Maternal and fetal outcome of gestational diabetes mellitus in Mulago Hospital, Uganda

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ABSTRACT

Objective: To determine the maternal and foetal outcomes in mothers with gestational diabetes mellitus attending antenatal clinics in Mulago Hospital Kampala Uganda.

Design: This was a cohort study.

Setting: Mulago Hospital antenatal clinics.

Participants: Ninety mothers with gestational ages between 24-32 weeks were recruited from April to September 2001.They were followed up to the time of delivery. The WHO criterion for the diagnosis of gestational diabetes was used. Thirty mothers with a 2 hrs post prandial capillary blood sugar more than 140 mg/dl were the exposed group and 60 mothers with less than 140 mg/dl were the unexposed group. Blood sugar was measured using a one touch glucometer.

Outcome variables: Socio demographic characteristics, maternal complications, mode of delivery and the foetal outcomes.

Results: The mean age of mothers in both groups was similar: 28.6 years vs 27.5 years. Both groups had similar body mass index more than 26. The mothers with gestational diabetes mellitus (GDM) were four times more likely to have hypertensive disease($p=0.04$) and nine times more likely to have vaginal candidiasis($p=0.002$).

The modes of delivery were similar in both groups but genital injuries were more common among mothers with GDM. The indications of Caesarian section in mothers with GDM were two times more likely to be due to big babies and obstructed labour. The babies for mothers with GDM were more likely to be macrocosmic, still born, and have shoulder dystocia than those of normal mothers.

Conclusion: Gestational diabetes mellitus exists in Uganda and is associated with adverse maternal and foetal outcomes. There is need to routinely screen mothers for gestational diabetes in this environment.

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INTRODUCTION

Gestational diabetes mellitus is the development of symptoms and signs of diabetes mellitus during pregnancy and the glucose intolerance reverts to normal during puerperium. Depending on the type of population and the diagnostic criteria used, gestational diabetes is said to complicate 1-16% of all pregnancies [1]. Many researchers in American, European and Asian settings have reported 3-6% prevalence [2,3,4]. Compared with white European women, the prevalence rate for GDM is increased approximately eleven fold in women from the Indian subcontinent, eightfold in South – East Asia; six fold and threefold in Arab and black Afro-Caribbean women respectively [5].

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Impaired glucose tolerance is usually more prevalent than diabetes in women of child bearing age. Increasing maternal age, overweight, increasing parity and a family history of diabetes are all risk factors for gestational diabetes [6]. The incidence of gestational diabetes is low in absence of risk factors, suggesting that selective screening programs may be cost effective [6]. The worldwide epidemic of glucose intolerance predicted by the latest WHO studies will undoubtedly increase the burden of gestational diabetes, especially in the developing countries [6]. Advocates of universal screening claim that one third to one half of women with gestational diabetes will be missed if the traditional risk factors are used for screening [7].

The WHO expert group recommended that all pregnant women or those with risk factors should be screened at the beginning of third trimester of pregnancy using oral glucose tolerance test (OGTT), that is, blood glucose 2-hr after 75g oral glucose load. This is recommended both for screening and diagnosis [8]. The results are interpreted according to WHO criteria for diabetes.

Pregnancy related morbidity and mortality in

gestational diabetes is less than that of overt diabetes mellitus however if not treated it is significantly higher than for non diabetic women [9,10]. There remains a small increase in unexplained stillbirth in mothers with gestational diabetes. Unlike established diabetes there is no increase in congenital malformation rates since significant maternal hyperglycaemia occurs when organogenesis is complete[10]. There is increased Caesarian section rate because of macrosomic babies and obstructed labour especially in developing countries. There is also associated birth trauma especially when these babies are delivered vaginally [11]. Most studies have found that women with gestational diabetes who develop pregnancy-related hypertension tend to be older and heavier [12].

