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COMPLICATIONS OF RAISED BMI IN PREGNANCY

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ABSTRACT... Objective: To study the effects of raised BMI on maternal and fetal well being. **Study Design:** Randomized Control Trial prospective study. **Setting:** Gynae/Obs department Military Hospital Rawalpindi. **Duration:** January 2006 to June 2007. **Subjects & Methods:** 200 primiparas with raised BMI (25 or more) were booked in first trimester. Patients were followed up with regular antenatal check-up and routine investigations of pregnancy. Patients found to be anaemic were further investigated and anaemia corrected. Another group of 200 primiparas was also booked with normal BMI (18.5 TO 24.9) in first trimester. Complications encountered during pregnancy were recorded in both groups. Mode of delivery and fetal outcome were also recorded. The relative frequency of pregnancy induced hypertension, gestational diabetes, sleep apnoea, urinary infection, preterm labour and intrauterine deaths were compared in both groups. Obstetric complications were also recorded. **Results:** The frequency of asymptomatic bacteriuria, sleep apnoea, pregnancy induced hypertension, induction of labour, instrumental delivery, caesarean section and post partum hemorrhage was found to be significantly increased in group-I (raised BMI). **Conclusion:** Pregnancies in obese women are considerably at higher risk for pregnancy and labour complications. It is advisable to achieve normal BMI before conception.

Key words: BMI, Pregnancy Complications, Obesity.

INTRODUCTION

Obesity has become an epidemic worldwide. The World Health Organization (WHO) has declared obesity as a major killer disease of the millennium on par with HIV and malnutrition. Millions suffer health related problems ranging from premature death to reduced overall quality of life. While most reports define obesity as an increased body mass index of greater than or equal to 30 Kg/m^2 (IOM), others have defined it as increased waist circumference, increased waist – hip ratio or body weight of more than 90 Kg. Body mass index is defined as the individual's body weight divided by the square of their height. The formulas universally used in medicine produce a unit of measure of kg/m^2. BMI provides a simple numeric measure of a person's "fatness" or "thinness", allowing health professionals to discuss over- and under-weight problems more objectively with their patients. For a fixed body shape and body density, and given height, BMI is proportional to weight.

Taller people having a reported BMI that is uncharacteristically high compared to their actual body fat levels. This anomaly is partially offset by the fact that many taller people tend to have narrower frames in proportion to their height.

The weight excess or deficiency may, in part, be accounted for by body fat (adipose tissue) although other factors such as muscularity also affect BMI significantly. BMI categories do not take into account many factors such as frame size and muscularity[1].

The categories also fail to account for varying proportions

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of fat, bone, cartilage, water weight, and more. One basic problem, especially in athletes, is that muscle is denser than fat. Some professional athletes are "overweight" or "obese" according to their BMI - unless the number at which they are considered "overweight" or "obese" is adjusted upward in some modified version of the calculation. Some people think that the error in the BMI is significant and so pervasive that it is not generally useful in evaluation of health[2]. Due to these limitations, body composition for athletes is often better calculated using measures of body fat, as determined by such techniques as skinfold measurements or underwater weighing and the limitations of manual measurement have also led to new, alternative methods to measure obesity, such as the body volume index. However, recent studies of American football linemen who undergo intensive weight training to increase their muscle mass show that they frequently suffer many of the same problems as people ordinarily considered obese, notably sleep apnea[3,4]. More recently, the waist-hip ratio has been used to study the effects of obesity on pregnancy, but data relating to this parameter are not yet available[5].

Despite this, BMI categories are regularly regarded as a satisfactory tool for measuring whether individuals are "underweight," "overweight" or "obese". Body mass index (BMI) is a measure of body fat based on height and weight.

BMI Categories:

- Underweight = <18.5
- Normal weight = 18.5-24.9
- Overweight = 25-29.9
- Obesity = BMI of 30 or greater

WHO[6] recommends some international variations For the Southeast Asian body type the values recommended are Normal from 18.5 to 22.9, Overweight from 23 to 27.5 and Obese from 27.6 to 40. These ranges of BMI values are valid only as statistical categories when applied to adults, and do not predict health. BMI is a better indicator of body composition than weight alone, being a more sensitive indicator of obesity in shorter women, more predictive of gestational diabetes and no less predictive than weight alone for any other outcomes[7].

SUBJECTS & METHODS

200 primiparas with raised BMI (25 or more) were booked in first trimester. Patients were followed up with regular antenatal check-up and routine investigations of pregnancy. Patients found to be anaemic were further investigated and anaemia corrected. Another group of 200 primiparas was also booked with normal BMI (18.5 TO 24.9) in first trimester. Complications encountered during pregnancy were recorded in both groups. Mode of delivery and fetal outcome were also recorded. The relative frequency of pregnancy induced hypertension, gestational diabetes, sleep apnoea, urinary infection, preterm labour and intrauterine deaths were compared in both groups. Obstetric complications were also recorded. All pregnant ladies with no obstetric complications previously, primiparas were included in the study. Patients with previous scars in the uterus were excluded from the study. Cases of multifetal pregnancy were excluded. Exclusion criteria included essential hypertension, established diabetes, known cases of congenital malformation of urinary system, patients with calculi in urinary system, known cases of coagulation disorder, patients on anticoagulants, smokers and addicts. Known cases of congenital malformation of uterus were excluded from the study.

