

Univariate and multivariate analysis of risk factors of gestational diabetes mellitus among pregnant women attending antenatal clinic at three urban health centers of Belagavi - A cross sectional study

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Abstract

Background and Objective: Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with the onset or first recognition during pregnancy with or without remission after the end of pregnancy. GDM is associated with increased incidence of maternal hypertension, pre-eclampsia, obstetric intervention and risk of developing Diabetes mellitus (DM) in later life. This present study was conducted to determine the univariate and multivariate analysis of risk factors associated with GDM. And to find out the prevalence of GDM among pregnant women attending antenatal clinic of three Urban Health Centres (UHCs)

Methods: This one-year cross sectional study was done in three Urban Health Centres (UHCs) Ram Nagar, Ashok Nagar and Rukmini Nagar which are urban field practice area of Jawaharlal Nehru Medical College, Belagavi. Data was collected from 360 pregnant women attending the antenatal clinic of three UHCs. Information on socio demographic details and risk factors associated with GDM was obtained. Univariate and multivariate analysis of risk factor of gestational diabetes mellitus among pregnant women were done. Diabetes in Pregnancy Study group India (DIPSI criteria) was used to diagnose GDM.

Results: Out of total 360 participants, In the present study mean age of study participants was 24.3±3.92 years. The prevalence of GDM in this study was 12.2%. Univariate analysis was done risk factors such as age, socio economic status, gravida, previous history of abortion, family history of diabetes, physical activity is significantly associated with GDM. And in multivariate analysis risk factors such as socio-economic status family history of diabetes, physical activity was significantly associated with GDM.

Conclusion: In this study there is a greater risk of GDM in women with increasing age, higher parity, increasing BMI and a family history of diabetes mellitus. There is a need for universal screening to pick up risk factors to prevent gestational diabetes mellitus.

Key words: Univariate, Multivariate, Risk factors, Pregnant women, Antenatal clinic.

Introduction

Gestational Diabetes mellitus (GDM) is defined as any degree of glucose intolerance with the onset or first recognition during pregnancy with or without remission after the end of pregnancy^[1]. GDM is associated with increased incidence of maternal hypertension, pre-eclampsia, obstetric intervention and risk of developing DM in later life^[2]. Major morbidities associated with infants of diabetic mothers include respiratory distress, growth restriction, polycythaemia, hypoglycaemia,

congenital malformations and perinatal mortality^[3]. Proper antenatal care is one of the important ways in reducing maternal and child morbidity and mortality^[4]. A healthy diet and life style during pregnancy is important for the development of a healthy baby and may have long term beneficial effects on the health of the child^[5]. Antenatal care (ANC) is the care a woman receives throughout her pregnancy in order to ensure that both the mother and child remain healthy^[6]. Understanding maternal knowledge and practices of

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the antenatal care during pregnancy and delivery are required for program implementation. Appropriate diagnosis and management of GDM can improve maternal and perinatal outcome. Limited studies regarding the prevalence and risk factors associated with GDM among urban population has been reported from Karnataka. Data on this very important issue are scarce in our state. Therefore, present study was carried out to assess the univariate and multivariate analysis of risk factors associated with gestational diabetes mellitus and prevalence of GDM among pregnant women attending antenatal clinic.

Material and methods

This one-year cross sectional study was done during 1st January to 31st December 2014 in three UHCs Ashok Nagar, Ram Nagar and Rukmini Nagar, which are urban field practice area of Jawaharlal Nehru Medical College, Belagavi. The sample size was calculated using the formula:-

$$n = Z_{\alpha}^2 \times p \times q / d^2$$

$$= 1.96 \times 1.96 \times p \times q / d^2$$

where, p = prevalence of GDM = 18% [7]

$$q = 100 - p = 100 - 18 = 82\%$$

$$d = \text{absolute error} = 4\%$$

$$\text{So, } n = 1.96 \times 1.96 \times 18 \times 82 / 4^2 = 354 \approx 360$$

Hence, 360 pregnant women were chosen for the study.

The sampling method adopted was systematic random sampling technique. Pregnant women attending antenatal clinic of three UHCs were informed about the nature of study. After obtaining written informed consent, a pretested questionnaire was used to collect information regarding socio-demographic details, risk factors, educational status. Further they were clinically examined and anthropometry measurements such as height, weight and other details were collected.

Following were considered as high risk factors^[8], included in the questionnaire assessment for GDM : GDM during previous pregnancy, family history of Diabetes, large weight babies born from a previous pregnancy (macrosomia ≥ 4000 g), baby born from a previous pregnancy showing any complications known to be associated as arising from maternal GDM, history of abortion or stillbirth during previous pregnancy, Obesity, Parity (multigravida), Age ≥ 30 years.

