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## OBSTETRICS

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# Pregnancy Outcomes of Parturients with Excessive-weight in Maharat Nakorn Ratchasima Hospital

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### ABSTRACT

**Objective:** To compare the maternal and fetal adverse pregnancy outcomes in parturients with excessive-weight and those with normal weight in Maharat Nakorn Ratchasima Hospital.

**Design:** Retrospective analytic study.

**Materials and Methods:** Data was collected from medical records of 1350 pregnant women, who attended the antenatal care clinic and delivered in Maharat Nakorn Ratchasima Hospital during the first of October 2004 till 30<sup>th</sup> of September 2006. Body mass index was calculated by using weight at pre-pregnancy period (kg), divided by height (m) squared. The subjects were divided into two groups according to maternal BMI (normal group, BMI 20-24.99 and excessive-weight group, BMI  $\geq 25$ ). Antenatal complications, intervention during labor, route of delivery, maternal morbidity, birth weight and neonatal outcomes were collected and analyzed.

**Results:** The prevalence of parturients with excessive weight was 16.18% (maternal overweight (BMI 25-29.9) was 11.67% and maternal obesity (BMI  $\geq 30$ ) was 4.51%). Compared to parturients with normal BMI, the following outcomes were significantly more common in excessive-weight pregnant women (odds ratio (95% confidence interval)): pre-eclampsia 6.99 (3.93-12.44), gestational diabetes mellitus 8.31 (3.22-21.42), preterm delivery 1.53 (1.04-2.27), postterm delivery 1.70 (1.19-2.44), cesarean section 1.33 (1.01-1.75), cephalopelvic disproportion 1.91 (1.32-2.77) and macrosomia 2.61 (1.19-5.74).

**Conclusion:** Parturients with excessive-weight had more significant adverse pregnancy outcomes compared with those with normal weight.

**Keywords:** excessive weight, overweight, obesity, pregnancy outcome

### Introduction

Obesity is a worldwide individual and public health issue because it contributes to the development of several chronic diseases such as hyperlipidemia, diabetes mellitus, cardiovascular

disease, ischemic stroke, gall bladder and liver disease, osteoarthritis, cancer (endometrial, colon, breast), deep venous thrombosis, poor wound healing and sleep apnea.<sup>(1,2)</sup>

Nowadays, the obesity is an important cause

in the rate expansion death that can be protected, like cigarette smoking. A non-smoke, 40 years old woman has a 3.3 years shorter live-span if her weight exceeds than standard, although she does not have obesity. However, a smoke woman will have 7.1 years shorter if she is obese with age short 13.3 down year.<sup>(3)</sup>

The incidence of overweight in pregnancy is increasing because obesity has substantially increased over the last decades, especially in women. In the Western World up to 18.5-40% of women are overweight.<sup>(4-8)</sup> In Thailand, a report from the Thai Ministry of Public Health stated an increase in the incidence of overweight and obesity was about 0.5% in the subsequent year (from 17.24% to 17.70% and from 2.61% to 3.03% respectively in the year 2004 and 2005).<sup>(9)</sup>

Edwards et al (1978) reported firstly about pregnancy outcomes in obesity (weight >150%) and found the increases in hypertension in pregnancy, preeclampsia, gestational diabetes, wound infection and macrosomia.<sup>(10)</sup>

From 1980-2007, many studies had found the increases in poor pregnancy outcomes associated with maternal excessive weight, such as gestational diabetes,<sup>(5,7,11-17)</sup> pre-eclampsia,<sup>(5,7,11-16,18)</sup> cesarean section,<sup>(14,16,18-20)</sup> cephalopelvic disproportion,<sup>(14,16,18-20)</sup> macrosomia,<sup>(14,17,18,21)</sup> postpartum hemorrhage,<sup>(14)</sup> and wound infection.<sup>(14)</sup>

In Thailand, there were few studies<sup>(18,28)</sup> reported about the effects of excessive-weight in relation to poor pregnancy outcomes. One study had reported about pregnancy outcomes in selective excessive-weight pregnant women, excluding pregnancy with diabetes mellitus.<sup>(18)</sup>

The aim of this study was to determine the prevalence of maternal excessive weight (BMI  $\geq$ 25: include maternal overweight and obesity) and compare the adverse obstetric outcomes between excessive weight group and normal group (BMI 20 – 24.99) in Maharat Nakhon Ratchasima Hospital.

