

## **Gestational Diabetes in a Tertiary Healthcare Centre at Abeokuta, South Western Nigeria: A Five Year Retrospective Review**

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### **Authors' contributions**

*This work was carried out in collaboration between all authors. Author CFC did the study design and wrote the protocol. Authors CFC and DOA did the statistical analysis and literature searches while analyses of study was by authors CFC and UI. All authors read and approved the final manuscript.*

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### **ABSTRACT**

**Background:** Women with gestational diabetes are at increased risk of adverse perinatal and maternal morbidities. Hence early detection and management of this condition is vital to ensure better outcome for both mother and baby [1,2].

Approximately 7% of all pregnancies are complicated by diabetes mellitus, resulting in more than 2000000 cases annually.<sup>1</sup> The prevalence of gestational diabetes mellitus(GDM) ranges from 1 to 14% of all pregnancies, depending on the population studied and the diagnostic test employed [8,9].

In the recent years, there had been a rapid rise in the incidence of diabetes in pregnancy. This is due to the increasing number of women in the reproductive age population with pre-gestational diabetes (type 2 DM) and increase in the number of women being diagnosed with gestational diabetes [2].

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**Aim:** To determine the incidence of gestational diabetes mellitus at Federal Medical Centre, Abeokuta and to evaluate the fetomaternal outcome of their pregnancies.

**Materials and Methods:** This study is a 5 year retrospective review of gestational diabetes mellitus cases at the Federal Medical Centre, Abeokuta (between 2009 to 2013) as well as the outcomes of these pregnancies.

A proforma was used to collect data from case notes of all gestational diabetes mellitus (GDM) cases diagnosed within the stated period. All pregnant women in 24 weeks of gestation and above who are considered to be at risk after undergoing preliminary clinical examination were given a 75g oral glucose load, using the WHO standardized oral glucose tolerance test [4,5]. Gestational diabetes mellitus was diagnosed if 2 hour plasma glucose was  $\geq 140$  mg/dl.

**Results:** The incidence rate of gestational diabetes mellitus was found to be 1.13% of the pregnancies. Overall, there was a preponderance of GDM mothers with tertiary level of education (34.15%). The majority of mothers with GDM in this study, had maternal age  $\geq 31$  yrs (78.1%), increased body mass index  $\geq 25$  (82.9%) and previous intrauterine fetal death (28.3%). Many of the women (48.78%) had parity of 2-3 and various complications were seen in 43.9% of mothers and 22% of the newborns. Caesarean section as the mode of delivery was significantly high at 61%.

**Conclusion:** The morbidities associated with gestational diabetes are still enormous and timely screening of mothers could be beneficial in reducing the complications seen in gestational diabetes mellitus mothers.

*Keywords: GDM; oral glucose tolerance test; world health organization; Abeokuta.*

## 1. INTRODUCTION

Gestational diabetes mellitus (GDM) is defined as glucose intolerance of variable degree with onset or first diagnosis during pregnancy [1,2,5].

Based on the demographic projections made by United Nations Population Division for the year 2015, WHO issued estimates of adults with diabetes in all countries and reported that there will be more women with diabetes than men and a considerable increase in the burden of gestational diabetes especially in less prosperous countries [4].

The increasing proportion of women with type 2 diabetes mellitus with their associated risk among the present antenatal population indicates why pregnancy outcomes in women with diabetes have not appreciably improved over the last four decades [5].

Gestational diabetes mellitus is a public health concern that currently affects a large proportion of the female population and has short and long-term consequences for the fetus and the mother. It has been reported that gestational diabetes complicates 1%-14% of all pregnancies worldwide [9,10] and its incidence has been steadily rising [6]. Gestational diabetes is a major cause of perinatal morbidity and mortality, as well as maternal morbidity [6].

