Assessment of Risk Factors for the Early Detection of Gestational Diabetes Mellitus

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Abstract

Purpose; Gestational diabetes mellitus affects 1-14% of all pregnancy with results of many maternal and fetal problems. Early detection and treatment may reduce the complications in pregnancy outcome. The main aim of the study is to assess the risk factors causing gestational diabetes mellitus. Methods; Study was carried out in the multispecialty hospital in Tamilnadu, south India, for the period of 10 years from January 2003 to December 2012. Pregnant women diagnosed with GDM were included in the study. Diabetes mellitus, hypertension, renal disorder and autoimmune disease woman were not included in the study. Antenatal, perinatal and neonatal data were collected from patient, family members, patient medical records and hospital database. SPSS statistical package version 20.0 was used for the statistical analysis. Paired't' test, ANOVA, were used for various data analysis. Results; Age, BMI, gravidity, primiparity and irregular menstrual cycle shows significant influence on the development of gestational diabetes mellitus($P<0.05$). The mean age of GDM women was 27.75 ± 3.90 years. The mean BMI of GDM women was 27.71 ± 3.61 kg/m^2. The average gravidity of GDM alone women was 1.91± 1.10, Conclusion; From our study we observed, Advancing age, increasing BMI, Multigravida, primiparity, family history of diabetes and irregular menstrual cycle shows an influence on the development of GDM. These risk factors are comparable with internationally documented risk factors. Assessing the risk factors and identifying those women as high risk group for GDM is important for the early diagnosis of GDM.

Keywords

Risk factors, GDM, advancing age and BMI, early screening

Introduction

Gestational diabetes mellitus (GDM) is a most common complication throughout the world that affects 1-14%[1] of all pregnancy. GDM is a condition of elevated blood glucose level generally detected during pregnancy and become normal soon-after delivery, resulting with immediate and long-term effects to both mother and child. A woman with GDM may lead to increased risk for preeclampsia[2] cesarean delivery, cardiovascular complications[3] neonatal macrosomia and hypoglycemia. In long term, GDM women are prone (20 – 50%) to develop type 2 diabetes mellitus in five years after delivery[4]. The early detection and adequate treatment reduce the potential complications to both mother and child[5]. Identifying women for possibility of GDM is depends on the presence of risk factors. Screening is usually carried out around 24 – 28 weeks of gestational age. But GDM can affect in any stage of gestation. The factors that can be influence the pregnant women to develop GDM in all trimesters include age, BMI, positive family history of diabetes, previous history of GDM, multiparity and irregular menstrual history[6]. According to American diabetic association (ADA), the common risk factors for

developing GDM are advancing maternal age, high Body mass index (BMI), positive family history of diabetes, previous GDM[7,8].

One study found that the incidence of GDM worldwide has increased by 35% from 1991 to 2000[9]. A national survey has shown that the prevalence of GDM was increasing from 2.1% in 1982 to 16.55% in 2002. The trend was 2.1% in 1982, which was increased to 7.62% in 1991, which further increased to 16.55% in 2002[10].

The implication of this is that the women with GDM are at increased risk of future diabetes as are their children. Better understanding of this complication may give effective strategies in identifying and care to women. Therefore we conducted a hospital based study to find the associated risk factors for the development of GDM.

Materials and Methods

The study was approved by Institutional ethics committee (KMCH ETHICS COMMITTEE) to carry out the study in Kovai Medical Center and Hospital, Coimbatore, Tamilnadu. All the women were informed about the study and consent was obtained.

The pregnant women who diagnosed and treated for GDM were taken in to the study for the period of 10 years from January 2003 to December 2012. The study is carried out at Kovai Medical Center and Hospitals Pvt Ltd, Coimbatore, Tamilnadu, India, a 750 bedded multispecialty hospital. A pregnant woman diagnosed by physician as GDM is the basic criteria to include in the study. The diagnostic criteria is as follows, fasting plasma glucose level of above 95 mg/dl, 1-h glucose level of above 180 mg/dl, and 2-h glucose level above of 155 mg/dl. Diabetes mellitus, hypertension, renal disorder, autoimmune disease woman were excluded from the study.

Totally 330 women were diagnosed as GDM. Antenatal, perinatal and neonatal data were collected from patient, family members, patient medical records and hospital database. Maternal data includes demographic details, family history, past medical history, obstetric history, laboratory investigations and current diagnosis. Neonatal details included sex, weight, height, length, head circumference, apgar scores, blood sugar level and bilirubin level.

The following factors were considered as risk factors for the analysis, Age, Weight, Body Mass Index (BMI), previous history of GDM, family history of GDM, gravidity, parity, Hemoglobin (HB) and irregular menstrual cycle.