## Materials and Methods

This research was a retrospective cohort study

using data from Maharat Nakorn Ratchasima Hospital. The Institutional Review Board, Maharat Nakhon Ratchasima Hospital committee had approved this study. Data were collected from medical records of 1,350 pregnant women, who attended the antenatal care clinic and delivered after 28 weeks of gestation at Maharat Nakorn Ratchasima Hospital from October 2004 till September 2006. Women who attended antenatal clinic after 16 weeks and underweight (BMI <20) were excluded. Data were divided into two groups by using body mass index (BMI: weight (kg)/height (m)<sup>2</sup>); normal BMI group (20 – 24.9 kg/m<sup>2</sup>) and excessive-weight group (BMI of  $\geq$ 25 kg/m<sup>2</sup>). Socio-demographic variables (age at delivery, height and weight measured at first antenatal booking visit, pre-existing diabetes mellitus and chronic hypertension) and obstetric outcomes (pre-eclampsia, gestational diabetes, anemia, preterm delivery, postterm delivery, route of delivery, postpartum hemorrhage, stillbirth, birthweight, Apgar score and admission to neonatal unit) were recorded and analyzed between both groups.

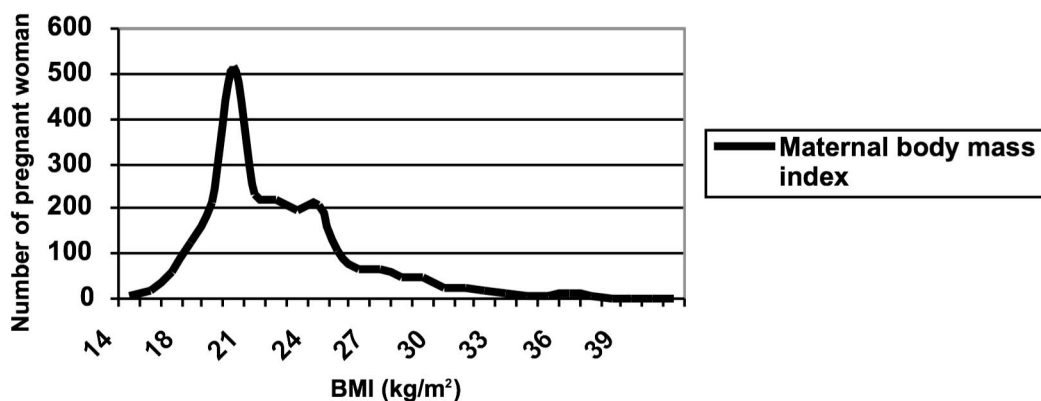
Gestational age was recorded according to the last menstrual period or confirmed by early ultrasound. Pre-eclampsia was defined as elevated blood pressure (systolic blood pressure 140 mmHg or greater, or diastolic blood pressure 90 mmHg or greater) at least 6 hours apart, with proteinuria (more than 300 mg/day), after 20 weeks of gestation.<sup>(22)</sup> Gestational diabetes was defined on the guideline used 2-step approach.<sup>(23)</sup> Preterm delivery was defined as delivery before 37 completed weeks.<sup>(24)</sup> Macrosomia was defined as the birth weight of more than 4000 grams(g).<sup>(25- 27)</sup>

All analyzes were performed with statistical program. Data were presented as mean and standard deviation (SD), range and frequencies (%). The student t-test was used to assess the differences between two means. Differences in the frequencies of events between patient-groups were analyzed by Chi-square test. Odds ratio and their 95% confidence intervals were estimated. The p-value of less than 0.05 was statistically significant.

## Results

A total of 2,040 women were included in the study. Of these, 690 (33.82%) patients were excluded due to underweight (BMI <20). There were 1,020 (50%) patients who had normal BMI (BMI

20-25) and 330(16.18%) patients who had excessive weight (BMI >25) (Overweight (BMI 25-29.9) 11.67%, Obese (BMI >30) 4.51%). The distribution of BMI is shown in Figure 1



**Fig 1.** Frequency distribution of maternal BMI

A comparison of the socio-demographic characteristics of the women in difference BMI is presented in Table 1. There was no significant difference in the average maternal age. The prevalence of chronic hypertension was higher in the

excessive group 10 (3.03%) as compared to the normal group 6 (0.59%). The prevalence of diabetes mellitus was higher in the excessive group 12 (3.64%) as compared to the normal group 18 (1.76%).

