Kanem J Med Sci 2024; 18(1): 28-38
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ISSN 2006-4772
https://doi.org/10.36020/kjms.2024.1801.005

Original Article

Pregnancy outcome of patients with Diabetes at University of Maiduguri Teaching Hospital: a 5-year retrospective review

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Abstract

Background: Diabetes Mellitus (DM) is a common medical disorder that complicates about 16% of pregnancies worldwide. DM may result in significant adverse maternal and fetal outcomes, if not recognised early and properly managed. **Objective**: To determine the prevalence, perinatal, and maternal outcomes of Diabetes in pregnancy at the University of Maiduguri Teaching Hospital, Nigeria. **Methodology:** A 5-year retrospective review of women with Diabetes Mellitus in pregnancy carrying a singleton pregnancy managed at the Obstetrics and Gynaecology department of the University of Maiduguri Teaching Hospital, Nigeria. Data was analysed using SPSS version 25 and presented in tables and figures. P-value < 0.05 was considered statistically significant. **Results**: A total of 16,390 deliveries were recorded during the period under review out of which 176 women had DM in pregnancy, giving a prevalence of 1.1%. Gestational Diabetes Mellitus (GDM) has a prevalence of 0.7% (accounting for 74.83% of cases). The risk factors for DM in pregnancy were found to be GDM in a previous pregnancy, family history of DM, booking weight greater than 90 kg, or BMI greater than 30k g/m^2. Significantly, women with GDM are more likely to be controlled by diet and exercise only compared to women with Pre-Gestational Diabetes Mellitus (PGDM); P= 0.004. The overall risk of preterm delivery was 4.2%, and preterm delivery was significantly higher in PGDM compared to the GDM group (P=0.048). Although not statistically significant, C-section rate (66.7% vs 52.3%), Pre-eclampsia (5.6% vs 4.75%), congenital anomaly (2.8% vs 1.9%), neonatal SCBU admission (25.0% vs 14.0%), recurrent UTI (2.8% vs 0%), and development of hypoglycaemia (5.6% vs 0.9%) were more common among patients with PGDM compare to those with GDM. While fetal macrosomia, (28.0% vs. 19.4%), shoulder dystocia (3.7% vs 0%), and IUFD(3.7% vs. 2.8%) were commoner in the GDM group compared to the PGDM group; however, the rate of ENND was the same among both groups. **Conclusion**: The prevalence of DM in pregnancy in this study is low and patients with GDM were more likely to be controlled with dietary therapy compared to patients with PGDM. Preterm delivery is commoner in patients with PGDM.

Keywords: *Diabetes Mellitus in pregnancy, Gestational Diabetes, Pregestational Diabetes, Maternal Outcomes, Fetal Outcomes*.

Introduction

Diabetes mellitus (DM) is a common medical complication of pregnancy that causes significant adverse outcomes to both the mother and her offspring if not adequately managed.[1-3] It is a collection of metabolic disorders with hyperglycaemia as the common feature. Hyperglycaemia results from absolute or relative insulin deficiency or resistance.[1]

In relation to pregnancy, diabetes mellitus is classified into Pregestational Diabetes (PGDM) and Gestational Diabetes Mellitus (GDM). [2,3]. Pregestational (pre-existing diabetes mellitus) consists predominantly of type 1 and type 2 diabetes mellitus, and other rare types of diabetes, such as monogenic diabetes.[2,3] Gestational diabetes mellitus is glucose intolerance leading to

Cite this article as: Ado D. Geidam, Rabiu Adams; Pregnancy outcome of patients with Diabetes at University of Maiduguri Teaching Hospital: A 5-year retrospective review. Kanem J Med Sci 2024; 18(1): 28-38

Received: 15th May 2023 **Accepted: 11th January 2024** **Published: 30th April 2024**

hyperglycaemia of variable severity, with onset or first recognition in pregnancy.[3,4] This includes previously unrecognized pre-existing (mostly type 2) DM and Overt DM.[1,2,4.]

