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Effects of family history of diabetes on blood glucose levels among Sudanese pregnant women at Dream maternity hospital, Khartoum, April, 2017

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Abstract

Background: The incidence of glucose intolerance in Sudanese pregnant women was found to be within the universal estimates. Family history of diabetes is considered by many authors a risk factor for pregnancy glucose intolerance. Regarding the diversity of the Sudanese population, international screening and diagnosis criteria of glucose intolerance may not apply.

Materials and Methods: This case-control cross-sectional study has recruited pregnant women at Dream Maternity Hospital (n=73) as well as nonpregnant women as control group (n=67). Blood samples were collected from all study units chosen by convenient sampling method and analyzed for blood glucose concentration using spectrophotometry and glucose oxidase-peroxidase kits. Results obtained were analyzed using SPSS (ANOVA).

Results: Mean age in the pregnant women group was 29.8

years and in the control group was 25.4 years. 30.1% of the pregnant women were in their first trimester, 37% in their second trimester and 32.9% in their third trimester. No significant difference was noted when blood glucose levels were compared in both groups (p=0.461) and this was also the case when age was considered in this comparison (p=0.264). Positive family history for diabetes has shown an obvious effect on blood glucose levels (p=0.015). When trimester of pregnancy was taken into consideration still there was no significant difference (p=0.114) although those in their third trimester exhibited higher concentrations of blood glucose.

Conclusion: Family history of diabetes is strongly related to high blood glucose levels in Sudanese pregnant women and warrants screening for GDM.

Keywords: blood glucose, Sudanese pregnant, pregnant women

Introduction

GDM is defined as carbohydrate intolerance of variable severity with onset or first diagnosed during pregnancy^[1]. The definition applies whether insulin or only diet modifications are used for treatment or whether the condition persists after pregnancy or not^[2]. Women with increased BMI, age, weight and positive family history of diabetes mellitus should be screened early in pregnancy^[3]. Women with GDM have a 10-fold higher risk of developing type 2 diabetes during a 10 years' follow up period compared to women without GDM^[4].

In Sudan, one study has concluded that the frequencies of GDM and glucose intolerance in Sudanese pregnant women are within the universal estimates^[5]. Another study has concluded that one of the strongest predictors of GDM in Sudanese women is family history of diabetes mellitus^[6]. These findings necessitate screening of pregnant Sudanese women for GDM.

There is no international consensus regarding timing and screening methods, although WHO criteria are universally accepted including fasting plasma glucose ≥ 7.0 mmol/L (126mg/dL), 2-hours after a 75 g oral glucose load plasma glucose ≥ 11.1 mmol/L (200 mg/dl) or random plasma glucose ≥ 11.1 mmol/L (200 mg/dl) in the presence of diabetes symptoms^[7, 8].

However, keeping in mind the diversity of the Sudanese population, judging the international criteria for screening and diagnosis of GDM may not be conclusive.

Objective

This study was designed to explore the effect of family history of diabetes mellitus on blood glucose levels in Sudanese pregnant women.

Materials and Methods

Study Design

This is a case- control cross-sectional study that is facility based. Study units were Sudanese pregnant women from Dream Maternity Hospital. Women who are diabetic or are using drugs for any other cause were excluded. Approval of the study was sought from both: College of Medicine, University of Bahri and Ministry of Health, Khartoum State. Volunteer consent was obtained from targeted subjects and they were insured confidentiality and their right to receive treatment even if they did not agree to participate.

Sampling

The number of subjects required for this study was calculated using Cochran’s size formula.

$$N = Z^2pq/e^2$$

where

- N= required number of sample units, Z= 1.96
- P= estimated proportion of the population that has the attribute in question= 0.95
- q= 1-p= 0.05
- e= margin of error= 0.05

Using this formula, N was found to be equal to 72.99. Accordingly, 73 subjects were chosen for this study. Convenient sampling method was used to choose the study units since the target population is ill-defined [9].