**Table 1.** Socio-demographic characteristics of parturients in different BMI groups

Characteristics	Normal weight BMI = 20–<25 (n = 1,020)	Excessive weight BMI ≥ 25 (n = 330)
Maternal age (years) (mean(SD))	28.13 (5.91)	29.62 (6.41)
BMI (Kg/m²) (mean(SD))	22.10 (1.37)	28.64 (3.29)
Parity 0	618 (60.70%)	238 (72.12%)
Parity > 1	400 (39.30%)	92 (27.88%)
Chronic hypertension	6 (0.6%)	10 (3.03%)
Diabetes mellitus	18 (1.8%)	12 (3.64%)

The relationships of pre-pregnancy BMI on maternal and fetal outcomes were summarized in Table 2 and Table 3 respectively. The excessive-weight group had significantly higher incidence in pre-eclampsia, gestational diabetes, preterm delivery, postterm delivery, cesarean delivery,

cephalopelvic disproportion and macrosomia. The incidences of anemia, postpartum hemorrhage, low birthweight, low Apgar score at 5 min and admission to neonatal intensive care unit were similar between two groups.

**Table 2.** The relationships of maternal pre-pregnancy weight on maternal outcomes

Characteristics	Normal weight (n = 1,020) N (%)	Excessive weight (n = 330) N (%)	Odds ratio	95%CI
Pre-eclampsia	18 (1.89%)	38 (13.19%)	6.99	3.93-12.44*
Gestational diabetes	6 (0.62%)	16 (5.16%)	8.31	3.22-21.42*
Preterm delivery	96 (14.20%)	44 (21.78%)	1.53	1.04-2.27*
Postterm delivery	110 (16.27%)	56 (27.72%)	1.70	1.19-2.44*
Cesarean delivery	286 (54.58%)	122 (72.62%)	1.33	1.01-1.75*
Cephalopelvic disproportion	86 (10.64%)	52 (20.16%)	1.91	1.32-2.77*
Postpartum hemorrhage	8 (0.90%)	6 (1.97%)	2.19	0.75-6.36

\*P-value < 0.05

**Table 3.** The relationships of maternal pre-pregnancy weight on neonatal outcomes

Characteristics	Normal weight (n = 1,020) N (%)	Excessive weight (n = 330) N (%)	Odds ratio	95%CI
Macrosomia	14 (1.75%)	12 (4.58%)	2.61	1.19-5.74*
Low birthweight	68 (8.48%)	28 (10.69%)	1.26	0.79-2.00
Low Apgar score	30 (3.51%)	4 (1.34%)	0.38	0.13-1.09
Admission to neonatal unit	14 (1.59%)	6 (1.97%)	1.24	0.47-3.26

\*P-value < 0.05

## Discussion

From the study, the incidence of excessive-weight pregnant women in Maharat Nakhon Ratchasima was 16.18% (BMI >25) (11.67% BMI 25-29.99 and 4.51% BMI >30). This result was the same when we compared to the study in Thailand.<sup>(28)</sup>

In England, United States of America and Australia, the incidences of overweight and obesity were 24.3% vs. 9.6%<sup>(17)</sup>, 17.85-18.2% vs. 9.17-

10.1%<sup>(15,7)</sup> and 20.2 vs. 11.8%<sup>(16)</sup>, respectively, which were much higher than this study. These may be due to the differences in the people livelihoods and their living cultures. In the near future, with this rate of development in Thailand, the author believed that the incidence of overweight population will be much higher in the future.

The study had found an increase in the incidence of preeclampsia in the excessive-weight

group when compared to the normal-weight group with statistic significant (odds ratio 6.99, 95%CI 3.93-12.44). This result was similar to other previous studies.<sup>(5,7,11-16,18,21)</sup> The actual pathophysiology was not known yet, however it may be related to low-grade inflammation<sup>(29)</sup> as there were increase in interleukin-6 and C-reactive protein with the impaired endothelial function.<sup>(30)</sup> A report had suggested an increase of 2 times risk in having preeclampsia in every rise of 5-7 kg/m<sup>2</sup> of BMI.<sup>(31)</sup>

This study had found an increase in the incidence of gestational diabetes in the excessive-weight group with statistic significant (odds ratio 8.31, 95%CI 3.22-21.42). This was similar to other previous studies<sup>(7,11-16)</sup> and the meta analysis of The American Diabetes Association who had reported the risks of 2.14 (95%CI 1.82–2.53), 3.56 (3.05–4.21) and 8.56 (5.07–16.04) in overweight, obese and severe obese respectively.<sup>(17)</sup>