Globally, 16% of pregnancies are estimated to be complicated by diabetes, out of which about 80% are GDM.[1] Because of the increasing incidence of obesity, the prevalence of both gestational and pregestational diabetes mellitus (particularly type 2 DM in women of reproductive age) has also been reported on the increase.[1-3] Other risk factors for diabetes mellitus in pregnancy include a history of diabetes mellitus in a first-degree relative, previous history of GDM, an ethnic group with a high prevalence of diabetes mellitus (Asian and African), advanced maternal age, parity, history of chronic hypertension, polycystic ovarian syndrome, history of the birth of a macrosomic baby or bad obstetric history.[2,3,5-11]

The adverse effects of diabetes in pregnancy on maternal, perinatal, and neonatal outcomes have been widely reported.[5-16] Generally, the magnitude and extent of these adverse outcomes depend on the duration and severity of maternal hyperglycaemia.[2,3,5,6,13] While PGDM has been associated with an increased risk of miscarriage and congenital anomalies such as cardiac anomaly and neural tube defect,[5,6] both PGDM and GDM may be associated with increased risk of perinatal and neonatal complications including fetal macrosomia, shoulder dystocia, birth trauma, prematurity, respiratory distress syndrome (RDS), hypoglycaemia, hypocalcaemia, polycythaemia, hyperbilirubinaemia, special baby care/neonatal intensive care admission, stillbirth and neonatal death.[5-16] And, the mothers are at increased risk of gestational hypertension, pre-eclampsia, induction of labour, preterm delivery, and caesarean section.[7,11,12]
In a study of pregnancy outcomes in patients with pregestational and gestational diabetes in Cape Town, South Africa, Zyl et al reported a higher rate of congenital anomaly, perinatal mortality, and pre-eclampsia among pregnancies complicated by pregestational diabetes compared to control.[5] While Naher et al reported a significant increase in the risk of neonatal respiratory distress syndrome and hypoglycaemia among pregnancies complicated by pregestational and gestational diabetes compared with non-diabetic pregnancy in Dhaka, Bangladesh.[6] Muche et al reported a high risk of caesarean section and premature rupture of membrane among pregnant women with GDM compared with non-diabetic pregnancy in Northwest Ethiopia.[7] Adoyi et al in a study in Nairobi, Kenya demonstrated a significant correlation between fetal macrosomia and GDM.[8] In Nigeria, John et al and Agofure et al in separate studies in Rivers[9] and Bayelsa[10] states respectively, reported a significant increase in the risk of pre-eclampsia, fetal macrosomia, and neonatal admission among pregnancy complicated by GDM compared to non-diabetes pregnancy. While a study by Salami et al showed a significantly increased rate of hypertensive disorder, caesarean section, and neonatal jaundice among GDM pregnancies compared to normal pregnancy.[11]

Screening for diabetes, early diagnosis, and optimal glycaemic control have been shown to improve outcomes of diabetes pregnancy,[12,17] however, the optimal screening modality and diagnostic criteria have remained a source of controversy.[3,4,18] Following the Hyperglycaemia and Adverse Pregnancy Outcome (HAPO) study report which demonstrated a continuum of risk for perinatal and neonatal complications with increasing maternal plasma glucose at 24-32 weeks gestation in a previously non-diabetic woman,[19] the International Association of Diabetes and Pregnancy Study Group (IADPSG)[20] proposed consensus criteria for screening and diagnosis of diabetes in pregnancy which was adopted by American Diabetic Association[3] and WHO[4] in 2013.

This IADPSG/WHO criteria include a universal screening of all pregnant women between 24 to 28 weeks using a 75-g 2-hour Oral Glucose Tolerance Test (OGTT) and diagnosis of GDM if any of the plasma glucose threshold (including fasting plasma glucose of 5.1 mmol/l, 1-hour post glucose load of 10 mmol/l or 2-hour post glucose of 8.5 mmol/l,) is reached or exceeded.

With the increasing prevalence of diabetes in pregnancy globally and the paucity of studies on diabetes mellitus in our environment, there is a need to study the effect of diabetes mellitus on pregnancy in our environment.

