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Gestational Diabetes Mellitus in a Nigerian Antenatal Population

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Abstract

Context: *Gestational Diabetes Mellitus (GDM) is defined as carbohydrate intolerance of variable severity, with onset or first recognition during the index pregnancy. Previous studies of the problem of pregnancy and diabetes in parts of Nigeria failed to distinguish between GDM (as defined) and pregnancy occurring in a previously diagnosed diabetic. Thus the actual prevalence of GDM in Nigeria antenatal populations is not known.*

Objectives: *To determine the prevalence of gestational diabetes mellitus and the pattern, behaviour, level of care and outcome of GDM pregnancies in a Nigerian antenatal population.*

Study Design & Setting: *Cohort observational study in a university teaching hospital.*

Main Outcome Measures: *Prevalence of GDM, glycaemic profile of GDM pregnancy, maternal and fetal complications, mode of delivery and outcome of GDM pregnancies.*

Results: *The GDM prevalence was 2.98 per 1000 pregnancies. Maternal age and gestational age at diagnosis (mean ± SD) were 31.0 ± 2.4 years and 23.88 ± 8.2 weeks respectively. Fasting venous blood glucose level at diagnosis was 7.76 ± 1.6 mmol/L while the cumulative mean FVBG throughout pregnancy was 6.56 ± 0.79 mmol/L. Pre-eclampsia 26.7%, mid-trimester abortion 6.7%, intrauterine fetal death (IUFD) 6.7% were the major antenatal complications. Caesarian section rate was 10%, gestational age at delivery - 37.55 ± 1.94 weeks and birthweight - 3.75 ± 0.55 kg.*

Conclusion: *Prevalence of GDM in this antenatal population remains low (but within the global range of 0.15 – 3.0%). Overall care and metabolic control of GDM pregnancies in our population remain sub-optimal with attendant poor feto-maternal outcomes.*

Key Words: Gestational Diabetes, Pregnancy Outcome, Glycaemia. [Trop J Obstet Gynaecol, 2001, 18: 56-60]

Introduction

Gestational diabetes mellitus (GDM) is defined as "carbohydrate intolerance of variable severity with onset or first recognition during present pregnancy". The definition applies whether or not insulin is used for treatment or the condition persists after pregnancy, but does not exclude the possibility that the glucose intolerance may have antedated the pregnancy. It however excludes previously diagnosed diabetic women who became pregnant [1]. Diagnosis of GDM is usually based on the result of standard oral glucose tolerance test during pregnancy interpreted according to diagnostic criteria of O'Sullivan and Mahen [2].

GDM is a *forme-fruste* or precursor of non-insulin depended diabetes mellitus NIDDM in women. Long term follow-up studies have shown that about 40–60 percent of GDM patients develop NIDDM in ten to twenty years [3, 4, 5]. GDM like any state of impaired glucose tolerance (IGT) is an opportunity for early medical intervention to prevent or delay the onset of overt diabetes and long-term complications. Globally the reported prevalence of diabetes in pregnancy is variable ranging from 0.75–5% while prevalence of GDM range from 0.15–3.0% among antenatal populations [1, 6, 7].

In Nigeria the prevalence of diabetes in pregnancy (based on report from the South Western parts of Nigeria) range from 0.06 – 0.25 percent [8, 9]. There has been no previous report of the prevalence of true GDM among Nigerian antenatal populations. This study seeks to determine the prevalence of GDM in our antenatal population as well as to determine the characteristics of pregnancies associated with GDM.

Patients and Methods

During the two-year period of study (1st June 1998 to 31st May 2000), all patients registered for antenatal care at the University of Port Harcourt Teaching Hospital (UPTH) who met the criteria for diagnosis of GDM were recruited for the study. It is routine practice in the antenatal clinic of the University of Port Harcourt Teaching Hospital for all newly registered antenatal patients to have urinalysis, heamatocrit, fasting venous blood glucose, ABO blood group and VDRL.

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Such mandatory screening enables the detection of candidates with GDM cases. Urinalysis and fasting venous blood glucose (FVBG) are performed at first booking and repeated at 28 weeks of gestation. Antenatal patients with borderline fasting venous blood glucose values are subjected to standard oral glucose tolerance test (OGTT) using 50g of glucose.

