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Israeli and British women's well-being and eating behaviours in pregnancy and the postpartum.

Abstract:

Objectives: The study had two main objectives a) track changes in self-esteem, eating behaviours and body satisfaction from early pregnancy to 24 months postpartum and b) to compare changes by context (Israel vs. UK) and maternal BMI . **Background:** High maternal body mass index (BMI) is associated with negative body image and restrained eating which are experienced differently across cultures.
Methods: 156 pregnant women were recruited from Israel and the UK. 73 women were followed up every six months from early postpartum and until 24m following birth. Women completed questionnaires assessing self-esteem (RSEQ), body image (BIS/BIDQ) and eating behaviours (DEBQ) and self-reported weights and heights so that BMI could be calculated.
Results: Women with higher BMI had higher levels of self-esteem and were less satisfied with their body. Healthy weight women were more likely to lose all of their retained pregnancy weight compared to overweight and obese women. Self-esteem, body image and eating behaviours remained stable from pregnancy until 24m postpartum. No significant differences were found for any measure by context.
Conclusion: BMI was the strongest predictor of self-esteem and body dissatisfaction and a higher BMI predicted less weight loss postpartum.

Key words: Obesity, Self-esteem, body image, eating behaviours, pregnancy, postpartum

Introduction:

Levels of obesity are increasing worldwide (Finucane et al., 2011) and weight gain during adulthood contributes to obesity in later life (Ogden. 2015). Pregnancy is a time during which women are at particular risk for weight gain (Kapadia et al., 2015). The Institute Of Medicine report (IOM. 2009; Rasmussen and Yaktine. 2010) suggests that healthy weight women should aim to gain 17-25Kg; overweight women 14-22Kg and obese women 11-19Kg. The National Institute for Health and Care Excellence (NICE) provides advice to women about healthy eating (NICE, 2010) in order to promote the health of the developing foetus (WHO; 2014). There is specific advice for women with obesity, and the guidelines note that dieting during pregnancy is not recommended as it may harm the health of the unborn child. There is no evidence-based UK guidelines on recommended weight-gain ranges during pregnancy, and so for women with obesity there is a worry that dieting to lose weight is harmful and yet there are elevated risks to health of the obese state for mother and baby (https://www.nice.org.uk/guidance/ph27/chapter/1-Recommendations#recommendation-2-pregnant-women

Weight gain is a natural process during pregnancy and in western societies there has traditionally been an expectation of "eating for two" (Tanentsapf et al., 2011). Some women show high levels of acceptance of the changes within their bodies (Loth et al., 2011; Duncombe et al., 2008; Shloim et al., 2014), associated with general wellbeing; whereas for others, body changes in pregnancy are associated with depression and shame (Fuller-Tyszkiewicz et al., 2012; Strang and Sullivan. 1985). Laraia et al (2009) investigated the association of pregravid weight status, previous dietary restraint and psychosocial factors during pregnancy in a large sample of US women (~2000) noting a significant positive association between pregravid weight and scores for perceived stress, anxiety, depressive symptoms and dietary restraint. There was an inverse association with self-esteem. By contrast, in a smaller sample of pregnant women in the UK and Israel, Shloim et al (2014) reported higher self-esteem with a higher BMI, although the study involved mostly healthy weight or overweight (rather than obese) women.

Pregnancy typically involves the greatest deviation from usual body size that women will experience (Strang et al., 1985; Loth et al., 2011; Boscaglia et al., 2003) and their acceptance of this may influence both emotional wellbeing during pregnancy

and have consequences for the postpartum period. Mothers who fail to recognise this absolute dependence might weaken the ability of the infant to recognise and to "tune-in" to their own needs. In a more recent study, Shloim et al (2014) reported that mothers with negative body image (less positive well-being) were more concerned with their infant becoming overweight or obese (age 6 months) and were less concerned about the baby's hunger compared to mothers with positive body image. However, it is not clear whether this relationship might change as the infant grows and develops. In the present study, this association was examined in the same sample over time.

One in five women experience postpartum weight retention noted as the retention of 5 kg or more above pre-pregnancy weight at 6 months and one year after delivery (Gunderson et al., 2008; Phillips, King, & Skouteris, 2014). The literature suggests that excessive postpartum weight retention is positively associated with mood disorders (Astrachan-Fletcher, Veldhuis, Lively, Fowler, & Marcks, 2008).