In an age of increasing patient empowerment, the diagnosis of gestational diabetes provides a

woman with the knowledge that her baby has an increased chance of complications before, during and after birth (including an increased chance of obesity, and or diabetes in the future); that she herself has an increased chance of future diabetes and future pregnancies are more likely to be complicated by diabetes (gestational or otherwise) [8]. Such knowledge could be harmful if there were no opportunities to reduce these risks. However, there is good evidence that there are fewer obstetric and neonatal complications with intensive management [6] and that future risk of developing diabetes can be delayed and possibly avoided [7].

According to NICE clinical guideline on diabetes in pregnancy, initially published in 2008, risk assessment for gestational diabetes should be undertaken at the first prenatal visit. Women with clinical characteristics consistent with a high risk of gestational diabetes (marked obesity, personal history of gestational diabetes, glycosuria, or a strong family history of diabetes) should undergo glucose testing as soon as feasible.

If they are found not to have GDM at initial screening, they are retested between 24 and 28 weeks of gestation. Women of average risk should have testing undertaken at 24-28 weeks of gestation. Low risk status requires no glucose testing, but this category is limited to those women meeting all of the following characteristics: Age  $< 25$  years, weight normal before pregnancy, member of an ethnic group

with low prevalence of diabetes mellitus, no known diabetes in first-degree relatives, no history of abnormal glucose tolerance and no history of poor obstetric outcome.

In FMCA, incidence of GDM is not known and no documented study has been done to evaluate the incidence. This present study therefore was undertaken to address this issues.

**Aim:** To assess and determine the impact of GDM among the expectant mothers in FMCA.

**Objectives:**

1. To determine the incidence of gestational diabetes in an obstetric population in Federal Medical Centre, Abeokuta.
2. To assess the socio-demographic features of pregnancies complicated by gestational diabetes mellitus.
3. To determine fetomaternal outcome of these pregnancies.

**2. MATERIALS AND METHODS**

A retrospective survey of all pregnant women with GDM who attended the antenatal clinics of the Federal Medical Centre, Abeokuta between 2009 and 2013 was carried out. Relevant information were obtained from the antenatal register as well as the antenatal wards, labour ward, emergency unit and the postnatal ward. Patients who had gestational diabetes were recorded down and the case notes were retrieved from the health records. Information obtained from the case notes were coded, fed into the computer and analysed. Antenatal performance as well as maternal and neonatal outcomes were analysed.

Also the records of all patients who attended the antenatal clinic for their pregnancy at Federal Medical Centre, Abeokuta during the study period were retrieved from the health records department through the antenatal register.

Screening for gestational diabetes was done usually with clinical history, urinalysis and oral glucose tolerance test. These clinical assessments included history of unexplained intrauterine fetal death, macrosomia in the previous pregnancy, polyhydramnios, family history of diabetes mellitus in the first degree relatives, maternal weight of  $\geq 90$ kg in the index pregnancy.

Gestational diabetes mellitus is usually diagnosed in FMCA with 75 g oral glucose tolerance test with 2 hours of plasma glucose value of  $\geq 7.8$  mg (140 mg) in line with WHO criteria [3,5].

The characteristics evaluated in women with GDM in this study included socio-demographic factors, family history, medical history, initial weight and body mass index, previous poor obstetric outcome, history of diabetes mellitus in the first degree relatives, symptomatology at presentation, maternal complications and neonatal outcomes.

The data collected were entered into Microsoft Excel and analysed. Frequencies were obtained using descriptive statistics. Ethical approval was obtained from the hospital ethical committee prior to the commencement of this study.

**3. RESULTS**

The total number of women who booked for and attended antenatal care during the period in view were 3624.

The number of expectant mothers discovered to have GDM were 41 giving incidence rate of 1.13% of the pregnancies.

The mean age of women with GDM were  $33.2 \pm 4.5$  years and the age ranged between 21 to 50 years. Majority, comprising 41.5% (17) of the studied population belonged to age group of 31 – 35 years and only 2.4% of the study population were 46 years and above (Table 1). Many of the GDM mothers had parity of 2-3 consisting of 48.78% while 36.58% and 12.20% of the mothers had parities of 0-1 and 4-5 respectively (Table 1).

