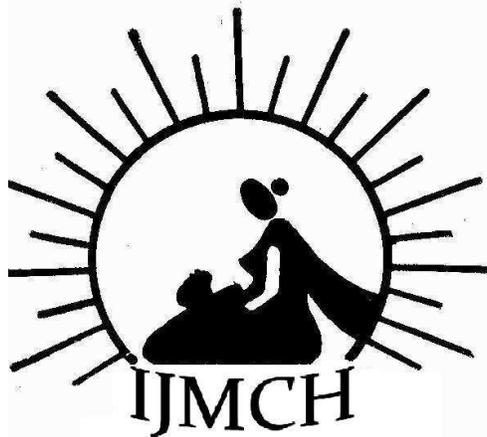


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Obesity is increasingly being recognized worldwide as a risk factor during pregnancy. Incidence of obesity in developing parts of world including India is rising.

REVIEW ARTICLE

Obesity and Pregnancy: Maternal and Fetal OutcomeTyagi M,^{*^} Tyagi R,^{**#} Malik VK,^{***^} Kapil U^{****@}^{*}Associate Professor, ^{**}Reader, ^{***}Assistant Professor, ^{****}Professor and Head.[^]Dept. of Gynecology and Obstetrics, Subharti Medical College Meerut[#]Department of Pedodontics, ITS-CDSR, Ghaziabad,[@]Department of Public Health Nutrition, AIIMS, New Delhi.

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Email: mamtanaveen@hotmail.com**ABSTRACT**

Obesity is increasingly being recognized worldwide as a risk factor during pregnancy. Incidence of obesity in developing parts of world including India is rising. Maternal risk include diabetes, hypertension and preeclampsia, increased incidence of operative delivery, postpartum hemorrhage, infective and thromboembolic complications and anesthetic risks; while fetal risks include miscarriage, neural tube defects, macrosomia and still births. Obstetric units should institute appropriate guidelines, maintaining awareness of the specific medical and obstetric problems associated with obesity. This will enable the clinician to maximize efforts to improve maternal health and fetal outcome.

KEYWORDS: *Obesity, pregnancy, morbidity, complications.***INTRODUCTION:**

Obesity is recognized as an important risk factor for various diseases. The prevalence of obesity is increasing world wide and has been recognized by the World Health Organization (WHO 2000) as a pandemic nutritional disorder. Currently, 24% women and 22% men in UK are obese.⁽¹⁾ In USA 33% women are obese.⁽²⁾ There is a greater incidence of obesity in women of child-bearing age. A department of Health survey in England showed that 32% of women aged 35-64 years of age are overweight (BMI 25-30Kg/m²) and 21% are obese (BMI >30Kg/m²).⁽³⁾ The prevalence of obesity in pregnancy ranges from 8.1% to 11.8%, depending upon the cohort studies in different countries.^(4,5) A recent study showed that 1 in 5 women booking for antenatal care in 2002-2004 were obese.⁽⁶⁾

Routine weighing of pregnant women has become an important feature of prenatal care. Epidemiologically pre-pregnancy weight may be considered a risk indicator, identifying those who are at an increased risk for complications during pregnancy and poor reproductive outcome. Pre-pregnancy weight is a crude reflection of nutritional status,

which is largely determined by maternal genotype and environmental factors, including woman's life long health status, beginning at her own conception.⁽⁷⁾

The measurement of body fat is too complex to be of practical clinical application. Hence surrogate measures such as the Quetlet index (Body mass index = weight in Kg/height in metres²) are used in daily practice. This measure however suffers from two major drawbacks in that it does not differentiate between body fat and fat free compartments. Therefore a high BMI may indicate either increased fat or fat free mass or body composition being affected by ethnicity, growth patterns, socio-economic, cultural and behavioral patterns. The BMI in people of different ethnicities and background may reflect different fat content.

