

# Obesity and pregnancy: A care plan for management

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## Citation

N Massiah, G Kumar. *Obesity and pregnancy: A care plan for management*. The Internet Journal of Gynecology and Obstetrics. 2007 Volume 9 Number 2.

## Abstract

Obesity has become a worldwide health problem. Increased maternal and fetal morbidity and mortality amongst obese women is a cause for growing concern among Obstetricians. We reviewed the literature and composed a care plan for the management of obese women receiving obstetric care. Obese women who would like to conceive should be counselled on weight reduction through diet, exercise and behaviour modification. There are situations where medication and/or surgery may be indicated. A pregnant obese woman is high risk and should have an antenatal booking appointment with a consultant. The care given during the pregnancy, labour and puerperium should be planned & documented and include a thorough assessment for the development of pregnancy related disorders. There are no national guidelines on the obstetric care of obese women. This care plan looks at the main areas needed to provide a high quality of obstetric care to this cohort of women.

## INTRODUCTION

Obesity is a major public health problem affecting an estimated 300 million people worldwide <sup>1</sup>. In England, obesity in women has increased from 16% to 23% between 1993 and 2002. The greatest rise of 10% was seen among women in the age range of 25 to 34 years <sup>2</sup>. With rising obesity, the prevalence of obesity among pregnant women is higher than before and ranges from 9 to 38.3% <sup>3,4,5,6</sup>. In 2005, Usha Kiran TS et al. reported a population based observational study that showed the incidence of maternal obesity had more than doubled from 3.2 to 8.9% between 1990 and 1999 in 60,107 pregnancies in Wales <sup>6</sup>. The World Health Organization and National Institutes of Health in America recommend that obesity is measured by the body mass index and calculated by weight (kg)/ height (m<sup>2</sup>). A body mass index of 30-34.9 kg/m<sup>2</sup> is classified as class I (mild obesity), 35-39.9 kg/m<sup>2</sup> as class II (moderate obesity) and greater than and equal to 40 kg/m<sup>2</sup> as class III (severe or extreme obesity). Alternatively, a body mass index between 30-34.9 kg/m<sup>2</sup> is considered obese and 35 or greater is considered morbidly obese.

Obesity is a chronic metabolic disorder caused by an imbalance between the intake of food and the expenditure of energy resulting in an excessive amount of adipose tissue. Genetic, environmental and behavioural factors play a role in the pathogenesis of this complex disease. When energy expenditure is less than food intake, energy is stored in the form of triglyceride in adipose tissue. Leptin, an adipocyte

polypeptide, controls the intake of food by stimulation of hypothalamic receptors. It plays a central role in energy production. Interestingly, obesity was found in homozygous carriers of a "loss of function" mutation in the leptin gene. Many genetic syndromes such as Prader-Willi, Cohen, Alstrom and Bardet-Biedl are characterised by obesity. The human obesity gene map, published in 2005, illustrates that more than 600 genes, markers and chromosomal regions have been associated or linked with obesity <sup>7</sup>.

The literature has shown that pregnancies in women with obesity are more frequently complicated than pregnancies of women with normal weight. Obesity has implications in morbidity as well as mortality. The most recent Confidential Enquiries into Maternal Deaths in the United Kingdom reported that obesity was a cofactor in a significant number of the maternal deaths between 2003 and 2005 <sup>8</sup>. Twenty seven percent of the women who died had body mass indices of greater than 30kg/m<sup>2</sup>. Of these women, 12% had a BMI between 30 and 34, 7% had values between 35 and 39 and 8% had a BMI of 40 or more. In 2001, Sebire NJ et al. was the first in the United Kingdom to report a large retrospective population study of obstetric outcomes of obese women. This study of 287,213 pregnancies showed that 10.9% of the women had a BMI of  $\geq 30$  kg/m<sup>2</sup>. These women had a greater chance of maternal and fetal morbidity in the form of gestational diabetes, preeclampsia, induction of labour, emergency caesarean section, postpartum haemorrhage, genital tract infection, urinary tract infection,

wound infection, birth weight above the 90th centile and intrauterine death<sup>4</sup>. Weiss JL et al. published a population based prospective multicentre study in 2004 and of the 16,102 pregnant women included, 1,473 (9%) were obese and 877 (6%) were morbidly obese<sup>5</sup>. Women with obesity and morbid obesity had a significant risk of developing preeclampsia (odd ratios, ORs 1.6 and 3.3), gestational diabetes (ORs 2.6 and 4.0), and fetal birth weight greater than 4500 g (ORs 2.0 and 2.4). The caesarean delivery rate for obese and morbidly obese nulliparous patients was 33.8% and 47.4%, values significantly higher than the national caesarean section rate in England and Wales which has increased from 8.8% in 1980 to 21.3% in 2000.