Body dissatisfaction was identified for both healthy-weight and obese women in the postpartum, however as maternal BMI increased, women reported a stronger desire for a smaller body size. Our findings are supported by a recent study by Collings et al (2018) who explored the influence of psychological factors on postpartum weight retention 12 months post-birth. These authors noted that women who felt less attractive 12 months postpartum were more likely to show higher levels of weight retention. (Rallis et al., 2007). In contrast, some women might experience a temporary relief from body image concerns during pregnancy (Rallis et al., 2007; Watson, Fuller-Tyszkiewicz, Broadbent, & Skouteris, 2015).

The main aim of this study was to track body image, self-esteem and eating behaviours from early pregnancy until two years postpartum in a group of Israeli and UK women. It was hypothesized, based on previous research in this area (Shloim et al., 2014; 2015), that weight gain during pregnancy would be linked to self-esteem, restrained eating and body satisfaction. Specifically that greater weight gained during pregnancy would influence psychological variables adversely and that weight retained postpartum would similarly produce negative outcomes for self-esteem,

eating restraint and body satisfaction The study was conducted in two countries to assess the generalisability of findings across different cultures and to assess whether greater identification by Israeli women with US ideals of body image would influence the outcome. Thus Israel is a country that is, despite western influences, often considered non-Western in terms of lifestyle (Heesacker et al., 2000). Research suggested that Israeli women have shown lower levels of body dissatisfaction than their US American counterparts (Barak, Sirota, Tessler, Achiron, & Lampl, 1994; Heesacker et al., 2000; Safir, Flaisher-Kellner, & Rosenmann, 2005), which can be attributed to Israeli women being less focused on thinness and more traditionally family-oriented than US femaleswomen. However, and not with agreement with such findings, higher levels of underweight were seen in 17 years old Israeli girls compared with other Western countries (Bar Dayan et al., 2005). Higher levels of disordered eating were also identified in native Israeli students compared to new immigrants from the USSR (Greenberg et al.,2007). Laungani (2006) notes that body dissatisfaction is more common in countries with a Western lifestyle, and both UK and Israeli women are exposed to Western body image values through the media and by close relationships with the USA (Heesacker et al., 2000).

Methods:

Recruitment:

In phase one (not reported here, see Shloim et al., 2014), pregnant women (n=156) were recruited from Israel and the UK. Women were recruited through distribution of posters and flyers in community centres and the University of Leeds, and emails were sent through the University circulation lists. Most of the women were in their first trimester aiming to minimise response bias as pregnancy progressed. Participants were recruited from both countries as the leading researcher was originally from Israel. Inclusion criteria were women from Israel (mainly caner of Israel e.g. Tel-Aviv, Hertzlia) and from Leeds (centre of Leeds, Leeds 17). Women were in good health, with no major health complications such as gestational diabetes. Women were recruited through distribution of posters and flyers in community centres in both countries and via university email circulation lists. Most of the women were in their first trimester when they agreed to participate in the study.

For phase 2, participants from phase one were asked to continue in a follow-up study for the duration of two years (Shloim et al., 2015). Women were invited to contribute to data collection every six months, with 4 data collections over two years. Some participants could not be traced through their contact details and some decided not to continue beyond phase 1. In total seventy three women (N=73) from Israel and the UK continued to participate in the study after giving birth. A power calculation was conducted to detect effects at the 5% level of significance. The calculations were repeated for each outcome variable separately, i.e. for self-esteem, eating behaviours, satisfaction with body and feeding perceptions. Our findings showed that a sample size of 70 women (n=50 healthy-weight; n=20 overweight/obese) was sufficient to detect the reported changes in levels of self-esteem/eating behaviours/satisfaction with body image when comparing healthy weight and overweight or obese women at each follow-up point with 80% power. Changes in the numbers of participants in each follow-up can be seen in figure 1.

The study was approved by the Joint School of Medicine Research Ethics Committee; reference number HSLTLM/10/021 and by the Institute of Psychology and Sciences at the University of Leeds for the follow up study, reference no. #11-0137.

