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# Weight gain restriction during pregnancy is safe for both the mother and neonate

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Short running title: Weight gain restriction during pregnancy

#### Abstract

The objective of this study was to investigate whether pregnancy, delivery and neonatal outcome among obese pregnant women who took part in an intervention study for weight restriction differed from a group of obese pregnant women attending regular antenatal care. The intervention group consisted of 155 obese pregnant women and 193 obese pregnant women who formed a control group. We found that a weight gain restriction of less than 7 kg during pregnancy is safe for both the mother and the neonate.

Key words: pregnancy, obesity, weight gain, intervention, outcome.

#### Introduction

The prevalence of pre-pregnancy obesity is increasing (1). Obesity is associated with elevated risks for complications during the pregnancy and delivery for both the woman and her fetus (2). Recommendations for pregnant obese women's weight gain vary and are a topic for current debate. The American Institute of Medicine recommends a gestational weight gain of at least 6.8 kg (3), while recent data from a Swedish study (4) found an optimal weight gain of less than 6 kg for obese women. Kiel et al (5) showed that the degree of gestational weight gain associated with minimal risk for preeclampsia, cesarean delivery, large-for-gestational age (LGA) or small-for-gestational age (SGA) births collectively was different for each maternal obesity class. They suggested that this minimal risk corresponded to a weight gain of 4 – 11 kg for class I obese women, a weight gain of 0-4 kg for class II obese women, and a weight loss of 0-4 kg for class III obese women. Some other studies have shown an association between gestational weight gain and increasing body mass index (BMI) during the pregnancy and obstetric and neonatal outcome (6-9). Low gestational weight gain, i.e. less than 8 kg, decreases the risk for adverse outcomes like preeclampsia, cesarean section, instrumental delivery and children born LGA, but increases the risk for children born SGA and low birthweight infants (6, 8). High gestational weight gain and increase in BMI category are, on the other hand, associated with increased risk of severe complications (6, 8, 9). Furthermore, even a modest increase of BMI, between the first and the second pregnancy, could result in adverse pregnancy outcome (10, 11).

Earlier studies have focused on preventing excessive gestational weight gain by providing an intervention with education and behavioral strategies to normal, overweight and obese women. The results vary and are not very promising (18, 19, 21). It is so far also unclear whether an intervention program for controlling weight gain may have an effect on pregnancy and delivery outcome. In a recent intervention study aiming to minimize obese women's total

weight gain to less than 7 kg during pregnancy, we found that the women who received a structured motivational and behavioral treatment combined with regular physical exercise had a significantly lower weight gain compared with a control group of obese pregnant women who received regular antenatal care (12). There was no difference in outcome between the intervention group and the control group regarding birthweight, gestational age and mode of delivery. The aim of this study was to further explore whether this intervention program for controlling weight gain could diminish the incidence of pregnancy-, delivery- and neonatal complications in comparison with the control group.

#### Material and methods

For detailed description of this prospective, controlled intervention study with a control group, the intervention program itself and the study participants, see Claesson et al (12). *Index group* 

All obese pregnant women consecutively registered at the antenatal care clinics in the city of Linköping and the surrounding area, during a period of 24 months, were approached. The exclusion criteria were inability to understand Swedish, a pre-pregnant diagnosis of diabetes, thyroid dysfunction or a psychiatric disease treated with neuroleptic drugs. Of the eligible women a total of 155 obese women (67.4 %) accepted and completed the intervention.

### Control group

To constitute a control group, all obese pregnant women consecutively registered at the antenatal care clinics in two nearby cities and the surrounding areas, were approached during the same time period. The exclusion criteria were the same as for the index women. Of the eligible women, 193 women accepted and completed the participation (50.1 %). There were no differences between the intervention and control group regarding age, parity, marital status, smoking, BMI and occupation, but a significant difference in socio-economic status (12).

#### Intervention

The intervention program was based on a number of extra visits to a specially trained midwife. The corner stone in the program was a motivational interview/talk in early pregnancy (12), with the aim of motivating the obese pregnant woman to change their behavior and to obtain information relevant to their needs. The obese women in the control group attended the routine antenatal care program.

All data related to pregnancy, delivery and the puerperium were registered in the standardized and identical Swedish antenatal pregnancy, delivery, and neonatal records. The data were manually extracted from the records. Large-for-gestational age (LGA) was defined as a birthweight at least 2 SD above the mean weight for the gestational length and small-for-gestational age (SGA) was defined as a birthweight at least 2 SD below the mean weight for the gestational length.

All analyses were performed using the SPSS program, version 14.0 (SPSS Inc., Chicago, IL). The study was approved by the Human Research Ethics Committee, Faculty of Health Sciences, Linköping University.

### Results

Maternal and neonatal complications are shown in Table I. There was a tendency towards fewer cases of preeclampsia in the intervention group, compared with the control group (p= 0.055). A sub- analysis was done among women whose weight gain was less than 7 kg and revealed no differences between the two groups. Regarding the incidence of preterm contractions, lumbar and pelvic pain or hyperemesis, there were no differences between the groups.