Furthermore, Cedergren et al. demonstrated the deleterious effect of morbid obesity on pregnancy. They found a 3 fold increased rate of stillbirths, 5 fold increased risk of preeclampsia and a 3 fold increased risk of caesarean section in their large study on the risk of adverse pregnancy outcomes of morbidly obese women<sup>9</sup>. Not only is the chance of a caesarean section higher, but the success rate for a vaginal delivery in the morbidly obese woman with a previous caesarean section is less than 15%<sup>10</sup>.

The escalation in global obesity among women, the rise in maternal obesity and the augmented maternal, fetal and neonatal risks associated with obesity in pregnancy indicate that an obstetric care plan aimed towards women with high body mass indices is vital in units providing obstetric care for women. The authors present a review with an evidence based care plan for obese women.

### METHODS

A search of the Cochrane database of systematic reviews, the Cochrane controlled trials register and the Medline database between 1966 and 2006 was performed to identify evidence on the obstetric care of obese women. The databases were searched using the key words: obese women, obesity, morbid obesity, high body mass index, maternal obesity, obstetrics, pregnancy, antenatal, intrapartum, labour, caesarean section and postpartum. Guidance from the Royal College of Obstetricians and Gynaecologists in the United Kingdom and the National Institutes of Health in America were reviewed. The papers chosen for this review and care plan, regarded different aspects of the care of obese women in the preconception, antenatal, intrapartum and/ or postpartum periods. Evidence was obtained from meta-analyses of randomised controlled trials, individual randomised controlled trials, controlled studies without

randomisation, comparative studies, correlation studies and reports from committees with expertise in Obstetrics and Gynaecology.

### CARE PLAN

#### PRECONCEPTION

Control of obesity in the preconception period is an important element of the care. Successful weight management results in significant reduction of maternal and fetal morbidity including caesarean sections, gestational diabetes and late fetal deaths<sup>11</sup>. This was established by a multicentre prospective study that examined the relationship between obesity, maternal and neonatal outcomes; and quantified the attributable population risk of obesity to negative pregnancy events<sup>11</sup>.

The BMI of a woman should be calculated in settings such as the gynaecology clinic, general practice surgery or medical clinic to monitor the degree of obesity. A weight management plan should be made to reduce the BMI of a woman before she conceives. Successful weight management will reduce the incidence of maternal and fetal complications during pregnancy. Weight loss may be achieved by diet, exercise, behaviour modification, medical and occasionally surgical treatment.

The aim of the dietary modification is to alter the content of energy intake and composition of macronutrients. Those with a BMI of 30-34.9 kg/m<sup>2</sup> should decrease their energy intake by 500 kcal/day and those with a BMI of 35 and higher should decrease their intake by 500-1000 kcal/day. In the obese, the diet for weight loss is low fat and low in calories ~1300-1500 kcal/day. This should result in a 10% weight loss over a 6 month period<sup>12</sup>.

Weight loss may be achieved by diet alone in the short term but in the long term it should be combined with exercise. Exercise increases the metabolic rate of the body and the expenditure of energy. It increases insulin sensitivity, decreasing the risk of developing diabetes and the risk of death from cardiovascular disease. An energy expenditure of 2500 kcal/day is required by obese patients to maintain weight loss<sup>13</sup>. This can be achieved by aerobics, jogging or cycling for 30 minutes/day or by fast walking for 75 minutes/day.

Behaviour modification is a psychological intervention that enhances weight loss<sup>13</sup>. Certain activities or habits are associated with some types of behaviour. The objective of behaviour modification in weight loss is to alter eating and

activity habits that lead to obesity. For example, watching television for long lengths of time may lead to overeating. Behaviour modification may result in a 9% weight loss in 20 to 26 weeks<sup>15</sup>. Techniques of behaviour modification are:

- a) Avoiding stimuli that may lead to excessive eating.
- b) Monitoring your habits by keeping daily records of food intake and exercise.
- c) Cognitive restructuring to think positively.
- d) Social support from relatives and friends to change to a healthy lifestyle.

Drugs such as Orlistat and Sibutramine have been shown to reduce weight loss in obese women<sup>16</sup>. They should only be tried in conjunction with diet, exercise and behaviour modification. These drugs have side effects and should only be considered under the guidance of a physician. Contraceptive methods should be utilised, since these anti-obesity drugs may have an adverse effect on the fetus.

