IMPACT OF MATERNAL OBESITY ON PREGNANCY OUTCOME

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ABSTRACT

Objective *To determine the frequency of overweight and obese pregnant women and to determine maternal and perinatal outcome in women with high pre-pregnancy body mass index (BMI).*

Study design *Case Control study*

Place & Duration of study *Private Maternity Home at Karachi, from January 2006 to April 2008.*

Patients and Methods *We included patients with parity between 0 to 4, booked before 10th week of pregnancy. They were followed regularly and delivered in the same facility. Exclusion criteria were multiple gestation, grand multigravidae and previous 2 or more caesarean sections. BMI calculated at booking visit was used for reference. Patients with BMI > 23 kg/m^2 were selected as study cases, while those with BMI between 18.5 to 22.9 kg/m^2 were taken as controls. Maternal and perinatal complications were studied. Data were entered and analyzed using SPSS version 15. Means with standard deviation were calculated for numerical variables and proportions for categorical variables. Significance of difference was calculated using Student t test, Chi square test and Fisher exact test where applicable.*

Results *Total number of deliveries were 864 during the study period. The BMI of 509 patients (58.9%) was > 23 kg/m^2 at booking visit, while 249 (28.8%) had BMI > 25 kg/m^2. The number of patients excluded from study were 391 on the basis of exclusion criteria and / or incomplete data. The number of patients selected were 118 patients. An equal number of controls were selected for comparison.*

Family history of diabetes was present in 75.8% cases and 47.5% controls (p=0.000), while that of hypertension was present in 30.3% cases and 12.1% controls (p=0.002). Impaired glucose tolerance was found in 10.1% patients (p=0.001), gestational diabetes in 4% (p=0.121), pregnancy induced hypertension in 10.1% (p=0.297), urinary tract infection in 20.2% (p=0.014), vaginal candidiasis in 36.4% (p=0.000) and surgical wound infection in 2% (p=0.242). 36.4% patients had caesarean delivery (p=0.064) while 11.1% had instrumental delivery (p=0.027). Shoulder dystocia was encountered in 4% patients (p=0.121) and 7.1% (p=0.170) experienced postpartum hemorrhage. The macrosomic babies were 16.2% (p=0.024) and 6.1% were born preterm (p=0.756).

Conclusion *The burden of overweight and obese pregnant women is high. There is a strong association of high pre-pregnancy BMI with family history of diabetes and hypertension. It should be regarded as a high risk state because of its association with adverse obstetric outcome.*

Key words *Obesity, Overweight, Body mass index, Pregnancy, Maternal outcome, Perinatal outcome*

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INTRODUCTION:

Maternal obesity, a reflection of obesity in general population, is emerging as a public health problem in developed as well as developing countries. Worldwide, obesity (BMI > 30), exists at a prevalence of 15-20% and accounts for 2-7% of total health care costs.[1] In UK, 28% of the pregnant women are overweight (BMI 25 – 29.5 kg/m^2) and 11% are obese.[2] In US incidence of obesity in pregnancy varies from 18.5%-38.3%.[2] A study using perinatal data of all live births from various counties of New York shows 11% increase in pre-pregnancy weight and 8% increase in pre-pregnancy obesity between 1999 to 2003.[3] Changing lifestyles, increasing urbanization, high calorie food consumption and reduced physical activity are responsible for increasing obesity in developing countries. Prevalence of obesity is reported to be 36.7% in urban regions of Iran.[4] A study from Islamabad showed that more women were obese than men and were more susceptible to complications.[5]

High pre-pregnancy BMI is associated with adverse obstetric outcome. Maternal complications include early miscarriage, pregnancy induced hypertension and pre-eclampsia, gestational diabetes, thrombo-embolic disease, infections, sleep apnoea, prolonged labour, increased risk of interventions like induction of labour and operative delivery, shoulder dystocia and post-partum haemorrhage. Perinatal complications include birth defects (mainly neural tube defects), macrosomia, in-utero growth restriction, still births, preterm birth and need for intensive care admission.[5, 6, 7] Data on maternal overweight and obesity in our local population is lacking. We, therefore conducted this study to compare our results with international research.