The world health organization (WHO) defines normal weight, overweight, obese and grossly obese people according to BMI (Table I)

Table I: Classification of Overweight and Obesity as per BMI

BMI (Kg/m ²)	Remark
<18.5	Underweight
18.5-24.9	Normal weight
25-29.9	Overweight /pre obese
30-34.9	Class I obesity
35-39.9	Class II obesity
>40	Class III (morbid) obesity

Pre-pregnancy:

It is widely known that anovulatory infertility is more common in obese women as compared to those underweight. This is often associated with oligomenorrhoea and polycystic ovarian syndrome, although 80% of obese women had ovaries with normal morphology on Ultrasound.⁽⁸⁾ Weight loss can correct the menstrual irregularities and also lead to resumption of ovulation. Obese women should be encouraged to lose weight before pregnancy. It has been suggested that weight loss programme should aim initially at a reduction of body weight by 10% from baseline, at a rate of 1 or 2 pounds per week, for 6 months.⁽⁹⁾ Diet with a deficit of 500 to 1000 kcal/day produces weight loss of 300 to 100 g/week, depending upon patient's weight.⁽¹⁰⁾ Apart from balanced diet, daily exercise programs should be promoted. They should be made aware of the increased maternal and fetal risks, which may be a motivating factor in weight control. This counseling, however should be given in a non judgmental way, as many of these women already have low self-esteem. Optimization of weight prior to conception is the goal, as weight loss is not recommended during pregnancy, because of concern regarding fetal growth. Recent data suggest that those women who gain >16 kg during pregnancy are more likely to remain overweight 1 and 15 years later.⁽¹¹⁾ It has important implications, both for future pregnancy and their future wellbeing. Women who gain even a modest amount of weight between pregnancies are at increased risk of adverse maternal and neonatal outcomes in subsequent pregnancies, like increased risk of preeclampsia, gestational hypertension, gestational diabetes, still birth, large for gestational age infant.⁽¹²⁾

The number of women undergoing surgery to combat morbid obesity (Bariatric surgery) is increasing. Restrictive procedures which reduce ability to eat and malabsorptive procedures like jejunoileal or biliopancreatic diversion, can lead to deficiency of iron, calcium, folic acid and B₁₂ hence are not recommended routinely. Women should be advised to avoid becoming pregnant during rapid weight loss phase.⁽¹³⁾

Ante partum:

Pre pregnancy weight and maternal height should be documented routinely in the prenatal health records. BMI should be calculated for all pregnant women. Women with a BMI over 30 should be considered to be at 'higher risk'. The recent UK confidential enquiries into maternal deaths (2000-2002) recommends that obese women with BMI of >35 should be booked for shared care with consultants and delivered in a consultant obstetric unit.⁽¹⁴⁾ Women with morbid obesity should ideally be referred antenatally for an anesthetic review, particularly if they have co-existent medical conditions.

All obese pregnant women should be offered a referral to a dietician for a dietary advice. They should be encouraged to follow an exercise programme, weight loss should be tackled before or in between pregnancies in order to minimize the risk associated with obesity in pregnancy.⁽¹²⁾

Recommendations for antenatal weight gain have been based on the Institute of Medicine (IOM) guideline 1990 (Table II).⁽¹⁵⁾

A systemic review revealed that pregnancy weight gain within the IOMs recommended ranges is associated with the best out-come for mothers and infants.⁽¹⁶⁾

Table II. Recommended total weight gain in pregnant women by pre pregnancy BMI (kg/m²) (IOM 1990)

Pre pregnancy BMI	Recommended total wt. gain (kg)
< 19.8	12.5-18
19.8-26	11.6-16
26.1-29.0	7.0-11.5
>29	7.0

Maternal complications:

1. Diabetes: Obese women are more likely to have preexisting diabetes and are also at increased risk of developing gestational diabetes. Around 17 % of obese women develop gestational diabetes during pregnancy as compared with approximately 1-3% women in general.⁽¹⁷⁾ In a prospective multicentre study, obesity and morbid obesity had a significant association with gestational diabetes.⁽¹⁸⁾ Incidence of gestational diabetes was found to be 24.5% in morbidly obese pregnant women as compared to 2.2% in non obese women.⁽¹⁹⁾
2. Gestational hypertension and pre-eclampsia: Obesity is an important risk factor for gestational hypertension.⁽²⁰⁾ Incidence of gestational hypertension and pre-eclampsia

increases in obese and morbidly obese pregnant women. Blood pressure measurements should be taken using sufficiently large cuffs. In a study, incidence of hypertensive disorders of pregnancy was 28.8% in morbidly obese and 2.9% in non obese.⁽¹⁹⁾ A systemic review showed a consistently strong positive association between maternal pre-pregnancy BMI and risk of pre eclampsia, the risk of which doubled with each 5-7 kg/m² increase in pre-pregnancy BMI.⁽²⁰⁾ Overall the literature shows that obese women have a 14-25% incidence of pre-eclampsia.⁽²¹⁾