	<b>Intervention group (n = 155)</b>				Control group (n=193)				
	Complications		No Complications		Complications		No Complications		
	n	%	n	%	n	%	n	%	$p^*$
Maternal complications									
Preeclampsia	8	5.2	147	94.8	21	10.9	172	89.1	0.055
Gestational diabetes	7	4.5	148	95.5	10	5.2	183	94.8	0.775
Lumbar and pelvic pain	39	25.2	116	74.8	50	25.9	143	74.1	0.874
Preterm contractions	5	3.2	150	96.8	12	6.2	181	93.8	0.198
Hyperemesis	8	5.2	147	94.8	5	2.6	188	97.4	0.209
Prelabor rupture of membranes †	2	1.4	138	98.6	20	10.9	163	89.1	0.001
Shoulder dystocia ‡	0	0.0	120	100.0	1	0.6	153	99.4	0.377
Perineal tears ‡	11	9.2	109	90.8	8	5.2	146	94.8	0.199
Neonatal complications									
Child born large- for-gestational age	13	8.4	142	91.6	17	8.8	176	91.2	0.889
Child born small- for-gestational age	3	1.9	152	98.1	1	0.5	192	99.5	0.218
Apgar <7 at 5 minutes	5	3.2	149	96.8	4	2.1	189	97.9	0.494
Respiratory distress	2	1.3	153	98.7	2	1.0	191	99.0	0.825
Infection	5	3.2	150	96.8	2	1.0	191	99.0	0.148

#### Table I. Distribution of maternal and neonatal complications

\*  $X^2$ -test

† exclusive elective cesarean section

‡ exclusive elective cesarean and acute cesarean section

We found fewer cases of prelabor rupture of membranes in the intervention group (p=0.001). When a sub-analysis among those women whose weight gain was less than 7 kg was performed, the difference disappeared.

There were no differences in the frequencies of abruptio placenta, induction rates, use of oxytocin or epidural anesthesia, retained placenta, bleeding > 1000 ml, pre- and postterm delivery (data not shown). There were in total three cases of fetal death of which two in the intervention group. Neonates from both groups, whose mothers weight gain was less than 7 kg, were analyzed separately and with no change of outcome. Parity did not influence the obstetric outcome results in the two study groups (data not shown).

#### Discussion

In this prospective case –control study for obese women with or without a specific intervention for weight control during pregnancy we found a tendency of fewer cases of preeclampsia and also fewer cases of prelabor rupture of membranes in the intervention group compared with the control group. Separate analyses among women who had gained less than 7 kg showed no differences regarding pregnancy, delivery and neonatal outcome irrespective of intervention or not. A low weight gain among obese women did not seem to be harmful concerning important obstetric and neonatal outcomes. Maternal obesity is associated with an increased risk of stillbirth (13). Some authors have found an increased risk of late fetal death with increasing body mass index and also an increasing excess risk of fetal death with advancing gestation (14, 15). In the present study the total number of stillbirths was 3/348, which is about three times the expected rate in Sweden (1) but in accordance with the rates for obese women presented by Kristensen et al (16). The intervention with a possibility to attend weekly aqua aerobic classes did not seem to reduce lumbar or pelvic pain. The incidence of hyperemesis was low in both groups of women. This is an interesting finding in line with a recent epidemiological study (17), which showed that obese pregnant women were less likely to use antiemetic drugs and to require hospitalization due to hyperemesis compared with normal-weight women.

Gestational weight gain among obese women and its association with different modes of delivery have also been investigated in large cohort studies with conflicting results (6, 8, 9). Cedergren (8) found a decreased risk of cesarean and instrumental delivery for obese women with weight gain less than 8 kg, but an increased risk for cesarean section with a weight gain more than 16 kg, which is in accordance results from with Karibu et al. (9). However Tsukamoto et al. (6) could not find any differences in the incidence of cesarean delivery between different weight-gain categories. In two earlier intervention studies on pregnant obese women no differences in the cesarean section rate could be detected (18, 19). In our study population there were no differences between the groups in the rates of planned as well as acute cesarean sections and instrumental deliveries (12). We found fewer cases of prelabor rupture of membranes in the intervention group compared with the control group, which is an interesting finding. Weiss et al. (20) also investigated prelabor rupture of membranes but found no difference between obese and non-obese pregnant women

Other intervention studies among overweight and obese pregnant women have also evaluated birthweight and gestational age at delivery as outcome variables (18, 19, 21). No differences were found between the intervention- and control groups, which are in line with our findings (12). We also investigated infant's birthweights and other possible differences in neonatal outcome, in relation to the mother's weight gain during pregnancy, irrespective of the group to which they belonged. No correlation could be demonstrated. In conclusion, this structured motivational and behavioral treatment combined with regular physical exercise did not affect pregnancy-, delivery- and neonatal outcomes. The most interesting finding is that weight gain restriction of less than 7 kg during pregnancy is safe for both the mother and the neonate.

