ORIGINAL RESEARCH

Maternal obesity increases risk of preeclampsia and diabetes mellitus

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Article Info	ABSTRACT
  *Corresponding author Hermanto Tri Joewono hermanto.tri@fk.unair.ac.id	**Background**: Obesity in pregnant women has been linked to negative outcomes for both the mother and the fetus. Gestational diabetes, preeclampsia, and postpartum haemorrhage are all threats for mothers during pregnancy. These may also affect labor outcomes because fat accumulation in the pelvis makes obese pregnant women more likely to have a caesarean section. **Objective**: To analyze the outcome of maternal obesity in pregnancy in 2017. **Materials and Methods**: This was an analytic cross-sectional, observational study in pregnant women with obesity in Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, within the period of January 1st – December 31st 2017 using medical records. Sample size was determined using cross-sectional sample size calculation with the result of n=162. After receiving approval of ethical clearance, medical records were collected and analyzed. The statistical analysis was done using chi-square test. **Results**: From a total of 162 subjects, most of the patients were 21-34 y/o (56.8%), under graduate (90.7%) and 58% of the subjects worked. Proportion of grade I, II and III were 60.5%, 22.2%, and 17.3%, and 67% suffered from complications such as PE, DM, PE with DM with percentages as follows: 56.2%, 4.9%, and 6.2%. Neonatal complications were preterm 42.6%, macrosomia 4.3%, stillbirth 4.9%, and low Apgar score 48.1%. No association was identified between maternal age and complications in grade I (p=0.764) and grade III (p=0.716). Obesity grades I and III had correlation with complications (p=0.035). **Conclusion**: No significant association was found between age and complications in grade III obesity, while there was significant correlation between obesity levels (grade I and grade III) and complications.

BACKGROUND

Obesity is defined as the accumulation of excessive fat. If a person gains weight, there will be an increase in size and number of fat cells (Sugondo, 2014). Obesity is defined three grades and the higher grade possesses greater health risk. Obesity can be caused by behavior and genetic factor. The behavior mentioned above comprises of dietary patterns, physical activity, drug use as well as supporting factors

from social life such as food, education and food marketing (U.S. Department of Health & Human Services, 2016). According to Indonesia's five-yearly Health Survey in 2013, the prevalence of obesity among adult women was 32.9 percent, increasing 18.1 percent from 2007 (13.9%) and 17.5 percent from 2010 (15.5%). Risk factors that can occur in obese women are hypertension, high cholesterol and blood glucose level, stroke, kidney problems and cardiovascular disorders (Martin, 2015). Likewise, the incidence of obesity in pregnant women also poses negative outcome risks for the mother and her fetus. Maternal risks during pregnancy include gestational diabetes, preeclampsia, post-partum haemorrhage, and sleep apnea. The fetus is also at higher risks of miscarriage, macrosomia, preterm birth, congenital anomalies and can even lead to infant mortality (The American College of Obstetricians and Gynaecologists, 2016). This can also affect labor outcomes because the accumulation of fat in the pelvis will increase the likelihood of obese pregnant women to undergo caesarean section (Alba, 2018).

OBJECTIVE

The objective of this study was to analyze the outcome of maternal obesity in pregnancy in 2017.

MATERIALS AND METHODS

This research was a descriptive-analytic observational cross-sectional study of pregnant patients with obesity in Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, in the period of January 1st - December 31st 2017 and had received approval of ethical clearance from ethics commission of Faculty of Medicine Universitas Airlangga and Dr. Soetomo General Academic Hospital, Surabaya, Indonesia. The data used was secondary data from medical record. The sample size was determined by a cross-sectional sample design technique (n=162). The exclusion criteria were incomplete medical record data (no weight and Apgar score for infants) and obese pregnant women who did not deliver baby at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia.

RESULTS

As seen in table 1, among the patients, most were aged 21-34 years, reaching 54% in grade I, 58.3% in grade II, and 62.3% in grade III obesity. Among the obese pregnant women, most had educational level under college, reaching 89.8% in grade I, 100% in grade II and 82.1% in grade III obesity. Most of the obese pregnant women were working, reaching 58.2% in grade I, 52.8% in grade II and 64.3% in grade III.

Table 1. The characteristics of subjects.

n=162	Grade I	Grade II	Grade III
Age			
≤ 20 years old	4 (4%)	1 (2.8%)	0 (0%)
21-34 years old	53 (54%)	21 (58.3%)	18 (64.3%)
≥ 35 years old	41 (42%)	14 (38.9%)	10 (35.7%)
Education			
Under graduate	88 (89.8%)	36 (100%)	23 (82.1%)
University degree	10 (10.2%)	0 (0%)	5 (17.9%)
Occupation			
Unemployed	41 (41.8%)	17 (47.2%)	10 (35.7%)
Employed	57 (58.2%)	19 (52.8%)	18 (64.3%)
Total	98 (100%)	36 (100%)	28 (100%)

As seen in Table 2, most of the patients had complications of preeclampsia, reaching 77.8% in grade II and 78.6% in patients with grade III obesity. Meanwhile only 41.8% patients with grade I obesity had preeclampsia.