3. Thromboembolism: Obesity is the most common risk factor for thromboembolism.⁽²²⁾ This remains the most important cause of maternal deaths in UK.⁽¹⁴⁾ Hospitalization may be required, correctly fitting thromboembolic deterrent stockings and low molecular weight heparin should be considered.
4. Respiratory complications: Obesity has been shown to have causal relationship with asthma and sleep apnea. In early pregnancy obese women have increased rate of sleep apnea, snoring, oxygen desaturation as compared to non-obese women.⁽²³⁾
5. Maternal mortality: Obesity is associated with increased incidence of maternal mortality from a number of different causes.⁽¹⁴⁾

Fetal complications due to obesity:

Fetal complications due to obesity are associated with first trimester miscarriages and congenital malformations, macrosomia and ante partum stillbirth. Obese women are at increased risk of first trimester miscarriages. Association between obesity and congenital malformation is conflicting. One case control study found significantly increased incidence of neural tube defects (NTD), defects of central nervous system, cardiac malformations in mothers with BMI>30.⁽²⁴⁾ Another study concluded that for every incremental unit increase in BMI the risk of NTD increased by 7%.⁽²⁵⁾ However other studies have found no association between maternal obesity and the risk of congenital malformations.⁽²⁶⁾ The mechanism for this observed association of increased congenital malformation with maternal obesity is unclear. Possible explanations include increased serum insulin, triglyceride, uric acid and endogenous oestrogen as well as increased insulin resistance, chronic hypoxia and hypercapnia.

There was three fold increased risk of ante partum stillbirth in morbidly obese women when compared with those with a normal BMI.^(27,28) Fetal macrosomia has been defined in different ways in different studies- birth weight >4,000 g or birth weight >90% for gestational age after correcting for neonatal sex and ethnicity. Several studies have shown an association between fetal macrosomia and maternal obesity and excessive weight gain in pregnancy.⁽²⁹⁾

Labor and delivery:

Fetal macrosomia is strongly associated with problems during labor, including poor progress as a result of cephalopelvic disproportion, shoulder dystocia, and birth asphyxia.⁽³⁰⁾ They also have higher rate of failed induction, 7.9% vs 14.6 % with increasing BMI.⁽³¹⁾ There is a

higher incidence of operative vaginal delivery in obese women, 8.4% vs 17.4% with increasing BMI.⁽³¹⁾

Caesarean section:

Several studies have shown an increased incidence of primary caesarean section in obese women when compared with non obese.^(18,19) In a separate study, a BMI >30 was an independent risk factor for caesarean section at full dilatation.⁽³²⁾ Another recent study found that myometrium from obese women contracted with less force and frequency and had less Ca²⁺ flux in-vitro than that of normal weight women.⁽³³⁾ Most often a 'Pfannenstiel incision' is used, the advantage of which include a more secure closure, less fat dissection and less post-operative pain. Extra care should be taken while closing the rectus sheath and some recommend using a delayed absorbable suture. For skin closure, particularly in morbidly obese women an interrupted suture or staples are recommended.⁽³⁴⁾

Obesity is associated with a reduced likelihood of successful vaginal birth after caesarean (VBAC). The success rate for VBAC in morbidly obese women was found to be 13%.⁽³⁵⁾ However others have found higher rates of successful VBAC in obese women, 68.2% as compared with 79.9% in the non-obese.⁽³⁶⁾

Anesthesia:

Obese women should have an anesthetic assessment antenatally. In view of technologic advances, there should no longer be a hesitancy to perform a cesarean section in morbidly obese women. Even in massively obese women epidural anaesthesia is preferred over general anesthesia.⁽³⁷⁾

In difficult situations, fiber optic intubation may be required. At caesarean section, a semi-recumbent rather than supine position may need to be adopted to maintain adequate breathing in morbidly obese women. Effective communication and team work is absolutely essential between the anesthetist, obstetrician and neonatologist for the safety of both mother and baby.

