



Original Article

Effect of Aging on Glycemic Status during Pregnancy

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Abstract

Background: Pregnancy is associated with profound alteration in maternal metabolism. But this altered glucose homeostasis during pregnancy causes significant increase in feto-maternal abnormalities. This risk may increase due to maternal ageing.

Objective: To assess the effect of ageing during pregnancy on fasting and postprandial glucose and glycated hemoglobin level in order to find out the risk of gestational diabetes.

Methods: This cross sectional study was carried out in the department of Physiology, Rajshahi medical college, between the periods of January 2010 to December 2010. Three hundred pregnant woman aged 15 to 39 years were enrolled in the study and were divided into 5 different age groups, fasting and postprandial blood glucose and glycated hemoglobin levels were estimated by standard laboratory procedure. Data were analyzed by using SPSS computer software program and the test for significance was done by Chi-square test.

Result: About 43% of pregnant women belonging to age group 35-39 years were detected as gestational diabetes mellitus, whereas less than 1% pregnant women among 20-24 years age group was detected as GDM. Blood sugar level both FBS and PPBS of all the pregnant women of age group 15-19 years are within normal limit.

Conclusion: Results of the study indicates that the incidence of GDM was proportionate to increasing maternal age. So close monitoring of older pregnant women should be done to avoid feto-maternal complications.

Key words: Gestational diabetes mellitus (GDM), Age, Risk.

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Introduction

Pregnancy consists of continuous Physiologic adjustments that alters maternal internal environment to provide a favourable condition to the fetus.^{1,2} Pregnancy is associated with changes in carbohydrate and lipid metabolism and alteration in insulin sensitivity which may lead to change in plasma glucose levels.^{3,4}

Plasma glucose level is well maintained within physiological limit by the action of insulin in both

pregnant and non pregnant conditions. Fasting plasma glucose level >7 mmol/l and postprandial glucose level >11.1 mmol/l are considered as diabetic, while fasting glucose level 6.1-7 mmol/l and postprandial glucose level 7.8-11.1 mmol/l respectively considered as impaired glucose tolerance.⁵

Women with glucose intolerance during pregnancy usually remain asymptomatic. But glucose intolerance during pregnancy causes

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significant increase in feto-maternal abnormalities inducing congenital fetal abnormalities, macrosomia, hypoglycaemia, hyperviscosity syndrome, respiratory distress syndrome in fetus. Maternal complications include increase incidence of pre-eclampsia, infection, post partum bleeding and cesarean deliveries.^{6,7}

Apart from pregnancy related changes in hormones, glycemic status of pregnant woman can also be related with other factors like ageing, BMI, socio economic condition etc. However there is no baseline data in our country about the effect of ageing on glycemic status during pregnancy.

So, the present study has been designed to determine the glycemic status during pregnancy and to find out its relation with ageing.

Materials and Methods

This cross sectional study was carried out in the department of Physiology, Rajshahi medical college, Rajshahi between the periods of January 2010 to December 2010. Three hundred pregnant women aged 15-39 years, without any known systemic disorders were enrolled in study group.

Results:

A total of 300 pregnant women at different trimester of pregnancy were recruited for the study. Plasma glucose levels both fasting and postprandial were done by standard laboratory procedure in all pregnant women included in this study. The results were expressed in mmol/L. HbA_{1c} level of all pregnant women were also estimated and expressed in percentage (%). Collected data were analyzed by using SPSS computer software program and the test for significance was done by Chi-square test. Age distribution of the study population is shown in Figure-1.

Study subjects were selected by following random sampling procedure from Rajshahi medical college hospital and other clinic of Rajshahi city. The protocol of the study was approved by Ethical Review Committee of Rajshahi medical college. All the subjects were free from Diabetes, hypertension, hypothyroidism, Cushing syndrome, polycystic ovary, renal and cardiovascular disorder. Before recruitment, aim benefit and procedure of the study was explained and their informed written consent from each subject was taken. Thorough physical examination of all subjects was done. Then under aseptic precaution, 5 ml blood samples were drawn from antecubital vein. Serum was prepared by ultracentrifugation. Fasting and postprandial blood glucose and glycated haemoglobin levels were estimated by standard laboratory procedures. A diagnosis of gestational diabetes mellitus was made if the fasting plasma glucose value was ≥ 7 mmol/liter and / or the 24 postprandial glucose value was ≥ 11.1 mmol/liter. The statistical analysis was done by Chi-square test.

