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Diagnosis and Management of Gestational Diabetes with Oral Glucose Tolerance Test and HBA1C

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ABSTRACT

Introduction: Gestational diabetes mellitus (GDM) is a potentially serious and prevalent condition such as fetal growth abnormalities, shoulder dystocia, birth injury, prematurity and increased Caesarean section rate, which may lead to serious effects in mothers and neonates. Recently HbA1c used diagnostic criterion for diabetes (DM).

Objective: Diagnosis and Management of Gestational Diabetes with Oral Glucose Tolerance Test and Hba1c.

Methods: A total of 241 pregnant women recruited in the study. Pregnant women in prenatal care, without previous DM, were included to perform OGTT tests in the third trimester of pregnancy. written informed consent was obtained from all the patients.

Results: All the patients were between 23 and 35 years of age in the third trimester of pregnancy (gestational age = 27±5 weeks). In patients without GDM mean SBP was 110±11.8and with GDM 119±12.6 (p <0.001). In cases without GDM mean DBP (Diastolic blood pressure) was 70±8.4 mmHg and with GDM 82±15.1 mmHg (p <0.001). In patients without GDM mean FBS (Fasting blood sugar) was 77.4±9.4 and with GDM 95.4±12.6 mg/dl. Mean 1hrs. Glucose was 120.6±12.4 in patients without GDM and with GDM it was 176.8±16.4. In patients without GDM mean 2HRS.Glucose was 115.2±11.4 and with GDM 147±15.4. In patients without GDM mean HbA1c was 5.2±0.3and with GDM 5.9±0.6 (p <0.001). In patients without GDM mean Hb was 11.6±0.7and with GDM 11.8±0.5 (p 0.022). In patients without GDM mean Cholesterol was 210±22.4 and with GDM 225±35.7 (p <0.001).

Conclusion: Different HbA1c cut-off points may be useful in a diagnostic tool for GDM in combination with OGTT. This will result in a considerable decrease in the research workload on both patients and the testing centre, employees and equipment.

Key Words: Gestational diabetes mellitus, GDM, HbA1c, Hb, Cholesterol, Blood glucose

INTRODUCTION

Gestational diabetes mellitus (GDM) is a potentially serious and prevalent condition such as fetal growth abnormalities, shoulder dystocia, birth injury, prematurity and increased Caesarean section rate, which may lead to serious effects in mothers and neonates.[1,2] The risk of adverse perinatal and maternal outcomes are directly proportional to the level of hyperglycaemia, and there is a linear relationship between maternal glucose and various neonatal outcomes.[3] Detection of GDM and treatment reduces the risks for the mothers as well as for the neonates.[3]

Customarily, the OGTT has been the test of choice for this condition. It can be preceded by a screening methodology, for example, fasting glycemia (FG) or a glucose load test. But still are controversies regarding OGTT cut-offs which should be used for the diagnosis of GDM and also a recent review concluded that the evidence is insufficient to permit assessment of which strategy is best to diagnose GDM.[4] HbA1c test as a diagnostic criterion for diabetes (DM) in the general population and was included in 2010 by the American Diabetes Association (ADA). The cut-off of HbA1c ≥48 mmol/mol (6.5%) was set up for the conclusion, and was endorsed by the World Health Organization (WHO) in 2011.[5,6] However weak agreement was seen in between HbA1c and glucose tests and these two tests may identify different populations of patients.[7]

OGTT is a cumbersome test which is time-consuming, labour intensive and generally poorly tolerated by pregnant women. It is important to fasten the patient, sit for more

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than 2 h and have at least three venipunctures. Pregnant women are susceptible to nausea and vomiting from delayed emptying of the stomach. This may contribute to an invalid test result, combined with gestational oedema compromising venous access. Also, the recommendation for universal screening has greatly increased the research burden. HbA1c is the result of glucose's irreversible non-enzymatic binding to plasma proteins, in particular haemoglobin. (Hb).HbA1c is a single, non-fasting blood test and reflects glucose levels over the previous 4 to 8 weeks. HbA1c has been shown to have greater reliability compared to glucose monitoring. [8,9]

Based on this study was carried out to analyse HbA1c test for detection of GDM based on OGTT as a reference test.

MATERIAL AND METHODS

The present study was carried out in the department of OBGY. A total of 241 pregnant women recruited in the study. Pregnant women in prenatal care, without previous DM, were included to perform OGTT tests in the third trimester of pregnancy. written informed consent was obtained from all the patients. There have been records of the era, gestational age, obstetric background, smoking, family history of cardiovascular disease (CVD), DM, arterial hypertension (HT), alcohol intake, and drug usage. The weight and height of patients have also been reported and used to measure BMI (kg/m^2) values.

Patients were excluded from the study if observed with the following conditions which are known to interfere with or lead to the misinterpretation of HbA1c results, anaemia, chronic renal disease and/or presence of haemoglobin variants. After an overnight fast, blood samples were taken to determine HbA1c levels, blood cell counts, lipid profile, creatinine and glucose concentrations. The OGTT was performed according to recommendations.