Postnatal:

Specific complications in obese women include postpartum haemorrhage, wound infection, wound dehiscence and pulmonary emboli.⁽³⁸⁾ Prophylactic administration of anticoagulants should be continued until patient is fully mobilized.

Lactation:

Obesity is associated with an increased risk of failure to initiate lactation.⁽³⁹⁾ Also obesity is associated with reduced prolactin response to suckling.⁽⁴⁰⁾

RECOMMENDATIONS:

Obstetric units need to work out strategies for obese women. These might include:

- Surveillance for pre-eclampsia.
- Screening for gestational diabetes.
- Thrombophylaxis.
- Anesthetics referral.
- Dietary and active lifestyle advice.

CONCLUSION:

Obesity is an increasingly prevalent health problem in many settings throughout the world with rising risks, midwives and obstetricians need to be aware of the maternal and fetal risks associated with obesity. Every practitioner of reproductive medicine should never-the-less be prepared to constructively and non-judgmentally counsel obese women regarding the benefits of sound nutritional approaches to weight loss and benefits of an active lifestyle. This counseling will not only serve her but her family and generations to come under her stewardship.

REFERENCES:

1. Vlad I. Obesity costs UK economy 2 bn pounds sterling a year. *BMJ* 2003; 327:1308.
2. Ogden CL, Carroll MD, Curtin LR. Prevalence of overweight and obesity in the United States, 1999-2004. *JAMA* 2006; 295:1549-55.
3. Department of Health. 2002. Health survey for England 2002 trends. London. Available from: www.dh.gov.uk/assetRoot/04/06/60/70/04066070.xls.
4. Callaway LK, Prins JB, Chang AM, McIntyre HD. The prevalence and impact of overweight and obesity in an Australian obstetric population. *Med J Aust* 2006; 184:56-9.
5. Usha Kiran TS, Hemmadi S, Bethel J, Evans J. Outcome of pregnancy in a woman with an increased body mass index. *Br J Obstet Gynaecol* 2005; 112:768-72.
6. Kanagalingam MG, Forouhi NG, Greer IA, Sattar N. Changes in booking body mass index over a decade: Retrospective analysis from a Glasgow Maternity Hospital. *Br J Obstet Gynaecol* 2005; 112:1431-3.
7. Routh VH, Stern JS, Horwitz BA. Physiological responses of mammals to over nutrition. In: Fregly MI, Blatties CM, editor's Handbook of Physiology Section 4: Environmental physiology. Newyork, Oxford University Press 1966.p.1411-36.
8. Rich-Edwards JW. Adolescent body mass index and infertility caused by ovulatory disorder. *Am J Obstet Gynaecol* 1994; 171:171-7.
9. Harvey EL, Glenny AM, Kirk SFL, Summer Bell CD. 'Improving health professionals' management and the organization of care for overweight and obese people: Cochrane review. In Cochrane Library, issue 2, 2003 Oxford, UK.
10. Astrup A. Dietary approaches to reducing body weight. *Baillieres Best Pract Resclin Endocrinol Metab* 1999; 109-20.