Gastrointestinal surgery was found to be an effective method of weight loss in obesity<sup>17</sup>. Successful techniques include the gastric bypass procedure, gastroplasty, gastric banding and partial biliopancreatic bypass. Indications to consider surgical treatment of weight loss are a BMI of 35 to 39.9 kg/m<sup>2</sup> with a medical complication such as hypertension or diabetes; or a BMI  $\geq$  40 kg/m<sup>2</sup> with or without medical complications. Pregnancy after gastrointestinal surgery has been successful. Martin LF et al. reported on the pregnancy outcomes of morbidly obese women after adjustable gastric banding<sup>18</sup> and Richards DF et al. reported on pregnancies in women following the gastric bypass procedure<sup>19</sup>. These studies have shown that the pregnancies are uncomplicated and these women have a decreased risk of developing gestational diabetes, macrosomia, and undergoing a caesarean section.

### ANTEPARTUM

Optimal care of obese women is essential for good pregnancy outcomes.

#### A) BOOKING ANTENATAL APPOINTMENT

The booking appointment is the first antenatal risk assessment of the woman.

All women should have their weight and height measured and the BMI calculated<sup>20</sup>. Women with a BMI  $>$ 30kg/m<sup>2</sup> should be offered shared care and ideally seen in the

consultant's clinic.

#### B) THE CONSULTANT'S CLINIC

The diagnosis of obesity, its implications in pregnancy and associated risk factors should be explained and discussed in detail. A thorough medical and family history sought. A plan of management should be made for the pregnancy, delivery and puerperium.

#### DIET

Obese women should be offered a referral to the dietician. Advice should be given on healthy foods, appropriate proportions, calorie intake and macronutrients.

Protein/energy restriction should be avoided. A review of clinical trials by Kramer MS in 2000 has shown that protein/energy restriction is unlikely to be beneficial and may be harmful to the developing fetus<sup>21</sup>. Alcohol and cigarette smoking must be discouraged.

#### EXERCISE

All obese women should be encouraged to undertake regular exercise. Exercise maintains a good cardio-respiratory capacity<sup>22</sup>. Obese women who exercise during their pregnancy develop gestational diabetes less frequently than those women who do not exercise<sup>23</sup>. Information leaflets should be provided and an exercise programme for pregnant women should be recommended. Long periods of immobility should be discouraged.

#### DEPRESSION

Obesity may affect a woman's mental and social health. An offer of counselling for depression, low self esteem or psychological problems should be made<sup>24</sup>.

#### DEHYDRATION

Oral fluids should be encouraged to prevent dehydration. Episodes of vomiting and diarrhoea should be treated quickly.

#### D) GESTATIONAL DIABETES

All women should have a glucose tolerance test between 24 and 28 weeks gestation. In women with BMI  $>$ 30, the risk of developing gestational diabetes is significantly more than in women of normal weight<sup>5</sup>. In the presence of gestational diabetes, the patient should be jointly managed by the obstetrician and physician. Exercise is essential in gestational diabetic women with elevated body mass indices. A resistance exercise training programme should be

considered in women with gestational diabetes. Brankston et al. reported a randomised controlled trial which found that in women with BMI of  $>25 \text{ kg/m}^2$ , resistance exercise reduces the insulin requirement in gestational diabetic women <sup>25</sup>. Another study showed that aerobic exercise has a greater effect on overweight women with gestational diabetes than on those with normal weight and suggests that exercise is useful particularly in the treatment of gestational diabetic women with high body mass indices <sup>26</sup>.

### **E) VENOUS THROMBOEMBOLISM**

All obese women must be assessed for risk factors for developing venous thromboembolism. Pregnancy has a ten fold increased risk of venous thromboembolism. This risk becomes greater in the presence of obesity or other factors such as age greater than 35 years, a parity of greater than 4, surgical obstetric procedures, hyperemesis, and preeclampsia. A combination of any of these factors further increases the risk in an obese woman.

The drug of choice for antenatal thromboprophylaxis is low molecular weight heparin (LMWH). Antenatal thromboprophylaxis should be considered for an extremely obese woman even in the absence of other risk factors. Advice may be sought from the haematologist. Thromboprophylaxis should be given to obese women with two or more risk factors, in the antenatal period <sup>27</sup>.

### **F) HYPERTENSIVE DISORDERS OF PREGNANCY**

In pregnancy obese women have higher blood pressures and altered cardiac function.

There is an increased risk of pre-eclampsia and eclampsia among women of high body mass indices.

Regular monitoring of blood pressure and urine for protein is suggested.

