Pregnancy outcome of the obese in Ilorin

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Summary

Background: Obesity is a nutritional disorder that is fast becoming a public health issue in the developing world. It is associated with increased incidence of maternal complications and adverse perinatal outcome.

Methods and results: This is a case-control study of obesity in pregnancy carried out in the maternity wing of University of Ilorin Teaching Hospital, Nigeria. The subjects and controls were 156 obese and 80 non-obese women booked at this hospital for antenatal care. The controls were matched for age and parity. Obesity occurred more commonly among the well educated ($P = 0.00$) and those in social classes I and II ($P = 0.00$).

The occurrence of other medical conditions was not significantly different. The obese women also had more caesarean sections ($P = 0.00$), more assisted vaginal deliveries ($P = 0.00$) and fewer spontaneous vaginal deliveries ($P = 0.00$) than the non-obese parturients.

The mean birth weight of infants of the obese mothers was 4.06 ± 0.13 kg (mean $\pm$ SD) while the mean for the controls was 3.36 ± 0.49 kg. The difference was statistically significant ($P = 0.000$). Also, the obese parturients had more macrosomic babies (defined as birth weight >4.2 kg) than the non-obese ($P = 0.00$). The risks of perinatal asphyxia, birth trauma, neonatal admission and low birth weight were not increased among obese women in this study.

Conclusion: This study suggests that in our community, obesity occurs more commonly among women of high socioeconomic status and is a risk factor for maternal and fetal complications.

Keywords: obesity, complications, high-risk pregnancy, maternal–fetal medicine

INTRODUCTION

Obesity is a nutritional disorder that is characterized by excessive accumulation of fat in the omentum, viscera and muscles.¹ It is a nutritional disorder of high prevalence in the developed world. However it is becoming a public health issue in the developing world despite the greater prevalence of poverty, malnutrition, infectious diseases and ignorance.²

In the urban centres of Nigeria, incidences of 7.4–7.7% of obesity in pregnancy have been reported with an increased incidence of maternal complications and adverse perinatal outcome such as hypertension, gestational diabetes mellitus, infections, thromboembolic disease, as well as prolonged and difficult labour.^{3–5} The poor fetal outcomes in pregnant obese patients are often due to the increased risk of fetal macrosomia, congenital abnormalities like neural tube defects, and birth injuries.⁵

In pregnancy, obesity is defined as the weight of 90 kg or more regardless of height and prepregnancy weight. It may also be defined using the prepregnancy body mass index (BMI) with a BMI of ≥ 30 kg/m² considered obesity.^{6–8}

Various interventions have been employed in combating these complications. They include preconceptional care,

weight gain monitoring and, in pregnancy, the serial use of ultrasound.⁹ The increasing incidence of obesity and its complications worldwide necessitates a study of its effects in pregnancy especially in the developing world where it is also becoming a health issue of great concern. The performance of obese parturients has not been studied at this centre, which is representative of the pregnant population in a developing country. This study was aimed at investigating sociodemographic characteristics and obstetric performance of obese parturients in this environment.

MATERIALS AND METHODS

The study was carried out in the maternity wing of the University of Ilorin Teaching Hospital (UITH), Ilorin, Nigeria, a major referral centre for Kwara, Osun, parts of Oyo, Ondo, Ekiti and Niger states. Approval for this study was obtained from the Ethical Committee of the University of Ilorin Teaching Hospital and also the study site. Subjects were booked pregnant women attending the antenatal clinic of the maternity wing of UITH with BMI ≥ 30 kg/m²,⁷ at gestational age not greater than 32 weeks. This ensured that they were followed up in the antenatal clinic for not less than three visits, before delivery. The controls were women with BMI less than 30 kg/m² matched for age and parity. Consecutive patients

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who presented for routine antenatal care were selected based on the inclusion criteria and the controls were subsequent patients in the same clinic matched for age, parity and gestational age. Exclusion criteria were gestational age greater than 32 weeks, previously diagnosed medical disorders prior to pregnancy, e.g. diabetes mellitus, and women with multiple pregnancies.

The sample size was calculated with the Fischer's formula. The minimum sample size was 122 but a total of 236 patients were studied. The social class stratification was performed according to Olusanya *et al.*¹⁰

A proforma was used to collect relevant data from the patients, case records and findings during clinic visits, labour and puerperium. Patients were counselled and interviewed at first contact. Data obtained from the subjects and controls included age, parity, educational status and occupation. The patients were followed through antenatal care, labour, delivery and 48 hours into the puerperium.

The research assistants were selected nurses and resident doctors attending regularly to the women in the antenatal clinics. They were involved in the measurements of various parameters such as weight, height, blood pressure and collection of samples for required investigations.