This study aims to determine the prevalence and to examine the perinatal and maternal outcomes of women with diabetes in pregnancy in the University of Maiduguri Teaching Hospital, Borno State, Nigeria.

Materials and Method

This was a retrospective review of women with singleton pregnancies who had DM in pregnancy who were managed at the Department of Obstetrics and Gynaecology department of the University of Maiduguri Teaching Hospital (UMTH) over 5 years period (January 2016 to December 2020).

The University of Maiduguri Teaching Hospital is the foremost tertiary health care facility in Borno State, North-Eastern Nigeria. It provides health care to all pregnant women including those with complicated pregnancies such as diabetic pregnancy and also receives and manages patients referred from peripheral health facilities in Borno State and neighbouring environments.
The Gynaecological, antenatal, labour, and postnatal

ward records, were checked to identify the Hospital numbers of eligible pregnant women. These Hospital numbers were used to retrieve the case files of the women from the central record, retainership, and the NHIS units of the hospital. The cases included were those who had both their antenatal care and delivery at the UMTH. The diagnosis of GDM was made using an oral glucose tolerance test (OGTT) with 75 gm of glucose per updated WHO/IADPSG criteria. Threshold values for the diagnosis of GDM were fasting blood glucose of 92 mg/dl (5.1mmol/l) or more, 180 mg/dl (10mmol/l) plasma glucose level or more 1-hour post glucose load, and 153 mg/dl (8.5mmol/l) plasma glucose level or more 2-hours post glucose load. Pregestational diabetes were those with known type 1, type 2 diabetes mellitus, or other rare types of pregestational diabetes. Excluded from this study were diabetic women with multifetal pregnancy and those with other medical conditions such as sickle cell disease, chronic renal disease, or cardiac diseases or who did not deliver in the UMTH.

Information on socio-demographic factors, Parity, Type of diabetes, Risk factors for GDM, level of glycated haemoglobin at booking/diagnosis, Mode of delivery, Maternal outcomes, and Fetal and Neonatal outcomes were extracted from the patient case files using a proforma designed for the study.

The data were processed and analyzed using the statistical package for social sciences (SPSS) version 25.0 software (IBM SPSS Statistic). Continuous variables were summarized using the mean and standard deviation or median and interquartile range as appropriate. The relationship between categorical variables was analyzed using the chi-square test or Fischer's exact test as appropriate. A P-value of less than 0.05 at a 95% confidence level was considered significant. Tables and a figure were used to present the results.

Ethical approval for this study was obtained from the ethics and research committee of the UMTH.
Pregestational diabetes mellitus is the diabetes mellitus that was diagnosed or existed before the current pregnancy.

Gestational diabetes mellitus is glucose intolerance leading to hyperglycaemia of variable severity, with onset or first recognition in pregnancy.

Chronic hypertension is hypertension that predates pregnancy or is diagnosed before 20 weeks of pregnancy.
Gestational hypertension is a new onset of systolic blood pressure of 140mmHg or more and/or diastolic blood pressure of 90mmHg or more measured on 2 occasions of at least 4 hours apart after 20 weeks gestation.

Pre-eclampsia is the occurrence of hypertension and proteinuria or signs of end-organ affectation after 20 weeks gestation.

Preterm birth is delivery before 37 completed weeks. Caesarean section is according to standard definition. Instrumental vaginal delivery is assisted vaginal delivery using forceps or vacuum extractor. Macrosomia is a birth weight greater than or equal to 4.0 kg.

Neonatal jaundice is jaundice requiring treatment with physiotherapy
Neonatal hypoglycaemia is plasma glucose of less than 2.5mmol/l without symptoms or less than 2.2mmol/l with symptoms in a term neonate or less than 1.7mmol/l in a preterm neonate. Perinatal death is the fetal death after 28 weeks and neonatal death within 7 days of birth.
Intrauterine fetal death (IUFD) is fetal death before the onset of labour.

Bad obstetric history (BOH) is a previous unfavourable fetal outcome in terms of the occurrence of two or more consecutive spontaneous abortions, early neonatal deaths, stillbirths, intrauterine fetal deaths, intrauterine growth restriction, or congenital anomalies.