Materials

Blood samples were collected in Na F containers from 73 pregnant women at Dream Maternity Hospital after consent as well as from 67 volunteer nonpregnant ones. Glucose oxidase-peroxidase kits were purchased from Biosystem, Costa Prava, Barcelona, Spain.

Method

Spectrophotometry was used for the assessment of plasma glucose concentration in all the samples. The technique compares light absorbance by the treated samples to that of a standard solution with known glucose concentration (100 mg\dl) [10].

10 microlitres of the standard solution were pipetted into a labeled test tube. 10 microlitres of all samples were also pipetted into labeled test tubes. 1ml of the reagent solution (containing phosphate, phenol, glucose oxidase, peroxidase and 4aminoantipyrine) was added to all tubes as well as to an empty tube containing neither sample nor standard that served as blank. All tubes were thoroughly mixed and were then incubated for 10 minutes at room temperature. The absorbencies of the samples and the standard were measured at 500nm against the blank. Glucose concentrations of the samples were then estimated using the following formula.

$$sample\ glucose\ concentration = \frac{absorbance\ of\ sample}{absorbance\ of\ standard} \times concentration\ of\ standard$$

Results

Pregnant women included in this study were in the age range 19-40 years (mean 29.8 years) while those in the control group aged 18-48 years (mean 25.4 years). Among the pregnant women, 22 were in their first trimester (30.1%), 27 in their second trimester (37%) and 24 in their third trimester (32.9%). Computer programs (Statistical Package for Social Sciences, SPSS) were used to analyze the results obtained through analysis of variance.

When blood glucose levels were compared between pregnant and control groups, no significant difference was observed (p=0.461, Fig 1) and this was also the case when age was considered in this comparison (p=0.264, Fig 2). However, positive family history of diabetes mellitus has an obvious effect on blood glucose concentrations in both groups (p=0.015, table1), This was not the case when the trimester of pregnancy was regarded, although a notable rise in blood glucose concentrations among those in their third trimester was detected (p=0.114, table2).

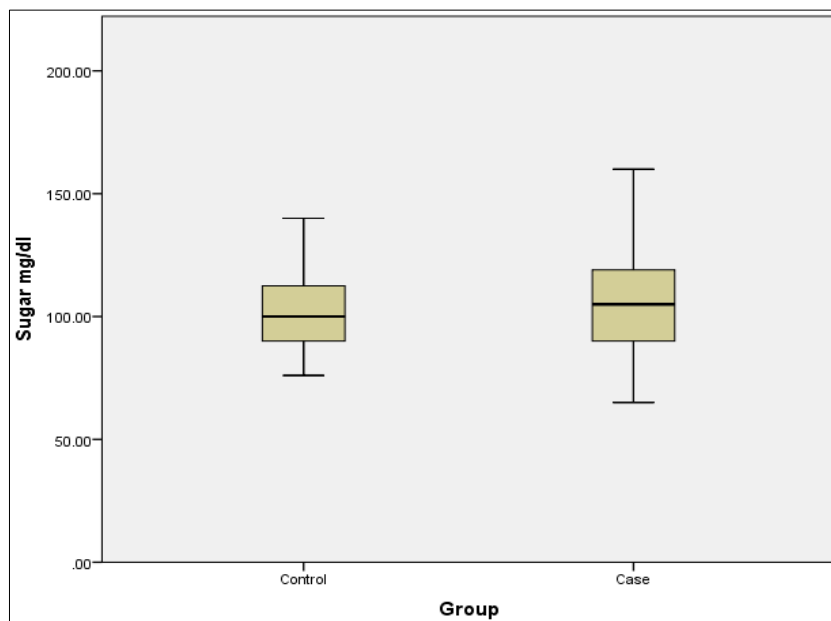


Fig 1: Comparison of Blood Glucose between cases (pregnant) and control (nonpregnant) Groups