Parameters measured included maternal complications, modes of delivery and intrapartum complications. Maternal complications included hypertension defined as blood pressure value of $\geq 140/90$ mmHg at two or more readings in a woman not previously diagnosed to be hypertensive before pregnancy and preeclampsia was defined as hypertension and dipstick proteinuria of 2+ or more in the second half of pregnancy. Gestational diabetes was defined as any form of impaired glucose tolerance or diabetes of first diagnosis or onset in pregnancy, i.e. fasting blood sugar level >6 mmol/L, or two hours postprandial sugar level >7.8 mmol/L.

Infection was defined as microbiological isolation/culture of any pathogenic organism in mid-stream urine, endocervical or urethral swab in a patient with clinical symptoms and/or signs. Fetal parameters collected included birth weight, Apgar scores, presence of congenital abnormalities, birth trauma, neonatal admission and perinatal mortality. Birth trauma was defined as any form of physical injury in the neonate that occurred during vaginal or caesarean delivery.

Other definitions were primary postpartum haemorrhage: blood loss ≥ 500 mL from the genital tract after the delivery of the baby within 24 hours of delivery, prolonged labour – duration of active phase of labour >12 hours, low birth weight (LBW) – birth weight <2.5 kg and macrosomia – birth weight ≥ 4.2 kg.

Data obtained were analysed using EPI-INFO statistical software. The results were expressed as percentages and means with standard deviation. The level of significance were based on 95% confidence interval ($P < 0.05$) using the appropriate tests.

RESULTS

Data from one hundred and fifty-six (156) obese pregnant women and 80 non-obese controls matched for age and parity were analysed. The mean maternal weights at term were 95.7 ± 13.2 and 72.8 ± 9.1 kg, respectively, and the mean BMIs were 35.6 ± 4.9 and 26.5 ± 2.6 kg/m² for the obese and non-obese groups, respectively.

Table 1 shows the sociodemographic characteristics of all subjects. The mean age of the women in the obese group was

Table 1 Sociodemography of the obese and the non-obese

Variable	Obese Freq (%), n = 156	Non-obese Freq (%), n = 80	χ^2 and P value
Age group			
20–29	60 (38.5)	25 (31.3)	$\chi^2 = 1.25$ $P = 0.53$ NS
30–39	90 (57.7)	51 (63.8)	
40–49	6 (3.8)	4 (5)	
Education			
None	2 (1.3)	10 (12.5)	$\chi^2 = 19.10$ $P = 0.00$
Primary	8 (5.1)	10 (12.5)	
Secondary	28 (17.9)	13 (16.3)	
Tertiary	118 (75.6)	47 (58.7)	
Marital status			
Married	156 (100)	80 (100)	
Single	0 (0)	0 (0)	
Tribe			
Hausa	4 (2.6)	1 (1.3)	$\chi^2 = 5.11$ $P = 0.16$ NS
Igbo	20 (12.8)	6 (7.5)	
Yoruba	120 (76.9)	71 (88.7)	
Others	12 (7.7)	2 (2.5)	
Parity			
0	59 (37.8)	27 (33.8)	$\chi^2 = 8.17$ $P = 0.09$ NS
1	13 (8.3)	1 (1.3)	
2	35 (22.4)	16 (20)	
3	26 (16.7)	22 (27.5)	
≥ 4	23 (14.7)	14 (17.5)	
Social status			
1	82 (52.6)	63 (78.8)	$\chi^2 = 15.93$ $P = 0.00$
2	46 (29.5)	12 (15)	
3	25 (16)	5 (6.2)	
4	3 (1.9)	0 (0)	

NS, non-significant

30.4 ± 4.5 years compared with 30.2 ± 3.5 years in the control group. Most were of low parity (≤ 2) and 76.9% were of Yoruba ethnic group. The majority of the patients in both groups had tertiary education ($P = 0.00$). The tertiary level of education and the high social classes of these parturients were statistically significant as shown in Table 1.

The occurrence of medical complications in these women is shown in Table 2. The obese parturients had a higher rate of gestational hypertension than the control group ($P = 0.00$) although the prevalence of preeclampsia was not significantly different.