Among all the 41 women, 26.80% (11) had no formal education, 14.63% (6) were educated up to primary level of education, 19.5% (8) had secondary level of education while 34.15% (14) had tertiary level of education (Table 1). The preponderance of the women (43.9%) had gestational age of  $\leq 20$  weeks and only 4.88% of the females were  $\geq 37$  weeks of gestation (Table 1).

In this study, 24.4% of the expectant mothers had positive family history of diabetes (Table 2). The women that presented with cardinal symptoms of polyphagia, polydipsia and polyurea comprised 24.4% (10) of the gestational diabetes

mothers. The other thirty one (75.6%) did not present with the cardinal symptoms of polyphagia, polydipsia and polyurea (Table 2).

Out of the 41 women with gestational diabetes mellitus, 43.9% had varying subtle complications during antenatal, intrapartum and puerperium while only 22% of the neonates had complications during NNU admission. A significant number of the women comprising 85% (35) were normotensive, while only 14.6% (6) of the women were hypertensive (Table 3).

In the modalities of treatment used for the GDM mothers in this study, 4.9% (2) had good glycaemic control with regular exercise, while 14.6% (6) were on dietary modification alone (Table 4). Majority comprising 70.70% (29) had their glycaemic control using combination of subcutaneous insulin injection and dietary modification while 9.8% (4) were managed on only oral hypoglycaemic agents.

The different routes of deliveries seen among the 41 gestational diabetes mothers were caesarean section consisting of 61% (25) of the mothers, while 1 (2.4%) had operative vaginal delivery (Fig. 1). Only 15 (36.6%) of the GDM mothers had normal spontaneous vaginal delivery.

In this study, significant numbers of GDM mothers comprising 31.7% were in the body mass index range of 35-39.9 kg/m<sup>2</sup> while 24.4% had BMI of 30-34.9 kg/m<sup>2</sup>. None of the mothers had BMI < 18 kg/m<sup>2</sup> while 7.31% had BMI of ≥ 40 kg/m<sup>2</sup> (Fig. 2). Only 17.07% of the GDM mothers were in the BMI range of 18 to 24.9%.

The birth weight of babies of GDM mothers showed most of the babies to be between 2.5 to 3.9 kg making up 53.70% (22), followed by 4 to 4.5 kg which consists of 24.40% (10) while 4.9% (2) of the babies has birth weight > 4.5kg (Fig. 3)

Among the past bad obstetric history seen in this study, sudden intrauterine fetal death and spontaneous miscarriage were the commonest complications constituting 28.3% (15) and 20.8% (11) of the GDM mothers respectively (Fig. 4).

#### 4. DISCUSSION

Among the endocrine disorders affecting pregnant women, gestational diabetes has been identified as one of the common metabolic disorders during pregnancy [11,12]. The current definition of gestational diabetes, "carbohydrate

intolerance of variable severity with onset or first recognition during pregnancy" [12,13], was first proposed by the National Diabetes Data Group (NDDG) in 1979 [8,19], although that group used the term "diabetes or impaired glucose tolerance (IGT)" [12] rather than "carbohydrate intolerance of varying severity" [12]. The latter term was introduced at the Second International Workshop-Conference on gestational Diabetes in 1985 [19]. The significance of this change is that it acknowledges the uncertainty regarding the most appropriate diagnostic criteria. Currently, the World Health Organization (WHO) does not consider that different diagnostic criteria are appropriate for the pregnant versus the nonpregnant state, preferring instead to use the same definitions of diabetes and IGT for both situations. For decades controversies remain regarding the screening test and diagnostic criteria. The incidence of gestational diabetes has been quoted to be between 1 to 10% depending on the population being studied [11]. Studies done in an African population by Ozumba et al. [14] quoted a prevalence rate of 1.7%. Works done at University College Hospital, Ibadan by Fawole et al. [15] gave an incidence rate of 1.6%. Other studies by Wokoma et al. [16] quoted incidence rates of 0.3% of pregnancies.