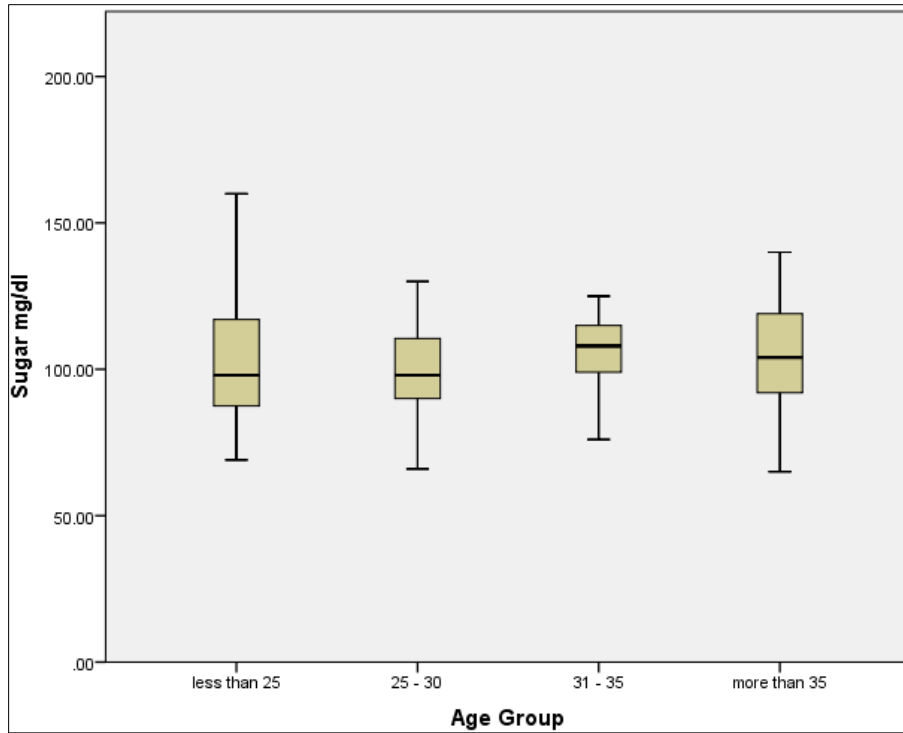


Fig 1: Effect of Age on Blood Glucose among Pregnant and Nonpregnant Women

Table 1: Comparison of Blood Glucose Levels in Both Groups Regarding Family History for Diabetes Dream Maternity Hospital, April, 2017

Family History for Diabetes	Number	Mean Blood Glucose (mg/dl)
Positive family history for diabetes	73	105.9
Negative family history for diabetes	67	98.6

Test: ANOVA P=0.015

Table 2: Comparison of Blood Glucose Levels in Both Groups Regarding Trimester of Pregnancy, Dream Maternity Hospital, April, 2017

Trimester	Number	Mean Blood Glucose (mg/dl)
Non – pregnant	67	101.1
First trimester	22	102.5
Second trimester	27	98.2
Third trimester	24	109.5

Test: ANOVA P=0.114

Discussion

This study has shown that there is strong relationship between family history of diabetes mellitus and elevated blood glucose encountered during pregnancy. A meta-analysis study has revealed that family history of diabetes is an important risk factor for gestational diabetes mellitus^[1]. Other authors have concluded that the risk of glucose intolerance in young women with positive family history of diabetes is similar to that in high risk pregnant women of older age^[12]. In accordance with our results, Maxima Anand *et al*^[1] have concluded that family history of diabetes is statistically significant in women with GDM compared to those without GDM.

Other authors have also concluded that family history of diabetes is one risk factor for GDM^[13].

The readily noted insulin resistance in those women with family history for diabetes may be attributed to an association between frequent single nucleotide polymorphism in the adiponectin gene, type2 diabetes and a higher insulin resistance index^[14].

Conclusion

We have concluded that family history of diabetes is strongly related to high blood glucose levels in Sudanese pregnant women and warrants screening for GDM.

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