RESULTS

Incidence of Lower Segment Caesarean Section (LSCS) was 14% in group-I and 3.5% in group-II. This low incidence of LSCS may be because the study was carried out on primiparas since previous scars is the most common indication of Caesarean section today. No case of intrauterine death or still birth was observed in either group. Average weight of babies was almost the same in both the groups.

This study, like any other observational study of this kind suffers from several limitations. Firstly, the ideal time to record the baseline height and weight of a pregnant woman is before she has started gaining weight due to gestation. In our study we have relied on height and weight recorded in early pregnancy, before any real impact of gestational weight gain. Still, values recorded in early pregnancy remain an approximation of the pre-

Variable	Group-I Raised BMI	Group-II Normal BMI	P-Value
UTI / Asymptomatic bacteriuria	33	03	<0.001
Sleep Apnoea	49	06	<0.001
PIH	49	17	<0.001
Gestational Diabetes	04	Nil	0.04
Preterm labour	03	03	1.00
Induction of labour	27	05	<0.001
Instrumental delivery	17	03	<0.001
LSCS	28	07	<0.001
PPH	27	03	<0.001
Vulval hematoma	02	Nil	0.156
Wound infection	07	Nil	0.008
Intrauterine deaths	01	Nil	0.317
Shoulder dystocia	Nil	Nil	-
Average Neonatal Birth-weight	3.4 Kg	3.2 Kg	-
Lactate dysfunction	03	02	0.653
Congenital malformations in baby	Nil	Nil	-

Indications of LSCS in Group-I. (n=28)		
Indication	**No. of Patients**	**%age**
Severe PIH	08	28.6%
Fetal distress	07	25%
Breech	04	14.3%
Leaking membranes with failure to improve Bishop	03	10.7%
Secondary arrest of labour	03	10.7%
IUGR not due to PIH	01	3.6%
Placenta praevia	01	3.6%
Cord presentation	01	3.6%

Indications of LSCS in Group-II. (n=7)		
Indication	**No. of Patients**	**%age**
Severe PIH	Nil	0%
Fetal distress	03	42.8%
Breech	02	28.6%
Leaking membranes with failure to improve bishop	01	14.3%
Secondary arrest of labour	01	14.3%
IUGR not due to PIH	Nil	-
Placenta praevia	Nil	-
Cord presentation	Nil	-

Indications of instrumental delivery (n=200)					
Indication	**Group-I**		**Group-II**		**P-Value**
	No	**%**	**No**	**%**	
Fetal distress	07	3.5%	03	1.5%	0.200
Prolonged 2nd stage	04	2.0%	Nil	0.0%	0.040
Maternal distress	06	3.0%	Nil	0.0%	0.014

pregnancy weight, and therefore subject to bias.

Our study did not include weight gain; therefore weight gain may bias results. Our adjusted data failed to show any differences in the risk of preterm delivery in both BMI categories. Cnattingius[8] found no association between preterm delivery before 37 weeks and prepregnancy weight. On the other hand, Sebire et al9 found that delivery before 32 weeks was significantly less likely in the obese.

DISCUSSION

This study adds to the increasing body of evidence which suggests that obesity, measured by BMI, predisposes women to complicated pregnancies and increased obstetric interventions. Maternal obesity carries significant risks for the mother and foetus. The risk increases with the degree of obesity and persists after accounting for other confounding demographic factors. The basis of many of the complications is likely to be related to the altered metabolic state associated with morbid obesity[9]. Potential complications of Obesity during pregnancy include difficulty in perinatal ultrasound diagnosis, inaccuracies in abdominal evaluation, increased risk of miscarriage, increased risk of infant birth defects, increased risk of stillbirth, increased risk of gestational diabetes and type-II diabetes, increased risk of pre-eclampsia and gestational hypertension, increased risk of a macrosomic infant, slow labor progression, difficulty in fetal monitoring due to the depth of maternal adipose, increased risk of operative vaginal delivery, increased risk of shoulder dystocia, increased risk of cesarean delivery.

Anesthesia related potential complications include failure of epidural catheter insertion, increased risk of aspiration,

difficult intubation, poor peripheral access, difficulty in monitoring maternal blood pressure, increased retention of lipid-soluble agents, increased drug distribution, and more rapid desaturations. Surgical complications include requirement of perfect hemostasis as postoperatively these women are difficult to assess for intra-abdominal bleeding and standard surgical equipment may be insufficient to assess the pelvis during surgery increased risk of major postpartum hemorrhage. Post partum complications include breastfeeding difficulties, prolonged hospital stay, increased risk of thromboembolism.

