ORIGINAL ARTICLE

Frequency of Fetal Macrosomia in Obese Pregnant Women

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ABSTRACT

Objective: To determine frequency of fetal macrosomia in obese pregnant women.
Study design: Descriptive case series.
Place and duration of study: Department of Obstetrics and Gynecology Unit III, Nishtar hospital Multan.Six months from 14th March 2010 to 13th September 2010.
Material & methods: One hundred and seventy four women with singleton pregnancy with BMI of more than 30 kg/m^2 were selected at gestational amenorrhea of 32 weeks or more. Fetal growth monitoring was done in these obese women twice weekly till delivery by ultrasonography (by measuring estimated fetal weight and abdominal circumference). It was done by the consultant radiologist having postgraduate qualification of at least fiver years and we observed whether these patients develop fetal macrosomia or not. Macrosomia was labelled as positive as per criteria mentioned in operational definition. Final outcome was measured after delivery of the baby and recorded in a proforma.
Results: There were 23 women (42.6%) who delivered macrosomic babies in present study having history of macrosomia in previous pregnancy.
Conclusion: Raised BMI increases the risk of fetal macrosomia and there is an association of maternal obesity and fetal macrosomia.
Key words: Obesity, Body mass index, macrosomia.

INTRODUCTION

Obesity is a worldwide individual and public health issue because it contributes to development of several chronic diseases.[1] The rate of obesity in general population is increasing dramatically with up to 40% women in the UK being overweight.[2] In the United States, the prevalence of overweight women of 20–29 years of age increased from 12% in 1971 to 1974, up to 20% in 1988-1991.[3]

Body mass index (BMI) is the most widely accepted measure of obesity in adults[4] which is measured as:

$$\text{Body mass index} = \frac{\text{Weight in kilograms}}{\text{Height in meter}^2}$$

A normal BMI is 18.5–24.9 kg/m^2. Overweight is defined as a BMI of 25–29.9 kg/m^2.

Obesity is a BMI more than ≥ 30 kg/m^2.

Class I obesity is a BMI of 30–34.9 kg/m^2.

Class II obesity is a BMI of 35–39.9 kg/m^2.

Class III obesity is BMI of more than 40 kg/m^2.[5]

During pregnancy there is three fold increase in triglyceride levels and 50% increase in low density lipoprotein (LDL) and high density lipoprotein (HDL)[6]. Leptin concentration determined by the degree of adiposity rises three fold during pregnancy and is correlated with mother's body mass index[6]. Whereas increased maternal BMI is associated with adverse maternal outcome like development of hypertension, diabetes mellitus, thromboembolic disease and infection while fetal complications associated with maternal obesity are neural tube defects, preterm, intrauterine demise and fetal macrosomia[7].

Fetal macrosomia is one of very important and challenging obstetrical issues which is defined as a birth weight of more than 4000 g or greater than 90th centile for gestational age. It complicates about 10% of all pregnancies which include prolonged labour, instrumental delivery, shoulder dystocia, increased rate of cesaerean delivery and postpartum hemorrhage[8-10].

Birth weight is influenced by a variety of maternal, fetal, metabolic and genetic factors. Factors which are associated with increased probability of developing fetal macrosomia include gestational age, maternal diabetes mellitus, maternal obesity, multiparity, previous macrosomic infant, maternal age, ethnicity and race. Maternal obesity is associated with three to four fold increased likelihood of fetal macrosomia.[11] Indeed maternal constitutional factors such as obesity (BMI≥30 Kg/m^2) has a stronger predictive value for development of fetal macrosomia when compared with maternal diabetes mellitus[8,9,12-14].

There seems to be a dose dependant relationship between maternal obesity and fetal weight. In a meta analysis, the prevalence rates of fetal macrosomia is 13.3% in obese pregnant women

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as compared to non obese (8.3%).[13] Obese women are expected to have larger babies and increased maternal weight is also associated with greater fat component in babies as well. In pregnancies which are at risk of fetal macrosomia, serial ultrasound examinations (every 3 to 4 weeks) for EFW (estimated fetal weight) and AC (abdominal circumference) starting at gestation of 32 weeks can be helpful for detecting this condition[8,15].

It has been highlighted that obesity is an important public health issue. There is a strong association between raised maternal BMI and a number of threatening complications during pregnancy including fetal macrosomia. So, pregnancies among overweight and obese women must be classified as high risk pregnancies and appropriate antenatal care should be provided.