Having a formal education is completion of at least primary school education

A booked patient is a pregnant woman who registers for antenatal care and has completed the routine antenatal investigations at the UMTH.

Results

During the period under review, 16,390 women attended antenatal clinics and delivered at the University of Maiduguri Teaching Hospital, out of which 176 had diabetes in pregnancy, giving a prevalence rate of 1.1%. Of these 176 women with DM in pregnancy, only 143 patient folders were available for this review, giving a retriever rate of 81%. Out of the 143 available case notes, 107(74.83%) were GDM giving a prevalence rate of 0.7%. Thirty-three women had type 2 PGDM giving a prevalence rate of 0.2% of deliveries and 3 women had type 1 PGDM with a prevalence of 0.02% of deliveries.

Table 1 shows the socio-demographic characteristics of the women with DM in pregnancy in this study. The age ranged from 18 to 46 years with a mean age of 32.91$\pm$2.96 years. Only 1(0.7%) patient was below 20 years, the majority, 82(57.3%) were within the age limit of 31-40 years, while 7(4.9%) of them were above 40 years.

The majority, 104(72.7%) of the studied group had formal education, however, only 44(30.8%) of them were employed.

The mean parity was 4.12±2.96, with a range between 0 and 14. Eighty-five (59.4%) of them were of low parity (Para 0-4), while 58(40.6%) of them were grand multiparous (Para ≥5).

As shown in Table 2, the commonest risk factors for DM in pregnancy in this study were GDM in previous pregnancy found in 85(59.4%), family history of DM in 80(55.9%), booking weight greater than 90kg or BMI greater than 30kg/m^2 in 67(46.9%) and previous delivery of macrosomic baby in 53(37.1) cases.

As detected in Figure 1, the majority, 48(33.6%) of women with DM in pregnancy were managed with nutrition, exercise, and insulin, thirty-seven (25.9%) managed with nutrition and exercise, 39(27.3%) with nutrition, exercise, and Metformin, while only 19(13.3) of them were treated with nutrition, exercise, Metformin, and insulin.

Table 3 presents the maternal and fetal outcomes of DM in pregnancy in the study population. The commonest mode of delivery 80(55.9%) was caesarean delivery, gestational hypertension occurred in 20(14.0%) of the study group, 7(4.9%) developed pre-eclampsia, while polyhydramnios was found in 8(5.6%) of cases.

The gestational age at delivery ranged between 30 weeks and 42 weeks with the mean gestational age at delivery of 38.21±1.36. The Majority, 131(91.6%) delivered between 37 and 40 weeks, while 6(4.2%) each delivered before 37 weeks and after 40 weeks gestation.

The mean APGAR score in the 1st minute was 6.9±1.5; this ranged between 0 and 9. The majority, 110(76.9%) of the babies had APGAR scores of 7 and above. The birth weight ranged from 2.0 to 5.0 kg with a mean weight of 3.47±0.65 kg. The majority 98(68.5%) of the babies were within normal birth weight (2.5-3.99kg), 37 (25.9%) were macrosomic (≥4.0kg), Intrauterine fetal death (IUFD), and early neonatal death occurred in 5(3.5%) and 4(2.8%) of the cases respectively. Gross congenital anomaly was found in 3(2.1%), while 24(16.8%) of the babies were admitted into SCBU.

Table 4 demonstrates the comparison of treatment modalities with types of diabetes mellitus in the study groups. Women with GDM are more likely to be controlled by diet and exercise alone compared to women with PGDM (32.7% vs. 56%), P=0.004.

Table 5 shows the comparison of maternal and fetal outcomes of PGDM and GDM in the study population. The overall risk of preterm delivery was 4.2%, and preterm delivery was significantly higher in PGDM compared to the GDM group (P=0.048). Although not statistically significant, C-section rate (66.7% vs 52.3%), Pre-eclampsia (5.6% vs 4.75%), congenital anomaly (2.8% vs 1.9%), neonatal SCBU admission (25.0% vs 14.0%), recurrent UTI (2.8% vs 0%), and development of hypoglycaemia (5.6% vs 0.9%) were more common among patients with PGDM compare to those with GDM. While fetal macrosomia, (28.0% vs. 19.4%), shoulder dystocia (3.7% vs 0%), and IUFD(3.7% vs. 2.8%) were commoner in the GDM group compared to the PGDM group; however, the rate of ENND was the same among both groups.