The cause of diabetes in overweight patient is believed to be insulin resistance. This is due to the higher body fat, increase intakes of calorie, higher ratio of carbohydrates in foods and the lack of exercise. All these factors increase secretion of insulin and down-regulation of insulin receptors. Insulin resistance also causes the increases in free fatty acids, LDL-cholesterol and decrease in HDL-cholesterol. These will, later on, precipitate atherosclerosis, hypertension and ischemic heart.<sup>(17, 3)</sup>

The consequences of excessive-weight in pregnant women to the preterm and post term deliveries were different among studies. These may be due to the differences in studied populations, studied designs and definitions.

In this study, the excessive-weight pregnant women had increased risk of having preterm delivery when compared with the normal-weight group with statistic significant (odds ratio 1.53, 95%CI 1.04-2.27). This result was similar to the study from Jared M. and colleagues.<sup>(15)</sup> However, some reports did not agree with this result.<sup>(7,14,16)</sup>

In this study, the incidence of post term delivery was increased when compared with the normal-weight group with statistic significant (odds

ratio 1.70, 95%CI 1.19-2.44). This result was similar to the report from Sebire and colleagues.<sup>(14)</sup> (odds ratio 1.72, 95%CI 1.23-2.42)

The incidence of cesarean delivery was significantly increased in the excessive-weight group when compared to the normal-weight group. (odds ratio 1.33, 95%CI 1.01-1.75). This result was in concordance with the study from Sebire and colleagues and many other studies.<sup>(14,16,18-20)</sup> The indication for cesarean delivery that had significantly increased was cephalopelvic disproportion (odds ratio 1.91, 95%CI 1.32-2.77).

Many studies had found an increase risk of having macrosomia in the excessive-weight pregnant women.<sup>(14,17,18,21)</sup> This was similar with this study (odds ratio 2.61, 95%CI 1.19-5.74). Other than race and genetic, the size of the neonate was also related with the nutrition.<sup>(21)</sup> This was because, in excessive-weight women, they had leucinel and triglyceride (fasting plasma triglyceride levels) increased.<sup>(32-34)</sup> Triglyceride will change into free fatty acids in maternal circulation and pass on to the fetus,<sup>(35)</sup> which subsequently will cause an excessive growth in the fetus. Macrosomia can led to many obstetrics and perinatal complications such as shoulder dystocia, increased obstetrics interventions, delivery injuries, low appgar score, stillbirth and the admission into neonatal intensive care unit.<sup>(16,17,19,20,21)</sup> However, this study did not find the correlation between excessive-weight pregnant women and the shoulder dystocia, delivery injuries, low Apgar score, stillbirth and the admission rate into the neonatal intensive care unit with statistic significant. The only correlation was an increase in the cesarean delivery which had stated above. This may be the main reason that provided advantageous for other complications.

In this study, the author did not find any correlation between excessive-weight pregnant women and postpartum hemorrhage, which was differ from the study from Sebire and colleagues.<sup>(14)</sup> Their report had found an increase in postpartum hemorrhage in the overweight and obese women (odds ratio 1.16 and 1.39 respectively).

The drawback of this study was that this design was a retrospective study. Some data may have been recorded wrongly, while some may have been lost. Some of the useful data were unable to collect such as occupation and household financial status, as these might indirectly represented on the nutrition of the patients. In the future, prospective study should have been done so that some variables can be controlled. Like the report from Siriraj hospital, where the diabetes patients were excluded from the study.

In conclusion, parturients with excessive-weight had more significant adverse pregnancy outcomes compared with those with normal weight.

