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Fetomaternal Outcomes in Overweight and Obese Pregnant Women: A Retrospective Analysis in a Tertiary Health Facility

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Abstract

Background: Extremes of weight could have an effect on the mother and her newborn. Obesity is no longer a problem of only Caucasian women, as it is also now a public health concern in women of African descent. Maternal underweight appears to also affect pregnancy and perinatal outcomes. The aim of this study was therefore to examine the effect of overweight and obesity on maternal and perinatal outcomes. ***Methods:*** This is a retrospective descriptive study among women who delivered at the Department of Obstetrics and Gynaecology, University of Benin Teaching Hospital (UBTH), Benin City, Nigeria, from January 1, 2022 to December 31, 2022. ***Results:*** The mean age of the women was 30.7 years (standard deviation 5.1). Most of the low-birth-weight babies were born to overweight women, and the relationship was statistically significant (p = < 0.001). Among the eight neonates who died, seven were born to normal-weight and overweight mothers. Many of the neonates admitted into SCBU were born to overweight mothers, and the test of association was statistically significant (p = < 0.001). A significantly large proportion of those who had complications during the antenatal and postpartum period were obese women (p = 0.053). ***Conclusion:*** The odds of low birth weight were significantly higher among overweight mothers compared to mothers who had healthy weight. Obese women were significantly more likely to have antenatal and postpartum complications relative to normal healthy weight women.

Keywords: Obesity, underweight, birth weight.

INTRODUCTION

Extremes of weight could have an effect on the mother and her newborn. Obesity is no longer a problem of only Caucasian women, as it is also now a public health concern in women of African descent [1, 2]. Developing countries are faced with the dual burden of underweight and obesity [3]. The adoption of a Western diet contributes to obesity. Also, poverty and low income are contributory factors to underweight. Underweight women therefore need to gain more weight in pregnancy, whereas this is not so for obese women.

Obesity has been clearly associated with adverse obstetric and perinatal outcomes [4]. These include preeclampsia, gestational diabetes, caesarean section, postpartum haemorrhage, preterm delivery, fetal macrosomia, fetal demise, thromboembolism, post-term delivery and induction of labour [1, 5-9]. These problems may ultimately contribute to maternal morbidity and mortality. Obesity is not only associated with the physical aspect of maternal health, but it may also have an impact on the mental health of pregnant women [10]. It is also associated with pelvic floor dysfunction [1]. It increases the risk for structural anomalies in the newborn. These babies are also at risk of shoulder dystocia and hypoglycaemia [11].

Maternal underweight appears to also have an effect on pregnancy and perinatal outcomes. These include increased incidence of preterm delivery, low birth weight and increased perinatal loss [1]. The effect of underweight on pregnancy outcomes becomes more pronounced if weight gain in pregnancy is inadequate. These findings have however, not been consistent across studies. The effect of underweight on pregnancy outcomes has not been studied as extensively as that of obesity. Most of the studies on the effect of body mass index on pregnancy outcomes were conducted among Caucasian women. The aim of this study was therefore

to examine the effect of overweight and obesity on maternal and perinatal outcomes.

MATERIALS AND METHODS

This is a retrospective descriptive study among women who delivered at the Department of Obstetrics and Gynaecology, University of Benin Teaching Hospital (UBTH), Benin City, Nigeria, from January 1, 2022 to December 31, 2022. UBTH is a multi-facility tertiary health institution in Nigeria. Patients are usually referred from general hospitals, government-owned health centres, private medical centres and other departments in the hospital. The Department of Obstetrics and Gynaecology has 84 beds.

The study population comprised 452 women whose body mass index was calculated. Records of eligible cases were obtained from the obstetrics theatre and labour ward register. Cases were women who booked in UBTH at 20 weeks' gestational age or earlier. Case notes of patients satisfying the inclusion criteria were retrieved from the medical records library, and relevant information extracted and exported into a database created for this study. Classification of body mass index was based on data from the World Health Organisation: Underweight <18.5kg/m^2, normal weight 18.5 – 24.9kg/m^2, overweight 25 – 29.9kg/m^2, obesity >30kg/m^2. None of the women in the analytical sample was underweight. The results were presented as frequencies and percentages for categorical variables, while continuous variables as mean with standard deviation.

