

# Outcome of pregnancy in the morbidly obese woman

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## Abstract

**Background:** Obesity is a growing global health problem. In South Africa, more than half of the adult women are overweight and almost 30% are obese. The problems associated with obesity, such as diabetes, hypertension, thrombo-embolism and coronary heart disease, are well described in the non-pregnant population, but the condition itself holds specific risks during the ante-, intra- and postpartum periods of the pregnant woman. Of particular concern is the intrapartum period. Complications such as slow progress during labour and increased rates of caesarean section are best addressed proactively. For this reason certain sources advocate that all morbidly obese women be referred for evaluation of the pregnancy and planning of labour and delivery by an anaesthetist and a specialist obstetrician. The aim of this study was to determine whether morbidly obese women are at increased risk of adverse outcomes, compared to women with a normal body mass index (BMI).

**Methods:** A case control study design was used. In this study a normal BMI was defined as 20–25 kg/m<sup>2</sup> and morbid obesity as a BMI of ≥ 40 kg/m<sup>2</sup>. The BMI was calculated from the weight and height measured at the booking visit.

The cases in this study comprised the first hundred morbidly obese women seen at the Obstetric Special Care Clinic in Tygerberg Hospital (TBH), a secondary and tertiary referral centre. The controls (n = 209) were women with normal BMIs and singleton pregnancies who booked as low-risk patients at the Bishop Lavis Midwife Obstetric Unit (MOU) during the same calendar period. A minimum ratio of 2:1 controls-to-case was used, with controls also matched for primi- or multiparity. Patients booking at the MOU with significant obstetric risk factors are referred to TBH for antenatal care. These women were not considered as controls. However, low-risk women who met the inclusion criteria at booking and who subsequently developed risks or complications were included, as the selection was done according to findings at the booking visit.

The main outcomes to be determined were: ante-, intra- and postpartum maternal complications, rate of epidurals, and perinatal outcomes.

**Results:** Women in the morbidly obese group were significantly older (p < 0.001) and of higher parity (p < 0.001) than those with normal BMIs. There was no difference in the numbers of primigravidae. Significantly more women in the morbidly obese group had experienced at least one miscarriage (p = 0.002). In similar fashion, significantly more of the previous deliveries in the morbidly obese group had been by caesarean section (p < 0.001). Again, significantly more women in the morbidly obese group had previously experienced pregnancies complicated by hypertension (p < 0.001).

In the index pregnancies studied, morbidly obese women experienced more hypertension (p < 0.001), diabetes (p = 0.02) and urinary tract infections (p < 0.001) than controls. They underwent induction of labour more often (p < 0.001) and had a higher rate of caesarean delivery (p < 0.001). Epidural anaesthesia was planned for all morbidly obese patients, but only 14% received it. During delivery, perineal damage was more common in morbidly obese women (p < 0.001) and their babies were significantly larger (p < 0.001). There was one perinatal death.

**Conclusions:** Morbidly obese women experienced increased complications during pregnancy and childbirth. Due to the high rate of caesarean sections and the potential difficulties of emergency anaesthesia among these women, epidural anaesthesia during labour should be planned and administered as often as possible.

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## Introduction

Obesity is a growing global health problem.<sup>1</sup> Although it has been better studied in developed countries, obesity is now becoming a problem in developing countries as well. The 1998 South African Demographic and Health Survey<sup>2</sup> showed that 55% of adult women were overweight and 29% obese. There are many sound reasons for advocating weight loss in overweight and obese women who are planning to become pregnant.<sup>3</sup> The problems associated with obesity, such as diabetes, hypertension, thrombo-embolism and coronary heart disease are well described in

the non-pregnant population, but the condition itself holds specific risks during the ante-, intra- and postpartum periods.<sup>4</sup> Of particular concern is the intrapartum period. Complications such as slow progress during labour<sup>5</sup> and increased rates of caesarean section<sup>6</sup> are best addressed proactively. For this reason all morbidly obese women are referred for evaluation of the pregnancy and planning of labour and delivery by an anaesthetist and an obstetrician, as suggested by Saravanakumar et al.<sup>7</sup> Epidural anaesthesia during the active phase of labour is always a part of this plan. The objective of this study was to determine whether morbidly obese women are at increased risk of adverse maternal and

fetal outcomes when compared to women with a normal body mass index (BMI), and to evaluate the epidural service to these women.

