East African Medical Journal Vol. 83 No. 4 April 2006
INCIDENCE OF OBESITY IN PARTURIENTS SCHEDULED FOR CAESAREAN SECTION, INTRA-OPERATIVE COMPLICATIONS, MANAGEMENT AND OUTCOME
N.P. Edomwonyi, FMCA, FWCS (A); Senior Lecturer / Consultant Anaesthetist and P.E. Osaigbovo, MBBS, DA, Senior Registrar, Department of Anaesthesia, University of Benin Teaching Hospital, P.M.B 1111, Benin City, Edo State, Nigeria

Request for reprints to: Dr. N.P. Edomwonyi, Department of Anaesthesia, University of Benin Teaching Hospital, P.M.B 1111, Benin City, Edo State, Nigeria

INCIDENCE OF OBESITY IN PARTURIENTS SCHEDULED FOR CAESAREAN SECTION, INTRA-OPERATIVE COMPLICATIONS, MANAGEMENT AND OUTCOME

N. P. EDOMWONYI and P. E. OSAIGBOVO

ABSTRACT

Objectives: **To determine the incidence of obesity in parturients scheduled for Caesarean section, identify intra-operative complications, management and outcome.**
Design: **A prospective observational study.**
Setting: **University of Benin Teaching Hospital, a university-affiliated tertiary centre.**
Subjects: **Parturients scheduled for Caesarean section excluding patients in American Society of Anaesthesiologists (ASA) health status 4 and 5.**
Results: **Three hundred patients were recruited in the study. One hundred and forty eight (49.3%) were non – obese (BMI < 30kgm^{-2}) while 152 (50.7%) were obese (BMI >30kgm^{-2}). The incidence of obesity was extremely significant P<0.0001, t = 19.721 and 95% C.I. = 11.998 – 9.820. Twenty four percent of the obese and 6% of the non-obese parturients had intercurrent medical diseases. 40.5% of the non-obese parturients had general anaesthesia while 13.1% of the obese parturients were offered general anaesthesia. The incidence of intra-operative complications was higher in the obese group. P<0.0001; extremely significant. Odds ratio = 3.647; 95% C.I. of 2.0007 – 6.626. The most common complications were hypotension (n = 14), shivering (n = 12) and inadequate anaesthesia (n = 8).**
Conclusion: **There is a high incidence of obesity in parturients. This group of patients constitutes a high risk group in obstetric anaesthesia. The incidence of complications was higher in the obese than in the non-obese.**

INTRODUCTION

Obesity is a condition of excessive body fat. The name is derived from the Latin word *Obesus*, which means fattened by eating (1). Obesity is defined as body mass index (BMI) of >30kgm^{-2}, morbid obesity >35kgm^{-2} and >45kgm^{-2} is super morbidly obese (2).

The prevalence of obesity varies with socio-economic status. In developed countries, poverty is associated with a greater prevalence of obesity whereas in developing areas it is affluence that carries the higher risk (3). During pregnancy, obese and morbidly obese women have an increased incidence of medical and obstetric problems such as (i) hypertension, diabetes, post term deliveries and macrosomic babies (4,5), (ii) higher incidence of difficult labour with increased likelihood of instrumental delivery and Caesarean section, (6,7), (iii) Caesarean section operations tend to be longer (8) with a higher incidence of post-operative complications, including greater blood loss, deep vein thrombosis and wound infection or dehiscence (6), (iv) increased risk of anaesthesia-related morbidity and mortality during Caesarean section and in particular, increased risk of failed intubation and gastric aspiration during procedures under

general anaesthesia, (v) increased incidence of multiple failed attempts at epidural siting (6,7), (vi) increased risk of fetal morbidity and mortality, (vii) increased possibility of hypoxaemia due to effects of supine and Trendelenburg positions on Functional Residual Capacity (FRC), and (viii) a greater cephalad spread of local anaesthetic during spinal and epidural anaesthesia (9) resulting in respiratory difficulty.

The aim of this study is to determine the incidence of obesity in parturients scheduled for Caesarean section, identify intra-operative complications and evaluate outcome of management.

MATERIALS AND METHODS

After the Hospital Ethics Committee approval, an informed verbal consent was obtained from the patients. Parturients who present for Caesarean section form the subjects of this prospective observational study carried out between June 2004 and June 2005.