Criteria for Diagnosis of GDM

For the purpose of this study the selection criteria for diagnosis of GDM were as follows:

- The presence of persistent glycosuria on urinalysis on at least two occasions
- Fasting venous blood glucose of > 5.8 mmol/L on at least two occasions
- 2 hour fasting venous blood glucose of > 7.8 mmol/L
- Diabetic pattern of oral glucose tolerance test as recommended by O'Sullivan[2].
- History of GDM in previous pregnancies

The presence of any three of the above criteria is considered diagnostic. Antenatal patients who were known diabetic patients before becoming pregnant were excluded from the study.

Study Data Acquisition

Data for analysis were obtained from two sources: direct interview of study patients and study patients' antenatal and obstetric records in the index pregnancy. Patients were then followed up from the time of recruitment to the first postnatal visit or at termination of pregnancy. Information obtained from these two sources were entered into a purpose designed data sheet. The data sheet covered demographic data, previous obstetric history and the clinical characteristics of the index pregnancy.

Data Management

Data generated were collated as statistical averages and presented as mean ± standard deviation. Student t-test is employed for test of significance. Tables are used as necessary.

Results

During the period under study (June 1998 and May 2000) a total of 5026 antenatal patients were seen in the antenatal clinic of the University of Port Harcourt Teaching Hospital. Of this number, 15 pregnant women satisfied the criteria for diagnosis of GDM. This gives a GDM antenatal population prevalence of 0.298% or 2.98 per 1000 pregnancies.

The base line characteristics of these patients are shown in Table 1. Only one out of the fifteen patients (i.e. 6.67%) had been diagnosed with GDM in previous pregnancies. Approximately 40% of the patients volunteered a positive history of diabetes in first-degree relatives of the patient. Of the six with positive family history of DM, three (50%) were in a father, two (30.0%) in a mother and one (16.7%) in a sibling.

Table 1

Baseline Characteristics of the GDM Patients

Parameter	Finding [n ± sd (range)] *[N = 15]*
Maternal age (years)	31.0 ± 2.4 (28-35)
Maternal BMI (kg/m^2)	31.8 ± 3.58 (23-38.9)
Gestational Age at Diagnosis of GDM (weeks)	23.88 ± 8.2 (8-36)
Parity	2.13 ± 0.6 (0-6)
Abortions	0 – 3
Ratio of Previous Abortions to Previous Pregnancies	10/32 (31.25%)
GDM in Previous Pregnancies:	
Yes -	1 (6.7%)
No -	11 (73.3%)
Don't Know -	3 (20.0%)
Family History of Diabetes:	
Yes -	6 (40.0%)
No -	6 (40.0%)
Don't know	3 (20.0%)

BMI: *Body Mass Index*

Previous Obstetric Status of Patients

The fifteen patients with GDM collectively had a total of 32 previous pregnancies out of which ten (10) ended up as spontaneous abortions. Thus about one-third of previous conceptions in these GDM patients ended in spontaneous abortions. A total number of eighteen (18) live births resulted from 22 pregnancies with four (4) stillbirths. The live babies had a mean birth weight of 4.34 ± 0.74 kg (range 2.5 – 5.8 kg). Out of the eighteen previous live births 13 (59.1%) were spontaneous normal vaginal delivery (SVD) while 5 (22.7%) were through caesarean section.

Mode of GDM Management and Glycaemic Pattern During the Index Pregnancies

Five patients (33.3%) were managed with Diet only, the remaining ten (66.7%) being managed with Diet and Insulin. For this group soluble (regular) insulin was used, the prescribed dose given 10 to 15 minutes before each meal (three meals per day). Physicians and dieticians participated in the care of all the patients. Glycaemic control was monitored with urine tests and fasting venous blood glucose. Sometimes spot venous blood glucose was employed. None of the patients was under intensive insulin regimen. HbA_1c assays were not used and

there was no access to home blood-glucose monitoring.

Table 2

Outcome of the Index GDM Pregnancy

Outcome of Pregnancy	Findings n (%)
Total Number of Pregnancies	15
Number of Women Delivered in Hospital	10
Mode of Delivery:	
Spontaneous Vaginal Delivery -	3 (30.0%)
Assisted Vaginal Delivery -	3 (30.0%)
Elective Caesarian Delivery -	3 (30.0%)
Emergency caesarian delivery -	1 (10.0%)
Gestational Age at Delivery (weeks)	*37.55 ± 1.94 (34-40)*
Status of Baby at birth:	
Normal baby -	9 (90.0%)
Premature -	0 (0.0%)
Fresh Stillbirth -	1 (10.0%)
Macerated Stillbirth -	0 (0.0%)
Congenital Abnormality -	0 (0.0%)
Baby weight (kg):	
Range -	2.5 - 4.7
Mean ± SD -	3.75 ± 0.55kg