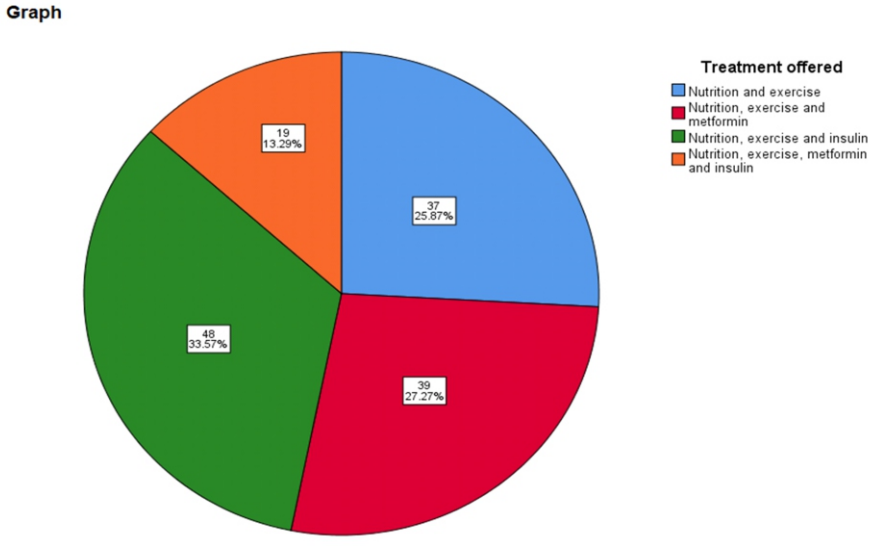

Figure 1: Distribution of treatment offered to patients with diabetes in pregnancy

Table1: Socio-demographic characteristics of the patients in the study group

Variable	Frequency	Percentages%
Age (year)		
Mean=32.9 ±5.68 years		
< 20	1	0.7
20-30	53	37.1
31-40	82	57.3
>40	7	4.9
Total	**143**	**100**
Educational status		
Formal education	104	72.7
No formal education	39	27.3
Total	**143**	**100.0**
Occupation		
Unemployed	99	69.2
Employed	44	30.8
Total	**143**	**100.0**
Marital status		
Married	143	100.0
Total	**143**	**100.0**
Parity		
Mean=4.12 ±2.96		
0-4	85	59.4
≥5	58	40.6
Total	**143**	**100.0**

Table 2: Distribution of known risk factors of diabetes in pregnancy in the study population

Risk factors	Frequency (N=143)	Percentages%
GDM in a previous pregnancy	85	59.4
Family history of diabetes mellitus	80	55.9
Weight>90kg/BMI>30kg/m^2	67	46.9
Previous Macrosomic baby	53	37.1
Bad obstetric history (BOHX)	32	22.4
History of chronic hypertension	22	15.4

Note: Some women have more than one risk factor

Table 3: Maternal and fetal outcomes of diabetes in pregnancy in the study group

Outcomes	Frequency	Percentage%
Maternal		
Gestational HTN		
Yes	20	14.0
No	123	86.0
Total	**143**	**100.0**
Pre-eclampsia		
Yes	7	4.9
No	136	95.1
Total	**143**	**100.0**
Polyhydramnios		
Yes	8	5.6
No	135	94.4
Total	**143**	**100.0**
Recurrent UTI		
Yes	1	0.7
No	142	99.3
Total	**143**	**100.0**
Hypoglycaemia		
Yes	3	2.1
No	140	97.9
Total	**143**	**100.0**
C-section		
Yes	80	55.9
No	63	44.1
Total	**143**	**100.0**
Instrumental vaginal delivery		
Yes	1	0.7

Table 4: Comparison of treatment modalities with types of diabetes in pregnancy in the study population