Patients in ASA 1, 2 and 3 were included in the study. Excluded were patients in ASA 4 and above. The patients were scheduled for Caesarean sections due to varying indications. Preoperative assessment was carried out in all the patients, and when indicated, patients were optimised prior to surgery. The Mallampati scoring system was used to assess the airway. Based on clinical and laboratory findings, the patients were graded using the ASA classification. As precautions against aspiration of gastric contents, all the patients were premedicated with 30 ml of mixture Magnesium Trisilicate orally, Metoclopramide 10mg and Ranitidine 50mg given intravenously 30 minutes before induction of anaesthesia.

Some of the patients were counseled for regional anaesthesia. Prophylactic Enoxaparin, a low molecular weight heparin, 40mg subcutaneously was prescribed for the super obese (n = 15) and the morbidly obese patients (n = 35), and discontinued for at least 12 hours before neuraxial block. Enoxaparin was continued in the post-operative period for two to three days in the same group of patients. Haematological and biochemical investigations were done for the patients. They included full blood count, urea and serum electrolytes, blood grouping and cross matching of two units of whole blood, platelet count, bleeding time (for pre-eclamptic - PET and Pregnancy-induced hypertensive - PIH patients on aspirin), urinalysis and HIV test. Echocardiogram, electrocardiogram, chest X-ray were also done when indicated. In case of low platelet count <100,000/L general anaesthesia was the preferred technique of anaesthesia.

The patients either had general anaesthesia or regional anaesthesia as dictated by the anaesthetist in attendance and the urgency of the case. Vital signs (pulse rate, blood pressure and oxygen saturation) were monitored in the theatre prior to establishing intravenous line and continued in the intra-operative period. Regional techniques entailed the use of spinal or epidural or combined spinal epidural anaesthesia. Under aseptic technique, regional anaesthesia was performed after preloading the circulation with 15 – 20ml/kg of warmed normal saline. For spinal anaesthesia a size 25 or 26 gauge pencil-point spinal needle (Whitacre) was used with patients in sitting position using $L_2 - L_3$ or $L_3 - L_4$ interspace. A dose of 2 – 2.4mls heavy bupivacaine 0.5% was injected into the subarachnoid space when there was free flow of cerebrospinal fluid. The planned anaesthetic level was T6.

Touhy needle of size 18 gauge (8 – 11cm in length) and a 26 gauge Whitacre spinal needle were used for epidural or combined spinal epidural anaesthesia. Plain bupivacaine 0.5%, 14mls was given following a 2 ml test dose through the epidural catheter and bacterial filter after confirming the epidural space. Top – ups were administered when indicated. The epidural catheter was removed at the end of surgery after injecting about 10mls of 0.0625% bupivacaine for immediate postoperative pain management. All parturients were positioned supine with left uterine displacement of about 15 degrees (to prevent aortocaval compression) till babies were extracted. Complications when identified were managed promptly. Fluid maintenance was with dextrose saline and normal saline. Intraoperative - hypotension (systolic pressure < 100mmHg or a drop of 20 - 30% the baseline blood pressure was considered for treatment.

General anaesthesia entailed the use of thiopentone sodium (5mg/kg body weight) for induction of anaesthesia, suxamenthonium chloride (1 mg/kg) for laryngoscopy and tracheal intubation. A rapid sequence induction with Sellick's manoeuvre was used. Atracurium dibesylate (0.5mg/kg) or

pancuronium bromide (0.06 – 0.1 mg/kg) was the drug of choice for muscular paralysis. Intermittent positive pressure ventilation was instituted using a gas flow rate of O_2/N_2O/Ha: 3L/min: 3L/min: 0.5% for maintenance of anaesthesia. As soon as the baby was extracted oxytocin 5 – 10 I.U was given intravenously, followed by 30 I.U oxytocin in 500ml infusion given slowly. Intraoperative analgesia was achieved with 0.5 – 0.75mg/kg pethidine given intravenously. At the end of surgery, residual muscle paralysis was reversed with a combination of atropine (1 – 1.2 mg) and neostigmine (2.5mg). The trachea was extubated when the patients were conscious, breathing spontaneously and responding to calls and commands.

A standardised form was used to document the characteristics of patients, anaesthetic technique, intraoperative and recovery room complications, management and outcome. All the patients were under closed observation in the recovery room by a trained senior nurse for at least 45 minutes. When they were cardio - respiratory stable they were transferred to the wards.

Data were grouped according to body mass index (BMI): <30, 30–35, >35.1 - <45 and > 45kg/m^2. The data were entered in Excel Spreed Sheet and is presented as frequency and percentages. Statistical analysis was done using Instat Graph Pad tm. The incidence of complications was compared using Fisher exact test with approximation of Woolf. The BMI were compared using alternate t-test; assumes Gaussian populations with different standard deviations. $P < 0.05$ was considered significant.