All data were entered in the Excel sheet, Data were expressed as mean and SD for normally distributed variables, and as median (range) for non-Gaussian variables. Student's *T*-tests and kappa coefficients were used as appropriate.

RESULTS

A total of 241 pregnant women recruited in the study. Pregnant women in prenatal care, without previous DM, were included to perform OGTT tests in the third trimester of pregnancy and were assessed as to the presence or absence of GDM. All the patients were between 23 and 35 years of age in the third trimester of pregnancy (gestational age = 27±5 weeks) (Table 1).

Table 1: Clinical and laboratory characteristics of study participants

	Gestational diabetes mellitus (GDM)		
Parameters	**Without GDM (n=159)**	**With GDM (n=82)**	**P value**
Age in years	27±5.2	33±5.4	<0.001
Gestational age	27±5.4	26± 4.5	NS
BMI (kg/m2)	28±5.2	31±6.8	<0.001
SBP (mmHg)	110±11.8	119±12.6	<0.001
DBP (mmHg)	70± 8.4	82 ±15.1	<0.001
Fasting glucose (mg/dl)	77.4 ±9.4	95.4 ± 12.6	
1hours glucose (mg/dl)	120.6 ± 12.4	176.8±16.4	
2 hours glucose(mg/dl)	115.2 ± 11.4	147±15.4	
HbA1c (%)	5.2 ± 0.3	5.9 ± 0.6	<0.001
Hb% g/dl	11.6±0.7	11.8±0.5	0.022
Cholesterol mg/dl	210±22.4	225 ±35.7	<0.001

NS: Not Significant

In patients without GDM mean age was 27±5.2and with GDM 33±5.4 (p <0.001). In patients without GDM mean Gestational age was 27±5.2and with GDM it was observed as 26±4.5 weeks. Mean BMI was observed to be 28.5±5.2 kg/ m^2 in cases without GDM and 31±6.8 in GDM (p <0.001)

In patients without GDM mean SBP was 110±11.8and with GDM 119±12.6 (p <0.001). In cases without GDM mean DBP (Diastolic blood pressure) was 70±8.4 mmHg and with GDM 82±15.1 mmHg (p <0.001). In patients without GDM mean FBS (Fasting blood sugar) was 77.4±9.4 and with GDM 95.4±12.6 mg/dl. Mean 1hrs. Glucose was 120.6±12.4 in patients without GDM and with GDM it was 176.8±16.4. In patients without GDM mean 2HRS.Glucose was 115.2±11.4 and with GDM 147±15.4. In patients without GDM mean HbA1c was 5.2±0.3 and with GDM 5.9±0.6 (p <0.001). In patients without GDM mean Hb was 11.6±0.7and with GDM 11.8±0.5 (p 0.022). In patients without GDM mean Cholesterol was 210±22.4 and with GDM 225±35.7 (p <0.001).

There has been a statistically important disparity between women with and without GDM in age, BMI, blood pressure and GDM history. 82 pregnant women were classified with GDM based on these results and taking into account HbA1c (5.8%) as a guideline in the cut-off point for GDM. The agreement between the diagnoses provided in this study according to the HbA1c cut-off and the results of the OGTT was fair.

DISCUSSION

Laboratory testing of HbA1c has been highly systematic and has evolved to be an easier, more reliable and automatic test to examine the importance of HbA1c for GDM diagnosis.[10] As predicted, our data revealed that in pregnant women without GDM, HbA1c values were significantly lower than those seen in pregnant women with GDM. There was some overlap between the HbA1c values showed by participants in the two groups, however. These findings were in agreement with another study by Balaji et al.[11] and Rajput et al.[12]

Differences in HbA1c values are more likely to be caused by other physiological causes during pregnancy.[13] Anaemia could not describe these variations in our research, as women with and without GDM presented with similar levels of total haemoglobin. When we used the HbA1c cut-off point of (5.8 per cent) to detect participants with and without GDM, it was found that those identified as having the disorder were more likely to be older and had prior GDM and DM family history, as well as higher BMI, blood pressure (systolic and diastolic), glycemia (fasting, 1h and 2hG) and cholesterol levels. Due to these parameters, there is an increase chance of adverse outcome for both mother and child[14]. A different GDM group from that diagnosed by glucose-based tests appears to be identified by the HbA1c test. The weak diagnostic agreement between tests corroborates this fact.

In our findings, it was found that 34.02% of GDM patients were diagnosed with the HbA1c cut-off point of around (5.8%) and that 6% of pregnant women were classified by the OGTTT as GDM negative. A study in Australia[15] found that a subgroup of pregnant women had a normal OGTT but elevated HbA1c, indicating that a clinically significant result is HbA1c > 40 mmol/mol (5.8 per cent) during pregnancy which is similar to our findings.

CONCLUSION

To conclude different HbA1c cut-off points may be useful in a diagnostic tool for GDM in combination with OGTT. This will result in a considerable decrease in the research workload on both patients and the testing centre, employees and equipment. Further investigations are needed to incorporate HbA1c with optimization of the cut-off value as a single non-fasting screening method for GDM.

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