Some Studies done showed incidence of 1.1% by Chen et al at Brooklyn, New York, US [17], 2.0% by Coustan at Providence city, USA [18]. 2.5% by O' Sullivan at Boston, USA [19]. 4.6% by Berkowitz at Manhattan, New York [20], 8.8% by Mestman at Los Angeles, California, USA [21] and 13.9% by Kuti et al. [22] at University College Hospital, Ibadan, Nigeria.

The incidence rate of GDM in this current study is 1.13% which is within the reported range in literature but higher than the incidence rate of 0.3% quoted by Wokoma et al. [16]. Also, the incidence rate in this study was less than that by Kuti et al. [23] in Ibadan who quoted an incidence rate of 13.9%. This difference may be related to the screening methods, diagnostic criteria used or the population studied.

More than half of the mothers (53.65%) had secondary and tertiary level of education and were residing in urban areas. This was in contrast to the work of Raja et al at Kashmir, India [3], in which majority of the GDM mothers (52.9%) had no formal education. In this study, only 26.83% of the GDM mothers in Abeokuta had no formal education. This could be due to the

location of the health facility (FMCA) used in this study in an urban population.

**Table 1. The age, educational level and gestational age of GDM mothers**

Age(yrs)	FREQ	Percent
21-25	3	7.30%
26-30	6	14.60%
31-35	17	41.50%
36-40	12	29.30%
41-45	2	4.90%
46-50	1	2.40%
Total	41	100.00%
Educationallevel	FREQ	Percent
None	11	26.83%
Primary	6	14.63%
Secondary	8	19.50%
Tertiary	14	34.15%
Total	41	100.00%
EGA(Weeks)	FREQ	Percent
≤20WKS	18	43.90%
21-28WKS	9	21.95%
29-36WKS	12	29.27%
≥37WKS	2	4.88%
Total	41	100.00%
Parity	FREQ	Percent
0-1	15	36.58%
2-3	20	48.78%
4-5	5	12.20%
>5	1	2.44%
Total	41	100.00%

Mean age =33.2yrs standard deviation = 4.5

Most of the mother (43.9%), were diagnosed at an earlier gestational age of ≤ 20 weeks, although 29.3% of the mothers were also diagnosed at 29-36 weeks. The former could be explained due to many high risk women may have booked on our facility because of their previous bad obstetric outcome while the later trend could be explained by late booking habit which could have led to making diagnosis of GDM at a later gestational age. However, some of the mothers may have first booked at the primary health facilities which may lack the manpower and expertise to make early diagnosis prior to transferring their client ship to the tertiary health facility such as FMCA.

Among the previous bad obstetric history found in the GDM mothers, history of sudden intrauterine fetal death (28.3%), spontaneous

termination of pregnancy (20.8%) and fetal macrosomia (20.8%) were the commonest. This could be due to previous undiagnosed hyperglycaemia in pregnancy which adversely affected those gestations.

**Table 2. Risk factors in the Index pregnancy**

Positive family HX of DM	FREQ	Percentage
Yes	10	24.40%
No	31	75.60%
Total	41	100.00%
Cardinal symptoms of PPP	FREQ	Percentage
Yes	10	24.40%
No	31	75.60%
Total	41	100.00%
HX of abnormal glucose tolerance	FREQ	Percentage
Yes	19	46.30%
No	22	53.70%
Total	41	100.00%

**Table 3. Complications observed in GDM mothers**

Maternal	FREQ	Percentage
Yes	18	43.90%
No	23	56.10%
Total	41	100.00%
Foetal	FREQ	Percentage
Yes	9	22%
No	32	78%
Total	41	100%
Hypertension	FREQ	Percentage
Yes	6	14.60%
No	35	85.40%
Total	41	100.00%

**Table 4. Modalities of treatment of GDM mothers**

Modalities of treatment	FREQ.	Percent
Exercise	2	4.90%
Diet	6	14.60%
Insulin+diet	29	70.70%
OHA	4	9.80%
Total	41	100.00%

