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Adverse Neonatal Complications from Pregnancies Complicated by Gestational Diabetes Mellitus in a Poor Resource Setting, Kenya

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***Abstract*: Gestational diabetes Mellitus (GDM) is a disorder at pregnancy causing insulin intolerance thus contributing to adverse pregnancy outcomes. The aim of this study was to evaluate neonatal outcomes associated with gestational diabetes mellitus among pregnant women with GDM in Kisumu County, Kenya. A case-control study was carried out among 210 pregnant women in Kisumu County. Screening and diagnosis were performed using the 2013 WHO criteria. Data was collected using a checklist, mother-baby booklet and gynaecological files. Descriptive and inferential statistical analysis were done in SPSS V.23 using Chi-square ($\chi 2$) test to test for associations. Analysis revealed that of the 105 GDM cases, majority were in 30-34 years age group, married and employed. Further analysis revealed that neonatal macrosomia and neonatal admission to intensive care unit (all $p<0.001$) were significantly associated with GDM. Therefore, these findings suggests that due to these adverse neonatal outcomes, there is need for interventions such as early GDM screening and management among the women at high-risk group.**

***Keywords*: gestational diabetes mellitus, neonatal, outcomes, macrosomia, pregnancy.**

1. Introduction

Gestational diabetes accounts for majority of pregnancy associated complications annually [4]. It is categorized into pregestational diabetes mellitus (PDM) type 1 (T1DM) or type 2 (T2DM) and gestational diabetes mellitus (GDM) [13]. GDM is glucose or carbohydrate intolerance of inconstant severity detected for the first-time during pregnancy [13]. Determining and regulating maternal glycaemia is crucial in mitigation adverse neonatal outcomes from pregnant women with GDM [15]. It is progressively emerging as a serious public health problem in poor resource settings associated with 90% of all pregnancies complicated by diabetes leading to adverse pregnancy outcomes [5].

Evidence indicates the prevalence of GDM is rapidly increasing in poor resource settings like Kenya [16]. It is projected that by 2035 nearly 592million will be suffering from GDM [6]. Global prevalences ranges from 1% to 28% due to variations in study population genetics, environment and diagnostic/screening methods used [1]. In sub-Shaharan Africa ranges from 2.6% to 24.5% [14]. Women with hyperglycaemia detected during early pregnancy are at greater risk of adverse pregnancy outcomes [18], including adverse obstetric outcomes [17]. Most of the time, adverse neonatal and obstretic outcomes among women with GDM are preventable by optimising glycaemic control. Early screening and treatment of mothers with GDM can reduce the complications for both mothers and their neonates [2].

Adverse neonatal outcomes posing an important health risk for both the mother and the neonate are associated with GDM [12]. The adverse neonatal outcomes include macrosomia, birth trauma, neonatal hypoglycaemia, preterm birth, congenital malformations and increased need for admission of neonates in the intensive care units [16], [14]. Despite the above realities, there is still a paucity of data on adverse neonatal outcomes in pregnancy complicated by GDM in Kenya. Therefore, the objective of this study was to evaluate the neonatal outcomes among pregnancies complicated with GDM relative to those with pregnancies not complicated by diabetes.

2. Methodology

This was a case-control study that targeted pregnant women, 18 years or older with singleton pregnancies, between 24 and 32 weeks gestation with a maximal range to 42 weeks, were eligible for inclusion who were attending antenatal, maternity and child health clinics of the Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH). Ethical approval was sought from JOOTRH Ethics Review Committee. Informed consent was sought from all the study participants using an approved consent form. Study participants were sampled through simple random technique and a sample size of 210 (105 cases and 105 Controls) was selected. Data was collected for both dependent and independent variables. Data was captured using a checklist, mother-baby booklet and laboratory examinations. Screening for GDM was done according to WHO recommendations. Data was analysed using

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descriptive and inferential statistical methods aided by SPPS (Statistical Package for the Social Sciences, Chicago, Illinois, version 23). Descriptive data were presented by frequencies and percentages. Pearson Chi-square and Fisher's exact test were used for comparison of categorical variables between groups. P-value ≤0.05 was considered significant.

3. Results

This section presents data obtained from a total of 210 pregnant women (105 cases with GDM and 105 controls without GDM). Table 1 shows the sociodemographic characteristics of the participants were investigated and a majority of participants with GDM were in 30-34 years age group (54, 51%), married (79, 75%), had secondary education (54, 52%) and unemployed (37, 36%).

Table 1
Sociodemographic characteristics of the participants (n=210)

	Gestational Diabetes Status	
Variable	**GDM = 105**	**no GDM=105**
Age in years		
<25	1(0.9)	41(39)
25-29	1 (0.9)	48 (45.7)
30-34	54 (51.4)	16 (15.2)
≥35	49 (46.7)	0 (0%)
Marital Status		
Married	79 (75.2%)	82 (78%)
Unmarried	26 (24.8%)	23 (21.9%)
Residence		
Rural	28 (26.7%)	35 (33.3%)
Urban	39 (37.1%)	46 (43.8%)
Peri-urban	38 (36.2%)	24 (22.9%)
Education level		
None	0 (0%)	1 (1.0%)
Primary	28(26.7%)	16 (15.2%)
Secondary	54 (51.4%)	70 (66.7%)
Tertiary	23 (21.9%)	18 (17.1%)
Employment status		
Employed	72 (68.6%)	41 (39%)
Unemployed	33 (31.4%)	64 (61%)

A. Neonatal Outcomes Associated with GDM

Pearsons Chi-square and fischer's exact test analysis of neonatal outcomes associated with GDM revealed that macrosomia, respiratory distress syndrome (RDS), neonatal hypoglycaemia, shoulder dystocia, neonatal intensive care unit admission and birth status (all p<0.001) were significantly associated with GDM. Both univariate analysis and multivariate analysis revealed that fetal macrosomia (aOR 22.5, 95%CI 9.42-59.3, p<0.001) and neonatal admission to intensive care unit (aOR 16.2, 95% CI 3.73, 115, p<0.001) were significantly associated with GDM.

4. Discussion

Proper management and clinical decision-making including life style changes, nutrition and antepartum fetal observation intended at reducing adverse neonatal outcomes associated with GDM are dependent on early diagnosis of GDM [7]. Screening and diagnosis of GDM in asymptomatic pregnant women is still a challenge and controversial. However, for optimal management of GDM and associated pregnancy outcomes, healthcare providers should identify and screen pregnant women who are at high risk of GDM earlier using both traditional risk factors and novel biomarkers [8].

We found that GDM was an independent predictor of macrosomia and neonatal admission to intensive care unit. This is consistent with previous studies showing associations between GDM and adverse neonatal outcomes such as neonatal macrosomia and increased admission to neonatal intensive care units [3], [9]. Studies have shown that pregnant women with GDM have maternal hyperglycemia that can lead to excessive fetal growth [10]. Hence, there is need for intervention targeted at glycemic control to reduce the risk of macrosomia [11]. This study also found increased risk of neonatal admission to intensive care unit consistent with previous observations [8].

5. Conclusion

GDM is associated with macrosomia and neonatal intensive care unit admission as the neonatal outcomes. Hence there is need for increased antenatal public health interventions that target management of pregnancy among women with GDM in order to reduce adverse neonatal outcomes.

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