The definition and cutoff values for the Maternal and Fetal Analysis,

1. Age – The cutoff value for age is≥ 25 years(≥ 25 years of age is high risk group and below 25 is low risk group)
2. BMI – The cutoff value for BMI is ≥25 (≥25 is high risk group and below 25 is low risk group).
3. Previous history of GDM (High risk- positive history, Low risk- negative history.)
4. Parity (multiparous women - high risk)
5. Family history of DM (positive history- high risk)
6. Hb – Hemoglobin more than 13mg/dl consider as high risk group for GDM
7. The cut of values for FBS and PPBS level of GDM women are 95mg/dl, 180 mg/dl for 1-hour post prandial blood sugar and 155mg/dl for 2-hours post prandial blood sugar according to ADA (above this value consider as above normal)
8. Maternal weight gain is the amount of weight gained by the mother during the pregnancy period. According to Institute of medicine and nutrition the normal maternal weight gain during pregnancy is 11.5 – 16kg.
9. The universal screening for gestational diabetes mellitus is between 24 – 28 weeks. The gestational diabetes mellitus diagnosed between 24 -28 week or before 28th week were consider as early gestational diabetes mellitus and the same was at or after 28th week is consider as late GDM.
10. Apgar score is determined by evaluating the new born baby in five simple criteria on a scale from zero to two, then summing up the five values thus obtained. The resulting apgar score ranges from 0 to 10. Apgar score of 8 or above indicates it's a good healthy baby.

In order to find out the risk factors and its influence on the early development of GDM, women were categorized in to early and late developed GDM. The risk factors were analyzed for 145 populations who developed GDM early or before the 28th week of gestation.

SPSS package version 20.0 for windows was used to do the statistical analysis. Paired 't' test was used to find out the control of blood glucose level. One way ANOVA was used to find out the significance on development of GDM against risk factors, Length of GDM and its effects on outcome of pregnancy, treatment and its effects on outcome of pregnancy and control level of blood sugar and outcome of pregnancy. Regression- Curve

estimation analysis was done to evaluate the advancing factors and its influence on early development of GDM. P<0.05 was considered as significant.

Results and Discussion

Age above 25 years of old was considered as risk for development of GDM; many studies reporting the risk of age greater than 25 years of old[11,12]. Study by Getahun D et al., 2010[13] reported that the prevalence of gestational diabetes mellitus largely driven by the increase in 25-35 years age group. Our study population average age was more than 25 years (27.75 ± 3.90) and found risk. Advancing age was found to increase risk for earlier development of GDM. In our study also the age of women who diagnosed GDM before 28th week of gestation was older than the age of women who diagnosed GDM late. The average age was respectively 28.33 ± 3.89 and 27.28 ± 3.85 years (P<0.05).

The increase in BMI is also a risk factor for gestational diabetes mellitus[6]. In our population the mean BMI was found to be risk with the value of 27.71 ± 3.61 kg/m^2 (P<0.05). About 51% of women were obese (BMI more than 25 kg/m^2). Several studies suggesting advancing in gravidity, lesser or Primiparity, family particularly paternal history of diabetes were highly risk to develop GDM[14,15]. In our study we could understand the same risk situation; about 52% of women found with multigravida and 36% of women were primiparous. The average gravidity value was 1.91 ± 1.10 which shows the chances of risk and average parity value was 0.46 ± 0.63 which was also shows the chances of risk. Multigravida and primiparity influences the early development of GDM as independent risk factors (P<0.05). 77% of multigravida and 44% of primiparous women developed GDM early in their gestation. 58% of women had positive family history of diabetes of which comparatively paternal history was more with 38% against 32% with maternal diabetes history.

A recent large epidemiological survey conducted in China to determine the risk factors of GDM revealed significant association between GDM and advanced maternal age, pre-pregnancy obesity and family history of diabetes[16]. The above mentioned factors were shows influence on the development of GDM in our study also.

Family history of diabetes is also a risk factor for gestational diabetes mellitus. In all studies conducted on GDM considers family history as an independent risk factor for the development of GDM[17]. In our study women with positive family history of diabetes were about 57.87% and shows influence on the development of GDM (P<0.05). Tabak et al[18]., 2011, discovered in their study that maternal history of diabetes and history of diabetes in the maternal line seems to be a stronger predictor of GDM than paternal history. Mohamed Ghaith Al-Rowaily et al[19]., 2011 performed study in pregnant women of Qatar and found that paternal history of diabetes is a strong risk factor for GDM. In our study women with maternal history of diabetes were 31.51%. Women with paternal history of diabetes were 38.78%. We found more women (n = 128) have the paternal history of diabetes.

Many studies tell that previous history of GDM can again lead to gestational diabetes mellitus in the subsequent pregnancies[20,21]. In our study 7.57% women has previous history of GDM and the current GDM diagnosis was at 22nd week of their pregnancy which is less compare to average week of GDM diagnosis (average week of diagnosis 27.71 ± 8.23 weeks)

Mary Claire Haver et al[22]., 2003 and Mamta Bhat et al[6]., 2010 in their study found that irregular menses as an independent risk factor for gestational diabetes mellitus (24%vs 7%). In our study 37.27% of women were found with irregular menstrual cycle. Of which 45.9% women developed GDM in their early period of gestation. Thus as per our study irregular menses shows same kind of influence as above mentioned study for the development of GDM.