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#### References

1.<a href="http://www.socialstyrelsen.se/NR/rdonlyres/70A20A7A-F6A9-45DE-97FC-7BF15BFE299C/12347/2008425\_rev2.pdf">http://www.socialstyrelsen.se/NR/rdonlyres/70A20A7A-F6A9-45DE-97FC-7BF15BFE299C/12347/2008425\_rev2.pdf</a>. Official Statistics of Sweden, Statistics – Health and Diseases, Pregnancies, deliveries and newborn infants, The Swedish Medical Birth Register 1973–2006. 2008 [updated 2008; cited]; Available from.

2. Cedergren M. Maternal morbid obesity and the risk of adverse pregnancy outcome. Obstet Gynecol. 2004;103:219-24.

3. Institute of Medicine Nutritional Status During Pregnancy, Weight Gain and Nutrient Supplement. Washington, DC: National Academy Press; 1990.

Cedergren MI. Optimal gestational weight gain for body mass index categories.
 Obstet Gynecol. 2007 Oct;110(4):759-64.

5. Kiel DW, Dodson EA, Artal R, Boehmer TK, Leet TL. Gestational weight gain and pregnancy outcomes in obese women: how much is enough? Obstet Gynecol. 2007 Oct;110(4):752-8.

Tsukamoto H, Fukuoka H, Inoue K, Koyasu M, Nagai Y, Takimoto H.
 Restricting weight gain during pregnancy in Japan: a controversial factor in reducing perinatal complications. Eur J Obstet Gynecol Reprod Biol. 2007 Jul;133(1):53-9.

 Stotland NE, Cheng YW, Hopkins LM, Caughey AB. Gestational weight gain and adverse neonatal outcome among term infants. Obstet Gynecol. 2006 Sep;108(3 Pt 1):635-43.

8. Cedergren M. Effects of gestational weight gain and body mass index on obstetric outcome in Sweden. Int J Gynaecol Obstet. 2006 Jun;93(3):269-74.

9. Kabiru W, Raynor BD. Obstetric outcomes associated with increase in BMI category during pregnancy. Am J Obstet Gynecol. 2004 Sep;191(3):928-32.

10. Villamor E, Cnattingius S. Interpregnancy weight change and risk of adverse pregnancy outcomes: a population-based study. Lancet. 2006 Sep 30;368(9542):1164-70.

11. Linne Y, Rossner S. Interrelationships between weight development and weight retention in subsequent pregnancies: the SPAWN study. Acta Obstet Gynecol Scand. 2003 Apr;82(4):318-25.

12. Claesson IM, Sydsjo G, Brynhildsen J, Cedergren M, Jeppsson A, Nystrom F, etal. Weight gain restriction for obese pregnant women: a case-control intervention study.BJOG. 2008 Jan;115(1):44-50.

13. Chu SY, Kim SY, Lau J, Schmid CH, Dietz PM, Callaghan WM, et al. Maternal obesity and risk of stillbirth: a metaanalysis. Am J Obstet Gynecol. 2007 Sep;197(3):223-8.

14. Nohr E, Hammer Bech B, Davis M, Frydenberg M, Brink Henriksen T, Olsen J.Prepregnancy and fetal death. A study wiyhin the Danish National Birth Cohort. ObstetGynecol. 2005;106:250-9.

Cnattingius S, Bergström R, Bergstrom R, Lipworth L, Kramer M.
 Prepregnancy weight and the risk of adverse pregnancy outcomes. N Engl J Med.
 1998;338:147-52.

16. Kristensen J, Vestergaard M, Wisborg K, Kesmodel U, Secher NJ. Prepregnancy weight and the risk of stillbirth and neonatal death. BJOG. 2005 Apr;112(4):403-8.

17. Cedergren M, Brynhildsen J, Josefsson A, Sydsjo A, Sydsjo G. Hyperemesis gravidarum that requires hospitalization and the use of antiemetic drugs in relation to maternal body composition. Am J Obstet Gynecol. 2008 Apr;198(4):412 e1-5.

18. Artal R, Catanzaro RB, Gavard JA, Mostello DJ, Friganza JC. A lifestyle intervention of weight-gain restriction: diet and exercise in obese women with gestational diabetes mellitus. Appl Physiol Nutr Metab. 2007 Jun;32(3):596-601.

19. Gray-Donald K, Robinson E, Collier A, David K, Renaud L, Rodrigues S. Intervening to reduce weight gain in pregnancy and gestational diabetes mellitus in Cree communities: an evaluation. CMAJ. 2000 Nov 14;163(10):1247-51.

20. Weiss JL, Malone FD, Emig D, Ball RH, Nyberg DA, Comstock CH, et al. Obesity, obstetric complications and cesarean delivery rate--a population-based screening study. Am J Obstet Gynecol. 2004 Apr;190(4):1091-7.

21. Olson CM, Strawderman MS, Reed RG. Efficacy of an intervention to prevent excessive gestational weight gain. Am J Obstet Gynecol. 2004 Aug;191(2):530-6.