RESULTS

Three hundred parturients were recruited in the study. Table 1 shows the socio-demographic characteristics of the patients. With regards to age, there was no statistical significant difference between the two groups. F= 1.000, P = 0.4997 using student t-test; assumes Gaussian population with equal standard deviations.

The incidence of obesity was 50.7%. There was a statistically significant difference between the BMI of the obese and non-obese (Table 2). $P < 0.0001$; t = 19.721, 95% C.I. = 11.998 – 9.820 using alternate t-test; assumes Gaussian populations with different standard deviations. Thirty seven (24%) of the obese patients had intercurrent medical diseases (IMD) while an incidence of 6% was recorded in the non-obese; the difference between the two groups was statistically significant. $P < 0.0001$, odds ratio = 4.969, 95% C.I. = 2.302 – 10.726 using the approximation of Woolf. The patients with pregnancy induced hypertension and pre-eclampsia were managed with low-dose (75mg) aspirin daily from 14 – 32 weeks gestation. All the super-obese (n = 15) and 35 morbidly obese patients were placed on pre-delivery enoxaparin 40 mg subcutaneously for two to four days before operative delivery, and discontinued 48 to 72 hours post Caesarean section.

The results of electrocardiogram and echocardiography in five of the super morbid obese patients revealed left ventricular hypertrophy. The chest X – ray showed cardiomegaly. These patients did not manifest clinical signs of heart failure.

Table 1

Sociodemographic data of patients

	Demographic Data (Mean ± SD)				American Society of Anaesthesiologists (ASA) HealthStatus				Mallampati Score			
	Age (Years)	Weight (kg)	Height (cm)	BMI (kg/m^2)	I	II	III	IV	I	II	III	IV
Obese (n = 152)	32.51 ± 4.53	94.39 ± 14.8	1.61 ± 7.12	36.40 ± 6.22	70 (45.8%)	62 (40.17%)	16 (10.45%)	4 (2.61%)	43 (25.1%)	59 (38.56%)	46 (30.71%)	4 (2.61%)
Non-Obese (n = 148)	29.68 ± 4.53	67.09 ± 7.00	1.62 ± 1.04	25.49 ± 2.76	100 (67.56%)	30 (20.28%)	18 (12.16%)	-	89 (60.13%)	51 (27.71%)	18 (12.16%)	-

Table 2

Body mass index (BMI) group

		BMI (Kg/M^{-2})	Frequency	(%)
Group 1	Non-obese	<30	148	49
Group 2	Obese	>30 – 35	80	27
Group 3	Morbidly obese	35.1 – 45	57	19
Group 4	Super morbidly obese	>45	15	5
			300	100

Group 1 (non – obese)
Groups 2, 3 and 4 (obese)
P <0.0001 – Extremely significant

Table 3

Indications for Caesarean section

Indication	Obese		Non-obese	
	No.	(%)	No.	(%)
Previous Caesarean section	28	(18.4)	38	(25.6)
Obstructed labour	30	(19.7)	35	(23.6)
Abnormal presentation	16	(10.5)	10	(6.7)
Pregnancy induced hypertension	24	(15.2)	5	(3)
Preeclampsia	6	(3.9)	2	(1.2)
Macrosomic baby	13	(8)		–
Diabetes mellitus	4	(2.6)	2	(1.2)
Previous uterine rupture	3	(1.9)	6	(4)
Morbid obesity with previous uterine scar	8	(5.3)		–
Placenta praevia	3	(2.0)	20	(13.4)
Foetal distress	4	(2.6)	15	(10)
Intrauterine foetal death	1	(0.7)	5	(3)
Post term delivery	8	(5.3)	10	(6.7)
Asthma	3	(1.9)		–
Total	152	(100)	148	(100)

The indications for Caesarean section were similar in both groups (Table 3). Out of the 152 obese patients, 100 (65.8%) had elective Caesarean section while 52 (34.2%) had emergency Caesarean section. In the non-obese group, 80 (54%) were elective cases while 68 (46%) had emergency Caesarean section. Table 4 shows the different techniques of anaesthesia used for the patients. In the obese group, only a small percentage (13.1%) was offered general anaesthesia as compared with 40.5% in the non-obese group.