Diabetes in Pregnancy Study group India (DIPSI) method was used to diagnose GDM. Woman was given a standardized 75gm of oral glucose load, irrespective of whether she was in fasting or non-fasting state and without regard to time of last meal, and plasma glucose was estimated at 2 hours by using Diabetes

in Pregnancy Study group India (DIPSI criteria) and all women with a plasma glucose of ≥ 140 mg/dl were diagnosed to have GDM.

Data was entered in Excel sheet after coding. Statistical Package for Social Sciences (SPSS) version 16.0 software was used for analysis of the data. Numerical variables were analysed as means and standard deviations. Chi-square test and Fisher's Exact Test was used wherever applicable. A probability value (p value) of less than 0.05 was considered as significant.

Ethical clearance was obtained from the Institutional Review Board of Jawaharlal Nehru Medical College, Belagavi.

Results

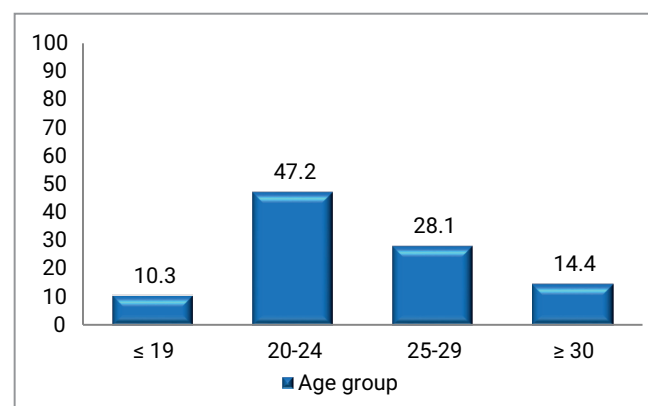


Figure 1: Distribution of study subjects according to age group

Three hundred and sixty (n=360) pregnant women who participated in the study, 37 (10.3%) were in the age group of ≤ 19 years, 170 (47.2%) were in the age group of 20-24 years, 101 (28.1%) were in the age group of 25-29 years and 52 (14.4%) were in ≥ 30 years age group.

Mean age group of the study participants was 24.3 ± 3.92 years. Range was 18-37 years.

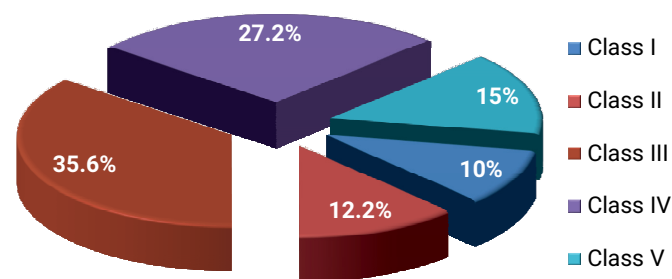


Figure 2: Distribution of study subjects according to socio economic status (Modified B.G. Prasad Classification)

In our study, 36 (10%) belonged to class I, 44 (12.2%) to class II; 128 (35.6%) to class III, 98 (27.2%) to class IV and 54 (15%) belonged to class V.

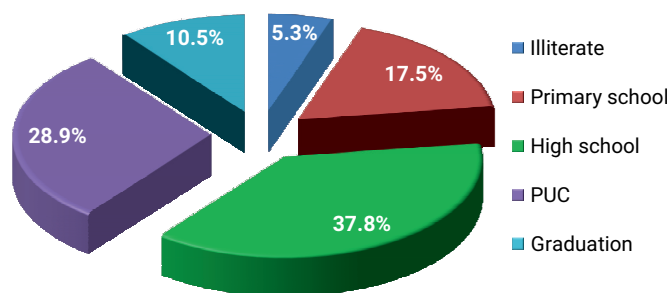


Figure 3: Distribution of study subjects according to educational status

In the present study, 19 (5.3%) were found to be illiterate, 63 (17.5%) had primary school education, 136 (37.8%) had high school education, 104 (28.9%) had PUC school education and 38 (10.5%) were graduated.

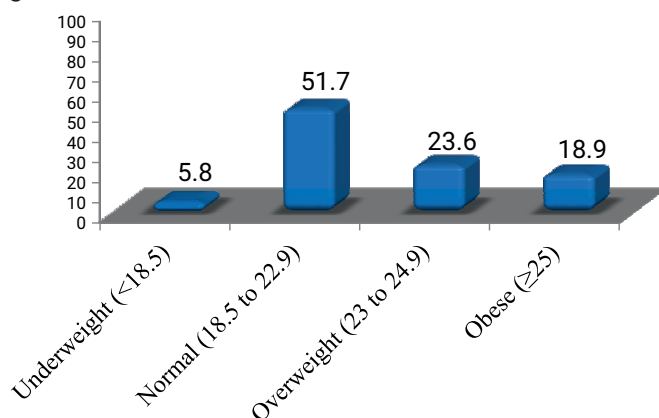


Figure 4: Distribution of study subjects according to BMI

In this study, majority of pregnant women 186 (51.7%) had normal BMI, 85 (23.6%) were overweight, 68 (18.9%) were obese and only 21 (5.8%) were underweight. Mean BMI of the study participants was $22.48 \pm 3.05 \text{ kg/m}^2$. Range was $16.82\text{--}34.89 \text{ kg/m}^2$.

