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Attitudes and awareness towards weight gain among normal weight and overweight pregnant women

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Abstract

Objectives: 1) evaluate the proportion who correctly classify- or misclassify maternal weight gain; 2) investigate weight gain attitudes, and 3) compare weight gain attitudes with weight gain recommendations by the Institute of Medicine (IOM), as well as background and lifestyle factors.

Methods: This is secondary analysis of cohort data collected as part of a prospective study of determinants of macrosomic infants in Norway (the STORKproject). The participants (n=467) answered a self-administered questionnaire, including report on maternal weight gain and attitudes towards weight gain, in mean gestation week 36.4 (SD=1.7). The women were also weighted (kg) at the hospital using a digital beam scale.

Results: A significant discrepancy was found between self-reported and measured maternal weight gain. About 76% reported to be satisfied with maternal weight gain while 24% were dissatisfied. Women reporting to be dissatisfied were significantly more likely to be sedentary, sick-listed, reporting poor eating habits and to be multiparous.

Conclusions: Most women reported to be satisfied with their maternal weight gain, but had gained excessively according to recommended weight gain ranges issued by IOM. Pregnant women may need targeted advice on their specific weight gain and impact of increased weight gain on health variables for mother and child.

Key words: Body Mass Index (BMI), excessive gestational weight gain, Institute of Medicine (IOM), maternal health; obesity; pregnancy

Introduction

Obesity is a significant health problem, and is a risk factor for many diseases, including coronary heart diseases, diabetes, depression and most types of cancers [1]. The International Obesity Task Force and the World Health Organization (WHO) report that over 1.1 billion adults and 155 million children are overweight or obese worldwide. Hence, prevention of increased body weight gain is an important public health issue in all age groups [1].

Pregnancy may be a risk period for significant weight gain in women, and maternal weight gain greater than recommended by the Institute of Medicine (IOM) [2] seems to be an important contributor to weight retention postpartum and later overweight and obesity amongst women [3]. In addition, several studies report multiple adverse outcomes related to obesity and excessive weight gain in pregnancy, including maternal hyperglycemia and risk of gestational diabetes mellitus [4], delivery complications, preterm birth and cesarean sections [5], as well as macrosomia and childhood obesity [6]. The economic cost of prenatal and postnatal care is increased for overweight mothers compared to normal weight mothers [7]. In addition, infants of overweight mothers are more often in need of neonatal intensive care than infants of normal weight mothers [8].

According to recommendations from IOM, approximately 40% of normal-weight and 60% of overweight women gain excessively during pregnancy [2]. Center for Disease Control and Prevention, have found that gaining in excess of the guidelines is more common than gaining within recommended levels (CDC, Pregnancy Nutrition Surveillance System. www.cdc.gov/PEDNSS/pnss_tables/pdf/national_table_20.pdf).

Although actual maternal weight gain has been studied, few research groups have reported on women's attitudes and satisfaction with maternal weight gain, including body changes during pregnancy. Further, weight gain is a result of many interacting causes, and a woman's misperception about her maternal weight status and pre-pregnant BMI, may increase the odds for excessive maternal weight gain. Hence, the specific aims of the present study were threefold: 1) evaluate the proportion of pregnant women who correctly classify or misclassify maternal weight gain; 2) investigate weight gain attitudes and compare weight gain attitudes with maternal weight gain, as well as weight gain below, within, or above the range recommended by the IOM, and 3) compare background and lifestyle factors with attitudes towards maternal weight gain and the IOM guidelines.

Methods

Participants

This is secondary analysis of cohort data collected as a part of a prospective study of determinants of macrosomic infants in Norway (STORK). The reporting of the study was conducted in agreement with the most recent STROBE guidelines (<http://www.strobestatements.org/index.php?id=2487>). Results from the main study have been published separately [9]. Study participants were recruited from 2002 and 2005 from the application form for birth at Rikshospitalet University Hospital, Oslo. Enrolment was limited to Scandinavian speaking women aged 18 years or older, > 14 weeks gestation with a singleton pregnancy and no known risks for adverse pregnancy outcomes. Exclusion criterion was pre-gestational diabetes due to the primary aim of the main study.

