Ph.D. Thesis:

The clinical effects of lifestyle intervention during pregnancy in obese women

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Summary in English

Maternal obesity has become highly prevalent worldwide and is associated with adverse outcomes for mother and infants. As one of the most common risk factors, maternal obesity remains a significant obstetric challenge and more than 12% of Danish pregnant women are obese (Body Mass Index $\geq$30 kg/m^2). Pregnancy offers the opportunity to manage or prevent obesity, but there is a lack of intervention studies showing an effect on these problems.

The overall aim with this PhD thesis was to study the clinical effect of lifestyle intervention in Danish obese pregnant women. The thesis is based on a literature review, description of own studies and 3 original papers (I, II and III). All results are based on a randomized controlled trial conducted among 360 obese pregnant women in Odense University Hospital and Aarhus University Hospital, Skejby between October 2007 and November 2010.

The intervention consisted of two major components: dietary counseling and physical activity. Dietary counseling included dietary advice and individually estimated energy requirements. Women in the intervention group were equipped with a pedometer for motivation. Furthermore they had a free full time membership in a fitness center for six months including closed training classes one hour weekly and coaching in minor groups. Both the intervention and the control group were followed during pregnancy with additional measuring of weight, blood pressure, fitness test, and fasting blood samples. A follow-up was performed six months postpartum.

In the first paper the effect of intervention on gestational weight gain (GWG) and five major obstetric and neonatal outcomes was studied: Gestational diabetes, preeclampsia, cesarean

section, large for gestational age infants and admission to neonatal intensive care unit. It was found that 1) lifestyle intervention resulted in a significantly lower GWG (7.0kg versus 8.6kg). 2) Adherence to weight gain according to American Institute of Medicine (IOM) recommendations was higher in the intervention group compared with the control group. 3) Though GWG was lower in the intervention group the clinical obstetric and neonatal outcomes were similar in the two groups.

In paper II the aim was to study the effect of restricted GWG on postpartum weight retention (PPWR) six months after birth and to determine the effect of breastfeeding on PPWR. It was found that 1) a lower percentage of women from the intervention group had retained weight after six months as compared to the control group, however the difference was not statistically significant. 2) Women with GWG within recommendations ($\leq$9kg) had significantly lower PPWR compared to women exceeding 9kg. 3) Full breastfeeding for six months was negatively associated with PPWR.

Paper III evaluated the metabolic effects of lifestyle intervention and restricted GWG in obese pregnant women. Fasting lipids, insulin, and glucose was measured. Insulin resistance was estimated (HOMA-IR), and 2h oral glucose tolerance test performed on 3 occasions during pregnancy. The physiological decrease in insulin sensitivity during pregnancy was less pronounced in the intervention group compared to control women. No significant difference in fasting blood glucose or glucose level after OGTT was measured. Lipids increased during pregnancy, but there was no difference between intervention and control group.

Lifestyle intervention in obese pregnant women has the potential to improve feto-maternal outcomes by limiting GWG and improve maternal metabolism. In the LiP study, only a limited positive effect was found concerning clinical and biochemical effects of lifestyle intervention. This might be due to the different methodological considerations concerning study power, the control group being motivated for lifestyle changes themselves or the intervention might not have been of sufficient nature, duration or intensity. So far there is no sufficient scientific evidence that intervention improves clinical obstetric outcomes or neonatal health. Importantly, there has been no reporting of adverse effects of the performed interventions as well.

Prevention and intervention should ideally be addressed prior to conception. But relevant intervention should also be considered for women entering pregnancy already being obese. This is an issue of public health and antenatal health care is one of them. However, lack of highest scientific evidence should not justify healthy lifestyle changes in pregnancy for being delayed nor implemented in obese women.