Table 1: Distribution of study subjects according to previous history of GDM.

Previous history of GDM	No.	%
Yes	4	1.1
No	188	52.2
Not applicable (Primigravida)	168	46.7
Total	360	100

Out of 360 pregnant women, 4 (1.1%) had previous history of GDM and 188 (52.2%) had no previous history of GDM.

Table 2: Distribution of study subjects according to previous history of abortion.

Previous history of abortion	No.	%
Yes	55	15.2
No	137	38.1
Not applicable (Primigravida)	168	46.7
Total	360	100

In the present study, 55 (15.2%) were having previous history of abortion, 137 (38.1%) were not have previous history of abortion and 168 (46.7%) were not applicable to ask history of abortion because they were primigravida.

Table 3: Univariate analysis of risk factors of GDM.

Factors	Unadjusted OR	P	95% CI
Age (≥ 30 / <30)	2.59	0.012	1.23-5.43
SES (I,II/III,IV,V)	2.53	0.006	1.29-4.93
Gravida (Multi/Primi)	2.96	0.003	1.44-6.07
Previous H/o abortion (Yes/No)	3.57	<0.001	1.76-7.23
Previous H/o GDM (Yes/No)	7.47	0.47	1.03-54.49
Previous H/o LSCS (Yes/No)	2.52	0.12	1.23-5.19
Family H/o Diabetes (Yes/No)	4.33	<0.001	2.25-8.32
Physical activity (Nil/Other)	3.28	<0.001	1.7-6.32
BMI (≥ 25 / <25)	2.26	0.022	1.12-4.55

In Univariate analysis showed that risk factors such as age [OR 2.59 (95% CI 1.23-5.43) $p = 0.012$], socio economic status [OR 2.53 (95% CI 1.29-4.93) $p = 0.006$], gravida [OR 2.96 (95% CI 1.44-6.07) $p < 0.003$], previous history of abortion [OR 3.57 (95% CI 1.76-7.23) $p < 0.001$], family history of diabetes [OR 4.33 (95% CI 2.25-8.32) $p < 0.001$], physical activity [OR 3.28 (95% CI 1.7-6.32) $p < 0.001$], BMI [OR 2.26 (95% CI 1.12-4.55) $p = 0.022$] are significantly associated with GDM and risk factors such as previous history of GDM [OR 7.47 (95% CI 1.03-54.49) $p = 0.47$] and previous history of LSCS [OR 2.52 (95% CI 1.23-5.19) $p = 0.12$] are not significantly associated with GDM.

Table 4: Multivariate analysis of risk factors of GDM

Factors	Adjusted OR	P	95% CI
Age (≥ 30 / <30)	1.41	0.455	0.57-3.46
SES (I,II/III,IV,V)	3.24	0.003	1.51-6.98
Gravida (Multi/Primi)	0.62	0.301	0.25-1.57
Previous H/o abortion (Yes/No)	1.86	0.187	0.74-4.69
Previous H/o GDM (Yes/No)	5.74	0.152	0.52-62.95
Previous H/o LSCS (Yes/No)	1.32	0.543	0.54-3.22
Family H/o Diabetes (Yes/No)	2.90	0.004	1.4-6.01
Physical activity (Nil/Other)	3.05	0.003	1.47-6.32
BMI (≥ 25 / <25)	1.33	0.491	0.58-3.03

In Multivariate analysis showed that risk factors such as socioeconomic status [OR 3.24 (95% CI 1.51-6.98) $p=0.003$], family history of diabetes [OR 2.90 (95% CI 1.4-6.01) $p=0.004$], physical activity [OR 3.05 (95% CI 1.47-6.32) $p=0.003$] was significantly associated with GDM and risk factors such as age [OR 1.41 (95% CI 0.57-3.46) $p=0.455$], gravida [OR 0.62 (95% CI 0.25-1.57) $p=0.301$], previous history of abortion [OR 1.86 (95% CI 0.74-4.69) $p=0.187$], BMI [OR 1.33 (95% CI 0.58-3.03) $p=0.491$] previous history of GDM [OR 5.74 (95% CI 0.52-62.95) $p=0.152$] and previous history of LSCS [OR 1.32 (95% CI 0.54-3.22) $p=0.543$] was not significantly associated with GDM.