11. Linne Y, Neovius M. Identification of women at risk of adverse of adverse weight development following pregnancy. *Int J Obes* 2006; 30:1234-9.
12. Villamor E, Cnattingius S. Interpregnancy weight change and risk of adverse pregnancy outcomes: A population based study. *Lancet* 2006;368:1164-70.
13. ACOG Committee opinion. Obesity in pregnancy. American College of Obstetricians and Gynaecologists, No. 315. *Obstet Gynaecol* 2005; 106:671-5.
14. CEMACH. 2004. Why mothers die. The sixth report of confidential enquiries into maternal deaths in United Kingdom 2000-2002. Regents Park. London: RCOG Press.
15. Institute of Medicine. 1990. Nutritional status and weight gain. In: IOM, editors. *Nutrition during pregnancy*. Washington, DC: National Academy Press. pp 227-33.
16. Abrams B, Altman SL, Pickett KE. 2000. Pregnancy weight gain: still controversial. *Am J Clin Nutr* 2000; 71:1233-41.
17. Linne Y, Barkeling B, Rossner S. Natural course of gestational diabetes mellitus: long term follow up of women in the SPAWN study. *Br J Obstet Gynaecol* 2002; 109:1227-31.
18. Weiss JL, Malone FD, Emig D, Ball RH, Nyberg DA, Comstock CH. Obesity, obstetric complications and caesarean delivery rate- A population based screening study. FASTER Research Consortium. *Am J Obstet Gynaecol* 2004; 190:1091-7.
19. Kumari AS. Pregnancy outcome in women with morbid obesity. *Int J Gynaecol Obstet* 2001; 73:101-7.
20. O'Brien TE, Ray JG, Chan WS. Maternal body mass index and the risk of preeclampsia: a systematic overview. *Epidemiology* 2003; 14:368-74.
21. Castro L, Avina R. Maternal obesity and pregnancy outcomes. Current opinion in *Obstet Gynaecol* 2002; 14:601-6.
22. Andreason KR, Anderson ML, Schantz AL. Obesity and pregnancy. *Acta Obstetrica et Gynaecologica Scandinavica* 2004; 83:1022-9.
23. Sahota PK, Jain SS, Dhand R. Sleep disorders in pregnancies. *Curr Opin Pulm Med* 2003; 9:477-83.
24. Waller DK, Mills JL, Simpson JL, Cunningham GC, Conley MR, Lassman MR. Are obese women at higher risk of producing malformed offsprings. *Am J Obstet Gynaecol* 1994; 170:541-8.
25. Watkins ML, Rasmussen SA, Honein MA, Botto LD, Moore CA. Maternal obesity and risk for birth defects. *Pediatr* 2003; 111:1152-8.
26. Feldman B, Yaron Y, Critchfield G, Leon J, O'Brien JE, Johnson MP. Distribution of neural tube defects as a function of weight, no apparent correlation. *Fetal Diagn Ther* 1999; 14:185-9.
27. Moore LL, Singer MR, Bradlee ML, Rothman KJ, Milunsky A. A prospective study of risk of congenital defects associated with maternal obesity and diabetes mellitus. *Epidemiology* 2000; 11:689-94.

28. Cedergren MI. Maternal obesity and the risk of adverse pregnancy outcome. *Obstet Gynaecol* 2004; 103:219-24.
29. Sebire NJ, Jolly M, Harris JP, Wadsworth J, Joffe M, Beard RW. Maternal obesity and pregnancy outcome: a study of 287, 213 pregnancies in London. *Int J Obes Relat Metab Disord* 2001; 25:1175-82.
30. Robinsow H, Tkacns, Mayes DC. Is maternal obesity a predictor of shoulder dystocia? *Obstet Gynaecol* 2003; 101:24-7.
31. Kabiru W, Raynor BD. Obstetric outcomes associated with increasing BMI category during pregnancy. *Am J Obstet Gynaecol* 2004; 191:928-32.
32. Fraser RB. Obesity complicating pregnancy. *Current Obs and Gynae* 2006; 16:295-8.
33. Zhang J, Bricker L, Wray S, Quenby S. Poor uterine contractility in obese women. *Br J Obstet Gynaecol* 2007; 114:343-8.
34. Alexander CI, Liston WA. Operating on obese women: a review. *Br J Obstet Gynaecol* 2006;113:1167-72.
35. Chauhan PS, Magann EF, Carroll CS, Berrileaux PS, Scardo JA, Martin JN Jr. Mode of delivery for the morbidly obese with prior caesarean delivery: Vaginal versus repeat caesarean section. *Am J Obstet Gynaecol* 2001; 185:349-54.
36. Juhasz G, Gyamfi P, Tocce K, Stone JL. Effect of body mass index and excessive weight gain on success of vaginal birth after caesarean delivery. *Obstet Gynaecol* 2005; 106:741-6.
37. Hood DD, Dewan DM. Anaesthetic and obstetric outcome in morbidly obese parturients. *Anaesthesiol* 1993; 79:1210-8.
38. Moynihan AT, Hehir MP, Glavey SV, Smith TJ, Morrison JJ. Inhibitory effect of leptin on human uterine contractility in vitro. *Am J Obstet Gynaecol* 2006; 195:504-9.
39. Donath SM, Amir LH. Does maternal obesity adversely affect breast feeding initiation and duration? *Breastfeeding Rev* 2000; 8:29-33.
40. Ramussen KM, Kjolhede CL. Prepregnant overweight and obesity diminish the prolactin response to suckling in the first week postpartum. *Pediatr* 2004; 113:465-71.