The mean fasting venous blood glucose at entry for all the patients was 7.76 ± 1.6 (5.6 – 11.6) mmol/L. The cumulative mean of the serial fasting blood glucose done for all the patients through out pregnancy was 6.56 ± 0.79 (5.68 – 8.60). The difference is not statistically significant (P > 0.1). Hypoglycaemia was observed in four (40.0%) of the ten patients treated with insulin. At six weeks post-partum the mean fasting venous blood glucose was 6.62 ± 1.22 (3.8 – 8.4) mmol/L. The major complications observed during the index pregnancy of the GDM patients were pre-eclampsia in 4 patients (26.71%), mid trimester abortion in 1 (6.7%) and intra uterine fetal death in 1 (6.7%).

Only ten of the fifteen GDM cases under study had their delivery in the hospital. Four completed antenatal care but did not present in labour. Table 2 shows the details of the outcome of the ten pregnancies delivered in hospital. Some of the values of antenatal and obstetrics indices generated from the study GDM patients during the index pregnancy were compared with values for the same indices generated from the UPTH departmental antenatal obstetric patients over one year period. Such data were obtained from departmental annual report for 1998 and 1999. Table 3 shows the comparison. In virtually all the parameters compared the GDM patients showed poorer statistics than the general obstetric population of the same hospital. Though maternal deaths and eclampsia were not recorded for the GDM patients their number was too few compared to the general obstetrics population of well over five thousand booked cases.

Table 3

Comparison of GDM Patients with Other Booked Antenatal Patients

Parameter	GDM	Non- Diabetic
Mean Booking Blood Pressure	118/72 mmHg	130/75mmHg
Spontaneous Abortion Rate	31.3%	18.7%
Pre-Eclampsia	26.7%	24.3%
Eclampsia Rate	0.0%	0.7%
Mid-Trimester Abortion	6.7%	No Rates
IUFD	6.7%	4.2%
Maternal Morbidity Rate	60%	49.3%
Maternal Mortality Rate	Nil	340/100,000
Obstetrics		
Caesarian Section Rate	40.0%	26.19%
Birthweight	3.75kg	3.25kg
Gestational Age at Delivery	37.5 weeks	No data available

Comparison Between Index GDM Pregnancies and Two Previous Nigerian Studies of Diabetes in Pregnancy

This comparison is illustrated in table 4. In all the variables compared, the GDM patients behaved like the cases of diabetes in pregnancy in the two previous Nigerian studies. There were no significant differences in the pre-eclampsia, maternal morbidity, caesarian delivery and over all fetal–wastage rates.

Discussion

This is the first formal study of the problem of GDM in our hospital and perhaps the first in Nigeria. Previous studies of the problem of diabetes in relation to pregnancy in Nigeria did not discriminate between GDM as defined [1] and diabetes in pregnancy (i.e. pre-pregnant diabetes). These studies, though undertaken several years ago, put the prevalence of diabetes in pregnancy between 0.06% and 0.25%. These values are lower than global values of between 0.1% and 3.0% [10]. Data from our study showed a GDM rate of 0.298% excluding pre-pregnant diabetics (i.e. cases of known diabetics getting pregnant).

Table 4

Comparative Analysis of Some Obstetric Parameters of the Index GDM Patients and Pregnancy Diabetes in Two Previous Nigerian Studies.

INDICES	COMPARISON		
	GDM patients (UPTH 1999-2000)	Pregnant Diabetics (UBTH 1975-1978) [8]	Pregnant Diabetics (UCH 1978-1982) [9]
Prevalence (per 1000 pregnancy)	(N = 15) 2.98	(N = 12) 0.64	(N = 37) 1.3
Mean parity	2.13 ± 0.6 (0-6)	1 – 10	3.27 ± 1.98
Maternal age (years)	31 ± 2.48 (28-35)	34.0 (25-40)	30.35 ± 5.06 (19-40)
Spontaneous abortion	1 (6.7%)	No data	1 (2.7%)
Pre-eclampsia	3 (26.7%)	3 (25.0%)	7 (18.9%)
Mid-trimester abortion	1 (6.7%)	No data	Nil (0.0%)
IUFD	1 (6.7%)	No data	Nil (0.0%)
Maternal morbidity	9 (60.0%)	12 (100.0%)	22 (33.3%)
Caesarian section rate	4 (40.0%)	5 (41.6%)	15 (40.51%)
Still birth rate	1 (6.7%)	No data	3 (18.11%)
Mean baby weight at birth (kg)	3.75 (2.5-4.7)	3.05-4.7	3.4-4.9
Gestational age at delivery	37.5 (34-40) wks	38-40 wks	5-40 wks
Perinatal mortality rate	Nil	2 (16.7%)	10.8%
Over all fetal wastage rate	3 (30.0%)	3 (25.0%)	3 (13.5%)
Maternal morbidity rate	Nil	Nil	1 (2.7%)