Treatment	Types of diabetes mellitus		P-V
Treatment modalities	**PGDM (N=36)**	**GDM (N=107)**	
Nutrition and Exercise	2(5.6%)	35(32.7%)	**0.004**
Nutrition, Exercise , and Metformin	11(30.6%)	28(26.2%)	
Nutrition, Exercise and Insulin	14(38.9%)	34(31.8%)	

Table 5. Comparison of maternal and fetal outcomes with the type of diabetes in pregnancy in the study population

OUTCOMES	TYPES OF DIABETES		P-V
Maternal	**PGDM** (N=36)	**GDM** (N=107)	
Gestational HTN			
Yes	4(11.1)	16(15.2)	
No	32(88.9)	91(85.0)	0.565
Pre -eclampsia			
Yes	2(5.6)	5(4.7)	
No	34(94.4)	102(95.0)	0.832
Polyhydramnios			
Yes	1(2.8)	7(6.5)	
No	35(97.2)	100(93.5)	0.395
Recurrent UTI			
Yes	1(2.8%)	0(0.0%)	
No	35(97.2%)	107(100%)	0.084
Hypoglycaemia			
Yes	2(5.6)	1(0.9)	
No	34(94.4)	106(99.1)	0.094
Instrumental VD			
Yes	1(2.8%)	0(0.0%)	
No	35(97.2%)	107(100%)	0.084
C -section			
Yes	24 (66.7)	56(52.3)	
No	12 (33.3)	51(47.7)	0.134
Shoulder dystocia			
Yes	0(0.0)	4(3.7)	
No	36 (100.0)	103(96.3)	0.239
Gestational age at delivery (weeks)			
<37	4(11.1)	2(1.9)	0.048
37 -40	30(83.3)	101(94.4)	
>40	2(5.6)	4(3.7)	
APGAR score at 1 st minute			
<7	10(27.8)	23(21.5)	
≥7	26(72.2)	84(78.5)	0.439
Birth weight(kg)			
<2.5	3(8.3)	5(4.7)	
2.5 -3.99	26(72.2)	72(67.3)	
≥4	7(19.4)	30(28)	0.470
IUFD			
Yes	1(2.8)	4(3.7)	
No	35(97.2)	103(96.3)	0.786
Congenital anomaly			
Yes	1(2.8)	2(1.9)	
No	35(97.2)	105(98.1)	0.742
Neonatal hypoglycaemia			
Yes	1(2.8)	4(3.7)	
No	35 (97.2)	103(96.3)	0.786
SCBU admission			
Yes	9(25.0)	15(14.0)	
No	27(75.0)	92(86.0)	0.127
Early neonatal death			
Yes	1(2.8)	3(2.8)	
No	35(97.2)	104(97.2)	0.993

PGDM: Pregestational diabetes mellitus, GDM: Gestational diabetes mellitus

Discussion

The result of this study showed that the prevalence rate of DM in pregnancy in the studied population was 1.1%. Among diabetes, GDM had the highest prevalence rate of 0.7% compared to type 2 and type 1 PGDM (0.2% and 0.02%) respectively. The commonest risk factors for DM in pregnancy were GDM in a previous pregnancy, family history of DM, and booking weight of greater than 90kg/BMI greater than 30 kg/m^2. Significantly more women with GDM were likely to be controlled with diet and exercise alone compared to the PGDM group (P= 0.004). While, with regards to maternal outcomes, preterm delivery was significantly higher in the PGDM group compared GDM group (P= 0.048).

The prevalence of DM in pregnancy of 1.1% found in our study is similar to the 1.6% reported from Cape Town, South Africa[5] but quite lower than the 21.7% reported from a study in Saudi Arabia.[13] Although the prevalence of DM in pregnancy has been reported to be high in Asians and Africans[1,2] our study and like others studies in Nigeria,[10,11] had failed to demonstrate a high prevalence of DM in pregnancy probably because many hospitals in Nigeria practice selective (risk factor based) screening rather than universal screening.