Glucose tolerance returns to normal in the majority of women with gestational diabetes but one-third to two-thirds of women will have glucose intolerance in subsequent pregnancies[5,13]. All women with gestational diabetes should have their glucose tolerance reassessed after delivery, and should receive advice and counselling regarding future pregnancies [14]. Clinical features which should alert one to the possibility of type 1 diabetes include; age<30 years, no obesity, first pregnancy and no family history of diabetes [5].

Women with postpartum impaired glucose tolerance should receive dietary advice and be informed of a likelihood of early diabetes. Long-term, it was noted that about 40% of Hispanic-American women with gestational diabetes developed overt diabetes over 6 years [15]. In those women where glucose intolerance persists postpartum, 70% develop frank diabetes. White Europeans, on the other hand, develop diabetes more slowly, that is, 20-40% over 20 years [12].

The maternal and foetal outcome among women who develop gestational diabetes mellitus in Uganda is not well documented. Therefore the major objective of this study was to determine maternal and foetal outcomes among women with gestational diabetes attending Mulago hospital antenatal clinics.

METHODS AND METHODS

Design

This was a cohort study.

Setting:

Mulago Hospital antenatal clinics.

Study population

Women who had come to attend antenatal clinics in Mulago hospital.

Sample size calculation

The sample size of 90 mothers was calculated using James Schelesselman's formula[16], at 95% confidence interval, providing a 80% power, it was assumed the ratio of unexposed to exposed was 2 to 1 and able to detect a relative risk of 3. We used the JAMA study where macrosomia rate in the exposed group was 28.7% versus 13.7% in the unexposed group [11].

Inclusion criteria

Women with singleton pregnancy and gestational age between 24-32 weeks.

Exclusion criteria

Women with diabetes mellitus co-existing with other medical conditions such as sickle cell disease.

Sampling procedure and data collection

All mothers who had come for antenatal clinic and met the inclusion criteria were recruited. Eligible mothers were consecutively recruited until the sample size of 90 was achieved. One of us (O.E) interviewed the mothers using partially coded questionnaires with both open and close ended questions. The mothers were booked for 75gm oral glucose tolerance test during the next visit. They were told not to have breakfast on the day of the test. Each mother's file was marked with a flier for easy identification during the next visit.

The WHO criteria for diagnosis of diabetes using a two-hour 75g oral glucose load and 2 hour post prandial plasma glucose value greater than or equal to 140 mg/dl was used [17].

In the morning of the visit, mothers booked for the test were identified using a flier marked on their files. Their weight and height were taken and recorded.

Blood samples were taken using finger pricks after cleaning the site using 70% alcohol antiseptic. The blood was analysed within 2 minutes using Life scan (One Touch) Glucometer and the results were recorded as fasting blood sugar. Each mother was then given 75g glucose dissolved in a glass of 200ml water to drink and two hours later more capillary whole blood was obtained and analysed in the same way giving results of a 2 hour postprandial capillary whole blood glucose. The results were recorded in the questionnaire forms. The cases were mothers with 2-hour postprandial capillary whole blood glucose levels ≥ 140 mg/dl.

The results of the blood test were made known to the mothers and their implications explained to them. Both the fasting and 2 hour post 75g oral glucose were interpreted using WHO criteria [15]. The mothers with 2-h hyperglycaemia less than 200 mg/dl (11.1mmol/1) were

given dietary advice and those with hyperglycaemia greater than 200mg/dl were started on insulin after confirmation of the results with the help of diabetic physicians. The mothers were followed up and encouraged to deliver in Mulago Hospital. They were asked to come back for postnatal clinic where they were reviewed and those who had gestational diabetes had an oral glucose tolerance test.

Variables:

Social demographic characteristics, pregnancy complications like pre eclampsia, urinary tract infection, candidiasis, fever, hydromnious and intra uterine foetal death, mode and complication of delivery, birth weight, Apgar score, still birth or early neonatal death and congenital abnormality in the babies were recorded. The data collected was coded and fed into a computer using EPI INFO 6.4 statistical package, cleaned and analysed with the assistance of a statistician. Analysis was done using Mantel- Haensel for relative risk with 95% confidence intervals and p values.