Questionnaires:

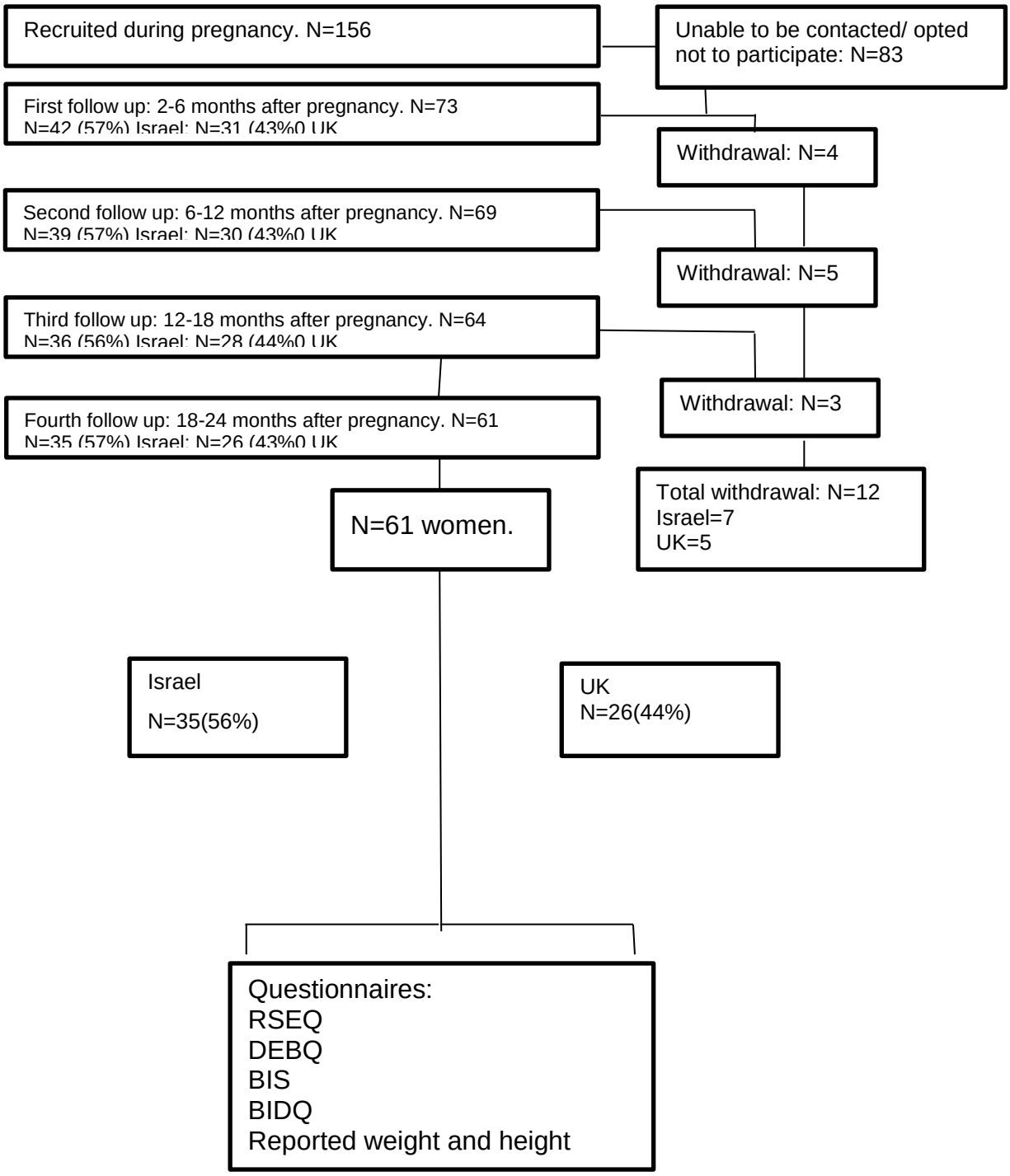
Participants were asked to complete the following questionnaire in each follow-up. All have been previously completed during pregnancy.

1. The Rosenberg Self Esteem Questionnaire (RSEQ). The scale consists of ten elements, five positive and five negative (Rosenberg, 1965) and higher score indicates a higher level of self-esteem. An example of a question is *"on the whole, I am satisfied with myself"*.
2. The Dutch Eating Behaviour Questionnaire (DEBQ; Van-Strien et al., 1986): The questionnaire was developed to measure eating styles and assesses restrained eating (the tendency to restrict food intake for weight loss or maintenance); emotional eating (overeating in response to negative emotions) and external eating (eating in response to food related stimuli regardless of hunger).