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## ผลการตั้งครรภ์ของสตรีที่มีภาวะน้ำหนักเกินมาตรฐาน ในโรงพยาบาลมหาราชนครราชสีมา

สิริยา กิติโยดม, พิเศก ทองสวัสดิวงศ์

**วัตถุประสงค์ :** เพื่อเปรียบเทียบภาวะแทรกซ้อนที่เกิดขึ้นในมารดาและทารกของผู้คลอดในผู้คลอดที่มีน้ำหนักเกินมาตรฐานเทียบกับผู้คลอดที่มีน้ำหนักมาตรฐานในโรงพยาบาลมหาราชนครราชสีมา

**ชนิดของการวิจัย :** การวิจัยแบบ Retrospective Analytic

**วัสดุและวิธีการ :** ทบทวนเวชระเบียนของสตรีตั้งครรภ์ ที่มาฝากครรภ์และคลอดที่โรงพยาบาลมหาราชนครราชสีมา จำนวน 1350 คน ในช่วงเวลาตั้งแต่ เดือน ตุลาคม พ.ศ. 2547 จนถึง เดือน กันยายน พ.ศ. 2549 สตรีทุกราย ที่นำมาศึกษา ต้องมีบันทึกน้ำหนักตัวก่อนตั้งครรภ์ในเวชระเบียนชัดเจน ถ้าไม่มีบันทึกไว้ก็คัดออกจากการศึกษา ค่าครรภ์นี้มีมวลกายคำนวณโดยน้ำหนัก (กิโลกรัม) หารด้วยส่วนสูง (เมตร) ยกกำลังสอง โดยแบ่งเป็น 2 กลุ่ม กลุ่มศึกษาได้แก่ สตรีตั้งครรภ์ที่มีค่าครรภ์นี้มีมวลกาย 25 กิโลกรัมต่อตารางเมตรขึ้นไป และกลุ่มควบคุมได้แก่ สตรีตั้งครรภ์ที่มีค่าครรภ์นี้มีมวลกาย 20 ถึง 25 กิโลกรัมต่อตารางเมตร ทำการรวบรวมข้อมูลต่าง ๆ เกี่ยวกับข้อมูลทั่วไป ภาวะแทรกซ้อนก่อนคลอด ข้อมูลการคลอด วิธีการคลอด การแทรกแซงระหว่างคลอด ความเจ็บป่วยของผู้คลอด น้ำหนักแรกคลอดและผลลัพธ์ของทารก และบันทึกข้อมูลในแบบบันทึกข้อมูลที่จัดทำขึ้น จากนั้นจึงนำข้อมูลที่ได้ไปวิเคราะห์

**ผลการศึกษา :** ความชุกของผู้คลอดที่น้ำหนักเกินมาตรฐานเท่ากับร้อยละ 16.18 โดยมารดาที่น้ำหนักมาก (BMI25-29.99) เท่ากับร้อยละ 11.67 ส่วนมารดาที่อ้วน (BMI>30) เท่ากับร้อยละ 4.5 พบว่าเมื่อเทียบกับกลุ่มควบคุม ในกลุ่มศึกษามีอัตราการเกิดภาวะความดันโลหิตสูงขณะตั้งครรภ์สูงขึ้น ภาวะเบาหวานขณะตั้งครรภ์สูงขึ้น การคลอดก่อนกำหนดสูงขึ้น การคลอดเกินกำหนดสูงขึ้น อัตราการผ่าตัดคลอดบุตรสูงขึ้น อัตราของการที่ศีรษะทารกไม่ได้สัดส่วนกับอุ้งเชิงกรานสูงขึ้น และอัตราของการที่ทารกมีน้ำหนักแรกเกิดตั้งแต่ 4,000 กรัมสูงขึ้น อย่างมีนัยสำคัญทางสถิติ

**สรุป :** ในสตรีตั้งครรภ์ที่มีน้ำหนักก่อนการตั้งครรภ์เกินมาตรฐานจะมีโอกาสเกิดภาวะความดันโลหิตสูงขณะตั้งครรภ์สูงขึ้น ภาวะเบาหวานขณะตั้งครรภ์สูงขึ้น การคลอดก่อนกำหนดสูงขึ้น การคลอดเกินกำหนดสูงขึ้น อัตราการผ่าตัดคลอดบุตรสูงขึ้น อัตราของการที่ศีรษะทารกไม่ได้สัดส่วนกับอุ้งเชิงกรานสูงขึ้น และอัตราของการที่ทารกมีน้ำหนักแรกเกิดตั้งแต่ 4,000 กรัม สูงขึ้นได้มากกว่าสตรีตั้งครรภ์ที่มีน้ำหนักก่อนการตั้งครรภ์อยู่ในเกณฑ์ปกติ อย่างมีนัยสำคัญทางสถิติ ผู้คลอดที่มีน้ำหนักเกินมาตรฐานมีผลลัพธ์การตั้งครรภ์ที่ไม่ดีมากกว่าผู้คลอดที่มีน้ำหนักปกติ