Of the 553 women enrolled in the parent STORK study, 467 (84.4%) received our supplementary self-administered survey. All the women signed informed consents, following the Helsinki declaration. The Regional Committee for Medical and Health Research Ethics, Southern Norway, Oslo, approved project and the complete data collection.

Assessment procedures and outcome measures

The survey used in the present study, and an ongoing cohort study (STORK) of pregnant women in Norway, was developed in 2001. It was initially designed to examine physical activity (PA) behaviour in pregnant women, as well as sedentary activities and perceptions of maternal weight. To our knowledge, no validated self-reporting questionnaire on PA and pregnancy existed when the data collection of STORK started in 2002. There was also scant knowledge about weight gain and level of PA and exercise during pregnancy. The survey was completed in the 3rd trimester (gestation week 36) to assess the situation before and during pregnancy. All the questions about total PA have been validated with a portable activity monitor and have been published in a separate article [10].

In the development of the survey it was important to minimize non-response. Hence, we had focus on keeping the questionnaire as short as possible, putting the questions in logical order, as well as using a simple and understandable language [11]. The survey started with questions about background information (e.g. age, pregnancy week, smoking habits, education, occupation), followed by assessment of health variables (e.g. height, weight, pre-pregnancy BMI, pregnancy complaints such as low back pain, pelvic girdle pain), daily life physical activity and sedentary behaviour (at work, transportation, household and sport/exercise). It was empathized to avoid leading questions, limit open-ended questions and to use simple rating scales and response option categories, but still include a relevant list of choices [11].

Totally, the questionnaire required about 10-15 minutes to complete and contained 53 questions. Some of the data in the current study are obtained from medical records (Rikshospitalet University Hospital). Hence, to better organize and administer (both questionnaire data and medical records), all included variables were categorized in three groups: 1) medical, 2) sociodemographic and 3) behavioural. In the present study medical factors included parity, height, weight, pre-pregnancy BMI, pregnancy complaints, gestation week at delivery, new-born birth weight (g), macrosomia (birth weight $\geq 4,000$ g) and reports of being sick-listed, adapted from questions asked in foregoing Scandinavian cohort studies in pregnant women [12]. Sociodemographic factors involved age, education, marital status and occupation. Behavioural factors were eating habits, daily smoking, physical activity (at home, occupational and commuting), as well as pre-pregnancy and 3rd trimester exercise, in addition to advice about health living, including exercise from health professionals. and background and health variables, including several detailed questions about physical activity level at work, in transportation, household, and leisure-time, as well as information on background and lifestyle factors.

Maternal weight gain and weight gain attitudes

The participants reported maternal weight gain in kg. In addition, the participants' weight gain was assessed electronically at the last clinic visit prior to delivery (week 37.0; SD 1.1). The weighing was done in light clothing and without shoes. Maternal weight gain was calculated as the difference between self-reported pre-pregnancy weight and measured body weight. Fifteen women had a pre-pregnancy BMI < 18.5 and 33 women had a pre-pregnancy BMI ≥ 30 . These women were categorized in two groups: BMI < 25 (underweight/normal weight) or BMI ≥ 25 (overweight/obese). Table 1 shows IOM recommendations for range of total gestational weight gain in singleton pregnancies, by pre-pregnancy BMI. Excessive maternal weight gain was defined as weight gain above given reference values [2]. Hence, cut off and upper limit for exceeding weight gain ranges, was 15.9 kg and 11.3 kg for participants categorized in group BMI < 25 (underweight/normal weight) and ≥ 25 (overweight/obese), respectively.

According to Eagly & Chaiken (1993), an attitude can be formed from a person's past and present and is defined as "a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor". In this study, we defined attitudes towards maternal weight gain as being satisfied /pleased with or dissatisfied/unpleased with present weight status (gestation week

36). Assessment of positive or negative weight gain attitudes were included as part of the health status section in the questionnaire: “Are you satisfied/pleased with your maternal weight gain so far, including body size and shape?” The responses were: “Yes, No or I do not know”.

The participants’ perception of daily diet was assessed by two similar questions, one asked retrospectively (pre-pregnancy) and one asked cross-sectionally: “How would you describe your eating habits, including making healthy nutritional choices? The response options were ranked from 1-5, with the following description: excellent, good, average, bad and very bad.