The outcome variable was pregnancy outcome, which was measured with five variables: birth weight, PCV at delivery, maternal postpartum complications, survival status of neonate, and SCBU admission. Birth weight was categorised as normal (2.5 kg and above), low (<2.5 kg) and macrosomia (4kg and above). Maternal postpartum complications were postpartum haemorrhage, caesarean wound infection, episiotomy infection/breakdown, and endometritis.

All the analyses were conducted with Stata 17 for Windows. The descriptive analyses were conducted with frequency, percentage, and summary statistics. A test of association between the outcome variables and BMI was conducted using chi-square and Fisher's exact test for variables with fewer than 5 counts in a cell. To estimate the effect of BMI on the outcome variables, two models of logistic regression were estimated for each outcome. An unadjusted model estimated the effect of BMI on the outcome variable, and in a second model, the covariates were adjusted. All the regression results are presented as odds ratios with a 95% confidence interval. Statistical significance was set at =<0.05.

RESULTS

The description of the study population by their socio-demographic, behavioural, obstetrics, and clinical characteristics is presented in Table 1. The distribution of BMI among participants was nearly uniform; however, a slightly greater percentage were overweight. The mean age of the women was 30.7 years (standard deviation 5.1). Most of them were between 25 and 34 years old. Alcohol use was reported in 2%, and occasional smoking in less than 1%.

Multiparous women were over 60%. Nearly 30% reported maternal complications such as abruption placentae, eclampsia, and gestational hypertension, among others. Preterm labour was recorded in 13%. Slightly above one-fifth had induced labour, and the mode of delivery in about 71% was spontaneous vaginal delivery (SVD) and instrumental. Admission in SCBU was reported in 16%. Eight neonates died, and maternal postpartum complications were recorded in 5%.

A cross-tabulation of BMI and the outcomes with the test statistics results are presented in Table 2. Most of the low-birth-weight babies were born to overweight women, and the relationship was statistically significant. A nearly equal percentage of anaemia was recorded in all the BMI categories. Among the eight neonates who died, seven were born to normal-weight and overweight mothers. Many of the neonates admitted into SCBU were born to overweight mothers, and the test of association was statistically significant.

The results of the unadjusted and adjusted models of logistic regression predicting the odds of each outcome by BMI are presented in Tables 3a and 3b. The odds of low birth weight were significantly higher among overweight mothers compared to mothers who had a healthy weight, in both the unadjusted and adjusted models. Other significant covariates for birth weight were maternal age, preterm delivery, and anaemia.

The odds of being anaemic after delivery were higher for obese women relative to normal healthy weight women; however, it was not statistically significant. Not being employed, delivery by CS, and postpartum complications predicted higher odds of being anaemic after delivery, whereas attainment of tertiary education predicted lower odds.

A large proportion of those who had complications during the antenatal period were obese women; BMI did significantly predict the odds of maternal postpartum complications. Obese women were significantly more likely to have postpartum complications relative to normal healthy weight women. These complications were hypertension in 49, miscarriage in 31 and abruptio placentae in 4 women. Significant covariates that predicted higher odds were secondary education and anaemic condition; the odds were lower in women who had no premorbid condition.

The odds of admission into SCBU were significantly higher among overweight women compared to normal healthy weight women. Significant covariates that predicted higher odds of SCBU admission included birth by CS, low birth weight, and anaemic condition.