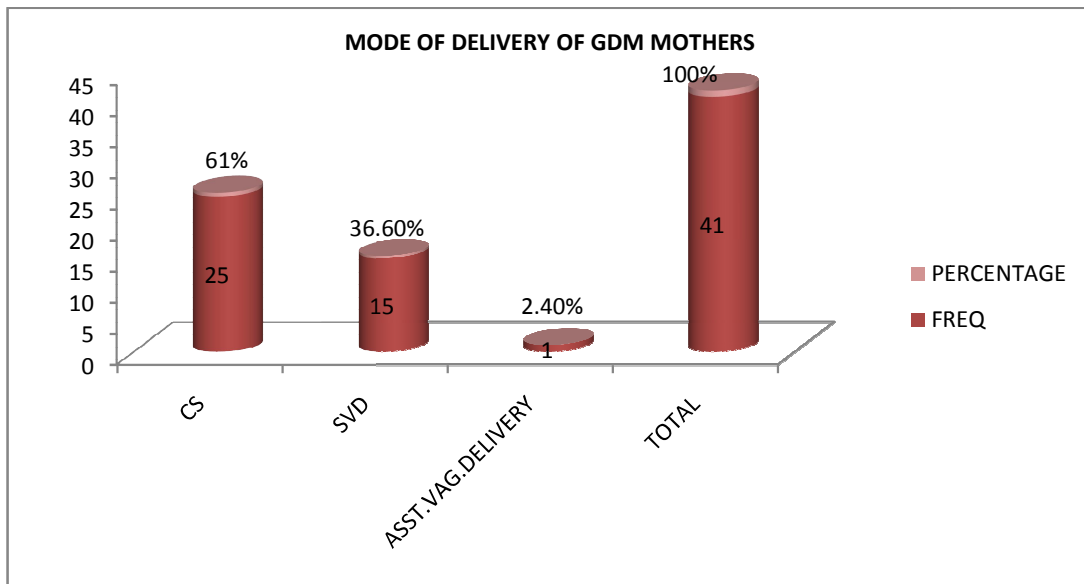


Fig. 1. Mode of delivery of GDM mothers

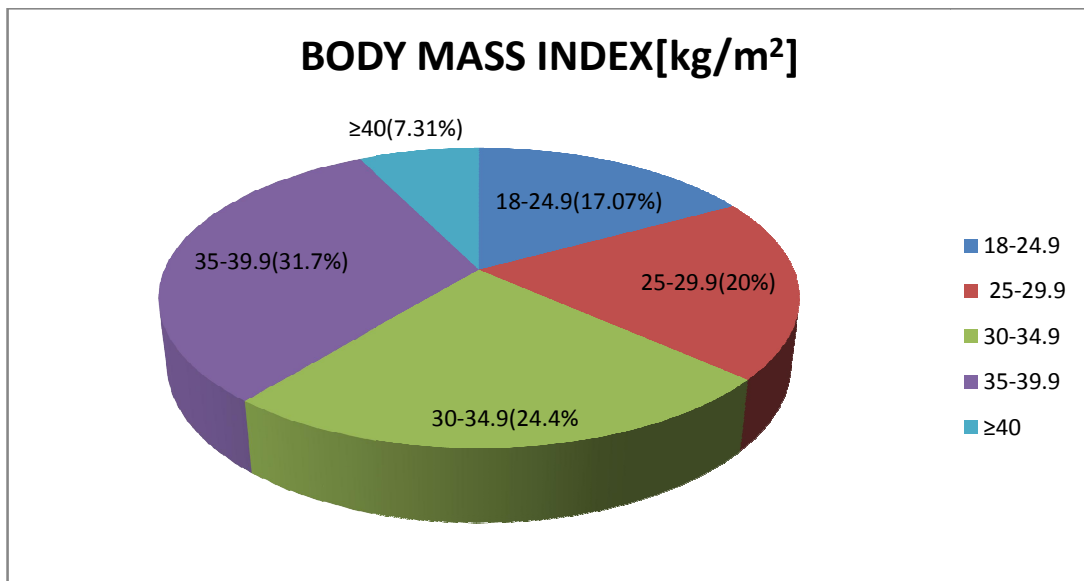