Table 2. Maternal outcome

n=162	Grade I	Grade II	Grade III
Preeclampsia	41 (41.8%)	28 (77.8%)	22 (78.6%)
Gestasional diabetes mellitus	7 (7.1%)	1 (2.8%)	0 (0%)
Preeclampsia with gestasional diabetes mellitus	5 (5.1%)	2 (5.5%)	3 (10.7%)
Other complications	45 (46%)	5 (13.9%)	3 (10.7%)
Total	98 (100%)	36 (100%)	28 (100%)

Table 3. Chi Square analysis to assess the relationship between age and complications in grade I obesity.

Grade I	< 35 years old	≥ 35 years old
Complications (PE, DM, PE & DM)	31	22
Other complications	26	19
p value=0.764		

Table 4. Chi Square analysis to assess the relationship between age and complications in grade III obesity.

Grade III	< 35 years old	≥ 35 years old
Complications (PE, DM, PE & DM)	16	9
Other Complications	2	1
p value=0.716		

Table 5. Chi Square analysis to assess the relationship between obesity rates (grade I and grade III) with complications.

≥ 35 years old	Grade I	Grade III
Complications (PE, DM, PE & DM)	22	9
Other Complications	19	1
p value=0.035		

Table 6. Perinatal outcome.

Perinatal outcome	
Macrosomia	7 (4.3%)
Apgar score Low <7	78 (48,1%)
Preterm	69 (42.6%)
Stillbirth	8 (4,9%)
Total	162 (100%)

DISCUSSION

Based on 162 obese pregnant women patients who were treated at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, most of patients were in the age group of 21-34 years in all grades 56.8%. A similar study was carried out in Manado; based on age, it was found that obese pregnant women were mostly in the age group of 20 to 30 years, which is the reproductive age group (Ekwendi, et al., 2016). Obese women aged ≥P35 years have higher risk of developing preeclampsia and gestational diabetes mellitus, doubled preterm births, low Apgar score, stillborn fetus, and increased risk of caesarean section (Lamminpää et al., 2015).

Most of the obese pregnant women had education level under graduate in all grades, consisting 90.7%. A similar study was carried out in Sweden, in pregnant women with low education (under graduate),

the risk of obesity was 2.7 times greater than pregnant women with college education (Edvardsson et al., 2013).

Most of the obese pregnant women were working in all grades 58%. On the contrary to the study in Sweden, pregnant women who did not work were more likely to be obese than those who worked (14.5% vs. 8.3%) (Edvardsson et al., 2013). The possible cause in the results of this study was that people who work tend to experience stress and ultimately affect dietary pattern such as excessive food with high fat consumption, often eating snacks while at work and increased coffee and tea intake (Khushboo & Shuchi, 2012).

The highest number of complications among these obese pregnant women was preeclampsia 56.2%. A similar study was conducted at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, in 2013-2015 which found that the most frequent complications in obese pregnant women in the Outpatient Pregnancy Ward were preeclampsia, reaching 38 patients (25.8%), followed by dyslipidemia in 36 patients (24.5%), gestational DM in 27 patients (18.4%) (Haslinda & Hermanto, 2017). Preeclampsia is a pregnancy disorder that affects 2-8% of all pregnancies and remains a major cause of maternal and perinatal morbidity and mortality worldwide (Jeyabalan, 2013). The risk of preeclampsia increases 2-fold each increase in body weight by 5-7 kg/m^2, while in grade III obesity, the increase reaches almost 5-fold. It may be caused by the increased risk of hypertension (Wafiyatunisa & Rodiani, 2016; Dodd, J.M & Briley, A.L., 2017).

If reviewed further in table 3, there was no significant relationship between age and complications in grade I obesity (p=0.764) and grade III (p=0.716) (table 4). However, there were significant differences between obesity rates (grade I and grade III) with complications p=0.035 (table 5).

There were 7 infants with macrosomia 4.3%. A previous study conducted at Dr. Soetomo General Academic Hospital, Surabaya, Indonesia, reported 5 (3.3%) cases of macrosomia, 3 (2%) cases of IUGR and congenital abnormalities and 1 (0.7%) fetus with IUFD amongst infants (Haslinda & Hermanto, 2017). The number of infants with low Apgar score was 48.1%. Among the population in Belgium, neonatal intensive needs were increased by 38% in obese pregnant women because the Apgar score of <7 increases by 31% (Minsart et al., 2013). A case study in Sweden reported that there was a two-fold increase of infants with low Apgar score in grade III obesity (Masturzo, B., et all, 2019). Whereas premature infants reaches 42.6%. The link between obesity and prematurity is not significant after several factors affecting the prematurity were excluded (multigravida, diabetes mellitus, hypertension and anemia) (Ju, A.C., et all, 2018).

CONCLUSION

The highest distribution of these obese pregnant women was in the age group of 21-34 years (56.8%), education level below college was 90.7%, and with work status was 58%. The highest proportion of complications in this maternal obesity was preeclampsia 56.2%. No significant association was found between age and complications in grade III obesity. It was found that there was a significant correlation between obesity levels (grade I and grade III) and complications. The outcome of macrosomia infants in pregnant women was 4.3%. The outcome of infants with low Apgar score was 48.1%. The outcome preterm infant was 42.6%. The number of stillbirth from cases of maternal obesity was 4.9%.

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