Women should be educated on the symptoms of preeclampsia such as headaches, blurred/changed vision and epigastric pain. In these circumstances they should seek immediate medical attention. A senior obstetrician should be involved in the management of the obese patient with preeclampsia. In severe cases of pre-eclampsia and in cases of eclampsia, the anaesthetist should also be involved.

### **G) ANAESTHETIC CONSULTATION**

An anaesthetic consultation should be considered for morbidly obese women during their antenatal care <sup>28</sup>.

### **H) SPECIAL EQUIPMENT**

A community assessment should be performed at the onset of the pregnancy and at regular intervals before delivery. Chairs and beds in the patients' home and place of work should be of adequate capacity to accommodate the weight of the woman which will change throughout the pregnancy. This is essential to prevent accidents, maternal and foetal harm. In preparation for delivery and admission to hospital, it is essential that chairs, beds and operating tables are of adequate capacity. Consider whether hoists will be needed. Should the equipment be unsuitable, the correct equipment must be found and arrangements made to have them available <sup>8</sup>.

### **INTRAPARTUM**

Obese women should deliver in a consultant led unit, since these pregnancies are high risk. A registrar should be informed when an obese woman is admitted to the labour ward. Indications for induction of labour and caesarean sections must be discussed with a senior obstetrician.

Advanced preoperative anaesthetic assessment should be arranged for morbidly obese women.

Women requesting caesarean sections must be counselled thoroughly. Maternal request is an increasing indication for caesarean section especially among women with previous caesarean sections. However the woman must be pre-informed of all the risks of the operation and the increased risks imposed by her excessive weight <sup>29</sup>.

Labour must be monitored closely and appropriate management implemented with the view of avoiding an operative delivery unless absolutely indicated. A risk assessment for labour must be performed with specific attention to the potential development of pre-eclampsia, thromboembolism and shoulder dystocia.

Intravenous cannulation is more difficult in obese persons <sup>31</sup>. Venous access should be secured early, simultaneously taking blood for full blood count, group and save. Because of the difficulty that may be encountered with cannulation, it is better to undertake this procedure early, rather than during an emergency.

Early placement of an epidural catheter is recommended for obese women in labour. This is safer and easier than inserting the catheter in emergency conditions and results in better maternal and neonatal outcomes <sup>28</sup>.

Encourage to be mobile.

Ensure that delivery beds, chairs and operating tables can accommodate the woman's weight. In the event of any obstetric surgery, there should be adequate theatre staff to ensure the safety of the woman whilst moving her from the operating table to the recovery bed. Hoists may be useful. It is important to consider this when obese women are admitted on the delivery suite, since obese women are more likely to have a caesarean section than women of normal weight. Crane SS et al. reviewed more than 20,000 women and the odd ratios showed that obese women were at increased risk of caesarean deliveries, including those who had no history of previous caesarean sections<sup>32</sup>. This is similar to the findings of Weiss et al. in 2004 who found that morbidly obese women were more likely to have a caesarean section compared to women of normal weight<sup>5</sup>.

In obese women, suturing the subcutaneous layer of the abdominal wall reduces the chance of developing postoperative wound morbidity<sup>33,34</sup>. A randomised controlled trial investigated whether suture closure of the subcutaneous tissue reduced the incidence of wound complications after caesarean section. Two hundred and forty five women were randomized into 2 groups of closure or non closure of the subcutaneous layer and the women monitored after caesarean section. The results of the trial indicated that suture closure of the subcutaneous layer significantly reduced postoperative wound complications<sup>34</sup>. Another trial randomised women into three groups. Group one had suture closure of the subcutaneous tissue, group two had placement of a subcutaneous drain, and group three had neither suture closure nor drainage. The study showed that the incidence of wound complications was highest in group three and lowest in group one<sup>35</sup>. These trials have shown that subcutaneous suturing is beneficial to obese women undergoing caesarean deliveries.

Placement of a subcutaneous drain at caesarean section has not proven effective in reducing wound morbidity in obese women<sup>35,36</sup>. Allaire et al. demonstrated that the incidence of wound complications was higher in a group of women who had subcutaneous drains without tissue closure compared with women who had subcutaneous suture closure with no additional insertion of a drain<sup>36</sup>. A multicenter study also evaluated the use of the subcutaneous drain in obese women at caesarean section. The investigators found that the incidence of wound morbidity was significantly higher in the women who had both subcutaneous suture closure and a

drain compared with the group of women who only had subcutaneous suture closure<sup>37</sup>.