Ethical considerations

Permission was obtained from the Makerere University Faculty of Medicine research committee, the Mulago hospital research committee and the National Council of Science and Technology. Informed consent was obtained from the mothers before interviews were conducted. Use of numbers ensured confidentiality and no names appeared anywhere on the questionnaires.

Results:

Socio-demographic characteristics of study subjects

These are shown in table 1. The age range for mothers with gestational diabetes was 18-39 years with the mean age of 28.6 years. The majority (96.8%) of mothers were 20-39 years.

The controls were similar with the mean age of 27.5 years. The self employed women were less likely to have gestational diabetes mellitus.

Table 1: Socio-demographic characteristics of the mothers

Characteristics		Mothers with GDM %	Controls %	P-Value
Age group	10 - 19	1(3.3)	3 (5.0)	0.856
	20 – 29	13(43.3)	33(55)	0.297
	30 - 39	16 (53.5)	23(38.3)	0.176
	40 – 49	0(0.0)	1(1.7)	0.002
Tribe	Baganda	15(50.0)	36(60.0)	0.367
	Banyankole	5(16.7)	9(15.0)	0.918
	Others	10(33.3)	15(25.0)	0.407
Gravidity	1-4	17(56.7)	31(51.7)	0.654
	5.9	13(43.3)	29(48.3)	0.654
Education	None	5(16.7)	10(16.7)	1.000
	Primary	14(46.7)	32(53.3)	0.551
	Secondary	11(36.7)	18(30.0)	0.523
Occupation	Housewife	26(86.7)	36(60.0)	0.009
	Peasant	1(3.3)	7(11.7)	0.359
	Self employed	2(6.7%)	11(18.3)	0.224
	Professional	1(3.3%)	3(5.0)	0.856
	Others	0(0.0%)	3(5.0)	0.143
Body Mass	19 – 25	8(26.7%)	13(21.7)	0.597
Index (BMI)	26 – 30	11(36.7%)	28(46.7)	0.367
	31 – 40	9(30.0%)	16(26.7)	0.739
	≥41	2(6.7%)	3(5.0)	0.871

Table 2: Pregnancy complications of associated with gestational diabetes

	Proportions of mothers who developed complications				
Complications	**Gestations diabetes %**	**Controls %**	**Relative risks (RR)**	**95% CI of RR**	**AR%**
Hypertension	5(16.7%)	4(6.7%)	2.49	0.72 – 8.64	59.8
Vaginal Candidiasis	6(20.0%)	2(3.3%)	6.06	1.24 – 27.96	83.5
Polyhydromnios	2(6.7%)	0(0.0%)	-	-	-
Preterm labour	1(3.7%)	0(0.0%)	-	-	-
Abortion	0(0.0%)	0(0.0%)	0.0	-	-
Fever	0(0.0%)	1(1.7%)	0.0		

Mode of delivery in present pregnancy

Table 3: Indications of Caesarian section in mothers with gestational diabetes

Indications	**Gestations diabetes%**	**Controls %**	**Relative risks (RR)**	**95% CI of RR**
Big baby	2(6.67%)	2(3.33%)	2.00	0.28 – 14.20
Fetal distress	1(3.33%)	4(6.67%)	0.25	0.03 - 2.24
Obstructed labour	2(6.67%)	2(3.33%)	2.00	0.28 – 14.20
Poor Obstetric history	1(3.33%)	0(0.00%)	-	-
Placenta Previa	0(0.0%)	1(1.67%)	-	-
Previous scar	0(0.0%)	2(3.33%)	-	-

Mothers with gestational diabetes were two times more likely to have Caesarean section because of big babies and obstructed labour than the controls.