Nishtar Hospital Multan is a tertiary care hospital which is providing health care facilities to about 35 million people in this area. In our Department of Obstetrics & Gynaecology, such cases come for antenatal care who are obese. The current study was designed to see whether such women carry increased risk of fetal macrosomia or not. This kind of study has not been conducted here before and no local data is available. Purported significance of our study is that it would provide local data with regard to the burden of problem in obese women.

METHODOLOGY

A proforma was developed to record findings of this study (Annexure I). Patients who fulfilled inclusion criteria were selected from obstetrical outpatient department. Proper permission was taken from institutional ethical committee to conduct the study. Informed consent was taken from each patient describing them procedures of the study ensuring confidentiality and fact that there was no risk involved to the patient while taking part in this study.

Detailed obstetrical and medical history was taken. Gestational age was calculated from early obstetrical scan.

Fetal growth monitoring was done in these obese women twice weekly till delivery by ultrasonography (by measuring estimated fetal weight and abdominal circumference). It was done by the consultant radiologist having postgraduate qualification of at least fiver years and we observed whether these patients develop fetal macrosomia or not. Macrosomia was labelled as positive as per criteria mentioned in operational definition. Final outcome was measured after delivery of the baby.

Confounding variables like maternal age, parity, previous history of macrosomic infant and gestational age were controlled by making stratified tables.

All information collected was recorded on a specifically designed proforma prepared for the study (proforma attached).

The data were entered and analyzed using computer programme SPSS version 10. Descriptive statistics were applied to calculate mean and standard deviation for maternal age, parity and gestational age. Frequencies and percentages were calculated and presented in tables for previous history of macrosomia and macrosomia in present delivery. Stratification was done for maternal age, parity, previous history of macrosomic infant and gestational age.

RESULTS

This study was conducted on 174 obese women (BMI ≥ 30 kg/m^2 in first trimester) with singleton pregnancy booked at 32 weeks of gestational amenorrhea. Later these women were followed to see how many of them delivered macrosomic babies (baby weight ≥ 4000 g).

Age at presentation of the obese women was highest in the age group 30–39 years i.e. 91(52.3%), followed by 77(44.3%) patients who were between 20–29 years of age. There were 6(3.4%) women of age 40 years. Mean age at presentation was 30.02±5.47 years with age range of 20–40 years as mentioned in Table 1.

There were 19(10.9%) nulliparous women, 98(56.3%) women were para 1–3 and 57(32.8%) women were para 4 or above (Table No. 2). Mean parity of the women was 2.77±1.66.

There were 18(10.35%) women having preterm infants, 154(88.5%) women with term infants and 2(1.15%) women with postdate pregnancy as shown in Table No. 3. Mean gestational age was 36.86±1.97 weeks.

Previous history of macrosomia was evident in 50(28.7%) patients (Table 4).

Frequency of macrosomia in our study was 31.0%; 54 women delivered macrosomic babies (Table 5).

There were 18(33.3%) patients between 20–29 years having macrosomic babies in present study while 34(63.0%) patients were between 30–39 years who delivered babies with macrosomia in present study. Only 2 cases (3.7%) were of the age of 40 years having macrosomic babies in present study as mentioned in Table 6).

Seven nulliparae (13%) delivered macrosomic babies, 29(53.7%) para 1–3 delivered macrosomic babies and 18(33.3%) para ≥ 4 delivered babies with macrosomia in current pregnancy (Table 7).

There was no women having preterm macrosomic babies, 52(96.3%) women had term

macrosomic babies and 2(3.7%) women had macrosomic babies in postdate pregnancy as shown in Table 8.

There were 23 women (42.6%) who delivered macrosomic babies in present study having history of macrosomia in previous pregnancy (Table 9).

Table 1: Age distribution of obese patients (n=174)

Age (in years)	=n	%age
20 — 29	77	44.3
30 — 39	91	52.3
≥ 40	6	3.4
Total	174	100.0

Mean age ± S.D. = 30.02±5.47 years.
Age range = 20 – 40 years.

Table 2: Parity distribution of obese patients (n=174)

Parity	=n	%age
Nullipara	19	10.9
Para 1 — 3	98	56.3
Para ≥ 4	57	32.8
Total	174	100.0

Mean parity ± S.D. = 2.77±1.66.