According to these five levels, we divided the women into two categories in the statistical analysis: healthy eating habits (excellent and good diet) and unhealthy eating habits (average, bad and very bad diet).

Statistical analysis

All statistical analyses were conducted with SPSS Statistical Software version 18.0 for Windows. Background variables are presented as frequencies, percentages or means with standard deviations (SD). The relationship between selected medical, socio-demographic and behavioural variables and attitudes towards weight gain were assessed by one-way ANOVA, independent ttests or Chi-square as appropriate. In addition, we compared weight gain satisfaction with a) total maternal weight gain, b) recommendations by the IOM (2) and weight gain ≥ 16 kg. To assess the relative importance of each of the background and lifestyle factors, multivariate logistic regression was performed. A p-value < 0.05 was considered statistically significant.

Results

The participants answered the survey in mean gestation week 36.4 (SD=1.7). Among the participants in the STORK study (n=553), 86 women did not receive or return the questionnaire. We have no data with respect to the reasons for non-participating (15.6%). The majority of the women were 30 years or older (71%), nulliparous (54%) and of high educational status (83%). Mean age and parity was 31.6 years (range 20-49) and 1.3 (SD 0.5), respectively. Twelve responders (2.6%) reported to be daily smokers in the 3rd trimester. In terms of pre-pregnancy BMI, 3.2% were underweight (BMI <18.5), 68.4% were normal weight (BMI 18.5-24.9), 21.3% were overweight (BMI ≥ 25 -29.9), and 7.1% were categorized as obese (BMI ≥ 30).

Maternal weight gain and weight gain attitudes

Women with high maternal weight gain (≥ 16 kg) tended to misclassify their maternal weight gain status significantly more often than women with lower maternal weight gain (< 16 kg). Maternal weight gain of ≥ 16 kg was self-reported among 21.8%. In contrast, 40.4% was categorized in this group at hospital weighing (p <0.001). No difference in underreporting of maternal weight gain was seen between overweight and obese (pre-BMI ≥ 25) and “normal weight-women” (BMI <25).

At the time the women answered the questionnaire, 76% reported to be satisfied with maternal weight gain, while 24% were dissatisfied. Mean weight gain was 12.5 kg (SD 4.5) and 18.0 kg (SD 4.8) in the two groups (p <0.001), respectively. Consistently, the proportion with high weight gain (≥ 16 kg) and exceeding the IOM recommendations was significantly lower in the group of women being satisfied with maternal weight gain compared to women being dissatisfied (Table 2). Pre-pregnancy BMI parameters were not related to low maternal weight gain satisfaction (p=0.70).

In total, mean weight gain was highest (14.2 kg, SD 4.8) among women with “normal body weight”, and lowest (12.8 kg, SD 5.8) among women classified as overweight or obese (p=0.01). Yet, significantly more overweight women gain above the updated IOM recommendations compared to normal weight women, due to lower weight gain range in this population (Table 1). According to self-

report, only 22% of the population perceived that they had gained excessively (“too much”). However, at the last weighing, the proportion for the overall group, exceeding and being within the updated IOM recommendations were 69.6% and 30.4%, respectively.

Gaining below the IOM 2009 recommendations was observed for 12.5% and 9% of overweight and obese women, respectively. Two women (one in each group) even lost weight (-1 kg) from pre-pregnancy to gestation week 37.

Comparison of background and lifestyle factors with maternal weight gain attitudes

The distribution of maternal weight gain attitudes, divided in two groups (satisfied and unsatisfied with weight status) and selected medical, socio-demographic and behavioural variables are presented in Table 3. As shown, several factors, including; sedentary behaviour, poor eating habits, being multiparous and sick-listed increased the likeliness of being dissatisfied with maternal weight. Women reporting to be dissatisfied were also significantly more likely to deliver a newborn with higher mean birth weight, as well as newborns with macrosomia (≥ 4000 g). In addition, they were more prone to report urinary incontinence (UI) and pelvic girdle pain (PGP). However, when investigating all these factors in multivariate logistic regression model, only perception of eating habits was actually predicting satisfaction with maternal weight gain ($p=0.012$). The other factors did not contribute significantly to the model.

Discussion

To our knowledge this is one of very few studies assessing maternal weight status misperceptions, in addition to weight gain attitudes in a cohort of pregnant women.