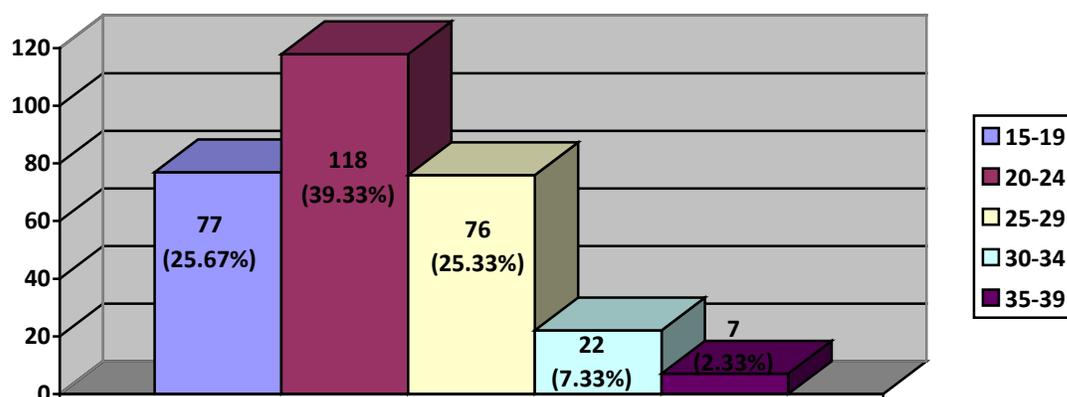


Figure-1: Age distribution of the study population

Study population were divided into 05 different age groups, 15-19 years, 20-24 years, 25-29 years, 30-34 years, 35-39 years. Among the study population 20-24 years age group constituted the highest number 118(39.33%) followed by 15-19 years age group 77 (25.67%), 25-29 years age group 76 (25.33%) and 30-34 years age group 22 (07.33%). Age group 35-39 years was lowest in number 7 (2.33%).

Table-1: Relationship between age group of the sample population and fasting blood sugar level.

Age group of the respondents (Years)	Grouping of the respondents by fasting blood sugar level			Total
	Up to 6.1 (mmol/L)	6.2-7.0 (mmol/L)	>7.0 (mmol/L)	
	Number (%)	Number (%)	Number (%)	Number (%)
15-19	77(100%)	0(0.0%)	0(0.0%)	77(25.7%)
20-24	117(99.2%)	1(0.8%)	0(0.0%)	118(39.3%)
25-29	71(93.4%)	1(1.3%)	4(5.3%)	76(25.3%)
30-34	20(90.0%)	2(9.1%)	0(0.0%)	22(7.3%)
35-39	4(57.1%)	2(28.6%)	1(14.3%)	7(2.3%)
Total	286(96.3%)	6(2.0%)	5(1.7%)	300(100%)

Relationship of fasting blood sugar level at different age groups is shown in table 1. Fasting blood sugar level of 300 pregnant women was done. Among them 289 (96.3%) had normal level, 6 (2.0%) had IGT and 5 (1.7%) had diabetic level. Significantly raised FBS level was noted with advancing age and it was statistically highly significant ($P<0.001$)

Table-2: Relationship between age group of the respondents and post prandial blood sugar level.

Age group of the respondents (Years)	Grouping of the respondents by PPBS			Total
	Up to 7.8 (mmol/L)	7.9-11.1 (mmol/L)	>11.1 (mmol/L)	
	Number (%)	Number (%)	Number (%)	Number (%)
15-19	77(100%)	0(0.0%)	0(0.0%)	77(25.7%)
20-24	117(99.2%)	1(0.8%)	0(0.0%)	118(39.3%)
25-29	68(89.5%)	4(5.3%)	4(5.3%)	76(25.3%)
30-34	20(90.9%)	2(9.1%)	0(0.0%)	22(7.3%)
35-39	4(57.1%)	0(0.0%)	3(42.9%)	7(2.3%)
Total	286(95.3%)	7(2.3%)	7(2.3%)	300(100%)

Table 2 shows relationship of postprandial blood sugar level with age groups. It shows that postprandial blood sugar level of 286(95.3%) pregnant women out of 300 were within normal limit. 14 women had sugar level above normal, of them 7(2.3%) women belongs to IGT group and 7(2.3%) belong to diabetic group. All women of age group 15-19 years had normal PPBS level. 3(42.9%) women out of 7 women of

35-39 years age group had diabetic PPBS level. PPBS in the range of GDM was statistically significant ($P<0.001$) with increasing maternal age.

