Maternal Obesity Increases Risk for Adverse Maternal Outcome at RSUP Dr. Mohammad Hoesin Palembang

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Abstract

Objective: To find the relationship between level of obesity and adverse maternal outcomes in pregnant women

Methods: An observational analytic study with a cross sectional design with secondary data from medical record. Subjects were pregnant women who gave birth at RSUP Dr. Mohammad Hoesin Palembang in January 2015-December 2017. Samples were taken by purposive sampling technique. BMIs were divided into 5 categories based on WHO criteria, normoweight, overweight, obese level I, II, and III. Underweight was excluded from the study.

Results: Of 252 research subjects, 94 (37.3%) were subjects with normal BMI, 102 (40.5%) were overweight, 44 (17.5%) were obese level I, 6 (2.4%) were level II, and 6 (2.4%) were level III. The maternal outcome consisted of 135 cases (53.6%) of preeclampsia, 6 cases of gestational diabetes mellitus (2.4%), 41 cases of uterine inertia (16.3%), 56 cases of preterm labor (22.2%), assisted delivery 111 cases (44%), and healthcare associated infections (HAIs) 6 cases (2.4%). Further analysis showed that increased level of maternal obesity is related significantly with preeclampsia, gestational diabetes mellitus, uterine inertia, and assisted delivery.

Conclusion: There are statistically significant association between obesity level and the incidence of preeclampsia, gestational diabetes, uterine inertia and assisted delivery.

Key words: Body Mass Index, Maternal Outcomes, Morbidity, Obesity.

Obesitas Pada Wanita Hamil Meningkatkan Morbiditas Maternal Di RSUP Dr. Mohammad Hoesin Palembang

Abstrak

Tujuan: Untuk menemukan hubungan antara tingkat obesitas dengan luaran maternal pada wanita hamil.

Metode: Studi analitik observasional dengan desain potong lintang menggunakan data sekunder rekam medis. Subjek adalah wanita hamil yang melahirkan di RSUP Dr. Mohammad Hoesin Palembang pada Januari 2015 - Desember 2017. Sampel diambil secara purposive sampling. Indeks massa tubuh (IMT) dibagi menjadi 5 sesuai kriteria WHO, yaitu normal, berat badan lebih, obesitas level I, II, dan III. Berat badan kurang dieksklusi dari penelitian.

Hasil: Subjek penelitian dari 252 orang, 94 (37.3%) subjek dengan IMT normal, 102 (40.5%) subjek berat badan berlebih, 44 (17.5%) obesitas level I, 6 (2.4%) obesitas level II, dan 6 (2.4%) obesitas level III. Luaran maternal terdiri dari 135 kasus (53.6%) of preeklampsia, 6 kasus diabetes mellitus gestasional, 41 kasus inertia uteri (16.3%), 56 kasus persalinan preterm (22.2%), 111 kasus (44%) persalinan pervaginam berbantu, dan infeksi luka 6 kasus (2.4%). Analisis menunjukkan adanya tingkatan obesitas maternal berkaitan secara signifikan dengan kejadian preeklampsia, diabetes mellitus gestasional, inertia uteri, dan persalinan pervaginam berbantu.

Kesimpulan: Terdapat hubungan antara tingkat obesitas pada ibu hamil dengan preeklampsia, diabetes mellitus gestasional, dan persalinan pervaginam berbantu.

Kata kunci: Indeks Massa Tubuh, Obesitas, Luaran Maternal, Morbiditas.

Introduction

Obesity is a condition of abnormal or excessive fat accumulation in adipose tissue that can interfere one health status.¹ Obesity is divided into three categories based on body mass index (BMI) level, level I obesity for BMI 30-34.99, level II obesity for BMI 35-39.99, and level III obesity for BMI ≥ 40 .² According to the 2013 Ministry of Health data, the prevalence of adult female obesity was 32.9%, increasing from previous data 18.1% in 2007 and 17.5% in 2010. In all age groups of adults, overweight is higher among women than men.³

Maternal obesity is commonly found in many developed countries and some developing countries. It is estimated that the incidence of obesity in pregnant women is between 18.5% and 38.3%.⁴ in India, 8% pregnant women suffered from obesity and 26% were overweight, while in China, 16% were overweight and obese.⁵ Soltani H, et al reported pre pregnancy body mass index in western Sumatera. According 21.7% of women were overweight (BMI: 23.0-27.4 kg/m²) and 5.3% were obese (BMI ≥ 27.5 kg/m²) using the Asian BMI classifications.⁶

Adipocyte cells release proinflammatory cytokines which induce C-reactive protein (CRP) production and result in oxidative stress. In pregnant women, oxidative stress can damage the endothelial spiral arteries resulting in endothelial dysfunction this lead to vasoconstriction in spiral artery which causes reduced blood perfusion to placenta and results in preeclampsia.⁷ This reduced placental blood perfusion increases the risk of fetal growth restriction and could trigger preterm labor. CRP production is also associated with insulin resistance.⁸

Fat accumulation in obese pregnant women is associated with poor uterine contraction caused by hypercholesterolemia.