The majority of women reported to be satisfied with maternal weight gain, but had in gestation week 36 gained excessively, according to the IOM weight gain ranges. In addition, we found a significant discrepancy between self-reported and measured maternal weight gain. Women being dissatisfied with maternal weight gain included significantly more nulliparous and women being sick-listed in the 3rd trimester, as well as women with sedentary behavior and unhealthy eating habits. Nutrition and physical activity are modifiable factors that can be target for health promotion during pregnancy.

The strength of the present study is the high response rate among the women receiving this particular questionnaire. In addition, the population in STORK was similar in marital status, educational level, mean maternal age, parity, gestational age at delivery and the baby’s birth weight as compared to non-participants giving birth at Oslo University Hospital. When compared to the general Scandinavian pregnant population, the STORK participants included more non-smokers, but were otherwise similar [13]. The questionnaire covered a broad range of possible determinants, ranging from sociodemographic characteristics to lifestyle and behavioural factors (such as smoking diet, total physical activity level), as well as several medical aspects, including pregnancy complaints. Hence, it was possible to compare several factors with attitudes towards maternal weight gain and the IOM weight gain ranges.

Limitations are that the study population was from a single hospital in Oslo and that the investigation was carried out in Norwegian only and accordingly excluded women from other ethnic groups. The study population also had a higher educational level than the average Norwegian level. Hence our results may have limited representativeness in less educated populations. On the other hand this provided an opportunity to assess attitudes towards weight gain in a well-educated, middle class sample of white women, in contrast to most other published studies which have investigated aspects of maternal weight gain in predominately black, Hispanic and low-income groups [14,15].

Bias in questionnaires is an important issue in public health research and poorly designed question can lead to deviation of results [11]. Clearly, a major bias is the unanticipated communication barriers between the researcher and participants. Bias may also source from the way separate questions and responses were outlined and phrased, the way the complete questionnaire was designed, as well as how the survey was managed and conducted [11]. Additionally, because of social desirability, over-reporting of "good behavior" or under-reporting "bad" or undesirable behavior may occur [16]. The pregnant women targeted in this study may also have had difficulty recalling behaviour (pre-pregnancy), and it is not certain that they all share the same understanding of health complaints such as urinary incontinence or pelvic girdle pain, as well as the definition of physical activity/exercise and healthy eating habits [11].

A pre-testing of the questionnaire was done among colleagues and pregnant friends. This helped us to identify any problems with the format or wording of the questionnaire. Hence we ironed out any ambiguities, vagueness or inaccuracies, as well as added and deleted some questions. Mostly, we needed to address the flow of questions, so that one question logically followed the previous one (e.g. started with one or two general questions, and then became more specific). Based on the pre-test we also included information with respect to the purpose of the questionnaire, why the study was important and how long it would take to complete.

Appropriate maternal weight gain is necessary for fetal growth; however, the IOM have highlighted that there may be a threshold at which increasing maternal weight gain is not improving the outcome for infant or mother [2]. The present data-collection was completed throughout 2002-2005, a time period when public attention of weight gain during pregnancy and its related health consequences increased; particularly there was emphasis on high maternal weight gain and risk of giving birth to a large infant. Hence, one might have expected that more women should have been able to more accurately perceive their maternal weight gain status. Herring and coworkers [17] stated that a woman's misperception about her maternal weight status may increase the odds for excessive maternal weight gain. Our study confirms these data. We also assumed that more women would be within rather than exceeding the IOM recommendations, due to the main objective of the primary study, investigating determinants of fetal macrosomia. While 30% of the participants gained within the IOM range, more than two-third of the women gained above the range. These results are consistent with previous data showing that merely 30-40% of women have weight gain within the optimal ranges [18]. Mean weight gain was less among women with a pre-pregnancy BMI \geq 25. Still, this group was more likely than normal-weight women (BMI $<$ 25) to gain above the IOM guidelines for their pre-pregnancy BMI. However, when the present study was conducted, there was no upper limit for maternal weight gain for obese women. This could have influenced on the women's perception of appropriate weight gain at that time, compared to if the data collection had been done after publication of the IOM 2009 guidelines.