Tables 3 and 4 indicate the perinatal events/outcomes (maternal and fetal) of both the obese and non-obese parturients. The obese mothers had more caesarean deliveries and more assisted vaginal deliveries than the non-obese. The mean birth weight of infants of the obese mothers was

Table 2 Medical complications in the obese and non-obese

Occurrence of medical complications in pregnancy	Obese Freq (%), n = 156	Non-obese Freq (%), n = 80	χ^2 and P value
Hypertension in pregnancy	59 (37.8)	2 (2.5)	$\chi^2 = 34.42$ $P = 0.00$
Gestational diabetes	8 (5.1)	2 (2.5)	$\chi^2 = 0.37$ $P = 0.54$ NS
Infection	5 (3.2)	0 (0)	$\chi^2 = 1.3$ $P = 0.25$ NS
Others	17 (10.9)	10 (12.5)	$\chi^2 = 0.13$ $P = 0.71$ NS
Preeclampsia	10 (6.4)	3 (3.8)	$\chi^2 = 0.3$ $P = 0.59$ NS

NS, non-significant

Table 3 Maternal outcome of the obese and the non-obese

Maternal outcome	Obese Freq (%), n = 156	Non-obese Freq (%), n = 80	χ^2 and P value
Gestational age at delivery			
<36 weeks	9 (5.8)	4 (5)	$\chi^2 = 0.06$
36–40 weeks	126 (80.7)	65 (81.3)	$P = 0.97$ NS
>40 weeks	21 (13.5)	11 (13.7)	
Vaginal delivery	31 (19.9)	40 (50)	$\chi^2 = 22.82$
Assisted vaginal delivery	62 (39.7)	5 (6.3)	$P = 0.00$
Caesarean section	63 (40.4)	16 (20)	$\chi^2 = 29.18$
CPD	13 (8.3)	3 (3.8)	$P = 0.00$
Perineal laceration	33 (21.2)	16 (20)	$\chi^2 = 9.87$
Postpartum haemorrhage	13 (8.3)	6 (7.5)	$P = 0.00$
Prolonged/obstructed labour	8 (5.1)	3 (3.8)	$\chi^2 = 1.76$
			$P = 0.19$ NS
			$\chi^2 = 0.04$
			$P = 0.84$ NS
			$\chi^2 = 0.05$
			$P = 0.82$ NS
			$\chi^2 = 0.02$
			$P = 0.88$ NS

CPD, cephalopelvic disproportion; NS, non-significant

4.06 $\pm$ 0.13 kg, while the mean for the controls was 3.36 $\pm$ 0.49 kg. This difference was statistically significant. The delivery of macrosomic babies was significantly related to obesity while other fetal parameters and complications were not. The birth traumas occurred only among the macrosomic babies of the obese patients and were clavicular fractures, Erb's palsy, facial bruises and femoral fracture. These necessitated admission into the neonatal intensive care unit in addition to other admission indications such as risk for sepsis, active sepsis, low Apgar scores, LBW and prematurity.

DISCUSSION

The mean BMI of the obese parturients was 35.6 kg/m² indicating that the average obese pregnant woman in this centre belongs to WHO class II. Thus obesity in pregnancy is a well established entity in our environment despite the low level of economic, political and social development. The majority of the patients were aged 30–39 years, which is consistent with

findings from other centres.^{3,4} This confirms that obesity may occur at younger ages even though it is increased with advancing maternal age.¹¹

The majority of the obese patients had tertiary education and belonged to social class I. The high level of education agreed with findings from Ibadan;³ additionally, the average socioeconomic status indicated by the social class is in consonance with findings by other authors.^{2,4,5,12} Thus, the growing public health issue of obesity does not spare the well educated and those in the high social classes in our centre, unlike in the industrialized countries where women of low socioeconomic status are more at risk of obesity.¹² The socioeconomic class in this study was based on the woman's educational level and her partner's occupation. Probably, the low physical activity among these women because of their economic status as well as a further reduction of their activities in pregnancy predisposed them to obesity. It would have been expected that their knowledge of nutrition and exercise as a result of their high level of education would have impacted on their weight. This finding is at variance with the observations regarding obesity and socioeconomic status in the developed world. There is a need for health education on obesity irrespective of educational and social status.

The obese patients were of low parity in this study. The relationship between parity and obesity as shown in this study does not agree with findings in other studies.^{4,5,7,11} In those studies, obesity was more common in multiparous women. This was related to an increase in body weight associated with increasing age.^{4,5,7,11} Our findings lead us to postulate that the combination of low parity, high social class, high educational level and the high proportion of those aged 30–39 years is highly suggestive of late marriage among the women studied, possibly reflecting the pursuit of academic qualifications associated with better socioeconomic status.

The obese pregnant women in previous studies had a higher incidence of medical complications when compared with the non-obese.^{3,4,11,13} However, in this study we demonstrated gestational hypertension in pregnancy as the only medical complication with higher incidence in the pregnant obese. Preeclampsia was particularly found to be commoner in the obese than the non-obese in Ibadan,³ which was not demonstrated in this study. Gestational diabetes was not more common in the obese parturients in contrast to other studies.^{1,4,13,14} It may be that our sample size was not large enough to demonstrate these other associations with obesity in pregnancy.