Table 1: Description of the sociodemographic and clinical characteristics of the study population

Variable	Frequency	Percent
BMI (kg/m2) (n=452)		
Normal weight	135	29.9
Overweight	166	36.7
Obese	151	33.4
Employment status (n=440)		
Employed	370	84.1
Not employed	70	15.9
Completed level of education (n=430)		
None/primary	103	24
Secondary	92	21.4
Tertiary	235	54.7
Marital status (n=442)		
Single/divorced	15	3.4
Married	427	96.6
Alcohol use (n=451)		
No	440	97.6
Yes	11	2.4
Smoking (n=451)		
No	448	99.3
Yes	3	0.7
Parity (n=443)		
Nulliparous	158	35.7
Multiparous	285	64.3
Premorbid conditions (n=452)		
Yes	49	10.8
No	403	89.2
Maternal complications (n=452)		
Yes	133	29.4
No	319	70.6
Gestational age at delivery (Weeks) (n=425)		
Term	368	86.6
Preterm	57	13.4
Type of labour (n=381)		
Induced	79	20.7
Spontaneous	302	79.3
Mode of delivery (n=445)		
SVD/instrument	314	70.6
CS	131	29.4
Birth weight (Kg) (n=443)		
Normal	387	87.4
Low birth weight	43	9.7
Macrosomia	13	2.93
SCBU admission(n=444)		
No	373	84
Yes	71	16
Survival status of neonate (n=445)		
Alive	437	98.2
Dead	8	1.8
Maternal postpartum complications (n=452)		
No	429	94.9
Yes	23	5.1

Table 2: Association between body weight and pregnancy outcomes

Outcome variable	BMI						
	Normal		Overweight		Obese		P-value
	No.	%	No.	%	No.	%	
Birth weight							<0.001
Normal	128	32	135	33.8	137	34.3	
LBW	4	9.3	29	67.4	10	23.3	
Maternal postpartum complications							0.053
No	130	30.3	161	37.5	138	32.2	
Yes	5	21.7	5	21.7	13	56.5	
Survival status of neonate							0.448
Alive	131	30	160	36.6	146	33.4	
Dead	3	37.5	4	50	1	12.5	
SCBU admission							<0.001
No	120	32.2	125	33.5	128	34.3	
Yes	14	19.7	40	56.3	17	23.9	

Table 3a: Logistic regression predicting body weight and pregnancy outcomes

Variable	Birth weight				PCV after delivery				Maternal postpartum complication			
	OR	95% CI	aOR	95% CI	OR	95% CI	aOR	95% CI	OR	95% CI	aOR	95% CI
BMI												
Healthy weight (Ref)												
Overweight	6.87***	2.35 - 20.10	4.90*	1.17 - 20.54	0.86	0.52 - 1.43	0.99	0.53 - 1.84	0.81	0.23 - 2.85	1.02	0.18 - 5.77
Obese	2.34	0.71 - 7.63	0.90	0.18 - 4.51	1.11	0.66 - 1.84	1.02	0.53 - 1.97	2.45	0.85 - 7.06	6.67*	1.22 - 36.53
Age			1.18**	1.04 - 1.33			1.04	0.98 - 1.09			1.02	0.88 - 1.18
Employment Status												
Employed (Ref)												
Not employed			0.88	0.17 - 4.57			2.22*	1.05 - 4.69			0.63	0.10 - 4.00
Religion												
Other Christian (Ref)												
Muslim							0.46	0.08 - 2.70			13.34	0.67 - 264.14
Pentecostal							1.02	0.59 - 1.76			0.81	0.18 - 3.57
Completed education												
None/Primary (Ref)												
Secondary			1.21	0.27 – 5.29			0.95	0.45 - 2.03			13.74*	1.03 - 183.71
Tertiary			0.55	0.16 – 1.84			0.52*	0.28 - 0.96			12.27	0.97 - 155.81
Marital status												
Single/divorced (Ref)												
Married							1.16	0.21 - 6.27			0.44	0.03 - 6.94
Alcohol use												
No(Ref)												
Yes			5.52	0.37-81.39			0.10	0.01 - 1.13				