Table 3: Gestational age distribution at delivery of obese patients (n=174)

Gestational age (in week)	=n	%age
34 — 36 (Preterm)	18	10.35
37 — 42 (Term)	154	88.50
> 42 (Post term)	2	1.15
Total	174	100.0

Mean gestational age ± S.D. = 36.86±1.97 weeks

Table 4: Previous history of macrosomia in obese patients (n=174)

Macrosomia	=n	%age
Yes	50	28.7
No	124	73.3
Total	54	100.0

Table 5: Frequency of Macrosomia in obese women in present pregnancy (n=174)

Macrosomia	=n	%age
Yes	54	31.0
No	120	69.0
Total	174	100.0

Table 6: Age distribution of obese patients in relation to outcome **(n=174)**

Age (in years)	No. of women with Macrosomic babies in present study	%age
20 — 29	18	33.3
30 — 39	34	63.0
≥ 40	2	3.7
Total	54	100.0

Table 7: Parity distribution of obese patients in relation to outcome **(n=54)**

Parity	No. of women with Macrosomic babies in present study	%age
Nullipara	7	13.0
Para 1– 3	29	53.7
Para ≥ 4	18	33.3
Total	54	100.0

Table 8: Gestational age distribution of obese patients in relation to outcome (n=54)

Gestational Age (in week)	No. of women with Macrosomic babies in present study	%age
34 — 36 (Preterm)	0	0.0
37 — 42 (Term)	52	96.3
> 42 (Post term)	2	3.7
Total	54	100.0

Table 9: Previous History of Macrosomia in Relation to Outcome (n=54)

Macrosomia in previous pregnancy	No. of women with Macrosomic babies in present study	%age
Yes	23	42.6
No	31	57.4
Total	54	100.0

DISCUSSION

Obesity is a global health problem that is increasing in prevalence. In many industrialised countries, one in five women booking for antenatal care is obese.[16] The World Health Organization characterizes obesity as a pandemic issue, with a higher prevalence in females than males[17]. Thus, many pregnant patients are seen with high body mass index (BMI). Obesity is a chronic condition that predisposes patients to multiple serious health disorders and premature deaths[18].

Obesity during pregnancy is considered a high-risk state because pregnancies in obese women are characterized by a high incidence of maternal (gestational diabetes, hypertensive disorders) and fetal (macrosomia, neural tube defects, late fetal deaths) complications[19]. Because of those complications, cesarean sections rate is higher in obese women than in lean women.

Infant birth weight is influenced by modifiable maternal pre-pregnancy behaviors and characteristics[20]. There has been a rise in the prevalence of macrosomic newborns over a few decades in many parts of the world. There is ample evidence that fetal macrosomia is associated with

increased risk of complications both for the mother and the newborn[21]. In current obstetrics, the macrosomic fetus represents a frequent clinical challenge. Evidence is emerging that being born macrosomic is also associated with future health risks[22] Diabetes, previous macrosomic birth, postdate (>42 weeks of gestation), obesity (BMI > 30 before pregnancy), male infant, gestational diabetes mellitus, and non-smoking are independent risk factors of fetal macrosomia.

Present study was conducted to find the frequency of fetal macrosomia in obese pregnant women. In our study, frequency of macrosomia in obese was 31.0% which is somewhat high perhaps due to poor antenatal care and education. Age at presentation was highest in the age group 30–39 years i.e. in 91(52.3%) patients. Mean age at presentation was 30.02±5.47 years and mean parity was 2.77±1.66. Mean gestational age was 36.86±1.97 weeks in our patients.

More number of macrosomic babies delivered in para ≥ 4 and (33.3%). There were 42.6% women who delivered macrosomic babies and having history of macrosomia in previous pregnancy. Different studies have shown varying frequency of fetal macrosomia in obese. Our study results coincide with national and international literature. Humaira Choudhry and colleagues in a local study[23] have reported frequency of macrosomia was 34% in obese as compared to 12% in non obese with a relative risk of 2.83 (95% CI 1.56-5.15). Riffat Jaleel[24] in a Pakistani study found higher mean birth weight and macrosomia 16.2% (p=0.024) but her patients were overweight (BMI > 23 kg/m^2) rather obese.

Usha Kiran et al showed that obesity was a risk factor for macrosomia (OR 2.1, CI 1.6-2.6) independent of diabetes. Owens et al[25] have reported that macrosomia occurred in 15.5, 21.4, and 27.8% of babies of normal BMI, overweight, and obese mothers, respectively (P<0.01) in their study. Hincz et al[26] found incidence of macrosomia (20.19% vs 5.69%, p<0.001), significantly higher in the study group (obese) than controls. They concluded that maternal obesity is a significant perinatal risk factor with macrosomia in newborns as one of the most common complications. deAmorim et al[27] found no significant association between macrosomia, mother's age and parity. A ratio of 5.4% of macrosomic newborns was found in their study in overweight/obese with a relative risk of 2.9 (CI 95%=1.0-7.8). The mean maternal age was 24.7 years and the mean gestational age was 38.6 weeks.

