



## Maternal and Neonatal Outcome in Pregnant Women with Obesity in a Single Tertiary Referral Hospital in January - December 2017

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### ABSTRACT

**Background:** Maternal obesity is defined when BMI is above 30. It is now considered one of the most commonly occurring risk factors seen in obstetric practice and it increased risks of specific complications, and to medical, surgical and technical challenges in providing safe maternity care. **Objectives:** This study aims to review maternal dan neonatal outcomes and complications from pregnant women with obesity in Soetomo General Hospital on January - December 2017. **Methods:** Retrospective cross-sectional study by using medical record data of Dr. Soetomo General Hospital on January - December 2017. **Results:** There were 297 (21,5%) of maternal obesity from 1384 deliveries, in which the majority age range from 20-34 years old and multiparity. The most BMI category was BMI class 1 (61%). Caesarean section (77,4%) in this study became a major proportion in mode of delivery. In our study, the incidence of hypertension in pregnancy was high (45,4%), while the incidence of severe preeclampsia were 20,9%. The incidence of gestational diabetes were 7,1%, and pregestational diabetes were 3,4%. In our cases, there were 294 cases (94,2%) of livebirth, while there were four stillbirth cases. The incidence of intrauterine fetal death were four cases. There were 11 cases of macrosomia, 7 in 11 came from mother with obesity class III. Other neonatal complications are intrauterine growth restriction which were 26 cases and 18 cases congenital malformation. **Conclusion:** Most maternal complications in obese pregnant women are severe preeclampsia with mode of delivery by cesarean section. Gestational diabetes cases were found mostly in maternal obesity class I, while pregestational diabetes cases were found mostly in maternal obesity class II. Most neonatal Apgar score in our study were between 7-10, while most of congenital malformation was omphalocele

### Introduction

Maternal obesity is now considered one of the most commonly occurring risk

factors seen in obstetric practice, and obstetricians are increasingly faced with

carings for women who are obese. Such patients pose particular management problems relating both to increased risks of specific complications, and to medical, surgical and technical challenges in providing safe maternity care. It is therefore not surprising that obesity is associated with increased rates of maternal and perinatal morbidity and mortality. Despite these problems, there remains a lack of awareness of both the range and severity of the problems associated with obesity in pregnancy.<sup>1</sup> According to RISKESDAS (Basic Health Research) in 2013, the prevalence of obesity in adult women in Indonesia (> 18 years) 32.9%, an increase of 18.1% over the year 2007 (13.9%) and 17.5% from 2010 (15.5%).<sup>2</sup>

A number of systems have been used to define and classify obesity. Body mass index (BMI) is currently in use the most widely used measure to determine categories of bodyweight (Table 1).<sup>3</sup> According to WHO, The BMI is calculated as weight in kilograms divided by height in square meters (kg/m<sup>2</sup>).<sup>4</sup> A desirable BMI is between 19 and 24.9. A BMI between 25 and 29.9 is considered overweight and an obese BMI is above 30.<sup>5</sup> Obesity in pregnancy is usually defined as a maternal BMI  $\geq 30$  at the antenatal booking visit.<sup>1</sup>

**Table 1.** Classification of weight status according to BMI

BMI (kg/m <sup>2</sup> )	Classification
<18.5	Underweight
18.5-24.9	Normal/ healthy
25.0-29.9	Overweight
30.0-34.9	Obese I
35.0-39.9	Obese II
$\geq 40$	Obese III

Pregnant women who are obese at booking have an increased risk for complications, both for themselves and their babies during pregnancy and

childbirth.<sup>6</sup> Women who are obese are at risk for gestational diabetes, miscarriage, preeclampsia, thromboembolism and postpartum haemorrhage<sup>7,8</sup>. There is a growing body of evidence that maternal obesity might represent an independent risk factor for an instrumental delivery<sup>8,9</sup> and caesarean-section delivery<sup>10</sup>, and for adverse neonatal outcomes<sup>11,12</sup> such as macrosomia, shoulder dystocia and stillbirth.

