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Obesity and Maternal Weight Gain

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Abstract Pregnancy is a time when women may be receptive to health advice and interventions. This article considers the evidence for interventions to affect body weight in obese and overweight women delivered either or both pre- and post-natally. The increasing prevalence of obesity across the adult population has affected many sectors of society and increasing numbers of obese and overweight pregnant women are evident. Obesity in pregnancy is frequently associated with excessive gestational weight gains and increases the risk of developing adverse pregnancy outcomes in terms of both maternal and infant health. Pregnancy has been described as providing "a teachable moment" when women may be receptive to health advice. Some lifestyle approaches, largely incorporating strategies to alter dietary and physical activity to challenge excess body weight before and during pregnancy, have been developed and tested. While a few have shown promise with limited success in reducing body weight prior to pregnancy and post-natally, and minimising excessive weight gains during pregnancy, all interventions are not sufficiently robust and effective to justify routine inclusion in clinical practice. Weight management pre- and post-natally appears largely overlooked in usual care.

Keywords Pregnancy · Body mass index · Optimal gestational weight gain · Weight control strategies

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Introduction

This article aims to judge the value of interventions to affect body weight in obese and overweight women. These have been delivered either pre-natally or in some cases over the post natal period also. It is increasingly evident that the lifestyle and health practices of women pre and post pregnancy can impact markedly on their own health and that of their foetus. Pregnancy has long been associated with "blooming health" and uniquely, is an occasion when positive encouragement is frequently given to women in response to their weight gain. This is probably an exception across the life course. Given the worldwide epidemic of obesity weight gain in pregnancy has more frequently become excessive [1]. Pregnancy can often provide a positive setting for individuals to re-evaluate their health, and potentially offers an opportunity for health improvement. Evidence is accruing that preparing for pregnancy could offer real health benefits to both maternal and infant health, particularly in the context of the current obesity epidemic. However, this opportunity appears only available to few, as in the UK only around to 50 % of all pregnancies are reported as planned, and there were close to 800,000 live births in the UK in 2012 [2].

Importance of good Maternal Health before and during Pregnancy

Good maternal health is crucial to reduce the chances of adverse outcomes such as gestational diabetes GD, miscarriage, pre-eclampsia, still birth, macrosomia caesarean section for the mother, and abnormal birth weight and increased risk of obesity in infancy for the unborn child [3].

Abstinence from smoking and alcohol consumption together with regular physical activity has long been advocated to pregnant women. Historically, dietary advice for optimal health in pregnancy has focussed on healthy eating with an

emphasis on the maintenance of good health in terms of dietary intakes [4]. Clinical guidelines for pregnancy [3] advocate alcohol in the first twelve weeks of pregnancy should be avoided completely and intakes throughout the remainder of pregnancy ought to be strictly limited, due to potential negative effects on foetal health [5]. Furthermore, as alcohol provides 7 kcal per g is a concentrated source of energy, and even moderate consumption may favour increased energy intakes and encourage excessive weight gain.

Weight gain in Pregnancy

Given the epidemic of obesity, specific guidelines for optimal weight gain throughout pregnancy are justified. Maternal obesity in the UK doubled from 7.6 to 15.6 % between 1989 and 2007 [1] something which has now been replicated across the developed world. The USA developed the first guidelines for weight gain in pregnancy and these have been revised [6]. Given the lack of others, IOM guidelines are probably most widely recognised and utilised internationally. These guidelines highlighted the dearth of information on interventions, with the IOM guidelines informed only by observational studies. The weight gain referred to by the guidelines is not solely due to increases in adipose tissue, but from weight gain from the placenta, foetus and other associated tissues. The IOM were the first organisation who recognised a need for body mass index BMI specific weight gain guidance. These guidelines are increasingly used in clinical practice internationally). Those women underweight at conception should gain 28-40 lb, those in the healthy weight BMI zone, gain between 25-35 lb and this falls with overweight (BMI 25-30 kg/m^2) advocated to gain between 15-25 lbs across their entire pregnancy, while the recommended weight gain falls to between 11-20 lbs in those obese at conception [6].

Consequences of Excessive Gestational Weight gain

There are numerous negative health consequences, more evident in the case of someone already obese at conception. The consequences of excessive weight gain are considerable, and negative health effects, resulting from GD for example, can persist into future generations [7]. Fertility is often reduced by a raised BMI, and this may reduce chances of future pregnancies for an obese mother [8]. Deliveries often become complex, requiring interventions such as the induction of labour and other medical interventions more frequently in obese rather than non-obese [3] women. Analyses have quantified the level of risk and shown that even moderate elevations in maternal BMI were associated with a 20 % increased risk of foetal death. These findings may reflect worse-case scenario as the comparator to estimate risk was a BMI of 20 kg/m [9].

