rate is high in India and Gestational Diabetes Mellitus is one of the causes [27]. 13.2% of our GDM patients had past history of Intrauterine fetal demise, which had significant association with occurrence of GDM , P=0.004.Our findings are in comparison with studies of Murgia C [26] et al, Hoseini [28] et al and Kalra [16] et al who observed that 12.1%, 12.3% and 15.15% of GDM patients had history of previous foetal or early neonatal deaths respectively. Past history of abortions was present in 39.62% of our GDM patients which

attained statistical significance, P<0.001.History of preterm labour was seen in 1.9% of GDM women which did not assume statistical significance (P=0.570)

Conclusion

Early diagnosis and management of GDM improves maternal and perinatal outcome; besides preventing the long term risks of future diabetes in both the mother and her offspring. Appropriate interventions are required for control and risk factor modification. Modifiable risk factors like increased BMI have to be targeted prenatally to reduce the prevalence of GDM. Community education regarding the diabetogenic potential of raised BMI is essential to prevent long term complications in both mother and offspring.

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