The obese were at higher risk of caesarean and assisted vaginal deliveries than the non-obese as demonstrated in this study. This is comparable with the findings of others.^{3,4,9,15,16} The indications for caesarean section were severe prolonged obstructed labour, cephalopelvic disproportion and failed induction of labour for obstetric and medical disorders such as hypertensive disorders in pregnancy. As expected, the rate of normal vaginal births was significantly lower in the obese; thus, obesity alone as a factor may reduce the chances of a vaginal birth apart from its contribution to medical problems in pregnancy. In addition, the obese delivered more macrosomic babies than the controls. The difference was also significant and consistent with the findings from other studies.^{2–4,6}

The high rates of macrosomia in this study probably reflect the direct relationship between birth weight and maternal weight. This is further supported by the high rate of normal birth weights among the non-obese. However, the occurrences

Table 4 Fetal outcome of the obese and the non-obese

Fetal outcome	Obese Freq (%), n = 156	Non-obese Freq (%), n = 80	χ^2 and P value
Mean birth weight	4.06 $\pm$ 0.13	3.36 $\pm$ 0.49	$F = 280.88$ $P = 0.00$
Birth weight			
LBW < 2.5 kg	11 (7.1)	8 (10)	$\chi^2 = 177.19$
Normal BW	5 (3.2)	68 (85)	$P = 0.00$
Macrosomia $\geq$ 4.2 kg	140 (89.7)	4 (5)	
(5 minutes APGAR < 7)			
<7	11 (7.1)	11 (13.8)	$\chi^2 = 2.81$
>7	145 (92.9)	69 (86.2)	$P = 0.09$ NS
Admitted into neonatal unit	43 (27.6)	20 (25)	$\chi^2 = 0.18$
Birth trauma	5 (3.2)	0 (0)	$P = 0.67$ NS
			$\chi^2 = 1.3$
			$P = 0.25$ NS

LBW, low birth weight; NS, non-significant

of LBW babies were comparable in the two groups although the rates were small. In conclusion, this study has demonstrated not only that obesity predisposes to macrosomia but also that maternal weight is a likely predictor of birth weight. Macrosomia was associated with a higher incidence of low Apgar scores, obstructed labour and perineal lacerations among obese patients.⁴

In this study, the difference between the Apgar scores of infants at five minutes in the two groups was not statistically significant. Previous studies have shown that obesity in pregnancy causes some complications which inadvertently result in perinatal asphyxia.⁴ Patients in this study (subjects and controls) were booked and had supervised deliveries. Moreover, their management in pregnancy and labour was anticipatory and when there were medical complications, interventions were prompt so that there were favourable outcomes of infants in this study. These also explain the low perinatal mortality, birth trauma and admission rate into the neonatal intensive care unit. This compares well with reports of Olayemi *et al.*³ in Ibadan.

Obesity in pregnancy is not limited to the developed world but is also a risk in the developing world especially among the well educated and those of high social class. It is a risk factor for hypertensive disorders, fetal macrosomia and caesarean and assisted vaginal deliveries.

This study has demonstrated that the obese parturient in the developing world may develop similar complications as her counterparts in developed countries despite the numerous preventable causes of maternal mortalities she is exposed to. These complications contribute significantly to the maternal and/or fetal outcomes of pregnancy either directly or indirectly.^{3,4,17,18}

In this study, gestational diabetes was not associated with obesity. Previous studies in the developed world have consistently shown that obesity is a risk factor for gestational diabetes.^{13,15-19} However, there appears to be some subtle differences in the occurrence of diabetes mellitus/glucose intolerance when obese pregnant women in the developing and the developed societies are compared. In 1975, Effiong²⁰ did not demonstrate any association between diabetes mellitus in pregnancy and overweight in Nigerians. This was also supported by Olayemi *et al.*³ in Ibadan, although Obi and Obute⁴ in Abakaliki, Nigeria, showed that diabetes mellitus was more likely in the obese pregnant population.

Preconceptional counselling and prenatal management could minimize the complications in the obese when they present before pregnancy and early in pregnancy. Unfortunately, routine preconceptional clinics are not available in our settings, as they are in the developed world. Moreover, our women do not book early in pregnancy like their counterparts in the more developed world. These differences affect the management and outcome of this condition in the two settings.

Where obesity is identified and managed as such in pregnancy, the obstetric performance is good. Preconception

counselling and management should be offered to the obese before pregnancy. It should include weight control and screening for associated medical complications. This will minimize risks in pregnancy. Pregnant women should be booked and managed in a facility with good obstetric and neonatal services. During antenatal care, risks such as obesity will be identified and promptly managed to ensure good outcome.

DECLARATIONS

The authors have no conflicts of interest to declare.

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