Table 5: Prevalence of GDM based on DIPSI criteria

Gestational diabetes mellitus	No.	%
Present	44	12.2
Absent	316	87.8
Total	360	100

In the present study the prevalence of GDM according to DIPSI criteria was 12.2%.

Discussion

In present study the mean age group of the study participants was 24.3 ± 3.92 years. Of the 360 pregnant women who participated in the study, 10.3% were in the age group of ≤ 19 years, 47.2% were in the age group of 20-24 years, 28.1% were in the age group of 25-29 years and 14.4% were in ≥ 30 years age group, whereas study conducted in Kashmir showed that there were no participants < 19 years and half of the participants were in the age group of 26-30 years and only 1.3% study participants belonged to age group >35 years. Another study done in Guntur, South India^[8] showed 53% study participants belonged to age group 21-25 years and only 4% belonged to >30 years of age. In the present study only 10% belonged to class I socio

economic status, 12.2% to class II, 35.6% to class III, 27.2% to class IV and 15% belonged to class V. A study conducted in North India^[9] showed 45.4% of the study population belonged to socioeconomic class III 45.4% and only 1% belonged to class I. In present study, 5.3% were found to be illiterate, 17.5% had primary school education, 37.8% had high school education, 28.9% had PUC school education and 10.5% were graduated. A study conducted in Haryana^[10] showed that, 4.9% were illiterate, 11.9% had primary schooling and 21.9% were graduated which is higher than our study. In the present study, 18.9% were having (≥ 25) BMI and only 5.8% were having BMI (<18.5). Mean BMI of the study participants was 22.48 ± 3.05 Kg/m². Other studies conducted in Haryana^[10] and Western Rajasthan^[11] showed that 8.2% and 27.6% of study participants had BMI (≥ 25).

In our study, half of the study participants did not have past history of GDM and only 1.1% had past history of GDM. Similarly, study done in different regions such as Hyderabad^[12], Mumbai^[13] and Western Rajasthan showed that less than one percent had past history of GDM. In present study, 15.3% were having history of abortion, 38.1% were not having history of abortion and 46.6% were not applicable to ask history of abortion because they were primigravida, whereas study conducted in Ghaziabad, Uttar Pradesh^[14] showed 22% had previous history of abortion.

In our study univariate analysis were done in which risk factors such as age more than 30 years, socioeconomic status, gravida, previous history of abortion, family history of diabetes, physical activity and BMI are significantly associated with GDM. Whereas risk factors such as previous history of GDM and previous history of LSCS are not significantly associated with GDM. In our study multivariate analysis were done showed risk factors such as socioeconomic status, family history of diabetes, physical activity was significantly associated with GDM and risk factors such as age, gravida, previous history of abortion, BMI, previous history of GDM and previous history of LSCS were not significantly associated with GDM. Whereas study conducted in coastal South India^[15] showed women having had abortions in the past were at a higher risk for development of GDM (OR 1.26; 95% CI 0.69-2.29). The prevalence of GDM in India varies from 3.8% to 21.0% in different parts of the country, depending on the geographical locations and diagnostic methods used^[16]. In the present study the prevalence of GDM based on DIPSI criteria was found to be 12.2%. There is wide variation in the prevalence of GDM in India. There are different studies conducted in various cities in India revealed prevalence of GDM as 13.4% in Chennai^[17], 6.94% in Jammu^[18], 6.6% in

Western Rajasthan, 2.5% in Guntur, South India and 7.8% in Kashmir. Another study done in Tamil Nadu showed that GDM was detected in 17.8%, 13.8% and 9.9% respectively in the women of urban, semi-urban and rural areas. However, the wide variation in the prevalence rates of GDM may be attributed to the use of different criteria for diagnosis, variation in different geographical region.

Conclusion

There is a need for universal screening to pick up risk factor such as family history of diabetes, previous history of abortion, physical inactivity and various other factors by assessing properly socio demographic profile of pregnant woman to prevent maternal and fetal morbidity. Larger studies are needed to analyze the risk factors associated with pregnancy. GDM is a major health problem in the world that necessitates effective preventive and control strategies. To improve community awareness on ANC, information, education, and communication activities should be increased on ANC through community campaign and mass media like local television channel, radio and local newspapers. There is a need to motivate women to utilize maternal care services which are freely available in all the government health set ups. Based on these results it concluded that, plan for preventive strategies and to improve maternal outcomes.

Recommendation:

Based on this study, following recommendations are being suggested for the prevention of gestational diabetes mellitus and improvement of health of pregnant women by assessment of the risk factors:

- Universal screening for GDM should be followed, as women of Asian origin and especially Indians are at a higher risk of developing GDM.
- Life style modifications like increase in physical activity decrease in consumption of sweetened beverages and high energy dense foods should be started early in life and continued throughout the life.
- Increasing prevalence of gestational diabetes mellitus and its co-morbidities among females need immediate attention in terms of prevention and health education.

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