

## Frequency of Gestational diabetes mellitus and impaired glucose tolerance in urban Sudanese pregnant women in the third trimester

Mohammed H.F. Shalayel<sup>1\*</sup>, Salah A.M. Ahmed<sup>2</sup>,  
Khattab A. H.<sup>3</sup> and Gwiria M. H. Satti<sup>2</sup>

### Abstract:

**Background:** Impaired glucose tolerance may be defined as intermediate group of individuals whose carbohydrate metabolism does not constitute diabetes but is not entirely normal. It carries a higher risk of developing microvascular disease and a significant percentage of these patients eventually become diabetics.

**Objective:** of the study was to estimate the frequency of gestational diabetes mellitus (GDM) and impaired glucose tolerance (IGT) in urban Sudanese pregnant women in the third trimester. The study also showed the effect of age and parity on IGT.

**Methodology:** The study was carried out on hundred pregnant women in the third trimester.

**Results:** The frequency of gestational diabetes was 2% and it was 6% for the IGT incidence whereas, 92% of the pregnant women revealed normal fasting plasma levels.

The IGT pregnant women were older than the control pregnant women but, the age difference was not significant [ $28.7 \pm 5.5$  years (mean  $\pm$  S.D) vs.  $27.3 \pm 4.8$  respectively,  $p > 0.05$ ].

Also, the IGT pregnant women were found to have mean parity significantly greater than that of the control group [ $6.7 \pm 2$  (mean  $\pm$  S.D.) vs.  $3.9 \pm 2.1$  respectively,  $p < 0.001$ ].

**Conclusion:** The frequency of GDM and IGT in Sudanese pregnant women is within the universal estimates and parity is an important risk factor that affects impaired glucose tolerance incidence in pregnancy.

**Keywords:** microvascular, chemical diabetes, carbohydrate intolerance.

Impaired glucose tolerance (IGT) was previously known as chemical diabetes or subclinical diabetes<sup>1</sup>. It may be defined as intermediate group of individuals whose carbohydrate metabolism does not constitute diabetes but is not entirely normal<sup>2</sup>. About 25% of patients with IGT eventually become diabetic<sup>1</sup>.

Impaired glucose tolerance carries a higher risk of developing microvascular disease. It is diagnosed if fasting glucose  $\geq 6$  but  $< 7.8$  mmol/l and/or 2h glucose  $> 7.8$  mmol and

$< 11.1$  mmol/l<sup>3</sup>. Estimates of the frequency of abnormal glucose tolerance during pregnancy range from  $< 1\%$  to nearly  $20\%$ <sup>4</sup>.

Gestational diabetes mellitus (GDM) was defined as carbohydrate intolerance of varying severity with onset or first recognition during the present pregnancy<sup>5-7</sup>. It is usually discovered in the second or third trimester<sup>1</sup>.

GDM is heterogeneous disorder which complicates 1-3% of all pregnancies, and in some cases can be managed satisfactorily by dietary treatment alone, while insulin treatment is required in other cases<sup>7</sup>.

50% women with gestational diabetes will be established diabetics 10 years later<sup>8</sup>.

Al-shawaf *et al.* Riyadh (1986) showed in their study on pregnant women that over all prevalence of abnormal glucose tolerance was

1. Department of Biochemistry, Faculty of Medicine and Health Sciences, Omdurman Islamic University.

2. Department of Biochemistry, Faculty of medicine, University of Khartoum .

3. Department of Pathology, Faculty of Medicine, University of Khartoum.

\*Correspondence: E.mail: drmhfs@hotmail.com

Table 1: Fasting and 2hrs plasma glucose levels of the studied groups:

	GDM	IGT	Control
Fasting plasma glucose mmol/l (mean $\pm$ S.D)	8.15 $\pm$ 0.6	6.5 $\pm$ 0.42	4.48 $\pm$ 0.32
2h plasma glucose mmol/l (mean $\pm$ S.D)	11.3 $\pm$ 0.08	8.33 $\pm$ 0.13	5.8 $\pm$ 0.4

10.3% according to the WHO criteria<sup>9</sup>.