An earlier study of the prevalence of medical disorders in our antenatal population found six diabetics out of 178 antenatal patients [10], yielding a diabetes prevalence rate of 3.37%. Comparing this figure with the Ibadan and Benin prevalence rates show that diabetes in pregnancy (GDM + pre-pregnant diabetes) in UPTH is about 53 folds and 26 folds more than the Ibadan and Benin antenatal populations respectively.

The wide disparity between the UPTH findings on the one hand and the Benin and Ibadan findings on the other hand may be explained partly by the long time span (over 16 years) between our study and the Ibadan/Benin studies, perhaps long enough to accommodate a real increase in the prevalence of diabetes in Nigeria's antenatal population. Indeed a real increase is expected. Epidemiological studies of the prevalence of diabetes (especially NIDDM) in Nigerian populations have shown a progressive rise over time. Earlier studies of prevalence of Diabetes in Nigeria show prevalence rates of zero to 0.1% whereas recent population surveys put prevalence rates from 1.6 to 3.0 percent [11, 12]. Report from other parts of Africa show similar trends over time [13]. GDM, being a precursor of NIDDM in women of childbearing age, could be expected to show a similar rise in our antenatal populations. It is also possible that real differences in the prevalence of diabetes in pregnancy exist between our population groups. Although the three centers of study i.e. Port Harcourt, Benin and Ibadan are located in the Southern parts of Nigeria, the Benin and Ibadan populations are predominantly Yoruba / Edo stock who are ethno-linguistically different from the Port Harcourt population which is predominantly Ijaw / Igbo ethno-linguistic stock. There is need for a carefully designed study of the prevalence of diabetes among the ethno-linguistic groups in Nigeria.

The results from our study indicate that the antenatal and obstetric history of the GDM patients as well as obstetric performance of the index pregnancy were generally characterized by poor performance. When compared with prevailing hospital antenatal/ obstetric indices, their past obstetric history was characterized by a high fetal wastage and stillbirth rates. Similarly the antenatal and obstetric performance of the index pregnancy in the GDM patients was poor compared to the hospital average for booked patients. On the other hand the antenatal / obstetric performance of the GDM patients in the index pregnancy were closely identical with the data for pregnant diabetic patient in two previous Nigerian studies [8, 9]

Thus, to all intents and purposes the GDM patients in this study showed antenatal and obstetric characteristics of diabetic pregnancies. The glycaemic profile of the GDM patients through out the index pregnancy was generally characterized by poor metabolic control. Factors responsible for this include poor dietary regulation and poor laboratory

support. In most Nigerian traditions it is customary for all pregnant women to be encouraged to eat lots of food (especially carbohydrates and glucose-based beverages). Tight metabolic control is still an ideal that is not achievable in Nigeria at present due to weak laboratory support, lack of self-blood glucose monitory devices in hospital and among patients as well as poor patient motivation. As a result, diabetic patients in Nigeria (including pregnant diabetics) are usually given insulin only twice or at the most thrice daily usually before each meal. Glycaemic control is often monitored by urinalysis and periodic fasting venous blood glucose.

The Diabetic Control and Complications Trials (DCCT) [14] have demonstrated the benefits of tight metabolic control in contributing to the delay and even reversal of some long-term complications of diabetes. Similar studies [15] in pregnant diabetics have demonstrated better antenatal and obstetric outcomes comparable to their non-diabetic counterparts.

In conclusion, this study has demonstrated that Gestational Diabetes Mellitus (GDM) is relatively common among antenatal population attending our teaching hospital. From a clinical stand point GDM did not differ in any substantial way from other forms of diabetes in pregnancy. GDM patients should therefore be treated as diabetes in pregnancy with optimal metabolic control and active management of labour to ensure better antenatal and obstetric outcomes. Early detection of GDM via routine screening of all antenatal patients at booking and during every visit will ensure early intervention and a significantly much better obstetric outcome.

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