The types and frequencies of intraoperative complications are shown in Table 5. The incidence of complications was higher in the obese than in the non-obese and it was extremely significant. P< 0.0001; odds ratio = 3.647, 95% C.I. = 2.0007 – 6.626. Establishment of intravenous access was difficult in ten of the super-morbidly obese patients, with three having venous cut-down. Tracheal intubation was equally difficult in three of the patients. After three attempts at intubation, anaesthesia was discontinued. When they regained consciousness, spinal anaesthesia was offered for operative delivery. Respiratory distress was observed in four patients following spinal anaesthesia. A low arterial oxygen saturation (<90%) was recorded with good response to oxygen supplementation by face-mask.

Hypotension due to high blocks was recorded in 14 (9%) patients in the obese group as against eight (6%) in the non-obese. Hypotension was managed with rapid infusion of intravenous fluids in all the patients. Five in the obese group required additional use of intravenous ephedrine 5–15mg. Inadequate anaesthesia as evidenced by pain was recorded in patients that had regional anaesthesia. It was managed with intravenous pethidine 0.5 – 0.75 mg/kg. Post-operative pain was managed with intravenous pethidine 0.5 – 0.75 mg/kg or tramadol hydrochloride 100mg. Shivering occurred mostly in regional anaesthesia group and the patients were managed with oxygen by face-mask and they were covered with extra drapes.

Table 4

Techniques of anaesthesia

Technique	Obese patients		Non-obese patients	
	No.	(%)	No.	(%)
General anaesthesia	20	(13.1)	60	(40.5)
Spinal anaesthesia	100	(65.8)	79	(53.4)
Epidural anaesthesia	17	(11.2)	7	(4.7)
Combined spinal-epidural anaesthesia (CSE)	15	(9.9)	2	(1.4)
	152	(100)	148	(100)

Table 5

Comparative incidence of intra-operative complications in the obese and non-obese parturients

Systems	Adverse events	Intraoperative			
		Obese		Non-obese	
		No.	(%)	No.	(%)
Cardiovascular System	Hypotension	14	(27)	8	(44.4)
	Hypertension	3	(6)	1	(5.6)
	Bradycardia	2	(4)	1	(5.6)
Central Nervous System	Anxiety	2	(4)	–	
	Shivering	12	(23.5)	4	(22.2)
	Inadequate anaesthesia (Pain)	8	(15.7)	4	(22.2)
Gastro-Intestinal Tract	Nausea	4	(7.8)	–	
	Vomiting	2	(3.9)	–	
Respiratory System	Respiratory distress	4	(7.8)	–	
		51	(100)	17	(100)

P < 0.0001; extremely significant

Anxiety was managed with intravenous midazolam 2mg statim. Acute hypertension was observed in four patients with pregnancy induced hypertension and they were treated with hydralazine 5mg bolus, given slowly after excluding other causes of hypertension such as pain, inadequate ventilation and hypoxaemia. Nausea and vomiting were documented in four and two patients respectively following severe hypotension. They all had spinal anaesthesia and they responded to rapid infusion of intravenous fluids.

DISCUSSION

Our study further confirmed previous findings of an increased incidence of intercurrent medical diseases (diabetes mellitus, hypertension and other cardiorespiratory and cerebrovascular diseases) in the obese patients (10). Mild to moderate hypertension is seen in 50 – 60% of obese patients and severe hypertension in 5 – 10% (11), with 3 – 4 mmHg increase in systolic and a 2 mmHg increase in diastolic arterial pressure for every 10kg of weight gain (12). 15.2% had moderate to severe pregnancy – induced hypertension in our study.

Some of the morbidly obese patients had occasional difficulty with breathing prior to the pregnancy. This is not surprising in obese patients because a combination of increased mechanical pressure from the abdomen, reduction in pulmonary compliance and increase in the metabolic demands of the respiratory system musculature result in respiratory muscle inefficiency and an increase in the work of breathing (13). This problem was also identified in five of the super – morbidly obese patients in our study group. Approximately 5% of all morbidly obese patients have obstructive sleep apnoes (14). As a result of recurrent apnoea there are accompanying physiological changes in patients with OSA. These include hypoxaemia hypocapnia and pulmonary and systemic vasoconstriction which in turn leads to right ventricular failure (14).

During clinical examination, vital signs might be missed. Vascular access may be so difficult that cannulation of a central vein or a peripheral cut down may be advisable before induction of anaesthesia. Three of our morbidly obese patients had a venous cut down prior to induction of anaesthesia.