Smoking												
No (ref)												
Occasional							10.09	0.46 - 221.65				
Parity												
Nulliparous [ref]											0.50	
Multiparous							0.70	0.39 - 1.27			0.50	0.10-2.60
Gravidity			0.97	0.70 - 1.34								
Premorbid condition												
Yes (Ref)												
None			0.46	0.11 - 2.00			1.73	0.79 - 3.82			0.16*	0.03 - 0.90
Maternal complication												
Complication (Ref)												
None			0.59	0.22 – 1.58			1.25	0.70 - 2.21			0.70	0.18 - 2.73
Gestational age at delivery												
Term (Ref)												
Preterm			19.83***	7.03-55.95			1.01	0.48 - 2.13			0.82	0.07 - 9.53
Type of labour												
Induced (Ref)												
Spontaneous											1.35	0.28 - 6.49
Mode of delivery												
SVD/instrument (Ref)												
CS							2.14**	1.20 - 3.83			0.51	0.11 - 2.42
Birth Weight												
Normal (Ref)												
Low birth weight											0.92	0.25 - 3.32
PCV after delivery												
Normal (Ref)												
Anaemia			2.85*	1.01-8.04							5.75**	1.53 - 21.62
Maternal postpartum complication												
None (Ref)												
Complication							3.06*	1.05 - 8.86				

Table 3b: Logistic regression predicting body weight and pregnancy outcomes

Variable	SCBU			
	OR	95% CI	aOR	95% CI
BMI				
Healthy weight (Ref)				
Overweight	2.74**	1.42-5.30	2.49*	1.12 -5.55
Obese	1.14	0.54-2.41	0.98	0.39- 2.45
Age			1.01	0.94-1.08

Employment Status				
Employed (Ref)				
Not employed			1.03	0.42-2.53
Completed education				
None/Primary (Ref)				
Secondary			1.23	0.50 – 3.04
Tertiary			0.71	0.33-1.54
Yes			4.29	0.98-18.90
Parity				
Nulliparous [ref]				
Multiparous			1.19	0.56-2.53
Gravidity			0.84	0.68 - 1.04
Premorbid condition				
Yes (Ref)				
None			0.91	0.34 - 2.45
Maternal complication				
Complication (Ref)				
None			0.71	0.37- 1.37
Gestational age at delivery				
Term (Ref)				
Preterm			1.19	0.48-2.94
Mode of delivery				
SVD/instrument (Ref)				
CS			2.29*	1.18- 4.42
Birth Weight				
Normal (Ref)				
Low birth weight			3.62*	1.42- 9.21
PCV after delivery				
Normal (Ref)				
Anaemia			2.85*	1.01-8.04

DISCUSSION

This study was conducted to explore the effect of overweight and obesity on maternal and perinatal outcomes. The odds of low birth weight were significantly higher among overweight mothers compared to mothers who had a healthy weight. Many of the neonates admitted to the SCBU were born to overweight mothers, and the test of association was statistically significant. Obese women were significantly more likely to have antenatal and postpartum complications relative to normal healthy weight women. The odds of admission into SCBU were significantly higher among overweight women compared to normal weight women.

Obesity is now becoming a global pandemic, and it is thought to be associated with adverse maternal and fetal outcomes. The increasing rate of overweight/obesity seen outside pregnancy is also now reflected among the antenatal population. A significant proportion of women who were reviewed were either overweight or obese. Obesity was previously known as a disease of the Western population. Low- and middle-income countries have now been hit with obesity and its consequences [12]. It does not appear that this trend will get better in the foreseeable future. The drivers of obesity and overweight in LMIC's are sedentary lifestyle, nutritional transition to refined and processed food, trade liberalization which encourages importation of food and excessively caloric diets [12]. Paradoxically, unavailability of resources will lead to malnutrition, and a reduction in body mass index can also occur in low-resource settings. Both overweight and obesity are associated with adverse pregnancy outcomes. For optimal pregnancy outcome, underweight women are advised to gain more weight while obese women are encouraged to gain less weight in pregnancy.