The mean age of mothers with DM in pregnancy (32.91±296 years), in our study, is similar to those reported in other previous studies.[11,13] This may be because both obesity and pancreatic beta cell dysfunction, which are risk factors for DM, increase with advancing maternal age.

The commonest risk factors for DM in pregnancy such as GDM in a previous pregnancy, family history of DM, maternal obesity, and previous delivery of macrosomic baby reported in previous studies[7,8,11,16] were also confirmed by our study. Other risk factors for DM in pregnancy observed in the current study include a history of chronic hypertension and bad obstetric history. In line with existing evidence[1,2,12-14,] our study demonstrated that a history of previous GDM, family history of diabetes mellitus, bad obstetric history, and chronic hypertension were more frequently associated with PGDM compared to the GDM group; while the history of previous macrosomia and booking weight greater than 90 kg/BMI greater 30kg/m^2 were commoner in mothers with GDM compared to PGDM group. Persistent insulin resistance and hyperglycaemia due to the chronicity of PGDM have been associated with microvascular damage, chronic hypertension, and bad obstetric history.[2] Also, GDM, type 2 DM, chronic hypertension, and bad obstetric history may be due to shared risk factors resulting from potential complications of obesity including inflammation, oxidative stress, insulin resistance, and mental stress.

In our study, statistically significant (P=0.004) proportions of mothers with GDM (32.7%) were more likely to be controlled with diet and exercise alone compared to the PGDM group (5.6%). This is comparable to a study in Sweden where 50% of GDM achieve control with diet alone.[12] However, our findings were contrary to previous reports from South Africa where more than 90% of GDM mothers were managed with insulin or Metformin.[5] Globally, the recommended management for GDM is dietary and exercise initially, with the introduction of Metformin and/ or insulin if optimal glycaemic control is not achieved.[18]

The maternal complications demonstrated in the current study include gestational hypertension (14.0%) pre-eclampsia (4.9%), polyhydramnios (5.6%), hypoglycaemia (2.1%), recurrent urinary tract infection (UTI) and shoulder dystocia were comparable to those reported by other investigators.[7,11,16] While pre-eclampsia, hypoglycaemia, and recurrent UTI were more likely in PGDM mothers, gestational hypertension and polyhydramnios were more likely in GDM groups. The higher rate of pre-eclampsia, hypoglycaemia in PGDM mothers compared to GDM mothers demonstrated by our study is also similar to those reported by other authors.[13,14] However, these differences were not statistically significant. Mothers with PGDM are more likely to develop diabetes microvascular complications predisposing them to pre-eclampsia and preterm delivery. They are also more frequently treated with insulin which may be associated with inappropriate use leading to hypoglycaemia.[2,18]

The overall rate of preterm delivery in this study was 4.2%. This is much lower than the 18.1% and 23.1% reported in some previous studies.[13,14] However, similar to the findings by other researchers,[6,12-14] our study demonstrated a significantly higher rate of preterm delivery in mothers with PGDM compared to GDM mothers (P= 0.048). This may be explained by the higher rates of bad obstetrics history and pre-eclampsia found in PGDM mothers compared to the GDM group in this study which are common reasons for early delivery. It may also be explained by the increased risk of microvascular disease such as diabetic nephropathy associated with the PGDM group which may worsen during pregnancy leading to preterm delivery.

The high rate of caesarean section, 55.9% demonstrated by our study is consistent with the findings from other previous studies.[6-15] This rate is significantly higher than the background caesarean section rate (11.8%) in Maiduguri.[21] Mothers with PGDM had a higher rate of caesarean section, 66.7% compared to 52.3% found in GDM mothers. This agrees with the rates of 58.5% in mothers with GDM compared with 91.7% in mothers with PGDM reported in a previous study.[14] However, it is in contrast with the reports of a study in Sweden[12] where