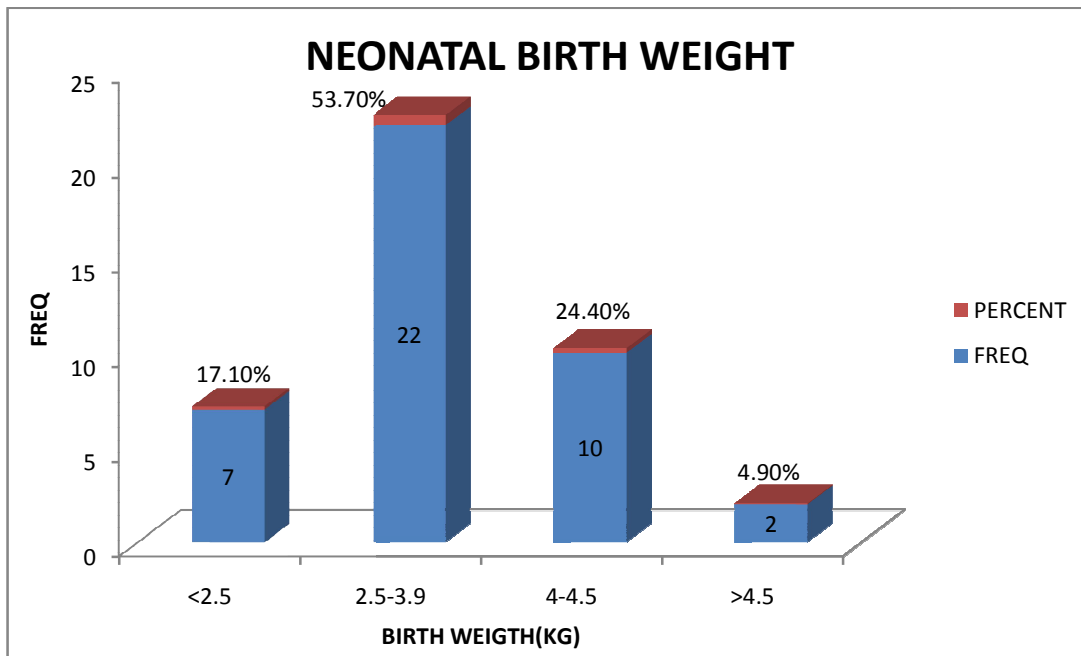


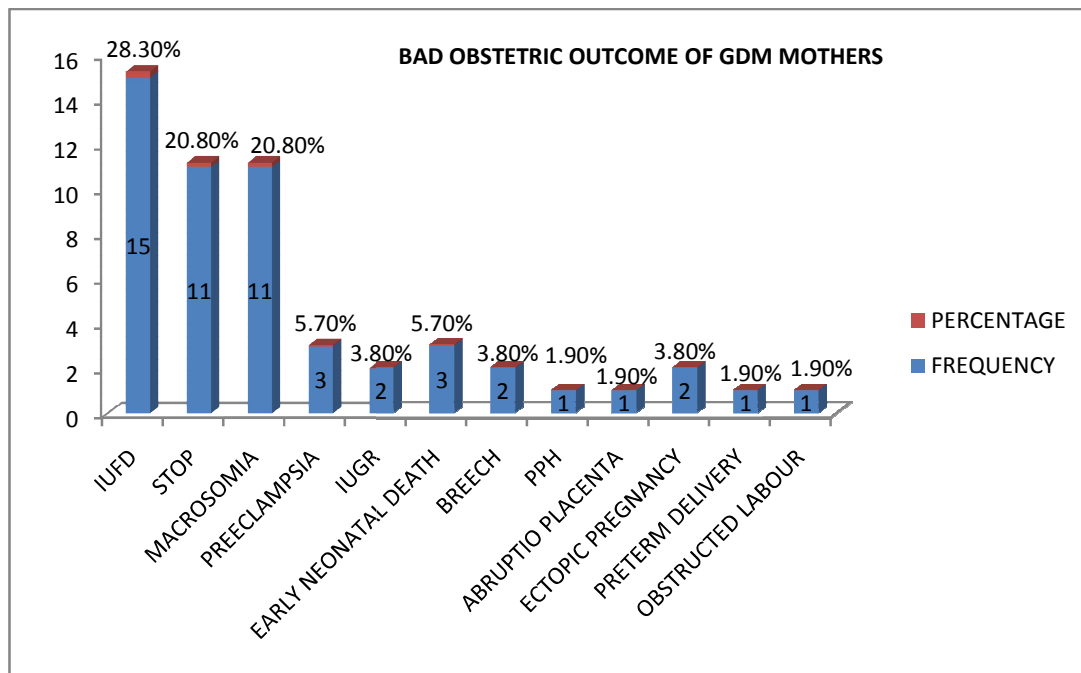
Fig. 2. A pie chart showing percentage of body mass index of GDM mothers