3. Stunkard figure rating scale (Body Image Scale; BIS): A pictorial scale assessing perceptions of body shape, image and size. It contains nine body shapes, from the slimmest (1) to the largest (9); Stunkard et al., 1983; Thompson and Altabe. 1991). Women in the study were asked to select the figure that best describes how they see themselves and then to choose the one which best represents their desired body size. Positive scores indicate that current body size is greater than the desired one.
4. Body Image Disturbance Questionnaire (BIDQ): The questionnaire is a revised questionnaire of the Body Dysmorphic Disorder Questionnaire (Dufrense et al., 2001; Cash et al., 2004) and measures level of disturbance in body image. Measures level of disturbance in body image. For example, one of the statements explores the tendency to avoid things because of one's appearance. Higher scores indicate higher levels of body dissatisfaction.

Participants were also asked to report their weight and height to enable calculation of their estimated body mass index (BMI). Maternal BMI was calculated as weight (kg) divided by height (m) squared from self-report measures. Mothers were then categorized as underweight (BMI<18.5 kg/m^2), healthy weight ($25kg/m^2$>BMI ≥$18.5kg/m^2$), overweight ($30kg/m^2$>BMI ≥$25kg/m^2$) or obese (BMI ≥30 kg/m^2) using WHO classifications (WHO. 2014). A possibility of reported weight bias was identified and a sensitivity analysis was conducted. This was carried out by creating a dummy variable where 2kg were added and subtracted to weights, and the BMI categories were re-checked. This analysis resulted in no difference in the distribution across the categories providing confidence that the use of reported rather than measured BMI was acceptable.

Figure 1: Changes in the number of participants and questionnaires as asked from the first to the fourth follow-up.



RSEQ (Rosenberg self-esteem questionnaire), DEBQ (Dutch eating behaviours questionnaire), BIS (Body Image Scale), BIDQ (Body image Disturbance Questionnaire).

Data analysis:

Stata version 12 (used for participants demographic characteristics and for questionnaires presentation of scores), SPSS statistics 23 (for presentation of questionnaires scores) and RStudio 0.99.902 (regression analysis) were used for all statistical analysis.
Maternal BMI was calculated as weight (kg) divided by height squared (m^2) from self-report measures.

In order to determine whether parametric or non-parametric tests were appropriate, the data were assessed for normality for each outcome variable at each time point. Mean (SD) and median scores were calculated for all participants combined, for each country separately for each BMI category (BMI<25 kg/m^2 vs. BMI≥25 kg/ m^2). The process was repeated for all outcomes and for each follow up time point. Most data are summarised as median scores as they pertain to ordinal categorical variables. Individuals' scores were explored as well including the changes in scores for each follow up.

A multilevel modelling approach was used to analyse the data, as this allows the data from all women to be included, even if there is not data for every time point. Three separate series of multilevel models were constructed to assess whether BMI predicted self-esteem, whether BMI predicted eating behaviours, and to see whether BMI predicted body image. The lme4 package in R (Bates et al., 2015), with estimates derived using maximum likelihood was used to create the models. In each model, BMI was considered as a fixed effect predictor, in relation to the questionnaire score for each outcome variable, with each participant treated as a random effect. In order to assess the effect of time, a second model with follow up time was added as a fixed effect. Finally, the effect of BMI was allowed to vary with each follow-up point. Where this statistical interaction improved the model, this is reported within the text.

Results:

156 pregnant women (Israel and the UK) participated in the first phase of the study exploring self-esteem, eating behaviours and body satisfaction during pregnancy. Most were married, healthy (no medical complications before and during pregnancy)

with 85 per cent holding a higher education degree. On average, the women were 32.8 years old (SD: 4.4 years), which is older than the average age for pregnancy in both countries (26.9 years) (The Central Bureau of Statistics, Israel, 2010; Office of National Statistics UK, 2011).Most of the women were of healthy weight. Findings from the pregnancy study are described in Shloim et al (2015).

Fifty women had not provided further contact details and 33 did not agree to continue in the study (N=33) resulting in a final sample of 73 women participating in the first follow-up, 2-6 months after giving birth (figure 1). The majority of women who did not participate in the follow up were from the UK. The women who continued in our study were significantly older, more educated and more likely to be married (Shloim et al., 2014).