PATIENTS AND METHODS:

This case control study was conducted in Mothercare Hospital, a private maternity home, where the author worked as consultant. It is situated in Karachi and caters medium socio-economic group of people. Study period extended from 1st January 2006 to 30th April 2008. Data were extracted from hospital birth records. We included patients with parity between 0 to 4, booked before 10 weeks of pregnancy. The patients were followed up at regular intervals. Delivery took place in the same facility. Exclusion criteria were grand multigravidae, late booking, previous 2 or more caesarean sections. BMI calculated at booking visit was used for study. Patients with BMI > 23 kg/m^2 were selected as study cases, while those with BMI between 18.5 to 22.9 kg/m^2 were taken as controls.

Outcome measures were maternal complications such as gestational diabetes, pregnancy induced hypertension, thrombo-embolism, infections, operative delivery, shoulder dystocia and post-partum hemorrhage and perinatal problems like macrosomia, preterm birth, birth defects and stillbirths. Data were entered and analyzed using SPSS version 15. Means with standard deviation were calculated for numerical variables and proportions for categorical variables. Significance of difference was calculated using t test, Chi square test and Fisher exact test where applicable.

RESULTS:

Total number of deliveries during the study period was 864. Out of this 509 patients (58.9%) had BMI > 23

Table-I: Baseline Characteristics of Patients

Characteristic	Cases	Controls	P value
Age, years (mean±SD)	25.6 ± 3	24.3 ± 2.8	0.003
Parity (mean±SD)	1.2 ± 1.3	1.15 ± 1.2	0.665
Gestational age, weeks (mean±SD)	38.1 ± 1.04	38.2 ± 1.04	0.642
Hb, g/dl (mean±SD)	10.4 ± 1.03	10.8 ± 1.08	0.018
Height, m (mean±SD)	1.58 ± 0.39	1.57 ± 0.37	0.856
Weight, kg (mean±SD)	69.2 ± 6.3	52.8 ± 4.4	0.000
BMI, kg/m^2 (mean±SD)	27.9 ± 2.05	21.6 ± 1.57	0.000
Birth weight, kg (mean±SD)	3.14 ± 0.4	2.97 ± 0.4	0.004
Family H/O hypertension, n (%)	30 (30.3)	12 (12.1)	0.002
Family H/O diabetes, n(%)	75 (75.8)	47 (47.5)	0.000

kg/m^2 at booking visit, while 249 (28.8%) had BMI > 25 kg/m^2. The number of patients excluded from study were 391. Thus 118 patients were selected for study. An equal number of controls were selected for comparison. Baseline characteristics of patients is shown in table I. Maternal and perinatal complications are shown in table II and III, respectively. .

DISCUSSION:

Body mass index > 30 kg/m^2 is a globally accepted definition for obesity, while overweight is defined as BMI 25-29.9 kg/m^2 .[8] The body fat percentage is considered to be higher in Asian populations as compared to European population at the same level of BMI and therefore different cut-off levels are recommended for Asians.[9] The provisional recommendations for Asia Pacific Region published in February 2000 by the WHO Regional Office for the Western Pacific, the International Association for the Study of Obesity and the International Obesity Task Force are overweight at BMI > 23 and obese at BMI > 25 kg/m^2.[2,10,11] Recently, a large study in Chinese population has been published, with same reference levels.[12]

We have measured BMI on first antenatal visit in early

Table II: Maternal Complications

Complication	Cases 118		Controls 118		P value
	n	%	n	%	
Impaired Glucose Tolerance	10	10.1	0	-	0.001
Gestational Diabetes	4	4.0	0	-	0.121
Pregnancy Induced Hypertension	10	10.1	6	6.1	0.297
Thrombo-embolism	0	-	0	-	-
Urinary Tract Infection	20	20.2	8	8.1	0.014
Vaginal Candidiasis	36	36.4	5	5.1	0.000
Wound Infection	2	2.0	0	-	0.242
Instrumental Delivery	11	11.1	3	3.0	0.027
Caesarean Delivery*	36	36.4	24	24.2	0.064
Shoulder Dystocia	4	4.0	0	-	0.121
Post-partum Hemorrhage	7	7.1	2	2.0	0.170

* Indications other than contracted pelvis

Table III: Perinatal Complications

Complication	Cases 118		Controls 118		P value
	n	%	n	%	
Macrosomia	16	16.2	6	6.1	0.024
Preterm Birth	6	6.1	5	5.1	0.756
Birth Defects	0	-	0	-	-
Still Births	0	-	0	-	-

first trimester, as patients in our set up seldom report for pre-pregnancy evaluation. A study in Brisbane showed that there is a very good correlation (r = 0.95) between weight recorded at the first antenatal visit and the pre-pregnancy weight.[13] This is also agreed in various other studies.[2, 14]

