

Original Article

Glycemic Status During Different Trimester of Pregnancy

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Abstract

Gestational diabetes mellitus (GDM) and impaired glucose tolerance (IGT) during pregnancy cause significant fetal and maternal morbidity. Evaluation of glycemic status throughout the pregnancy especially during second and third trimesters is of paramount importance to detect GDM and IGT cases. This can help taking appropriate control measures and to avoid unwanted feto-maternal outcomes. The focus of this research is to understand variation of glycemic status at different trimester and generate a baseline data for Bangladesh using a case study. A total of 300 pregnant women at different trimester of pregnancy were recruited for the study. Plasma glucose levels both fasting and post prandial were done by standard laboratory procedure in all pregnant women included in this study. Glycosylated haemoglobin (HbA1C) level of all pregnant women were also estimated and expressed in percentage (%). Out of 300 pregnant women 57% were in 3rd, 32% were in the 2nd and 11 % were in the 1st trimester. The results found 3%, 6.3% and 4.1% pregnant women in the 1st, 2nd and 3rd trimester respectively had significantly raised level of postprandial blood sugar (PPBS) and HbA1c levels with cumulative prevalence of 4.7%. This finding is consistent with the range of GDM as per World Health Organization (WHO) estimates in different population study. The finding from this research will be beneficial to understand the risk for GDM implement patient screening plan to work effectively in Bangladesh.

Key words: Glycemic Status, Trimester, Pregnancy, Gestational diabetes mellitus (GDM), Impaired glucose tolerance (IGT).

Introduction

Pregnancy consists of continuous physiologic adjustments that alters maternal internal environment to provide a favorable condition to the fetus. Plasma glucose level is well maintained within physiological limit by the action of insulin in both pregnant and non-pregnant conditions¹. Longitudinal studies of glucose tolerance during gestation show a progressive increase in nutrient stimulated insulin responses despite an only minor deterioration in glucose tolerance, consistent with progressive insulin resistance^{2,3}. During pregnancy, estrogens, progesterone, cortisol, prolactin and human placental lactogen levels are increased. Increased concentration of those hormones cause increase

secretion of insulin but decreases its sensitivity to target tissues⁴. It has been reported that on an average 2 to 4% pregnant women develop gestational diabetes mellitus (GDM)^{5,6}. This happens because they are unable to produce an increased amount of insulin to overcome the resistance level¹. Women with glucose intolerance during pregnancy usually remain asymptomatic. But glucose intolerance during pregnancy causes significant increase in feto-maternal abnormalities including congenital fetal abnormalities, macrosomia, hypoglycemia, hyper-viscosity syndrome, respiratory distress syndrome in fetus. Women with GDM have an approximately 50% risk of developing type-II diabetes over the next ten years.

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Maternal complications also include increase incidence of pre-eclampsia, infection, post-partum bleeding and cesarean deliveries^{7,8,4}. So determination of glycemic status is very vital to identify risk of pregnancies. There is few base line data about the glycemic status of pregnant women in our country. So the aim of the present study was to determine the glycemic status during different trimester of pregnancy for better understanding of glucose homeostasis during pregnancy.

Method

This descriptive type of cross-sectional study was carried out in the Department of physiology, Rajshahi Medical College, Rajshahi between the period of January 2010 to December 2010. Three hundred pregnant women without any complication in different trimester of pregnancy aged 18-35 years were enrolled in study group. Cluster sampling technique was followed for data collection among pregnant women attending out patient department of obstetrics and gynaecology in Rajshahi Medical College hospital and other clinics in Rajshahi city. The protocol of this study was approved by Ethical Review Committee (ERC) of Rajshahi medical college. All the subjects were free from Diabetes, Hypertension and other systemic diseases. Before recruitment, aim, benefit and procedure of study was explained and informed written consent from each subject was taken. Thorough physical examination of all subjects were done. Fasting blood sample was collected after 8-10 hours of fasting by venipuncture taking all aseptic precautions. Post-prandial blood sample was collected two hours after 75gm glucose intake. 3ml collected blood was immediately transferred into a sterile test tube containing anticoagulant EDTA. Plasma was prepared by ultra-centrifugation. Plasma glucose level was estimated by glucose oxidase method (GOD-PAP) using colorimeter. HbA1C level was measured by nycocard HbA1C test. The statistical analysis was done by ANOVA test.

Results

A total of 300 pregnant women at different trimester of pregnancy were recruited for the study. Plasma glucose level both fasting and post prandial were done by standard laboratory procedure in all pregnant women included in this study. The results were expressed in mmol/L. HbA1C level of all pregnant women were also estimated and expressed in percentage (%). Collected data were analyzed by using SPSS computer software program. The level of significance was set up at 0.05

and P value <0.05 was considered to be statistically significant.

Table 1: Blood Sugar Levels and HbA1C Level of the Pregnant Women in Different Trimester of Pregnancy.