Estrogen and oxytocin receptors in the myometrial membrane are localized to the caveolae and their effectiveness is

regulated by cholesterol levels. Zhang's 2007 study in the UK reported that myometrium in obese women has lower strength and frequency compared to women with normal weight. Poor uterine contraction results in obstructed labor, especially at latent phase of labor, which increases the risk of caesarean section.⁹ In addition, obese pregnant women are also associated with poor perfusion in their adipose tissue, which might result in delayed postpartum wound healing and longer postnatal stay compared to non-obese women.¹⁰

Marchi et al. reported increased morbidity in obese pregnant women, gestational diabetes, hypertension, caesarean section, preterm birth, maternal death, and congenital malformation.¹¹ From Scott-Pillai et al. study in UK, pregnant women with level 1 obesity had significantly increased hypertension during pregnancy, gestational diabetes mellitus, labor induction, caesarean section, postpartum hemorrhage, and macrosomia, whereas pregnant women with level 3 obesity are at risk of preterm labor, stillbirths, and postnatal stays of more than 5 days.¹²

Obesity in pregnant women can worsen maternal outcomes so it is important to educate pregnant women to maintain a balanced body weight and controlled weight gain during pregnancy. This study aims to look at the relationship between obesity rates in pregnant women and maternal outcomes.

Methods

This study was an analytic observational study with a cross sectional design. This study was conducted in July 2018 until December 2018 and at the Medical Record Department, RSUP Dr. Mohammad Hoesin Palembang.

The population of this study was women who delivered at RSUP Dr. Mohammad Hoesin Palembang for the January 2015 until December 2017 and met the inclusion

criteria (gestational age ≥ 22 weeks). Data were obtained from their medical records.

Pregnant women who were underweight, had history of hypertension before pregnancy, had history of diabetes mellitus before pregnancy, and women with multiple pregnancies were excluded. Samples taken were 252 by purposive sampling technique. BMI was divided into normal (18.5-24.99), overweight (25-29.99), level I obesity (30-34.99), level II obesity (35-39.99), and level III obesity (≥ 40). Of the 252 subjects, most subjects were overweight (40.5%), normal (37.3%), and obese level I obesity category (17.5%). The highest BMI found was 42.45 while the lowest BMI was 18.71.

Results

Table 1 shows the distribution of pregnant women giving birth at Dr. RSUP Mohammad Hoesin Palembang according to BMI. Almost half of the subjects were overweight (40,5%). Subjects who were underweight were excluded from the study.

Tabel 1 Distribution of subjects based on

BMI (N=252)

Body Mass Index	n	%
Normal	94	37,3
Overweight	102	40,5
Level I obesity	44	17,5
Level II obesity	6	2,4
Level III obesity	6	2,4
Total	252	100%

The relationship between obesity level and maternal outcomes can be seen in Table 2. Normoweight and overweight were categorized as non-obese.

Preeclampsia was more commonly found in obese pregnant women compared to non-obese women (p value 0.002).

Gestational DM was not as common as preeclampsia in pregnant women, but the occurrence was still more common in obese women (p value 0.034). Uterine inertia was also more common among obese mothers compared to non-obese ones (p value 0.012). Preterm labor, mode of delivery and hospital associated Infections (HAIs) were not

Tabel 2 Relationship between obesity level and maternal outcomes

		Obese III n	Obese II n	Obese I n	Non obese n	Total	P value
Preeclampsia	Yes	6	4	31	94	135	0,002
	No	0	2	13	102	117	
Gestational DM	Yes	1	0	3	2	6	0,034
	No	5	6	41	194	246	
Uterine Inertia	Yes	2	4	9	26	41	0,012
	No	4	2	35	170	211	
Preterm Birth	Yes	0	0	11	45	56	0,124
	No	6	6	33	151	196	
Mode of delivery	Assisted	5	4	24	78	111	0,053
	Spontaneous	1	2	20	118	141	
HAIs	Yes	0	0	0	6	6	-
	No	6	6	44	190	246	

* Test using Pearson Chi-square and Likelihood ratio

Table 3 Relationship between obesity and maternal outcomes

		Obes		P value	PR
		Ya	Tidak		
		n	n		
Preeclampsia	Yes	41	94	0,001	1,527
	No	15	102		
Gestational DM	Yes	4	2	0,023	7,000
	No	52	194		
Uterine inertia	Yes	15	26	0,027	2,019
	No	41	170		
Mode of delivery	Assisted	33	78	0,017	1,481
	Spontaneous	23	118		

* Pearson Chi square test

significantly different between obese and non-obese pregnant women.