Frequency of obesity in our study is higher than internationally reported figures. Prevalence of obesity in the fore mentioned Chinese study was 31.7%.[12] A study in a public sector hospital of Karachi reported that 47% females above the age of 30 years and 82% of married females, attending medical out- patient department were obese.[15] It is probable that staying at home, physical inactivity and fat and sugar rich diet is responsible for the higher frequency of obesity in our urban female population.

Research has shown that obesity is associated with a higher rate of perinatal complications. Our study results are comparable with these observations. The mean age of cases in our study was higher than controls, which suggests that women gain weight with age. This observation was also reported by Callaway LK in an Australian obstetric population[7] Callaway LK also found increasing weight with parity. In our study any difference in parity was not significant, as we had excluded grand multigravidae.

We have found a strong relationship of high BMI with family history of diabetes as well as impaired glucose tolerance. Gestational diabetes and impaired glucose tolerance were only seen in our cases with high BMI. It appears that genetic predisposition to this disease is greatly influenced by weight. Callaway LK showed that gestational diabetes is strongly related to overweight and obesity.[7] Similar results are reported by Arendas K,[16] Galtier F,[17] Abenhaim HA[18] and many more.

We have also found a strong association of high BMI with family history of hypertension. Frequency of pregnancy induced hypertension and pre-eclampsia was also higher in cases than in controls. Majority of studies have found a positive correlation of obesity with this complication.[2,7,16,17,18] Andreasen KR has suggested obesity as a most common risk factor for thrombo-embolic disease, but we have not observed any case in our study. [14]

There was significant increase in infections like urinary tract infection and vaginal candidiasis during pregnancy in our overweight patients. There were only two cases of surgical wound infection, probably because of routine antibiotic prophylaxis. Increased risk of urinary tract infection was also seen by Usha KTS, but no increase in genital or wound infections.[19] Tilton Z has also found increased risk of urinary tract infection, genital and wound infections in obese women.[20]

We also observed increased frequency of caesarean deliveries in our cases, which is consistent with other studies. Sherrord A studied maternal anthropometric risk factors for caesarean delivery in a Canadian University Hospital and found that pre-pregnancy BMI > 25 kg/m^2 increases the risk in all women irrespective of age, parity, socio-economic factors, gestational diabetes, pregnancy induced hypertension and other obstetric factors.[21] It is suggested that a reduced rate of cervical dilatation and increased depot of soft tissues in maternal pelvis may obstruct labour and lead to dystocia or cephalo-pelvic disproportion. This second reason could also explain the higher frequency of instrumental deliveries in our cases, although this observation was not reported by other authors. We observed slight increase in post-partum haemorrhage in our patients. Bhattacharya S also found post-partum haemorrhage more frequently in obese patients[2] One reason could be that women with increased BMI would generally bleed more and secondly increased number of operative deliveries could partly be responsible for the greater blood loss.

Higher mean birth weight and macrosomia was found in our overweight patients, which is compatible with studies by Callaway LK,[7] Arendas K,[16] Galtier F[17] and Abenhaim HA.[18] Usha KTS showed that obesity was a risk factor for macrosomia (OR 2.1) independent of diabetes.[19] Our finding of shoulder dystocia is also in conformity with the observation of Abenhaim HA[18] and Usha KTS.[19] A case control study by Robinson et al showed that the strongest predictors of shoulder dystocia are related to fetal macrosomia rather than obesity.[22] We did not find any increase in preterm birth, birth defects or still births in our study. Bhattacharya S[2] and Callaway LK[7] found strong relationship of obesity with these complications. Smaller number of patients in our study may account for these differences.

Our results highlight overweight and obesity as an important public health issue in our country. Owing to the increasing prevalence of childhood and adolescent obesity, larger number of obese pregnant women are likely to be encountered. Larger studies are therefore required to further investigate the results.

CONCLUSIONS:

The burden of overweight and obese pregnant women in our population is high. There is a strong association of high pre-pregnancy BMI with family history of diabetes and hypertension. It should be regarded as a high risk state because of its association with adverse obstetric outcome.

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