A careful and detailed assessment of the morbidly obese patient's upper airway is required before they are anaesthetised. Difficulties with mask ventilation and tracheal intubation may be considerable (6,15), with the incidence of difficult intubation being quoted at around 13% (4). Three of the super-morbidly obese patients who presented with difficult intubation were offered spinal anaesthesia for operative delivery after regaining consciousness.

Obese patients present formidable problems to the nursing and portering staff responsible for the patients' general care. Most operating tables are designed for patients of up to 120 –140kg in weight. Exceeding this limit may put the patient and staff at risk. Specially designed tables may be required or two normal tables may be placed side by side (16) Six of our patients required the use of two operating tables placed side by side for surgery.

In small series, a Mallampati grade of three was associated with 10% incidence of difficult intubation (17). A similar observation was made in our study. It is helpful to have two experienced pairs of hands available for endotracheal intubation. In our department it is a policy that a consultant, or at least a senior registrar with four or more years of experience, is in attendance during operative delivery for this group of high-risk patients.

The use of regional techniques has gained wide spread popularity in our centre as evidenced by our findings where more than 80% of the patients were offered regional anaesthesia for Caesarean section. The use of regional anaesthesia in the obese patients reduces the risks from difficult intubation and acid aspiration and also provides safer and more effective postoperative analgesia (18). Spinal anaesthesia can lead to an unpredictable spread of local anaesthetic and variability in block height (11,19). Blocks extending above T_5 risk respiratory compromise and cardiovascular blockade (20). High blocks resulting in hypotension and respiratory distress was recorded in our study. It is for this reason that the anaesthetists are always prepared to convert to general anaesthesia by assembling all the necessary drugs and equipment for general anaesthesia.

Local anaesthetic requirements for epidural and spinal anaesthesia are reduced to 75 – 80% of normal in the morbidly obese, since fatty infiltration and the increased blood volume caused by increased intra – abdominal pressure reduce the volume of the

epidural space (19). Many regional anaesthetic blocks can be technically challenging in the obese patients because important anatomical landmarks are often obscured and there are difficulties in identifying the boney landmarks (20). The longer spinal and Tuohy needles were used for some of our patients.

Caesarean section tends to be longer in obese patients, hence we offered combined spinal epidural (CSE) anaesthesia for the super morbidly obese. Our study also demonstrated the benefits of CSE, rapid onset of spinal anaesthesia and flexibility of the epidural catheter top–ups. All the patients that had CSE had good analgesia, full muscle relaxation and good postoperative pain relief.

Pulmonary embolism occurs in obese patients twice as often as in non obese patients. Risk factors for development of thrombo – embolic events in obese patients include prolonged immobilisation, polycythaemia, increased intra-abdominal pressure which increases the pressure in the inferior vena cava and causes venous blood statis, heart failure and decreased fibrinolytic activity with increased fibrinogen concentrations (21). Measures are always taken in our patients to prevent venous thrombo-embolism. Such measures include the use of enoxaparin (low molecular weight heparin) 40mg subcutaneously, before surgery and physiotherapy of the chest and lower extremities in the postoperative period.

Enoxaparin has advantages over the conventional heparin and an enhanced anti – factor Xa: anti – factor IIa ration leading to a reliable anticoagulant activity (22). In a consensus statement by the American Society of Regional and Pain Anaesthesia (ASTRA), it is recommended that the low molecular weight heparin be discontinued 10 – 24 hours before needle placement for neuraxial techniques and that they be recommended not earlier than 24 hours after the procedure or 24 hours postoperatively (23). This recommendation has gained popularity in our centre. Intra-operative complications were promptly managed with satisfactory outcome.

Patient controlled analgesia (PCA) has been used successfully in the morbidly obese and may provide superior analgesia and be less associated with lesser degree of pulmonary dysfunction than intra-muscular opioids (24). Intravenous route without the use of infusion pump is favoured in our centre for postoperative pain management.

CONCLUSION

Our study showed that anaesthetists frequently encounter obese parturients in obstetric anaesthesia as evidenced by a high incidence of obesity recorded. Obese patients are at greater risk for anaesthetic and surgical morbidity and mortality than non-obese patients undergoing similar operations as evidenced by our findings. With a good understanding of the pathophysiology, special problems of obesity and a logical plan for their anaesthetic management, the risks of anaesthesia and surgery can be substantially reduced.

ACKNOWLEDGEMENTS

To the residents in the Department of Anaesthesia for their support during the period of study. We also thank Engr. Ugieosa Ima-Edomwonyi for her secretariat work.

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