An increasing proportion of women are overweight or obese at the start of their pregnancy [19]. It is acknowledged that self-reported data on body weight may be underreported, particularly in overweight women [3]. Hence, misclassification of pre-pregnancy BMI could bias the results[20], and give an overestimation of maternal weight gain among overweight women. Nevertheless, most studies need to use self-reported data regarding this measure as correct body weight just before conceptions hardly can be determined.

Pregnancy is considered to be a unique period where women are likely to be motivated for lifestyle changes, including reducing excessive weight gain [21]. Hence, one would think that interventions to reduce such excessive weight gain had a fairly chance to be successful. A Cochrane Review from 2012 [22] including 28 RCTs with a total of 3976 women and their babies in the period 1968 to 2011, showed that behavioral counseling, including lifestyle change versus standard routine follow-up was significantly associated with a reduction in weight gain (according to IOM weight recommendations)

for normal weight women. Unfortunately, the same results were not shown with respect to women in high-risk groups (overweight and obese pregnant women). Currently there are no evidence-based recommendations regarding effective interventions to support pregnant women and facilitate their success of appropriate weight gain goals.

The cut off for exceeding IOM weight gain recommendations are set according to Table 1. Hence, upper limit for gestation weight gain is 15.9 kg and 11.3 kg for participants categorized in group BMI<25 (including underweight and normal weight women) and ≥ 25 (including overweight and obese mothers), respectively. We are aware that this a somewhat higher upper limit (2.2 kg) for obese pregnant women (categorized in the ≥ 25 group) and lower (-2.2 kg) for underweight women (categorized in the <25 group), being a disadvantage in the dichotomy of data. However, only a small proportion of the total sample was affected (about 10%), with 15 women defined in the category BMI<18.5 and 33 women in the category BMI ≥ 30 .

To date, it is limited knowledge on women's attitudes and satisfaction with weight gain during pregnancy. The number of women who expressed a negative attitude in the present study was only 24%. A negative attitude and dissatisfaction with weight gain were significantly more common in women with high weight gain and among women exceeding IOM recommended ranges. Although, this finding was somewhat expected, others [23] have reported that negative attitudes were not limited to women who gained above IOM guidelines. Finding a balance between advising women to gain weight within recommended IOM ranges, as well as communicating this information to support improved body satisfaction during pregnancy is challenging. Hence, we need more studies investigating how health personnel may be successful in finding this balance within the context of prenatal weight gain counselling.

In the present study, assessment of positive or negative weight gain attitudes were assessed by a "Yes, No or I do not know" response to the question: *Are you satisfied/pleased with your maternal weight gain so far, including body size and shape?* This is a simplification of a very complex question, and it would have been interesting to further examine women's responses to the physical changes that accompany pregnancy, for example by using the Body Shape Satisfaction Scale [24], including 10 items assessing satisfaction with different body parts.

Copper R.L et al [25] found that pre-pregnancy BMI has been the single factor consistently linked to maternal weight gain attitudes, with normal weight women having a more positive attitude than overweight women. We did not find this relation in our comparison between pre-pregnancy BMI and maternal weight gain attitudes. However, fewer women with a high pre-pregnancy BMI (≥ 25) reported to be regular exercisers.

Women who regarded their weight gain and body changes positive were still working (fully or partly), reported no pregnancy complaints such as PGP or urinary incontinence, exercised regularly and considered their eating habits healthy in comparison with those who expressed a negative attitude. The latter was the only persisting factor in the multivariate analysis, and we have not been able to find comparable studies to evaluating pregnant women's perception of daily diet in comparison to weight gain attitudes.

Why urinary incontinence and pelvic girdle pain are higher among pregnant women being dissatisfied with maternal weight gain may be due to that both pre-pregnancy overweight and excessive weight gain in pregnancy increases the risk of developing both conditions, particularly urinary incontinence [26,27]. To date, there is some evidence that weight loss may be effective to treat urinary incontinence [28]. Hence, controlling pregnancy weight gain may be an important approach, given that 15-25% of women retain at least 5 kilos after giving birth [29].

Considering that most pregnant women have frequent contact with the health care system, health professionals may have a unique possibility to address weight gain aspects with their pregnant clients. This is supported by several studies showing that pregnant women tend to follow the advice of health care providers regarding maternal weight gain [30]. According to IOM [2], the present guidelines need to be used together with proper clinical evaluation, including special emphasize and dialog about diet and regular exercise.