Table 4: Present pregnancy foetal outcomes

	Proportions of mothers whose babies experienced the described outcome				
Complications	**Gestations diabetes %**	**Controls %**	**Relative risks (RR)**	**95% CI of RR**	**AR%**
Normal babies	12(40.0%)	54(95.0%)	0.44	0.28 – 0.69	
Macrosomia	11(36.7%)	3(5.0%)	7.33	2.21 – 24.32	86.4
Still birth	5(16.7%)	2(3.3%)	5.00	1.03 – 24.28	75.3
Shoulder dystocia	7(23.3)	1(1.7%)	14.00	1.80 – 108.64	92.7
Hypoglycaemia	0(0.0%)	0(0.0%)	0.00	-	-
Trauma/Injury	0(0.0%)	0(0.0%)	0.00	-	-
Congenital abnormality	0(0.0%)	1(1.7%)	0.00	-	-
Cot death	0(0.0%)	0(0.0%)	0.00	-	-

Babies born to mothers with gestational diabetes were more likely to be macrosomic, stillborn and have shoulder dystocia than those of normal women($p < 0.0001$). Complications of hypoglycaemia, trauma to the baby, congenital abnormality of the baby and cot death were infrequent in both groups.

All mothers with gestational diabetes at postnatal visit were screened for diabetes mellitus and were found to be normal.

DISCUSSION

Pregnancy is a diabetogenic state manifested by insulin resistance and hyperglycaemia. The age group at risk of getting gestational diabetes in this study was between 20-39 years in 96.8% of cases. This was similar to other studies where age was equal or more than 25 years and was considered as a high risk for screening[6,12,17,18].

The majority (56.7%) of the mothers with gestational diabetes were of low parity (that is, para 1-4) and only 43.3% were of high parity (para 5-9). Similar studies have shown that increased parity was less consistently associated with increased risk for developing gestational diabetes mellitus [10]. There was no particular tribe at risk of developing gestational diabetes in this study, but the self employed women were less likely to develop the condition ($P <= 0.04$).

In this study nearly 50% of mothers with gestational diabetes had a body mass index of greater than 30. This finding confirms the earlier conclusions made by other studies that women who are obese were at high risk of getting gestational diabetes mellitus in pregnancy[6,12,17,18].

Likewise, mothers with gestational diabetes mellitus were four times more likely to have hypertension ($p<=0.04$) and nine times more likely to have vaginal candidiasis($p<=0.002$) than the controls. The high body mass index or obesity of women with gestational diabetes predisposed them to hypertension. Most of these patients have chronic or essential hypertension with superimposed pre-eclampsia. It was difficult to establish how many of these women were hypertensive before pregnancy since most of the mothers did not know their pre-pregnancy blood pressure. Moreover most of these women booked for antenatal clinic after twentieth week when it is difficult to differentiate chronic hypertension from pre-eclampsia.

The increased incidence of vaginal candidiasis in women with gestational diabetes observed in this study would be explained by the increased spill of sugar in urine thus contaminating the genitalia leading to increased fungal infection. Secondly, diabetic state is generally associated with reduced immunity encouraging opportunistic infections to become prevalent. It is difficult to say whether HIV infection played a role since no HIV tests were carried out.

The mode of delivery was similar in both groups studied, but other studies have observed increased operative deliveries such as Caesarean sections[11,20]. In our setting the estimation of foetal weight is done by clinical examination which depends on the clinical judgment of the obstetrician which has limitations. The routine ultrasound for estimation of babies' weight is not usually done. Therefore, some babies' weights were underestimated and vaginal deliveries attempted. This resulted into shoulder Dystocia and genital injuries like tears and spontaneous symphysiotomy.

In this study, the indication for Caesarian section in mothers with gestational diabetes were twice likely to be for big babies and obstructed labour than in the controls. This observation further explains the fact that macrosomia was a single complication from which many other complications arise [11,12,21].

Congenital anomalies of babies were not observed in the cases in this study probably because of a small sample size which is the main short coming of this study. However, this was not surprising because even the fourth International Workshop Conference on gestational diabetes suggested that since the onset of hyperglycaemia occurs late in pregnancy when organogenesis is complete, it is not associated with increased incidence of congenital malformations[12,22].

Conclusion:

Gestational diabetes mellitus is prevalent in mothers attending antenatal clinics in Mulago hospital and is associated with increased risk of pregnancy and delivery complications. There is need to screen mothers who are at risk of developing gestational diabetes.

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