El-Gilany and Hammad[28] in a study conducted in Saudi Arabia, found that neonates born to obese women had an increased risk for macrosomia (Relative Risk=6.8 [95% CI 1.5-30.7]). The incidence of macrosomia was 4.4% in obese. Mean age of obese patients was 30.7±6.4 years. In one study conducted by Zonana-Nacach et al[29] it was found that obese women had a risk of newborn macrosomia (OR 6.6 CI 95% 1.8-23). In one study Michlin et al[30] revealed frequency of macrosomia 16.8% in obese women. Jared M et al found Odds Ratio 2.1 (CI: 1.9, 2.3) of having macrosomia (≥ 4000 g) in women with BMI ≥ 30.0. They concluded that obesity during pregnancy is associated with increased risk of fetal macrosomia. Schaefer-Graf et al[31] found significantly higher rate of fetal macrosomia in obese women i.e. 15.5 at birth (p < 0.05). Frequency of macrosomia (>90th centile) was 17.5% in the obese group in the study conducted by Yu CK et al[32]. Incidence of macrosomic births was 13.1% as reported by Tomić et al[33]. The incidence of fetal macrosomia was 3.4% in the study conducted by Heiskanen et al[34]. Higher incidence of macrosomia (odds ratio, 1.6; 95% CI, 1.2-2.0) has been reported by Sukalich et al[35] Ehrenberg et al revealed that obese and overweight subjects had a higher risk for macrosomia (25% versus 9.4%) in their study. Berle et al[36] analyzed between (1990–2000) to calculate the incidence of a birth weight between 4000 and 4499 g and of a weight > or = 4500 g in relationship to maternal obesity and found 3.4 times higher risk of a macrosomia (> or = 4500 g) in cases of obesity. Driul at al[37] found increased rates of fetal macrosomia (> or =4,000 g) in obese women in their study (OR = 2.58, p = 0.033).

Blissing et al[38] while comparing the years 1980 and 2005, however, found decreased rates of macrosomia > 4500 g (5.6% vs. 1.3%) 1980 vs 2005 probably due to better antenatal care. Sohinee Bhattacharya[39] reported that macrosomia was more common in the obese and morbidly obese groups with odds ratios of 1.9 (95% CI 1.6, 2.2) and 2.1 (95% CI 1.3, 3.2) respectively, compared to the normal BMI group. Compared to women with normal BMIs, overweight, obese, and morbidly obese women had an increased risk of macrosomia with odds ratio of 1.66 (1.23-2.24), 2.32 (1.58-3.41) and 2.10 (0.64-6.86) respectively in the study carried out by Abenhaim et al[40]. The risk of fetal macrosomia increased with BMI such that morbidly obese women were at greatest risk (relative risk of macrosomia = 4.78 [95% CI: 3.86, 5.92])[41]. Similarly Schrauwers et al[42] found odds ratio 4.04 in morbidly obese women, Mantakas and Farrell[43] found three times the risk of macrosomia in morbidly obese women compared with normal BMI (RR 3.1–CI 2.1-4.8), fetal macrosomia occurred in 24.8% in morbidly obese women as reported by Voigt et al[44]. The highest prevalence of macrosomia was noted in morbidly obese 42.3% (p<0.05) reported by Grossetti et al[45].

Other workers have also found an association between obesity and the risk of fetal macrosomia as well[46-57]. Pregnancy in obese women calls for close monitoring and careful planning of delivery. Pre-conceptional weight reduction should be considered.

Our study is a hospital based with a small sample size and cannot depict the whole scenario of increasing number of women with obesity and emerging risk of macrosomia in our region. So, further investigation may be considered.

CONCLUSION

- As the BMI increases, risk of fetal macrosomia and other complications increase.
- Frequency of macrosomia (31%) in obese pregnant women in our study is an alarming situation.
- Obesity in pregnancy should be regarded as a high risk state because of its association with adverse obstetric outcome.
- There is need to encourage obese women to lose weight before conception, using lifestyle changes if possible.
- Occurrence of macrosomia in previous pregnancy enhanced the risk of macrosomia in present study (42.6%).

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