It has been reported that, for every increase in Body Mass Index (BMI) of 5 kg/m<sup>2</sup>, there was a 30% overall higher mortality with a 40% increase in vascular mortality, a >50% increase in diabetic, renal and hepatic mortality, a 10% in neoplastic mortality and 20% increase in respiratory and other mortalities.<sup>1</sup> This study aims to review maternal dan neonatal outcomes and complications from pregnant women with obesity in Dr. Soetomo General Hospital as a single tertiary teaching hospital in East Java.

## Method

The study was carried out at Dr. Soetomo General Hospital, the main tertiary level referral hospital of East Indonesia, in Surabaya, East Java. This study was a cross-sectional retrospective study using electronic medical data records in dr. Soetomo General Hospital. All patients in dr. Soetomo General Hospital admitted at delivery room in one year from January 2017 until December 2017 with obesity criteria were included in this study. BMI was calculated by dividing one's weight in kilograms by height in squared meters (kg/m<sup>2</sup>). The classification of obesity according to BMI used from

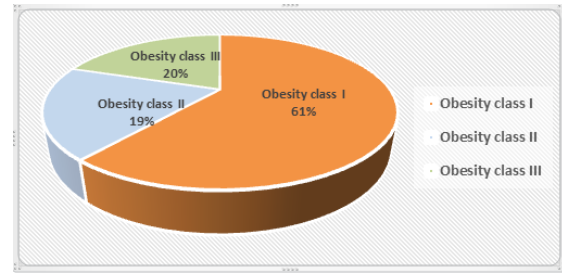
WHO. Obesity was defined as a BMI  $\geq 30$  kg/m<sup>2</sup>(1).

The inclusion criteria of this study was obese pregnant women who terminated and or delivered spontaneously in dr. Soetomo General Hospital from January – December 2017, while for exclusion criteria were obese pregnant women who got conservative treatment. From these data, we traced the maternal and neonatal outcomes.

### Results and Discussion

During the period January until December 2017, there were 297 (21,5%) cases of obesity in pregnancy from 1384 total delivery in dr. Soetomo General Hospital. Maternal obesity was classified into 3 categories, to make it easier to identify BMI classes. Picture 1 shows the percentage of maternal obesity based on BMI. The most BMI category is BMI class I (BMI range of 30.0-34.9).

As a tertiary level hospital, our study revealed high proportion of obesity cases in pregnancy (21,5%). Based of study in the North East of England, BMI recorded at the booking visit in 36,821 pregnancies showed a significant increase in the prevalence of obesity from 9.9% to 16% (P <0.01) between 1990 and 2004.<sup>13</sup> In Glasgow, a comparison of booking BMI between two randomly selected groups of women who booked for antenatal care in 1990 and in 2002-2004 also showed an increase in obesity prevalence from 9.4% to 18% (P=0.003).<sup>14</sup> Sebire et al.<sup>11</sup> retrospectively analyzed data from 287,213 completed singleton pregnancies in the north-west Thames region between 1989 and 1997 and found the overall prevalence of women with a BMI  $\geq 30$  to be 10.9%



**Picture 1.** Percentage of maternal obesity based on BMI in dr Soetomo General Hospital on January-December 2017

### Maternal Clinical Characteristic on Pregnancy With Obesity

In our study, based on maternal age, majority of our cases were aged 20-34 years (56,6%). Based on antenatal care, most of them were non-booked case (79,1%), while most of them came from Surabaya (70%). Based on parity, majority of our cases were multigravida (76,4%). This was similar with studies of 36.821 pregnancies in north-eastern England that showed that pregnant women with obesity were older and tend to have more parous with more children.<sup>1</sup>

Caesarean section (77,4%) in this study became a major proportion in mode of delivery. The main causes of high caesarean section in this study were due to previous caesarean section, followed by malpresentation and abnormal fetal assessment or fetal distress. It was similar with the result from other observational study that had shown the association between obesity and higher intrapartum complication.<sup>15</sup> The risk of caesarean section is increased in women who are obese and caesarean sections tend to be technically difficult as compared to normal weight women.<sup>16</sup> A meta-analysis study was also performed by Chu et al., which involved only women without comorbidities, showed higher caesarean section rate in obese women without

complications 1,75 times than normal BMI.<sup>17</sup>

**Table 2.** Maternal Clinical Characteristic and Pregnancy Outcome on Pregnancy with Obesity in dr. Soetomo General Hospital on January – December 2017.