Analysis showed that there was a relationship between the level of obesity with the occurrence of preeclampsia, gestational diabetes mellitus, and uterine inertia. When we combined all the three levels of obesity and compared them to normal BMI women, the risk of preeclampsia is 1.527 x higher in obese compared to non obese women, 7 x higher for gestational DM, twice as high for uterine inertia, and 1.481 x higher for having assisted deliveri.

Discussion

From this study we found an association between the level of obesity and preeclampsia. The results obtained are in accordance with the research conducted by Dumais in 2016 at RSUP Prof. Dr. R.D. Kandou Manado which stated that there was a relationship between obesity and preeclampsia. Obese pregnant women are four time as lively to have pre eclamsia compare normal women.

In obese women, there is an increased accumulation of triglycerides in adipocyte cells which leads to the release of proinflammatory cytokines in an attempt to maintain energy balance. These cytokines

will induce CRP production, cause oxidative stress and damage spiral arteries endothelium. This will also reduce nitride oxide (NO) production and result in spiral arterial vasoconstriction so that placental blood perfusion is reduced and preeclampsia occurs.⁷

The results of the analysis show that there was a relationship between the level of obesity and gestational diabetes. This is in line with the 2013 Gaillard study in Rotterdam which found that there was a relationship between obesity and gestational diabetes. The study stated that obese pregnant women have a chance of 6.28 times greater than normal BMI.¹⁴

In the 2nd and 3rd trimester, placental steroid levels and peptide hormones (such as estrogen, progesterone and chorionic somatomammotropins) will increase. These hormones can cause insulin resistance. Normally, calorie intake will induce insulin secretion to maintain blood glucose level, but during pregnancy, there is a slight insulin resistance caused by pregnancy hormones, thus hyperglycemia may occur.¹⁵

Excessive fat in the body will cause increase secretion of TNF and leptin in local circulation. TNF- α will interfere insulin work by inhibiting insulin signal receptors

or disrupting the activity of tyrosine kinase receptors so that insulin receptor (IRS) is not phosphorylated. Thus IRS will not be able to react with Phosphatidil Inositol 3-kinase so that its activity decreases. This causes the vesicles in GLUT4 unable to merge with the cell surface and nitride oxide (NO) formation decreases, then glucose cannot enter the cell.¹⁶ Therefore, pregnancy itself, which physiologically shows insulin resistance, added by obesity, increases the risk of gestational diabetes mellitus.

That the results of the analysis, we found the relationship between obesity level and uterine inertia in pregnant women. The results obtained were similar to study by Zhang et al⁷ which stated that obesity would result in prolonged labor caused by weak uterine contractions. In the study, it was found that the myometrium in obese women has lower strength and frequency than women with normal weight.⁹

Cholesterol is an important component of cell membranes and has an important role in controlling smooth muscle contractility. Some components of the cellular signal system that are important for smooth muscle signal transduction are found in cholesterol-rich regions of the cell membrane, called lipid rafts and caveolae. Estrogen and oxytocin receptors in the myometrial membrane are localized in the caveolae and their effectiveness is regulated by cholesterol levels.⁹ In addition, study by Burhimsch et al¹⁷ found that obese women will need more supplemental oxytocin.

In this study, obesity level did not show a statistical relationship with preterm birth. These result was different from McDonald et al⁵ which stated that there was a relationship between obesity and preterm labor. This difference can occur due to confounding factors that can result in preterm birth such as premature rupture of membranes and intrauterine infection.

In this study, we found an association

between obesity and assisted delivery. This was in line with Zhang et al⁷ which stated that obesity increased labor with forceps, vacuum, and cesarean section. Obesity is associated with inadequate uterine contraction due to hypercholesterolemia that will cause the need for assisted delivery.

In addition, Ekwendi et al¹⁸ stated that higher BMI on pregnant women increased the risk for cesarean section labor, because women with higher BMI suffered from various complications in pregnancy such as hypertension and gestational diabetes which will increase the risk of delivery with cesarean section. In the study, 50.22% of pregnant women who were obese underwent delivery with cesarean section. Obese women who gave birth vaginally experienced wider perineal lacerations than non-obese women.¹⁹

The relationship between obesity rates and healthcare associated infections (HAIs) cannot be analyzed in this study because HAIs patients were only found in non-obese patients. Lack of data in medical record at Dr. Mohammad Hoesin Palembang can be the cause of the absence of HAIs found in obese pregnant women. Wuryaningsih²⁰ et al stated that there was no relationship between obesity and wound infection. Increased BMI does not specifically increase the risk of wound infection, it depends on the thickness of the subcutaneous tissue. Women with overweight BMI and women with normal BMI who both had the same subcutaneous tissue thickness, had an equal risk of wound infection.²⁰ In addition, there were other factors that affect wound healing such as hygiene, age, and the use of antibiotics.