Questionnaires were sent via email every six months (2-6; 6-12; 12-18; 18-24 months postpartum). Overall, a total of twelve women withdrew from the study between the first and the final follow-up (figure 1). The main reason was failure to respond to researcher contact attempts.

Table 1 summarises the main characteristics of the participants. Our sample consisted of women who were generally highly educated, and mostly multiparous. This is addressed in the limitations of this study.

At the time of the first follow-up (2-6 months postpartum), women were on average 3 kg ±7.1kg heavier than their pre-pregnancy weight. Mean (SD) BMI postpartum was 23.9± 4.1kg/m^2, similar to participants' BMI in early pregnancy, 22.5±3.6 kg/m^2.

Women's weight at the time of the fourth follow up was available for 58 women. Mean weight was 63.6±11.8 kg and ranged from 44 to101 kg. 13% of the sample were on average 2 kg lighter at this time compared to their weight in early pregnancy with 11% being 2 kg heavier. The findings indicate as well that 14% of the women were more than 4 kg lighter two years postpartum compared to early pregnancy (range -5-13) with nearly 25% being more than 5 kg heavier (range 5 to17). Thus although participants' mean weight two years postpartum was similar to their mean

weight in early pregnancy (for the total sample), exploring individual changes in weight and BMI indicated that more women were heavier postpartum.
Healthy weight women were more likely to lose all of their retained pregnancy weight whereas overweight and obese women were more likely to retain the additional weight gained during pregnancy. Moreover, although the average retained weight was relatively low, most women were heavier two years postpartum compared to their early pregnancy weight and about 50% were more than 4 kg heavier

Table 1: Participants' main characteristics at the first follow-up (2-6 months postpartum).

	N (%)			Mean (SD)			Median			Missing data (%)		P value
	Israel	UK	Total	Israel	UK	Total	Israel	UK	Total	Israel	UK	
Mothers Age (years)	42(57%)	31(43%)	73	34.6(3.8)	34.4(3.2)	34.5(3.5)	35	34	34			0.80
Infants age (weeks)	33(55%)	27(45%)	60	18.8(6.1)	22.4(3.7)	20.5(5.4)	20	24	24	15%	6%	0.09
Number of children before pregnancy:							0	1	1			*0.02
None	11(26%)	13(42%)	73									
One or more	31(74%)	18(58%)										
Levels of education:												
First degree only	2(5%)	4(13%)	72									0.19
Higher than first degree	40(95%)	26(87%)										
Mother's BMI (Kg/m^2):	41 (98%)	26 (87%)		23.5(3.6)	24.2(4.7)	23.8(4.1)				2%	13%	0.74
<18.5	4(10%)	1(4%)	69									
≥18.5<25	26(63%)	15(58%)										
≥25<30	9(22%)	7(27%)										
≥30	2(5%)	3(12%)										
Weight Z scores	33(55%)	27(45%)	60	-0.37(0.9)	0.45(0.88)	0.00-09(1)	-0.54	0.19	0.07	15%	6%	*0.008
Breastfeeding:												
Yes	30(77%)	23(77%)	69							7%	3%	0.92
No	9(23%)	7(23%)										

(Modified from Shloim et al., 2013) *Mann Whitney test comparing median scores between countries. SD (Standard Deviation).

Models:

The Rosenberg Self-Esteem questionnaire; RSEQ:

Table 2a summarises the scores for the RSEQ by time of follow-up, country and by maternal BMI category. The findings suggest more variability in scores in the higher BMI category.

Table 3 shows the coefficients for the multilevel mixed linear regression models. For the RSEQ, BMI was a significant predictor in all models. No other variables were significant predictors, and models 2 and 3 did not improve upon model 1. Finally, when the effect of BMI was allowed to vary with time, this did not improve the model, compared with model 3 (Chi-sq(3) < 0.001).

The Body Image Scale; BIS:

Table 3 shows a significant positive relationship between BMI and body image satisfaction in all 3 models, indicating a strong positive relationship between BMI and desire for a smaller body. Model 2 significantly improves on the fit for model 1, (p = 0.018). The coefficients show a positive relationship between time and desire for a smaller body. Country was not a significant predictor, and model 3 did not improve on the fit for model 2. Additionally, when BMI was allowed to vary with time, this did not improve the model fit further (P=0.081). Therefore, time and BMI were independent predictors of dissatisfaction with body.