Pregnancy Charateristics	Obesity Class I n (%)	Obesity Class II n (%)	Obesity Class III n (%)	Total n (%)
<b>Maternal Age</b>				
<20 y.o	4 (1,3%)	0 (0%)	0 (0%)	4 (1,3%)
20-34 y.o	109 (36,7%)	27 (9,1%)	33 (11,1%)	169 (56,9%)
>34 y.o	68 (22,9%)	30 (10,1%)	26 (8,8%)	124 (41,8%)
<b>Mode of Delivery</b>				
Spontaneous vaginal	39 (13,1%)	9 (3,0%)	1 (0,3%)	49 (16,5%)
Instrumental vaginal	10 (3,3%)	3 (1,01%)	0 (0%)	13 (4,4%)
Vaginal breech	3 (1,0%)	1 (0,3%)	1 (0,3%)	5 (1,7%)
Caesarean section	129 (43,3%)	44 (14,8%)	57 (19,1%)	230 (77,4%)

### Pregnancy Complications Associated with Maternal Obesity

There are number of studies that have investigated the association between BMI and pregnancy outcome. Many studies have used different BMI ranges to define obesity in pregnancy. In our study, the incidence of hypertension in pregnancy was high (45,4%), while severe preeclampsia (20,9%) became the major proportion of comorbid (Table 3).

**Table 3.** Hypertension in Pregnancy Incidence on Pregnancy with Obesity in dr. Soetomo General Hospital on January – December 2017

Pregnancy Complication	n (%)
<b>Hypertension in Pregnancy</b>	
Severe Preeclampsia	62 (20,9%)
Chronic Hypertension	42 (14,1%)
Super Imposed Severe Preeclampsia	
Chronic Hypertension	10 (3,36%)
Eclampsia	7 (2,3%)
Preeclampsia	14 (4,7%)
<b>Total</b>	<b>135 (45,4%)</b>

The majority of observational studies since 1996 have shown a direct correlation between maternal BMI and risk of preeclampsia.<sup>18</sup> Women who are overweight had two fold increased risk in developing hypertensive disorders in

pregnancy than their nonobese counterparts. A link has also been drawn between obesity and preeclampsia. Several studies have demonstrated a linear relationship between preeclampsia risk and BMI and one systematic review have reported the risk of preeclapsia doubled with each 5-7 kg/m<sup>2</sup> of BMI.<sup>16</sup>

According to Swedish cohort study of 805,275 pregnancies to women delivering between 1992 and 2001 found that 2.8% of women with a BMI of 29.1 – 35.0 had preeclampsia compared to 1.4% of women with a BMI of 19.8–26.0 (adjusted OR 2.62, 95% CI 2.49–2.76).<sup>19</sup> A raised booking BMI, as defined for each included study, compared with a healthy BMI was associated with a 50% increase in the risk of preeclampsia, while a booking BMI >35 doubled the preeclampsia risk. The increased overall risk associated with raised pre pregnancy BMI appeared to persist even after adjustment for confounding factors, such as maternal age and chronic hypertension.<sup>20</sup>

Based on our study, the incidence of gestational diabetes were 21 cases (7,1%), while the incidence of pregestational diabetes were 10 cases (3,4%) (Table 4). A retrospective UK study of 287,213

pregnancies between 1989 and 1997 showed that after adjusting for ethnic group, parity, maternal age, and history of hypertension, women with BMI  $\geq 30$  were more likely to develop gestational diabetes than women with BMI of 20.0-24.9 (odds ratio [OR] 3.6, 99% confidence interval [CI] 3.25–3.98).<sup>10</sup> Gestational diabetes mellitus (GDM) increases the long-term risk of developing type 2 diabetes. Data from an observational cohort study of 330 Danish women with diet-treated GDM showed that 41% of these women developed diabetes during a median of 10 years follow-up.<sup>21</sup>

**Table 4.** Diabetes Mellitus Incidence on Pregnancy with Obesity according to the maternal obesity degree in dr. Soetomo General Hospital on January 2017–December 2017

Type of Diabetes Mellitus	Obesity Class I n (%)	Obesity Class II n (%)	Obesity Class III n (%)	Total n (%)
Pragestatio nal DM	2 (0,7%)	5 (1,7%)	3 (1,0%)	10 (3,4%)
Gestational Diabetes	13 (4,4%)	3 (1,0%)	5 (1,7%)	21 (7,1%)