Conclusion

The present study found a significant difference between measured maternal weight gain compared to self-reported weight gain by questionnaire. In addition, the majority of women reported to be satisfied with maternal weight gain, but had in gestation week 36 gained excessively, according to the IOM weight gain ranges. Hence, more efforts are needed to change pregnant women's attitudes towards weight gain, as well as information on how high weight gain may impact the health for mother and fetus, including provider education on gestational weight gain.

Declaration of Interests

The authors report no competing interests or financial disclosure.

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Table 1

IOM 2009 recommendations (2) for range of total gestational weight gain in singleton pregnancies, by pre-pregnancy BMI.

Category	Pre-pregnancy BMI range (kg/m ²)	Total weight gain range (kg)
Underweight	<18.5	12.7-18.1 (lb 28-40)
Normal weight	18.5-24.9	11.3-15.9 (lb 25-35)
Overweight	25.0-29.9	6.8-11.3 (lb 15-25)
Obese*	≥ 30	5.0-9.1 (lb 11-20)

* Includes class I (30-34.9), II (35-39.9) and III (>40)

Table 2

The association between maternal weight gain parameters and reports of being satisfied or dissatisfied with maternal weight gain. Results are presented as means with standard deviation (SD), in addition to number and percentages.

Maternal weight gain parameters	Attitudes towards total maternal weight gain			p- value
	<i>I am dissatisfied with my weight gain</i>	<i>I am satisfied with my weight gain</i>	Missing	
Self-reported (kg)	16.0 (4.5)	11.1 (3.9)	4	<0.001
Measured (kg)	18.0 (4.8)	12.5 (4.5)	29	<0.001
Weight gain ≥ 16 kg	78 (73.6%)	70 (21.1%)	29	<0.001
Within IOM	8 (7.5%)	128 (37.7%)	29	<0.001
Exceeding IOM	98 (92.5%)	207 (62.3%)	29	

Table 3

Comparison of background and health variables with reports of being satisfied or dissatisfied with maternal weight gain. Results are presented as means with standard deviation (SD), in addition to number and percentages. Missing data is reported for each outcome as there are different response rates for several variables.

Attitudes towards total maternal weight gain				
	<i>I am dissatisfied with my weight gain</i>	<i>I am satisfied with my weight gain</i>	<i>Missing</i>	<i>p- value</i>
Age (years)	31.5 (4.0)	31.6 (4.0)	0	0.80
No higher education	16 (14.8%)	55 (15.8%)	3	0.81
Multiparous	60 (54.1%)	154 (43.5%)	1	0.05
Sick-listed 3 rd tri	50 (45.9%)	114 (33.1%)	13	0.02
Daily smokers 3 rd tri	1 (0.2%)	11 (2.4%)	1	0.20
Pre-preg BMI	24.0 (3.3)	23.4 (3.8)	2	0.14
Pre-preg BMI \geq 25	33 (29.7%)	99 (27.9%)	0	0.70
Urinary incontinence	36 (32.4%)	81 (22.8%)	0	0.04
Pelvic girdle pain	78 (70.3%)	188 (53.6%)		0.02
Gestation week delivery	37.1 (1.0)	37.0 (1.1)	24	0.50
New-born birth weight (g)	3858.5 (473.1)	3630.6 (498.9)	15	<0.001
Macrosomia (\geq 4000 g)	44 (40.4%)	78 (23.0%)	18	<0.001
"I consider my eating habits unhealthy"	49 (45%)	86 (24.4%)	4	<0.001
Pre-preg exercise*	30 (33.7%)	87 (30.0%)	2	0.51
Regular exercise in pregnancy *	6 (9.8%)	44 (19.4%)	1	0.04
Walking for transportation (\geq 30 min daily)	52 (47.7%)	197 (56.1%)	6	0.12
Work-related physical activity	12 (13.6%)	31 (11.2%)	23	0.53
"I have received advice about health living, including exercise from health professionals"	37 (34.6%)	131 (37.5%)	10	0.56

* Exercise is defined as moderate intensity (Borg's scale 12-14) for a minimum of 20 minutes performed >3/weekly