

## **Weight gain and restrictive eating in pregnancy:**

### **A study of the effects of the Protective Edge military conflict on weight gain in pregnancy of Israeli women**

September 2015

#### **1. Introduction**

Many studies show that stress can have significant effects on the health of a pregnancy for both mother and child. High levels of stress during pregnancy are particularly associated with preterm delivery (PTD) and with low birth weight (LBW) of the newborn (Hobel, Goldstein and Barrett, 2008). Recent animal research shows that the negative effects of stress are even more significant as they can be passed on to further generations through epigenetic mechanisms: Yao et al (2014) exposed three generations of rats to stress during their pregnancy and found a wide range of negative effects that included reduced length of pregnancy, excessive maternal weight gain and high blood glucose levels, and inappropriate maternal behavior. Offspring showed restricted growth and developmental retardation with the third generation of stress exposed rats being the most affected. The researchers discovered miRNA changes in various tissues in the exposed rats, a finding that provided a mechanism to strengthen their hypothesis that stress in pregnancy is a causative factor in many adverse health findings that may persist throughout subsequent generations.

Despite recent research to investigate the different mechanisms in which stress could affect pregnancy and offspring health outcomes, the picture is far from complete. Stress is thought to lead to overeating and there are two different models that have been tested empirically (Greeno and Wing, 1994). The first model that has been assessed primarily in animal studies proposes that stress will increase eating in all organisms. In keeping with this model Torres, Susan and Nowson (2011) describe a mechanism in which chronic stressors cause an HPA axis response elevating cortisol levels. This in turn leads to an increase in nutrient dense food intake and weight gain. Cortisol may also contribute to an increase in abdominal fat. The second model focuses on individual differences in learning history, attitudes or biology causing a psychological or physical change in highly vulnerable people who react to stress by eating more. Tan and Chow (2014) found that eating dysregulation was the factor that mediated this association between stress and emotional eating. Some individuals (low in eating regulation capability) were less capable of responding to internal triggers of hunger or satiety and those same individuals tended to engage in emotional eating in response to stress. In a closer look at

the concept of emotional eating and its effects on unhealthy snack consumption, Adriaanse, Ridder and Evers (2009) found that the unhealthy snacking was not predicted by emotional eating but by habits and by restrained eating. Dietary restraint (attempted restriction of food in order to lose weight) has been identified as a contributing factor to overeating and eating disorders (Herman, Polivy, & Leone, 2005) and is the best predictor of stress induced eating, particularly in women (Greeno & Wing, 1994).

There is a substantial amount of research devoted to correct weight gain and the problems that can ensue from excess weight gain in pregnancy. Boney et al (2005) found a correlation between maternal weight gain, gestational diabetes and infant birth weight and the incidence of metabolic syndrome in older children. Langford et al (2011) found that overweight women who gained >25lbs were 1.7 times as likely to have preeclampsia, c-section, macrosomia and LBW. The authors conclude that patient education to remain within the recommended IOM guidelines should be one of the goals of obstetric care. However, some women have difficulty staying within the parameters of this goal and indeed continue to overeat in pregnancy. Both stress and restrained eating patterns may be factors involved in this difficulty. We hypothesize that stress in pregnancy may be associated with excess weight gain particularly amongst those women who have a tendency to restrictive eating pattern.

While previous studies have found a link between either stress and overeating in non-pregnant humans, or between stress and adverse pregnancy outcomes in animals, the authors did not find any relevant literature on the connection between all of these factors - stress, overeating and pregnancy outcomes in humans. The gap in this field of research may be due to the difficulties in operationalizing stress in pregnant humans. Lab based stress studies usually expose animals or humans to a short term aversive experience but this method would be unacceptable in pregnant humans for ethical reasons.. A more common approach to measurement of stress in humans is to ask the people how stressed they feel (Cohen, Kamarck & Mermelstein, 1983). However, this is also hard to apply to a protracted period such as the length of a pregnancy. Therefore, in order to test our hypothesis regarding stress and weight gain in pregnancy we looked for populations who had been subjected to stress over a substantial period in their pregnancy. People in war or continuous terror situations serve as an appropriate study population. In July and August 2014, the "Protective Edge" military conflict between Israel and Gaza provided an example for the study of the effect of stress on pregnant women. During this wartime period, the Israeli population had been subjected to missile attacks with varying degrees of frequency dependent on location in the country. Location also determined time available to seek cover in a protected area so that women