Study by Lao et al, found that the women having the blood hemoglobin concentration more than 13 gm/dl shows increased risk of GDM. Where as in our study population the average value was 11.51 ± 1.22 gm/dl and 9.96% of women have hemoglobin value more than 13 mg/dl. As per our study result the level of hemoglobin doesn't show any influence on the development of GDM.

Conclusion

Age, BMI, Multigravida, primiparity, family history of diabetes and irregular menstrual cycle shows an influence on the development of GDM. Advancing age, advancing BMI, increasing gravidity and increasing parity were found to be risk factors for the early development of GDM. These risk factors are comparable with internationally documented risk factors. Assessing the risk factors and identifying those women as high risk group for GDM is important for the early diagnosis of GDM.

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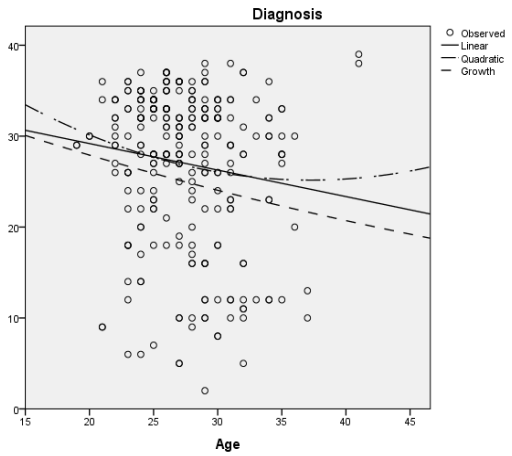
Table 1 shows the average value of maternal characteristics

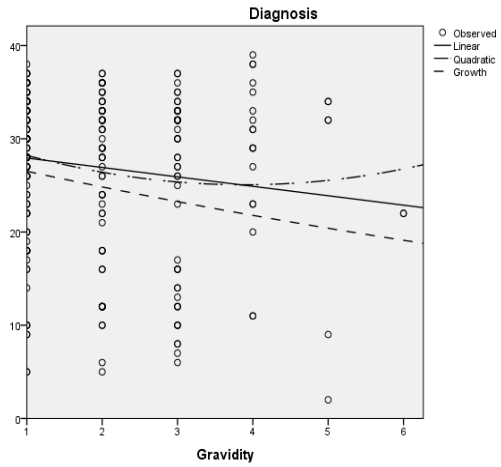
	Mean ± SD and Percentage	P value
Age(years)	27.75 ± 3.90	P < 0.000
Height(cm)	156.95 ± 5.34	
Weight(kg)	68.05 ± 9.12	
BMI(kg/m^2)	27.71 ± 3.61	P < 0.000
Parity	0.46 ± 0.63	
Nulliparity	59.39%	P < 0.190
Primiparity	36.36%	P < 0.000
Multiparity	4.25%	P < 0.843
Family History	57.87%	P < 0.000
Father Diabetes Mellitus	38.78%	
Mother Diabetes Mellitus	31.51%	
Irregular Menstrual Cycle	37.27%	P < 0.020
Previous History Of GDM	7.57%	P < 0.009
Gravida	1.91 ± 1.10	P < 0.010
Multigravida	51.81%	
Primigravida	48.18%	
Hemoglobin (gm/dl)	11.51 ± 1.22	P < 0.135
HB >13 gm/dl	9.69%	

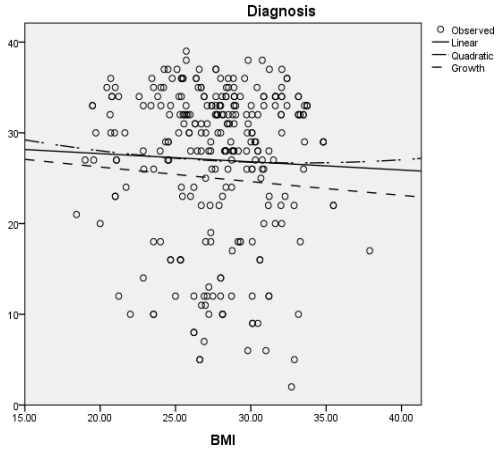
Table 2 shows the average values of risk factors of the women who developed GDM early.

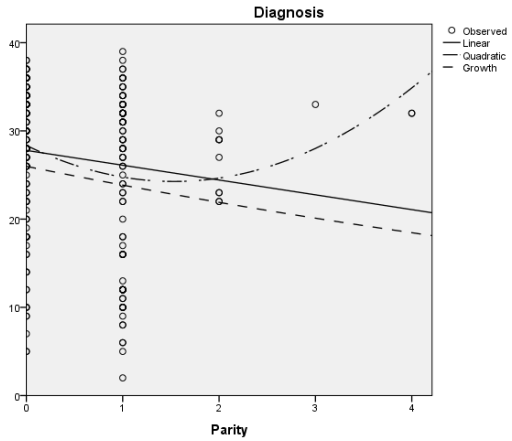
Risk factors	Average value
Age	28.33 ± 3.89 yrs.
BMI	0.50 ± 0.57
Gravidity	1.95 ± 1.10
Parity	

The following graphs are showing age against diagnosis, BMI against diagnosis, gravidity against diagnosis and parity against diagnosis.









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