Gestational Age	Pregnant women Number (%)	FBS (mmol/L)		PPBS (mmol/L)		HbA 1C >6%
		Mean value (±SD)	>6.1	Mean value (±SD)	>7.8	
1 st trimester (up to 12 wks)	33 (11%)	3.6 (±0.174)	1(3%)	5.0 (±0.348)	1(3%)	1(3%)
2 nd trimester (13-24 wks)	96 (32%)	4.0 (±0.386)	6(6.2%)	5.6 (±0.422)	6(6.3%)	6(6.3%)
3 rd trimester (25-40 wks)	171 (57%)	4.1 (±0.239)	4(2.4%)	5.7 (±0.271)	7(4.1%)	7(4.1%)

Blood sugar levels (FBS, PPBS) and HbA1C levels in different trimester of pregnancy are shown in Table 1. Out of 300 pregnant women 171 (57%) were in 3rd, 96 (32%) were in the 2nd and 33 (11%) were in the 1st trimester. 1 (3%), 6 (6.3%), 7 (4.1%) pregnant women in the 1st, 2nd and 3rd trimester respectively had significantly raised level of PPBS and HbA1C levels.

Table 2: Statistical analysis of FBS level in different trimester of pregnancy.

Gestational age	Pregnant women Number (%)	FBS (mmol/L) Mean±SD	df	P value
1 st trimester	33 (11%)	3.6 (±0.174)	32	0.029
2 nd trimester	96 (32%)	4.06 (±0.386)		
3 rd trimester	171 (57%)	4.1 (±0.239)		

ANOVA test done

df = Degree of freedom

p value = 0.029 (<0.05) both between groups and within groups.

Table 3: Statistical analysis of PPBS level in different trimester of pregnancy.

Gestational age	Pregnant women Number (%)	FBS (mmol/L) Mean±SD	df	P value
1 st trimester	33 (11%)	5.0 (±0.348)	32	0.089
2 nd trimester	96 (32%)	5.6 (±0.422)		
3 rd trimester	171 (57%)	5.7 (±0.271)		

ANOVA test done

df = Degree of freedom

p value = 0.089 (>0.05) both between groups and within groups.

Table 4: Statistical analysis of HbA1C level in different trimester of pregnancy.

Gestational age	Pregnant women Number (%)	HbA 1C (>6%)	df	P value
1 st trimester	33 (11%)	1(3%)	32	0.047
2 nd trimester	96 (32%)	6 (6.3%)		
3 rd trimester	171 (57%)	7 (4.1%)		

ANOVA test done

df = Degree of freedom

p value = 0.047 (<0.05) both between groups and within groups.

Discussion

Glucose is a hexose sugar vital as a substrate for energy metabolism. Glucose is a major nutrient for fetal growth and energy. It is thus logical that mechanisms exist during pregnancy to minimize maternal glucose use, so that the limited maternal supply is available to the fetus³. However abnormalities of carbohydrate metabolism occur frequently during pregnancy and between 3% to 5% of all pregnant women show glucose intolerance. Approximately 90% of those women have gestational diabetes⁹. So determination of glycemic status is very vital to identify risk pregnancies. In the present study, we have found that fasting and post-prandial blood sugar were gradually increased with advancing gestational age but mostly they were within normal physiological range. This finding is compatible with Butte, 2000. It may be due to the fact that placental lactogen (FPL), a hormone normally present in abundance in the mother but not in the fetus, blocks the peripheral uptake and use of glucose while promoting the mobilization and use of free fatty acids by maternal tissue³. Moreover, increased production of cortisol, estradiol and progesterone as well as increased insulin destruction by kidney and placenta might result increased maternal glucose level¹⁰.

In the present study, the prevalence of Gestational diabetes mellitus in 1st, 2nd and 3rd trimester was 3%, 6.3% and 4.1% respectively with cumulative prevalence 4.7%. This finding coincides with the range of GDM as per WHO estimates in different population study^{11,12,13,14}. However, our finding is much lower than the prevalence rate of GDM observed by Akirprle, 2011 and Swami, 2008. It may be due to the fact that they have observed prevalence rate of GDM among women with identified risk factor. On the other hand, the prevalence

rate of GDM in our study is a random finding because the aim of our study was to reveal the glycemic status as a whole among the pregnant women, not only among high risk groups. One of the strength of our study is that we have observed glycemic status during pregnancy among large sample size. However we did not follow blood sugar level of pregnant women throughout their pregnancy due to non-compliance of the participant which is a drawback of the study. So cross-longitudinal study on larger sample size should be done for better understanding of glucose homeostasis during pregnancy.

Conclusion

It was observed in this study that blood sugar levels vary within normal range in different trimesters of pregnancy. Over 50% of the GDM diagnosed in this study were in the 1st trimester. There is no global consensus on screening strategies to be employed for GDM, although there are calls for universal screening of all pregnant women between 24th and 28th weeks of pregnancy. Our dataset suggest screening would be effective if starts slight early from 22nd weeks of pregnancy. Selective screening is more commonly employed strategy. Our findings of GDM before 3rd trimester of pregnancy have raised the issue of screening of pregnant women for their glycemic status during 1st antenatal check-up. Since GDM has important fetomaternal complications. Its early detection will have unique opportunity for the obstetricians to closely monitor the situation for a better outcome. This research suggest further study consider multi-centered studies involving risk pregnancies to estimate the prevalence of GDM in Bangladeshi women is recommended.

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