Conclusion

Based on the findings in this study, there is an increase in prevalence of obesity in pregnant woman. It can be concluded that obesity in pregnant women is associated with higher risk of preeclampsia, gestational diabetes,

uterine inertia, and need for assisted delivery. Since obesity has many implications and rules in affecting maternal homeostasis and metabolism, excessive weight gain which results in obesity during pregnancy should be discouraged. Pregnant women should be educated on nutritional status and calories intake to avoid obesity. Further study with prospective design would be beneficial to explain the relationship between obesity in pregnancy and maternal morbidity outcomes.

References

1. WHO. Obesity: preventing and managing the global epidemic. World Health Organization, Geneva, Switzerland. 2000.
2. WHO. The Asia-Pacific perspective: redefining obesity and its treatment. World Health Organization, Geneva, Switzerland. 2000.
3. Kementerian Kesehatan RI. Profil Kesehatan Indonesia Tahun 2013. Kementerian Kesehatan RI, Jakarta. 2014.
4. Aviram A, Hod M, Yogeve Y. Maternal obesity: Implications for pregnancy outcome and long-term risks- a link to maternal nutrition. *IJGO*. 2011;115(1):6-10
5. McDonald SD, Han Z, Mulla S, Beyene J. Overweight and obesity in mothers and risk of preterm birth and low birth weight infants: systematic review and meta-analyses. *BMJ*. 2010;341:c3428
6. Soltani H, Lipoeto NI, Fair FJ, Kilner K, Yusrawati Y. Pre-pregnancy body mass index and gestational weight gain and their effects on pregnancy and birth outcomes: a cohort study in West Sumatra, Indonesia. *BMC Womens Health*. 2017;17(1):102
7. Zahra W, Rodiani. Obesity relationship with the occurrence of preeclampsia. *Majority I*. 2016;5(5):184-190
8. Romy G, Sheryl L, Wei Perng, Emily Oken, and Matthew WG. Maternal inflammation during pregnancy and childhood adiposity. *Obesity* (Silver Spring). 2016 June ; 24(6): 1320–1327. doi:10.1002/oby.21484.
9. Zhang J, Bricker L, Wray S, Quenby S. Poor uterine contractility in obese women. *BJOG: An International Journal of Obstetrics and Gynaecology*. 2007;114(3): 343–348
10. Jasim HH, Sulaiman SA, Khan AH. Incidence and risk factors of surgical site infection among patients undergoing cesarean section. *Clinical Medicine Insights: Therapeutics*. 2017;9:1–7
11. Marchi J, Berg M, Dencker A, Olander EK, Begley C. Risks associated with obesity in pregnancy, for the mother and baby: a systematic review of reviews. *Obesity Reviews*. 2015;16(8):621-38
12. Scott-Pillai R, Spence D, Cardwell CR, Hunter A, Holmes VA. The impact of body mass index on maternal and neonatal outcomes: a retrospective study in a UK obstetric population, 2004-2011. *BJOG*. 2013;120(8):932-39
13. Dumais CEG, Lengkong RA, Mewengkang MA. Hubungan obesitas pada kehamilan dengan preeklampsia. *e-Clinic (eCI)*. 2016;4(1). <https://ejournal.unsrat.ac.id/index.php/eclinic/article/view/11686/11276>
14. Gaillard R. Risk factors and outcomes of maternal obesity and excessive weight gain during pregnancy. *Obesity*. 2013;21(5):1046–55
15. Boricha BG. High Risk Pregnancy. Jaypee Brothers Medical Publishers, New Delhi. 2011.
16. Barry S, Mary P. The role of fatty acids in insulin resistance. *Lipids in Health and Disease*. 2015;14:121
17. Buhimschi CS, Buhimschi IA, Malinow AM, Weiner CP. Intrauterine pressure during the second stage of

- labor in obese women. *Obstet Gynecol.* 2004;103(2):225-30
18. Ekwendi AS, Mewengkang ME, Wagey FM. Perbandingan persalinan seksio sesarea dan pervaginam pada wanita hamil dengan obesitas. *e-Clinic (eCI).* 2016;4(1).
 19. Kabiru W, Raynor BD. Obstetric outcomes associated with increase in BMI category during pregnancy. *Am J Obstet Gynecol.* 2004; 191: 8–9
 20. Wuryaningsih B, Widyawati, Akhmadi. Hubungan Status Gizi dan Kadar Hemoglobin dengan infeksi luka operasi. *Jurnal Ilmu Keperawatan.* 2007. 2(3).
 21. Melatunan M, Tiho M. Hubungan kadar triasilgliserol darah dengan kadar high sensitivity C-reactive protein pada remaja obes. *e-biomedik.* 2014. 2(1):1–6. (<https://ejournal.unsrat.ac.id/index.php/ebiomedik/article/view/3647/3173>).