### POSTPARTUM

All obese women who have undergone obstetric procedures such as caesarean sections and manual removal of placenta should be prescribed LMWH for 3 to 5 days or longer if indicated. Obese women with an additional risk factor for venous thromboembolism should be prescribed LMWH for 3 to 5 days following a vaginal delivery as well<sup>27</sup>. Assessment of risk factors and prophylaxis for venous thromboembolism in the postpartum period is essential. Between 2000 and 2002, 68% of maternal deaths from pulmonary embolism occurred in the postpartum period and 32% of these women were obese<sup>8</sup>.

Offer referral to the dietician and advise on regular exercise to promote weight loss and prevent further weight gain. A nutritionally balanced approach of decreasing fat and protein intake and maintaining an appropriate intake of carbohydrate is recommended to promote weight loss in obese postpartum women<sup>37</sup>.

A structured weight management programme has been shown to be effective among postpartum obese women. O'Toole et al. reported a study that evaluated the impact of an individualized, structured diet and physical activity intervention on weight loss in the first postpartum year of women with elevated body mass indices. The women were randomised to groups of either a structured or a self-directed programme and they found that women were unlikely to lose weight without the aid of the formal programme. This supports the need for postpartum women to have a structured diet and exercise programme<sup>37</sup>. Leermakers et al. published an interesting study in 1998, illustrating that a behavioural weight loss intervention, delivered by correspondence, was effective in reducing postpartum weight. Women who had delivered in the previous 3-12 months and whose postpartum weight exceeded their pre-pregnancy weight by  $\geq 6.8$  kg were randomised into 2 groups of either a six-month behavioural weight loss intervention, delivered by correspondence or a no-treatment control group. Body weight, physical activity and eating patterns were assessed at pre-treatment and six months post-treatment. They found that women in the correspondence group lost significantly more weight than the control group, they lost a greater percentage of excess postpartum weight and a significantly greater percentage returned to their pre-pregnancy weight<sup>38</sup>.

Offer referral to a specialist for consideration of medical

and/or surgical treatment if necessary.

Programmes aimed at weight loss have not been successful in everyone, more so in morbidly obese women. In those women, cognitive group therapy not aimed at weight loss can be used to improve coping mechanisms and reduce the chance of developing psychological disorders such as depression. This may be a suitable alternative for some women. Interestingly, one study of morbidly obese women found that cognitive group therapy not aimed at weight loss but at aspects of mental wellbeing resulted in significant weight loss. The authors randomised women into those receiving cognitive therapy with no focus on weight loss, those receiving behaviour therapy weight loss programme and a control no treatment group. The cognitive group and behaviour therapy group had significant weight loss but the control group did not have significant weight loss. Depression and anxiety were reduced significantly in the cognitive therapy group <sup>39</sup>.

Postpartum assessment of obese women by obstetricians and midwives for the development of psychological disorders is advised. Obesity and the postpartum periods are independent risk factors for the development of psychological disorders.

Advise on contraception. Evidence has shown that as many as 23 % of obese women do not use contraceptives <sup>40</sup>. The literature has established the increased risk of pregnancy related disorders with maternal obesity. Therefore, until a woman wants to conceive, a method that prevents conception is advisable. The contraceptive chosen should have minimal effects on weight gain.

### CONCLUSIONS

The literature has established that maternal obesity is increasing globally. Maternal obesity has been shown to increase the incidence of morbidity and mortality during pregnancy and the puerperium. All obstetricians and midwives must be aware of the potential complications in women with obesity. The latest edition of Confidential Enquiries into Maternal Deaths reported that obesity was not identified as a risk factor in many of the reviewed medical notes. A care plan is indicated as an approach to target this growing health problem. Ideally, obesity should be addressed before conception and as early as in childhood. In our care plan, we have outlined the major areas for providing a high standard of obstetric care in these high risk women. In the antenatal period, women should be seen in a consultant's clinic for their booking antenatal appointment and monitored during the pregnancy. Emphasis should be made on good

nutrition, exercise, prevention and treatment of pregnancy related disorders, anaesthetic review and the provision of appropriate equipment. During labour, the assessment by a senior obstetrician should be made and particular attention paid to the progress of labour, process of induction of labour and aspects of the surgical technique of caesarean sections. Postpartum support can not be overlooked and women should be assessed particularly for venous thromboembolism and psychological disorders. With the additional weight gained from the pregnancy, postpartum obese women must be encouraged to visit the dietician, exercise, commence a weight management programme and use contraception.

Continuing education of health care workers on the deleterious effect of maternal obesity is needed. Further research and clinical trials are needed in the field of obstetrics to contribute towards evidence based care of obese women. Many authors have reported on the pregnancy outcomes of obese women. However, audits must be performed to evaluate the quality of care provided to obese women. This is an important area of interest, on which there are no national guidelines. A care plan will improve the quality of care of obese women in obstetrics.

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