Current Practice

According to IOM guidelines [6] the aim for a pregnant woman who is obese, BMI 30 kg/m^2 is to minimise their gestational weight gain. However, counter intuitively, recommended UK clinical practice is not to weigh pregnant women, beyond their week 12 booking appointment [3]. The pros and cons of regular weighing throughout pregnancy have been carefully considered but at present regular weighing is advocated only for those at risk of insufficient weight gain, which of course may compromise a pregnancy and infant birth weight. However a similar argument, but in reverse, could be made for regular weighing of overweight and obese pregnant women. Researchers have however been examining this issue, a small study in the UK discovering that regular weighing across pregnancy by community midwives was acceptable to overweight women, did not cause them anxiety, but encouraged them to think about their weight [10].

Health professionals who deliver ante-natal care appear ideally placed to expand their routine contacts to incorporate and address concerns associated with weight issues. This is particularly true given the mounting evidence that links high weight gains with development of GD among other negative maternal and foetal health consequences [11]. Midwives though have reported unease about raising the issue of a women's weight during their consultations. The reasons commonly reported in UK and Australian studies relate to compromising their clinical relationship with their patient, and feeling insufficiently trained to manage any weight related issues [12, 13]. A recent systematic review [14] of interventions to change maternity healthcare showed few interventions have been carried out with an aim to upskill midwives to deal well with weight management in pregnancy. The majority of interventions have not addressed the needs of health care professionals, in particular midwives, instead focussed on approaches to change the behaviour of patients [14].

Furthermore, many pregnant women report being unconcerned about their weight gain in pregnancy, despite many having already gained weight in previous pregnancies and failed to return to their pre-pregnancy weight [15]. This study found over 80 % of participants expressed dissatisfaction with their current weight, but were still resistant to dietary strategies to avoid excessive weight gain [15]. Obese pregnant women reported a preference for increasing their physical activity which they recognised as being valuable in pregnancy [16]. However, it is likely that self-assessment of fitness levels is unrealistic and the feasibility of undertaking through increased activity is improbable, especially as their pregnancy progressed. It may indirectly suggest that overweight pregnant woman either felt they had sufficient knowledge of "healthy eating", or considered pregnancy a time when caution with weight gain, may be not required.

Pre-conception Interventions

The physiological stress imposed by pregnancy is often elevated in proportion to BMI [17]. One solution could be an intervention to improve the health and fertility of women pre-conceptually by achieving weight loss in those whose BMI is elevated. However, a lack of evidence in this area is likely to reflect difficulties regarding the feasibility of any prenatal intervention, which no doubt will include identifying women who are planning a pregnancy, and perhaps more tellingly be willing to postpone their attempts at conception, until their weight has been reduced.

A recent study [18] delivered using the internet was moderately successful in women who were preparing for pregnancy. It aimed to address behaviour related to all aspects of maternal health. Despite an attrition rate of over half of all participants after the six month intervention, increased compliance with folic acid supplementation and reduction in alcohol intakes were seen, though no impact on obesity and or body weight, was evident. An overall improvement in the knowledge of participants concerning pre-conceptual health to avoid adverse pregnancy outcomes was shown but this was not universal. Those who completed the programme were more likely to be graduates in employment, perhaps the group who were easiest to engage. However, this framework is attractive, and offers promise to identify those considering pregnancy and improve their preparation for this.

Pre conceptual weight management interventions may have a role in the context of assisted conception. Those seeking assisted conception are a diverse group, inherently motivated to pursue health improvement. The literature in this area is very weak overall, but encouragingly improvements in menstrual patterns and reductions in miscarriage rates have been observed [19•]. Evidence suggests that clinicians should exercise caution with this patient group in the approaches used to reduce body weight. Radical approaches such as weight loss surgery and very low calorie diets, (providing<800 kcal daily) to achieve weight loss require careful consideration. These data are sufficient to support the clinical statement that advice to lose weight prior to assisted conception is justified [19•]. As such this area deserves further evaluation, and ideally future prospective randomised studies to strengthen evidence in this field.

Impact of Pregnancy and Breast Feeding on Energy Requirements

The myth that a pregnant woman is actually eating for two is an old one, probably reflecting times of food scarcity, rather than the current situation of excessive food availability. In actual fact there is only a small increase in energy requirements, of around 191 kcal per day. This occurs largely in the third trimester, coinciding with the period of rapid weight gain [20].