## Methods

A case control design was used for this study. The Obstetric Special Care Clinic (OSCC) is situated in Tygerberg Hospital (TBH), a secondary and tertiary referral centre. The OSCC is a consultant-driven, outpatient clinic to which women with the highest obstetric risk profiles are referred. For the purposes of this study a normal BMI was defined as 20–25 kg/m<sup>2</sup> and morbid obesity as a BMI of  $\geq 40$  kg/m<sup>2</sup>. The BMI was calculated from the weight and height measured at the booking visit. Since December 2003, all morbidly obese patients have been referred to the OSCC for evaluation of the pregnancy and planning of labour and delivery by an anaesthetist and an obstetrician.

The cases in this study comprised the first hundred morbidly obese women seen at the OSCC. The controls were women with normal BMIs and singleton pregnancies who booked as low-risk patients at the Bishop Lavis Midwife Obstetric Unit (MOU) during the same calendar period. A minimum ratio of 2:1 controls-to-case was used, with controls also matched for primi- or multiparity. Patients booking at the MOU with significant obstetric risk factors are referred to TBH for antenatal care. These women were not considered as controls. However, low-risk women who met the inclusion criteria at booking and who subsequently developed risks or complications were included, as the selection was done according to findings at the booking visit.

After delivery, the files of the mothers and babies were retrieved and individually reviewed by the principal author, after which a datasheet was completed. The main outcomes were ante-, intra- and postpartum maternal complications, rate of epidural anaesthesia and perinatal outcomes. Hypertension was classified according to the criteria accepted by the International Society for the Study of Hypertension in Pregnancy.<sup>8</sup>

Statistical analyses were carried out using the Statistical Package for the Social Sciences (SPSS) version 13. Data are expressed as number and percentage for qualitative variables, and the mean with standard deviation (SD) and median with range for quantitative variables. Comparisons between mean values of quantitative variables were calculated using the Student's t-test, while the chi-square ( $\chi^2$ ) test was used for qualitative data. The results were considered statistically significant with a p value of less than 0.05. Quality control was performed by re-examining 15/100 files in the case group and 30/209 in the control group. The study was approved by the Committee for Human Research of Stellenbosch University.

## Results

The morbidly obese group (cases) comprised 100 women and the control group 209 women. The descriptive characteristics of these women are shown in Table I.

The details of the previous pregnancies of both groups of women, as obtained from their medical records revealed the following: Significantly more women in the morbidly obese group had experienced at least one miscarriage (21/100 versus 18/209,  $p = 0.002$ ). In similar fashion, significantly more of the deliveries in the morbidly obese group had been by caesarean section (21/213 versus 2/260,  $p < 0.001$ ). Again, significantly more women in the morbidly obese group had previously experienced pregnancies complicated by hypertension (32 versus 4,  $p < 0.001$ ). According to the records there were no significant differences between the two groups for any of the following: intra-uterine deaths,

**Table I: Characteristics of cases (BMI = morbid obesity) and controls**

	Morbid obesity (100)	Controls (209)	P
Age (years)	30.5 (17–42)	24 (15–40)	< 0.001
Gravidity	3 (1–8)	2 (1–6)	< 0.001
Parity	2 (0–7)	1 (0–4)	< 0.001
Primigravidae	22 (22)	48 (23)	
Multigravidae	78 (78)	161 (77)	

Data are given as median with range, or n (%).

preterm labour, sepsis, including urinary tract and puerperal sepsis, macrosomic babies or perinatal deaths. No cases of deep venous thrombosis, pulmonary embolism, shoulder dystocia or postpartum haemorrhage were documented in any of the records.