### Subjects, Materials and Method:

Fasting blood samples were collected from hundred urban Sudanese pregnant women in the third trimester from Khartoum Teaching hospital, Khartoum North Hospital, Soba Hospital and Fath-Elrahman Elbasheer Referral Centre. Another blood sample was collected from each patient two hours after a 75g oral glucose load. The blood samples were collected in sterile collection tubes Monoject. Manufacture by Sherwood, USA), containing potassium oxalate and sodium fluoride (Plasma glucose was estimated using glucose enzymatic colorimetric test, glucose oxidase test of Crescent diagnostics, Glucose enzymatic colorimetric test (1991) Package insert, Saudi Arabia)

### Results:

Results of fasting and 2-hrs after a 75g glucose load, plasma glucose levels of the studied groups (Mean of gestational age = 33.7 weeks) are shown in table 1.

The frequency of gestational diabetes was 2%, 6% for the IGT and 92% of pregnant women (considered as a control group), showed normal fasting plasma levels. Gestational diabetes mellitus was recognized for the first time during the present pregnancy.

Pregnant women with IGT were found to be older than those control pregnant women but the age difference was not significant [28.7  $\pm$  5.5 years (mean  $\pm$  S.D) vs. 27.3  $\pm$  4.8 respectively,  $P > 0.05$ ]. Also, the IGT pregnant women were found to have mean parity significantly greater than that of the control group [6.7  $\pm$  2 (mean  $\pm$  S.D.) vs. 3.9  $\pm$  2.1 respectively.  $P < 0.001$ ].

### Discussion:

Our results showed the incidence of gestational diabetes mellitus (2%) and impaired glucose tolerance (6%) in the third trimester of pregnancy, may be explained in terms of hormonal changes in pregnancy. Hormonal changes that occur in pregnancy profoundly affect carbohydrate metabolism. The level of oestrogen, progesterone, human placental lactogen (hPL), free cortisol and prolactin rise progressively as pregnancy advances. Of these hormones, human placental lactogen and cortisol, are insulin antagonists so insulin resistance develops as the pregnancy advances, and is most marked in the last trimester. In response to this change the normal women produce an increased amount of insulin to keep carbohydrate metabolism stable. In normal pregnancy the increased insulin production counters the rise in insulin resistance and blood glucose levels are kept within a very narrow range of between 4 and 6 mmol/l during most the 24 hours. In the second half of pregnancy, especially during the third trimester, there is an increase in insulin resistance with a slight deterioration in the glucose tolerance and the hypoglycemic effect of intravenous insulin is less. Pregnancy-onset gestational diabetes is most commonly seen at this time<sup>2</sup>.

Most pregnant women are able to counteract the insulin resistance in pregnancy by increasing their insulin secretion. However, when the capacity of insulin secretion is not sufficiently large to meet the resistance, glucose intolerance develops and the women develop gestational diabetes<sup>10</sup>.

There is suggestion that the increased insulin action on carbohydrate metabolism in early pregnancy is reduced in later pregnancy so as to provide ample glucose to the fetus at a time when its growth is maximal and its

preferential utilization of this substance reaches a peak<sup>2</sup>.

From this study, it has been clearly shown that two major factors, the age and the parity may affect the incidence of IGT.

The finding that the IGT group was older than the control group, agrees with many previous studies<sup>11, 12</sup> and this ensures that there is an age related deterioration of glucose tolerance<sup>1</sup> and makes age a very important maternal risk factor that affects glucose intolerance incidence.

Parity is a very important maternal risk factor in impairment of glucose tolerance. This may be explained in terms of the diabetogenicity of the pregnancy, which is related to a pronounced peripheral resistance to insulin<sup>13</sup>. Since, parity reflects the duration of exposure to the insulin resistance<sup>14</sup>, one can conclude that higher parity may lead to accumulation of the diabetogenic effect of pregnancy.

### Conclusion:

The incidence of GDM and IGT in Sudanese pregnant women is within the universal estimates and parity is a very important maternal risk factor that affects impaired glucose tolerance incidence in pregnancy.

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