For those who choose and are able to breast feed, the additional energy needs for lactation are close to 502 kcal /day. These estimates are based on requirements for those whose BMIs are in excess of or below the midpoint BMI of 22.5 kg/m^2 [20]. Whilst it is recognised that breast feeding has great benefits for maternal and infant health, and should be advocated in all cases its role in offering benefits in weight control is unclear. It is difficult to distinguish from other factors predicting maternal weight loss post-natally such as low junk food intake, regular physical activity, healthy food choices and hormonal contraception [21].

How Can the Excessive Gestational Weight Gain be Challenged?

Given the recognised risks associated with being overweight or obese in pregnancy, there have been a number of studies which have looked at formal approaches to weight management. Weight management in pregnancy is different, and weight loss is not advocated [1]. A stalling of weight gain in the overweight/obese and an increase in appropriate physical activity, such as walking etc. are the only tools that are available and safe to utilise.

Such an intervention was reported in a randomised controlled study in which women with a BMI of close to 35 kg/m^2 were recruited at 15 weeks gestation [21]. Treatment allocation was either to usual care or to a ten hour one-to-one intervention delivered by a dietitian. Dietary advice focussed on consuming low fat foods which were eu-caloric with the individuals estimated energy requirements. This was in the form of advice and a meal plan was also included. The intervention group minimised their gestation weight gain to ~7 kg, while the control group gained ~13 kg. Glucose metabolism was also superior to the control subjects and this was reflected in their lower HBA1c. Similar positive findings were seen in other small studies, including one which showed no negative effects from weight management which imposed a moderate energy deficit of 500 kcal per day along with advice to take regular physical activity. Importantly no negative effects on breast feeding and infant weight were observed, as this is something that practitioner's report as a potential disadvantage of weight management post-natally [22].

The recently completed randomised controlled LIMIT study appeared to follow the ideal approach to challenge excessive maternal weight gain in obese or overweight pregnant women [23•]. Comprehensive dietary advice and plans for appropriate physical activity were delivered using current guidelines and by expert health professionals to deliver and reinforce the advice. It was a light touch intervention which offered women with a singleton pregnancy whose BMI was

≥25 kg/m^2 or over, guidance and support to minimise excessive weight gain. Primary outcome was the delivery of a baby over the 90th centile weight, with a number of secondary outcomes covering maternal weight and co-morbidities, including delivery methods. Despite this intervention there were no reported differences in babies' weight in either group at birth. Upon reflection, the authors suggested that perhaps the intervention as delivered was insufficiently intensive or to "light touch" and/or that alterations in lifestyle implemented by women were insufficient to impact on the outcome of birth weight >90th centile for gestation and sex gain. It is hoped that the ongoing complex lifestyle intervention to challenge excessive GWG, the "upbeat study" [24] will reduce occurrence of GD and the birth of large for gestational age babies.

In this challenging area, the majority of interventions have failed to show clinically important benefits on maternal or infant outcomes resulting from lifestyle interventions. Also of concern is the pilot work that has shown that accessing those pregnant women who are at high risk of negative excess weight related pregnancies who live in relative poverty can be even more difficult to achieve [25].

Conclusions

Nutritional advice is most often aimed at the pregnant women's dietary intake, with the aim of ensuring that she is consuming "sufficient foods" from all food groups to achieve the appropriate dietary reference value [26] or Scientific Advisory Committee on Nutrition target [20, 27]. There are opportunities to minimise energy intake, but within current clinical practice in the UK, there are no particular approaches that are regularly in use.

Prenatal care, such as initiating supplemental folic acid consumption, improving diet composition and reducing body weight where required are all attractive options to maximise maternal and foetal health. It would seem important that all women with a BMI 30 kg/m^2 should be advised by a trained health professional of the benefits of healthy eating and how this can best be put into practice. However, the impact of such advice on maternal weight gain is unclear, and given the increasing occurrence of obese and overweight pregnancy, it is likely that any impact from this will have been very limited. The negative effects of obesity and overweight on maternal and foetal health are well recognised. Management approaches pre-conceptually and post-natally, which follow current guidelines are valuable; however the major studies which have used robust study designs and comprehensive interventions to challenge excessive GWG have found only weak effects of the interventions at best. As a result it seems that additional interventions to emphasise diet and physical activity, beyond the general advice already given in a brief fashion, are not justified in clinical practice. At present there is insufficient evidence to incorporate these approaches in routine clinical practice.

Perhaps the period of pregnancy is too short to facilitate lifestyle changes, given it is most often 12 weeks into the pregnancy before women enter the care of the midwife and other professionals. It may be that the period between pregnancies is an opportunity that can be pursued with new mothers being recruited when attending their postnatal baby checks. Having said that, obesity and excess weight gain in pregnancy must be challenged, given the impact on health. Effective interventions must be sought and urgently.

Compliance with Ethics Guidelines

Conflict of Interest Catherine R. Hankey is employed by the University of Glasgow.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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