Table-3: Relationship between age groups of the respondents and HbA_{1c} level

Age group of the respondents (Years)	HbA _{1c}		Total
	4-6%	>6%	
	Number (%)	Number (%)	Number (%)
15-19	77(100%)	0(0.0%)	77(25.7%)
20-24	117(99.2%)	1(0.8%)	118(39.3%)
25-29	68(89.5%)	8(10.5%)	76(25.3%)
30-34	20(90.9%)	2(9.1%)	22(7.8%)
35-39	4(57.1%)	3(42.9%)	7(2.3%)
Total	286(95.3%)	14(4.7%)	300(100%)

Table 3 shows HbA_{1c} level of the pregnant women at different age groups. All pregnant women in the age group of 15-19 years had their HbA_{1c} level within normal limit. Increasing maternal age of >25 years was significantly ($P<0.001$) associated with HbA_{1c} level above normal limit of >6%.

Discussion:

The first half of pregnancy is primarily a time of preparation for the demand of the rapid fetal growth that occurs later in pregnancy, changes in carbohydrate and lipid metabolism occur during pregnancy to ensure a continuous supply of nutrients to the growing fetus despite intermittent maternal food intake. These metabolic changes are progressive and may be accentuated in woman who developed gestational diabetes mellitus.^{9,1}

In the present study, we observed a positive correlation between increased plasma glucose level and increasing maternal age. Fasting blood sugar, postprandial blood sugar and glycated hemoglobin levels were all significantly raised in pregnant woman having increasing age. Around 11% of pregnant women of 25-29 years, 9% among 30-34 years and 43% among 35-39 years age groups were found to have their glycated hemoglobin level more than 6% and also had impaired glucose tolerance and frank diabetes mellitus. On contrary, less than 1% of pregnant women among 20-24 years age group was detected as gestational diabetes mellitus. These

findings are compatible with many investigators.^{10,11} It may be due to the fact that pancreatic beta cell function declines with ageing which increases the risk of abnormal glucose homeostasis.¹² Moreover aging causes weight gain which is a recognized cause of increased insulin resistance.¹³

During pregnancy, estrogen, progesterone, cortisol, prolactin and human placental lactogen levels are increased. Increased concentration of these hormones cause increase secretion of insulin but decreases its sensitivity to target tissues. This study revealed that insulin resistance during pregnancy was exaggerated due to ageing process.

One of the strength of this study is that it established increased maternal age as an independent predictor of gestational diabetes mellitus. So it is important to pay attention to the older pregnant woman. However we did not measure insulin level and insulin resistance which are weaknesses of the study.

Conclusion:

Our findings indicate that the risk of gestational diabetes mellitus becomes significantly and

progressively increased from 25 years onwards. So in clinical practice, maternal age of at or above 25 years should be adopted instead of at or about 40 years as a risk factor for the development of gestational diabetes mellitus.

References

1. Strehlow SL, Greenspoon JS, Janzen C, Palmer SM. Diabetes Mellitus and Pregnancy in Current diagnosis and treatment obstetrics and Gynaecology. 10th edition, MacGraw-Hill, 2007.
2. Dutta DC. Physiological change in pregnancy 6th edition. Calcutta (INDIA): New central book agency (P) LTD, 2004; 51-54.
3. Dornherst A and Williamson C. Diabetes and endocrine disease in pregnancy in Dornhorst's text book of obstetrics and gynaecology, 7th edition. Blackwell publisher, Oxford University press, 2007; 247-253.
4. Alfadhli EM. Gestational Diabetes Mellitus. Saudi Med J. 2015; 36(4): 399–406.
5. Marsharani U, Diabetes Mellitus and Hypoglycemia: Current Medical Diagnosis and Treatment, Fourty Eight Edition, McGraw-Hill, USA. 2009.
6. Arias F, Diabetes and Pregnancy in practical guide to high risk pregnancy and delivery, 3rd edition. Elsevier, New delhi. 2008.
7. Consin L. Pregnancy complications among diabetic women: Review 1965-1985. Obstet Gynecol Surv. 1987; 42: 140-148.
8. King JC. Physiology of pregnancy and nutrient metabolism 1-3. Am J Clin Nutr 2000; 71(Suppl): 1218S-25S.
9. Xiong X, Saunders LD, Wang FL. Deminanczuk NN. Gestational diabetes mellitus: Prevalence, risk factor, maternal and infant outcomes. Int J Gynaecol Obstet. 2001; 75: 221-228.
10. Nanda S, Savvidou M, Syngelaki A, Akolekar R et al. Prediction of gestational diabetes mellitus by maternal factors and biomarkers at 11 to 13 weeks. Prenat Diagn 2011; Doi: 10.1002/Pd 2636.
11. Walker BR, Colledge NR, Ralston SH, Penman ID. Davidson's Principles and Practice of Medicine. 22nd edition. China: Elsevier Limited; 2014.
12. Guyton AC, Hall JE. Insulin, glucagon and diabetes mellitus. Textbook of Medical Physiology. 11th edition. WB Saunders Company. Philadelphia, 2006.

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