The details of the index pregnancies are shown in Table II.

**Table II: Details of the index pregnancies**

	Morbid obesity (100)	Controls (209)	P
Gestation: booking (weeks)	21 (7–42)	19 (6–36)	0.05
Weight (kg)	113.4 (87–152)	56.5 (44–74)	
Height (cm)	158 (144–178)	158 (144–186)	
Body mass index	45.6 (40–59)	23 (20–25)	
Smoking *	22 (22.7)	116 (56.9)	< 0.001
Diabetes mellitus	9 (9)	5 (2.4)	0.02
Hypertension	48 (48)	6 (2.9)	< 0.001
Urinary tract infections <sup>†</sup>	6 (6)	0	
Anaemia (Hb < 10.5 g/dl)	6 (6)	54 (25.8)	< 0.001

Data are given as median with range, or n (%)

\* Status was unknown in three cases from the morbid obesity and five cases from the control groups

<sup>†</sup> = Confirmed by culture

The numbers within the classes of hypertension encountered in the study group were as follows: chronic hypertension: 16 cases, gestational hypertension: 13 cases, pre-eclampsia: 2 cases, super-imposed pre-eclampsia: 1 case, and unclassified hypertension (where the patient booked after 20 weeks' gestation): 16 cases. In the control group there were two cases of gestational hypertension, two cases of pre-eclampsia, as well as a single case of chronic hypertension and unclassified hypertension each.

The details pertinent to labour and delivery are shown in Table III.

**Table III: Details of labour and delivery**

	Morbid obesity (100)	Controls (209)	P
Induction of labour n (%)	36 (36)	7 (3.3)	< 0.001
Gestation (weeks)*	39.6 (1.8)	38.4 (1.9)	< 0.001
Birth weight (grams)*	3 516 (541)	3 008 (512)	< 0.001
Apgar < 7 at 5 minutes n (%)	3 (3)	1 (0.5)	
Epidural during labour/delivery n (%)	14 (14)	0	
Vaginal delivery n (%)	65 (65)	206 (98.6)	< 0.001
Instrumental delivery n (%)	3 (3)	1 (0.5)	
Episiotomy n (%)	6 (9)	9 (4.4)	
Any perineal tear n (%)	31 (47.7)	24 (11.7)	< 0.001
Third or fourth degree perineal tear n (%)	1 (1.5)	1 (0.5)	
Caesarean section n (%)	35 (35)	3 (1.4)	< 0.001

Data are given as mean with standard deviation.

The labour/delivery plan for all morbidly obese women included epidural anaesthesia during the active phase of labour. However, only 14% underwent the procedure. In 61% of cases it was stated that there was no opportunity to perform the procedure, while in 25% of cases the reason for not performing an epidural could not be ascertained. However, when patients required anaesthesia for caesarean sections a local procedure (spinal = 26, epidural = 8) was almost always used. There were no complications from either epidural or spinal procedures in this study. Only one woman underwent a general anaesthetic for caesarean section. Two (2%) of the morbidly obese women were admitted to the adult intensive care unit. In the morbidly obese group, only six of the 35 caesarean sections were performed before induction or labour. Twelve of the remaining 29 caesareans were for failure to progress while eight were performed for fetal distress. There were three caesarean sections performed after labour or induction in the control group. All four cases of wound sepsis occurred in the morbidly obese group. There were two cases of abdominal wound and two of episiotomy sepsis. The other cases of maternal morbidity were as follows: one case of prolonged postpartum hospitalisation in each group, a single case of endometritis and of transfusion, both in the control group.

There were no intra-uterine deaths in this study. There were four macrosomic babies ( $\geq 4500$  grams) in the morbidly obese group and one in the control group. No babies from either group needed admission to neonatal intensive care. There was only one neonatal death in the study. This occurred on day 4 in the group with morbidly obese mothers. This mother presented at term with ruptured membranes and signs of chorio-amnionitis. The baby died of septicaemia.