There was one maternal death from obesity class III in our case due to several complications such as eclampsia, acute kidney injury, sepsis and posterior reversible encephalopathy syndrome. There is evidence that obesity is associated with a higher risk of maternal death. In the triennium 2003 – 2005, 28% of all women who died in the UK were classified as obese.<sup>22</sup> These deaths in obese women are associated with many causes of direct and indirect death, including preeclampsia and pulmonary embolism.<sup>1</sup>

### Perinatal Outcome on Pregnancy With Obesity

In our study, based on infant’s gender, majority of our cases were male (55,8%). Most of birth weight were in the range 2500-3999 grams by 52,9%. There were 11 (3,5%) cases of macrosomia in our study (Table 5). It is already stated that a multitude of maternal, fetal, neonatal, and potentially lifelong complications were increasing significantly in the setting of obesity. Greater risks for gestational diabetes mellitus, hypertensive disorders of pregnancy, fetal macrosomia, birth trauma, fetal malformations, protracted labor, operative vaginal delivery, shoulder dystocia, cesarean section (particularly emergent cesarean) delivery, and the postpartum complications of hemorrhage, thrombosis, and infection are all associated with obesity in pregnancy.<sup>3</sup>

**Table 5.** Neonatal outcome characteristic on Pregnancy with Obesity in dr. Soetomo General Hospital on January – December 2017

Neonatal outcome	n (%)
Infant’s Gender	
Male	174 (55,8%)
Female	137 (43,9%)
Ambiguous	1 (0,3%)
Birth Weight (gram)	
<2499	136 (43,6%)
2500-3999	165 (52,9%)
>4000	11 (3,5%)
Five-minutes APGAR Score	
1-3	62 (19,9%)
4-6	87 (27,9%)
7-10	149 (47,8%)

In our study, most of five-minute Apgar score were between 7-8 (47,8%). The five-minute Apgar score provides information to health workers regarding the survival of infants outside the uterus<sup>23</sup>. The Apgar

score at 5 minutes was shown to be more predictive of neonatal survival than that at 1 minute. Low Apgar score at 5 minutes was associated with an increased risk of neonatal and infant death, with a higher magnitude for very low Apgar (0-3) compared with intermediate scores (4-6). A systematic review and meta-analysis study by Zhu et al.,<sup>24</sup> said that maternal overweight or obesity increased the risk for Apgar score <7 at 1 minute. They also revealed the following factors associated with Apgar score <7 at 5 minutes: overweight (odds ratio [OR] 1.13; 95% confidence interval [CI], 1.08–1.20), obese (OR 1.40; 95% CI, 1.27–1.54), and very obese (OR 1.71; 95% CI, 1.55–1.89).

In our cases, there were 294 cases (94,2%) livebirth, while there were four (4,5%) stillbirth cases. The incidence of intrauterine fetal death were 4 cases (1,3%) (Table 6). A recent meta-analysis of six cohort studies and three case-control

studies found a doubling in the risk of stillbirth among obese women (unadjusted OR 2.07, 95% CI 1.59–2.74) compared with women with a healthy BMI.<sup>25</sup> There was one retrospective UK-based cohort study included meta-analysis, which analysed 287,213 pregnancies from 1989 to 1997.<sup>11</sup> Women with a BMI  $\geq 30$  had a stillbirth rate of 6.9/ 1000 total births compared with 4/1000 total births in women with a BMI of 20–25 (adjusted OR 1.40, 99% CI 1.14–1.71, OR adjusted for ethnicity, parity, maternal age, history of hypertension, gestational diabetes, preeclampsia, emergency caesarean section and smoking). Fetal death is a dramatic result of any pregnancy, especially when it occurs late in pregnancy. An increase of up to five times the risk of intrauterine death and increased infant mortality in obese women was recorded in some studies.<sup>26</sup>

**Table 6.** Pregnancy outcome of Maternal Obesity according to the maternal obesity degree in dr. Soetomo General Hospital on January – December 2017