an equal caesarean section rate was recorded among various groups. The increased rate of caesarean section among mothers with DM in our study may be due to a genuine desire for good maternal and perinatal outcomes for these women. As a result, mothers with DM especially PGDM, are followed up more frequently and if fetal maturity is achieved, a caesarean section may be scheduled to prevent an adverse event such as late IUFD, birth trauma, shoulder dystocia, and low APGAR scores.
In this study, low fifth-minute Apgar scores (<7) were found in 23.1% of the neonates in the studied group. There was no significant difference in Apgar scores of neonates of mothers with various types of diabetes. This was similar to the findings from a study conducted in Saudi Arabia[13] but in contrast with the finding of one study[12] which reported a higher rate of low Apgar score among neonates of mothers with PGDM compared with GDM mothers. The reason for these differences is not clear as all of these studies were conducted in diabetes mothers who received medical intervention during the pregnancy and delivery. However, it could be that our patients with PGDM were given extra attention intrapartum because of their perceived risk of intrapartum complications.

The commonest adverse fetal outcome in this study was fetal macrosomia. Despite the medical intervention the mothers received, 25.9% of their babies were macrosomic. This agrees with the reports from other studies.[7,8,11,13] However, in contrast to some previous studies which reported either equal or higher rates of macrosomia among neonates of mothers with PGDM compared with those of GDM mothers,[5,12,18] Our study also demonstrated a higher rate of macrosomia in neonates of mothers with GDM compared with PGDM mothers; though the difference was not statistically significant. Pregestational diabetes may be associated with vasculopathy which negates fetal growth and the majority of our patients with GDM were managed with diet and exercise compared to patients with PGDM and the control might not be tight compared to when pharmacology agents are used.

The overall rate of IUFD in our study was 3.5%. This is similar to the 3.4% reported by previous investigators.[13] However, unlike the previous reports, the results of our study demonstrated a higher rate of IUFD as well as neonatal hypoglycaemia in the neonates of mothers with GDM compared to the PGDM group. This may be because mothers with PGDM are likely to have received preconception counseling and are more adapted to diabetes management guidelines.

The rate of congenital anomalies in our study was 2.1%. This is comparable to the rate of 2.4% reported in South Africa[5] but much lower than the 6% and 19.2% reported elsewhere.[12,14] In line with the findings by other investigators,[5,12] our study depicted a higher rate of congenital anomaly in PGDM compared to GDM. Poor glycaemic control during organogenesis (first 8 weeks of pregnancy) predisposes a woman with PGDM to a high risk of congenital anomaly especially if they are not taking a high dose of folic acid.[2,18]

The overall rate of SCBU admission in this study was 16.8%. A high rate of SCBU admission in neonates of mothers with DM in pregnancy has been widely reported.[13,14,16] and similar to these studies, a higher rate of SCBU admission was also observed in neonates of PGDM mothers compared to the GDM group in the current study. However, this was not statistically significant.

The rate of early neonatal death in our study was 2.8%. This is similar to the 2.5% reported elsewhere.[5] However, in contrast to the higher rate of early neonatal death in PGDM mothers compared with the GDM group as previously reported, the result of our study demonstrated a similar neonatal mortality rate among the studied groups.

The lack of statistically significant difference in the majority of the maternal and all the perinatal outcomes between PGDM and GDM mothers in this study may be due to the small sample size. It may also be explained by the fact that the study was conducted in a tertiary centre where all the participants were managed according to standardized multidisciplinary protocols with the majority achieving. This has been shown to improve outcomes of DM in pregnancy by other investigators.[12-14,17]

Limitation of the study

This was a retrospective study that is prone to misclassification bias and a high rate of missing data.

Conclusion and recommendation

The prevalence of diabetes mellitus in pregnancy observed in this study appears to be relatively low and patients with GDM were more likely to be controlled with dietary therapy compared to patients with PGDM. Preterm delivery is commoner in patients with PGDM. Also, the other well-documented adverse maternal and perinatal outcomes of diabetes in pregnancy including a high rate of caesarean section, gestational hypertension, and pre-eclampsia, as well as macrosomia, congenital anomaly, SCBU admission, and perinatal mortality were demonstrated.

We recommend universal screening of all pregnant mothers and diagnosing DM in pregnancy using the updated WHO (2013) criteria as many of our patients were diagnosed based on risk factors screening which can result in missing a lot of cases. A prospective multi-centre study is essential to further evaluate this important medical disorder in pregnancy.

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