The aim of this study was to examine pregnancy outcome in obese women compared to those of normal weight by reviewing a large number of singleton pregnancies using a validated database. Increasing BMI is associated with increased incidence of pre-eclampsia, gestational hypertension, macrosomia, induction of labour and caesarean delivery; while underweight women have better pregnancy outcomes than women with normal BMI[5]. Pre-eclampsia in our study was defined and documented as new onset hypertension and proteinuria, since the measurement of blood pressure alone may over represent the true prevalence, particularly if an inappropriate sized blood pressure cuff is used in obese subjects. Sohinee et al[5] found a linear relationship between increasing body mass index and the risk of developing pre-eclampsia, gestational hypertension, induction of labour and emergency caesarean section5. Previous research has found a strong association between increasing BMI and pregnancy induced hypertension[10]. Our results agree with earlier reports which have shown an association between increasing BMI and interventions like induced labour[10,11,12] and caesarean delivery[10,13,14,15]. In another study induction of labour and delivery by caesarean section were both more common in obese women. The frequency of both elective and emergency caesarean section was almost twice as high for very obese women as it was for women of normal BMI, which may have in part been related to the increased rate of induction of labour[9].

As measurement of blood loss is subjective, it is difficult to make comparisons across studies. Obviously, it appears that women with higher body mass index should bleed more, but this is at least in part due to the increased incidence of induced labour and operative deliveries in these women. It is possible that uterine contractility may be suboptimal in a subgroup of obese women, or there may be increased fat deposition in the soft tissues of the pelvis. The increased risk of postpartum haemorrhage in obese women, even after accounting for such predisposing factors as caesarean section may be explained by more bleeding from the relatively larger area of implantation of the placenta usually associated with a large for gestational age foetus.

Several studies investigating the relationship of maternal obesity with fetal growth have shown that obese women have an 18 – 26% increased chance of delivering large for date infants, even after controlling for maternal diabetes[9,10,11,12]. The original Pedersen hypothesis[13] suggested that increased glucose concentrations in the diabetic mother led to foetal hyperglycaemia and hyperinsulinaemia causing increased foetal growth. Obesity is associated with maternal insulin resistance and foetal hyperinsulinaemia even in the absence of maternal diabetes[14]. Insulin resistant individuals have higher fasting plasma triglyceride levels and greater leucine turnover[15,16]. Amino acids are insulin secretagogues and an increased flux on amino acids could stimulate foetal hyperinsulinaemia. Triglycerides are energy rich and placental lipases can cleave triglyceride and transfer free fatty acids to the foetus[17]. The combination of an increased energy flux to the foetus and foetal hyperinsulinaemia may explain the increased frequency of large for gestational age infants seen in the obese non-diabetic women.

Yu et al[18] suggest that the rapid fetal growth induced by maternal hyperinsulinaemia coupled with placental insufficiency may result in the antepartum demise of the fetus in obesepregnant women. Another study shows that the risk of stillbirth is increased in women with raised BMI and is significantly increased in those women with the highest BMI[9]. The combination of rapid foetal growth induced by the endogenous hyperinsulinaemia in obese women and the functional limitations of the placenta to

transfer sufficient oxygen to meet the requirements of the foetus, may lead to hypoxia and death in some cases. The authors found higher maternal weight before pregnancy was associated with increased risk of late foetal death although it protected against the delivery of small gestational age infant. The Swedish workers had better outcome data in terms of foetal death but less information on antenatal complications as we have demonstrated in this study[9]. Several complications like postpartum haemorrhage, preterm delivery and macrosomia were found to increase linearly with rising BMI[5].

Obese women appear to be at risk of intrapartum and postpartum complications (Post-dates, induction of labour, Caesarean section, macrosomia, shoulder dystocia, failed instrumental delivery, PPH, UTIs, neonatal trauma, feeding difficulties and incubator requirements). Induction of labour appears to be the starting point in the cascade of events. They should be considered as high risk and counselled accordingly[19].

In our study there was no patient with thromboembolism in either group. Changes in thromboembolic disease associated with obesity were not significant; even in a large study[9] done previously.

CONCLUSION

Although the exact incidence of obesity in pregnant women in the UK is not known, the Confidential Enquiry into Maternal and Child Health 2004[20] reported that 35% of all maternal deaths occurring in the triennium 2000–2002 were in obese women with Body Mass Index > 30 Kg/m^2. Krishnamoorthy et al[21] suggest that all pregnancies in obese women be acknowledged as high risk and managed according to strict guidelines. Management should include prepregnancy counselling to reduce weight; shared antenatal care and appropriate management of complications. Greater understanding is needed of the pathophysiological link between obesity and the various adverse outcomes of pregnancy we have described before effective and safe management strategies can be devised. At present one can only advise that it would be sensible to attempt to achieve nearer normal weight before conception.

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