Pregnancy outcome	Obesity Class I n (%)	Obesity Class II n (%)	Obesity Class III n (%)
<b>Livebirth</b>	167 (53,5%)	52 (16,7%)	58 (18,6%)
<b>Stillbirth</b>	9 (2,9%)	4(1,3%)	1 (0,3%)
<b>Intrauterine Fetal Death</b>	4 (1,3%)	0 (0%)	0 (0%)
<b>Macrosomia</b>	3 (0,9%)	1 (0,3%)	7 (2,3%)
<b>Intrauterine Growth Restriction (IUGR)</b>	16 (5,1%)	7 (2,3%)	3 (0,9%)
<b>Congenital malformation</b>	15 (4,8%)	3 (0,9%)	0 (0%)

We found 11 cases (2,3%) of macrosomia in maternal obesity. Interestingly, 7 in 11 came from mother with obesity class III. Maternal obesity, is associated with increased risk of macrosomia. Data from a study of 350,311 pregnancies showed that nearly a fifth women with a BMI  $\geq 30$  had fetal macrosomia defined as birthweight  $\geq 4$  kg

(OR 1.97, 95% CI 1.88-2.06), or defined as birthweight  $> 90^{\text{th}}$  percentile for gestational age (OR 2.08, 95% CI 1.97-2.17).<sup>27</sup> The increased incidence of macrosomia was independent of whether the mother also had pre-existing or gestational diabetes. In turn, macrosomia is a risk factor for operative delivery, a low Apgar score at one minute and a low umbilical arterial pH level, as well as

shoulder dystocia and significant injuries to the baby, including fractures and nerve palsies.<sup>28</sup>

We also found 26 cases (8,3%) of IUGR in maternal obesity. An interesting paradox exists between maternal obesity and intrauterine growth restriction, with some reports that the offspring of obese women are also at an increased risk of being growth restricted in utero (unrelated to preeclampsia).<sup>29</sup> Mechanisms underlying these findings are not known but may be related to poor placental function.<sup>30</sup>

In our study, the most type of congenital malformation was omphalocele which were four cases followed by heart defect, meningoencephalocele, and cleft palate. There were other congenital malformations that were complicated by obesity (Table 7). Women who are obese have an increased risk of carrying a fetus affected by a congenital malformation, particularly structural cardiac and neural tube defects but also limb reduction anomalies, orofacial cleft defects, diaphragmatic hernia, and omphalocele.

**Table 7.** Congenital malformation on Pregnancy with Obesity in dr. Soetomo General Hospital on January – December 2017

Type of congenital malformation	n (%)
Omphalocele	4 (1,3%)
Heart defect	2 (0,6%)
Meningoencephalocele	2 (0,6%)
Cleft palate	2 (0,6%)
Dacryocystocele	1 (0,3%)
Lung hypoplasia	1 (0,3%)
Body stalk anomaly	1 (0,3%)
Ebstein anomaly	1 (0,3%)
Trisomy 18	1 (0,3%)
Skeletal dysplasia	1 (0,3%)
Conjoint twin	1 (0,3%)

Dandy walker	1 (0,3%)
Liver cyst	1 (0,3%)
Wilm's tumor	1 (0,3%)

Factors, which may contribute to this increased risk in obese women have been suggested to include: dietary deficiencies, in particular folate; alteration of in-utero environment, akin to those found in diabetic women and also technical difficulties with accurately diagnosing congenital malformations antenatally on ultrasound due to body habitus. Although lower maternal folate levels have been implicated to cause increased congenital malformations, no definite mechanism has been identified. It is thought that obesity affects the distribution and metabolism of folate and it may be that poorer dietary intake in obese women affects overall levels. As a result, obese women may benefit from a higher dose of folate supplement (5 mg instead of the usual 400 mcg) for at least 1 month before conception and through the first trimester. The fact that many women do not start taking folate until organogenesis has occurred reiterates the importance of multidisciplinary preconception counselling.<sup>16</sup>

## Conclusion

This one-year study revealed high incidence of obesity during pregnancy in Dr. Soetomo General Hospital. Most of maternal obesity came from multi gravida, while sectio caesarean became major proportion in mode of delivery. Severe preeclampsia was a major complication in maternal obesity. Gestational diabetes cases were found mostly in maternal obesity class I, while pragestational diabetes cases were found mostly in maternal obesity class II. Most neonatal

Apgar score in our study were between 7-10, while most of congenital malformation was omphalocele.

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