## Discussion

Obesity represents a low-grade inflammatory state that is associated with metabolic and cardiovascular complications.<sup>9</sup> The rates of hypertensive diseases of pregnancy and gestational diabetes among morbidly obese women are significantly increased.<sup>6</sup> In the index study both of these diseases were significantly more common in morbidly obese women. These complications may in turn lead to higher rates of inductions as evidenced in this study. Induction of labour may be the starting point in the cascade of adverse events.<sup>4</sup> The details of the previous pregnancies in the group of morbidly obese women did not reveal many of the expected associated complications. These findings may be questioned and probably reflect poor quality of history taking by the booking officers.

Compared to women with normal BMIs, morbidly obese women have significantly higher rates of caesarean section.<sup>6,10</sup> Barau et al<sup>11</sup> have described a linear association between maternal pre-pregnancy BMI and the risk of caesarean section in term deliveries. In addition, obesity is an independent risk factor for failed trial of labour after previous caesarean section,<sup>12-14</sup> with Hibbard et al<sup>12</sup> finding that morbidly obese women who failed a trial of labour had a six-fold greater composite maternal morbidity than those undergoing successful trial of labour. Possible reasons for increased abdominal deliveries may be cephalopelvic disproportion,<sup>6</sup> failure to progress, intra-uterine growth restriction<sup>15</sup> presenting as fetal distress<sup>10</sup> or fat deposition in the maternal pelvis. Moynihan et al<sup>16</sup> postulate that leptin may exert a physiologic inhibitory effect on uterine contractility, leading to dysfunctional labour and increased operative delivery.

Obesity has been shown to increase the rate of analgesic failure by epidural<sup>10</sup> but this difficulty should not preclude the procedure in labour. Rather, a more liberal prophylactic approach has been advocated to decrease both anaesthetic and perinatal complications when an emergency procedure is required.<sup>7</sup> This is preferable to jeopardising

the mother's life in an emergency to save a compromised foetus. In the index study, the prophylactic placement of epidurals in the morbidly obese women was disappointingly low. This was probably due to the heavy workload experienced by the staff (doctors and nurses) in most cases. Even with this low rate of epidurals for these high-risk women the maternal and fetal outcomes were good. This may be due to an efficient system of 'flagging' these high risk patients. Eight of the fourteen women with epidurals required caesarean sections while 20 of the 86 women who did not receive an epidural required non-elective caesarean delivery using a spinal procedure. Whether insertion of epidurals caused a higher incidence of caesarean section in our patients is not clear. Larger numbers would be needed to determine whether this was really significant. However, 20 non-elective spinal procedures in high-risk patients could have been avoided had prophylactic epidurals been placed. One woman who did receive an epidural underwent a general anaesthetic for the caesarean delivery. Six morbidly obese women underwent elective caesarean delivery under spinal anaesthetic. None of the control patients received an epidural for analgesia during labour as the service is not available at the MOU. Three women were, however, referred to and delivered by caesarean section in Tygerberg Hospital.

Maternal obesity more than doubles the risk of stillbirth and neonatal death.<sup>17,18</sup> In the index study there was only one perinatal death. This occurred in the morbidly obese group. The difference in gestational age at delivery is not clinically significant, with both groups reaching term. As expected, the babies born to obese mothers were heavier although only two significant perineal tears occurred (one in each group).

In conclusion, morbidly obese women experience increased complications throughout pregnancy. In this study morbidly obese women were carefully 'flagged' as high-risk patients throughout their pregnancies. Due to potential intrapartum complications among these women, epidural anaesthesia was planned for, but not administered to all such women. Despite the fact that adverse outcomes were largely prevented, the authors still believe that epidural anaesthesia during the active phase of labour should be administered in as many cases as possible.

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