In this study, overweight and obese women were more likely to have low birth weight babies compared to women with normal body mass index. Obesity therefore is not only associated with fetal macrosomia but can also be associated with low birth weight. This multidirectional effect of increasing maternal weight on the placenta calls for further investigation. We postulate that reduced dietary intake in obese women so as not to gain more weight may be the underlying factor for low birth weight seen in this cohort of women. The association between increasing body mass index and hypertension in pregnancy may also limit fetal growth. Problems associated with obesity, such as chronic inflammation, oxidative stress, insulin resistance and dysregulation of neurohormones and cytokines, as well as epigenetic changes, affect the ability of the

placenta to transport nutrients [13]. Previous studies have also shown an association between obesity/gestational weight gain and reduced birth weight [13, 14]. There are future consequences of low birth weight, and these include reduced educational achievement, neuropsychiatric disorders, stunting, underweight in offspring, obesity, diabetes and cardiovascular disease [13]. Despite the high proportion of overweight and obese women in this study, this did not necessarily translate into increased incidence of fetal macrosomia. Only thirteen babies were macrosomic in this study and this was not significantly affected by maternal body mass index. Other significant covariates for birth weight were maternal age, preterm delivery, and anaemia in pregnancy.

A large proportion of those who had complications in the antenatal period were obese women. These maternal complications were mainly hypertensive disorders of pregnancy, miscarriage, abruptio placentae and premature rupture of fetal membranes. Obesity is known to be a risk factor for hypertensive disorders in pregnancy. The pathophysiology is not well understood. Obesity is associated with hyperinsulinism, insulin resistance and maternal systemic inflammation which leads to endothelial dysfunction, hypertension, proteinuria and multi-organ damage [15]. The cases of abruptio placenta encountered may have been as a result of the hypertension recorded in this study. Previously, hypertensions in pregnancy have been linked to abruptio placentae [16, 17]. There are several risk factors for miscarriage and obesity have been implicated. This has been shown in a previous study.[18] It is a modifiable risk factor for spontaneous miscarriage. The association between obesity and premature rupture of membranes noted in this study has been previously reported [19]. Obesity is associated with increased systemic inflammation which subsequently leads to an increased risk of premature rupture of fetal membranes [19, 20].

Maternal postpartum complications were shown to be significantly more with increasing body mass index. These were postpartum haemorrhage, caesarean wound infection, episiotomy infection/breakdown, and endometritis. Obesity has always been known to be associated with poor wound healing. It is therefore not surprising that caesarean wound and episiotomy site infection were associated with increasing maternal weight. Meticulous surgical skills and judicious use of antibiotics may be useful in minimizing these complications. Caesarean section for obese women may be associated with difficulties, thereby predisposing them to haemorrhage. The clinical implication of this is to prepare and offer prophylactic measures against postpartum haemorrhage with increasing body mass index.

Another important finding in this study was that the odds of admission into SCBU were significantly higher among overweight women compared to normal healthy weight women. Significant covariates that predicted higher odds of SCBU admission included birth by CS, low birth weight, and maternal anaemia. Overweight and obesity is therefore a pointer to adverse fetal outcome. The high proportion of low-birth-weight neonates in this study may be the reason for significantly increases neonatal intensive care admissions among overweight and obese women. Such babies are particularly susceptible to complications hence the need for critical neonatal care. Overweight and obese women should therefore be encouraged to deliver in facilities capable of neonatal intensive care support. Similarly, other authors have reported increased risk of admission into neonatal intensive care unit among babies born to overweight and obese women [21]. However, another study suggested that in otherwise healthy term, singleton pregnancies, obesity does not seem to increase the risk of severe fetal impairment, neonatal admission to intensive care or duration of postnatal hospitalization [22].

CONCLUSION

The odds of low birth weight were significantly higher among overweight mothers compared to mothers who had healthy weight. Many of the neonates admitted into SCBU were born to overweight mothers, and the test of association was statistically significant. Obese women were significantly more likely to have antenatal and postpartum complications relative to normal healthy weight women. The odds of admission into SCBU were significantly higher among overweight women compared to normal weight women

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