In this study population, mothers who were considered at risk met an acceptable indication for their screening. Although there is still arguments on doing either selective or universal screening. Considering the numerous morbidities associated with GDM, some had argued that universal screening would be preferred to selective screening in reducing the obstetric risks and morbidities associated with gestational diabetes mellitus.

This study found positive family history of diabetes in 24.4% % of women with GDM. This result was similar to the study of Hadaegh et al. [25] in which majority of the GDM mothers did not have positive family history of diabetes mellitus.



**Fig. 3. Bar chart showing the neonatal birth weight of gdm mothers**



**Fig. 4. Bar chart showing past bad obstetric history of GDM mothers**

This study found that the majority of the GDM mothers were in the obese range of their body mass index during their pregnancies. Though similar studies done by O' Sullivan et al. [19] showed that high BMI could be a predictor for the

development of GDM. Studies have also shown that GDM tend to occur more frequently in women with body mass index greater than 25 kg/m<sup>2</sup> [23]. This is in agreement with results of this study.

The parity of GDM mothers in this study showed that majority (48.78%) of the diagnosed mothers had parity of 2-3 while few (2.44%) had parity >5. This was in line with the study of Rudra et al. [23], who also found a similar pattern of decrease in number of GDM mothers with progressively increasing parity. However, increased parity should be discouraged among GDM mothers because of the fact that increasing parity is associated with other diabetic risk factors like increasing age, body weight and fat deposition and could accelerate the known complications of diabetes mellitus such as retinopathy, ischaemic heart disease and nephropathy.

History of glucose intolerance was found in 46.3% of the diagnosed gestational diabetes mellitus mothers. Other studies by Naylor et al. [24] found glucose intolerance in 14.5% of women who had adverse obstetric outcomes.

Various maternal complications were noted in GDM mothers during this study. These results are in concordance with other studies [20-23], which found that pregnancy outcomes in GDM mothers had more morbidity compared to the general population of women without GDM. Caesarean section as a mode of delivery of the gestational diabetes mothers was found to be high in this study.

However, early booking and diagnosis are to be encouraged among pregnant women because they are very essential in reducing the morbidities associated with GDM.

## 5. CONCLUSION

This study found that the incidence of gestational diabetes mellitus is 1.13%. It also showed that the majority of GDM mothers had parity 2-3. Many GDM mothers had encountered bad obstetric outcome comprising of intrauterine fetal death, spontaneous miscarriage and macrosomia with caesarean section for 61% of the deliveries. This study underscores the need for GDM screening in an African population, which is very pertinent in reducing morbidities of pregnant women.

## 6. RECOMMENDATIONS

The need for GDM screening should be advocated among all the levels of the health care providers. This will increase the awareness and accuracy of diagnosis of GDM, which will go a

long way in reducing the morbidities of future pregnancies.

## CONSENT

It is not applicable.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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