The Body Image Disturbance Questionnaire: BIDQ:

Table 3 shows a significant inverse relationship between time and body disturbance in model 2. This model was a better fit than model 1 (P = 0.038).

Model 3 showed a marginal improvement in fit over model 2, P= 0.012. The negative co-efficient for country indicates that the women from the UK had a non-significant lower body image disturbance than those from Israel. When the effect of BMI was

allowed to vary with time, this also did not improve the fit for model 3 (P=0.091). Therefore, time was the only significant predictor of body image disturbance.

The Dutch Eating Behaviour questionnaire; DEBQ:

Table 2b summarizes the scores for the DEBQ and is divided into restraint, emotional and external eating behaviours. Table 3 shows that there was no relationship between restrained eating, and any of the predictors in the three models, and models 2 and 3 did not improve the model fit. When the effect of BMI was allowed to vary with follow-up, this also did not improve the model (P= 0.225). The same pattern was observed for emotional eating, however, when the effect of BMI was allowed to vary with time, this failed to improve the model fit compared to model 3, (P = 0.059). Examination of the co-efficient revealed that 12-18 months post-partum, there was a small positive relationship between BMI and emotional eating (b = 0.025, 95%CI = 0.010), suggesting that at this time point, heavier women were more likely to eat according to emotional cues compared to healthy weight women. At all other time points, the relationship between BMI and emotional eating was not significant.

A similar pattern was observed for external eating, in that there were no significant fixed effect predictors within models 1, 2, or 3. However, model 2 showed no significant improvement in fit over model 1, (p = 0.090). The coefficient for time was 0.03 (95% CI=0.013), suggesting that external eating increased slightly over time. When the effect of BMI was allowed to vary with time, this also had no significant impact on the model (P = 0.093). Therefore, time was not identified as a significant predictor for levels of restraint indicating that levels of external eating did not significantly vary from pregnancy until two years post-partum.

Table 2a: Summary of scores of the RSEQ, BIS and the BIDQ according to BMI status presented by time of follow up (FU) and for each country (Israel vs. UK).

	Median score(N)					
	Israel			**UK**		
RSEQ	**BMI<25**	**BMI≥25**	**Total**	**BMI<25**	**BMI≥25**	**Total**
Time 1	25(45)	25(17)	25(63)	24(54)	25.5(21)	25(82)
1st FU	25(29)	26(10)	25(40)	24(16)	25.5(10)	24(29)
2nd FU	25(27)	26(11)	25(39)	25(19)	25(8)	25(30)
3rd FU	25(26)	27(9)	*25(35)	23(19)	25(6)	23(28)
4th FU	25(28)	25(5)	25(34)	25(18)	25(7)	25(27)
BIS						
Time 1	0.5(46)	1(18)	1(67)	0(55)	1(20)	1(82)
1st FU	1(30)	2(11)	1(41)	1(16)	2(10)	1(29)
2nd FU	1(27)	1(11)	1(39)	1(19)	1(8)	1(30)
3rd FU	1(27)	2(9)	1(36)	1(19)	2(6)	1(28)
4th FU	1(28)	1(5)	1(34)	1(17)	1(8)	1(25)
BIDQ						
Time 1	1.5(46)	1.7(18)	1.5(65)	1.2(52)	1.2(18)	1.2(75)
1st FU	1.5(30)	2(11)	1.6(41)	1.4(14)	1.5(10)	1.4(27)
2nd FU	1.7(27)	2(10)	1.8(38)	1.3(18)	1.5(8)	1.4(29)
3rd FU	1.4(26)	1.7(9)	1.4(35)	1.3(19)	1.9(6)	1.3(28)
4th FU	1.4(28)	1.4(5)	1.4(33)	1.2(18)	1.4(7)	1.3(26)

Time 1-pregnancy ; RSEQ (Rosenberg esteem questionnaire), BIS (Body Image-selfscale) and the BIDQ (Body Image **Disturbance Questionnaire),** ≤25 (healthy weight), >25 (Overweight+ (United Kingdom) UK,(Obese

Table 2b: Summary of scores of the DEBQ according to BMI status presented by time of follow up (FU) and for each country (Israel vs. UK).

	Median score(N)					
	Israel			**UK**		
DEBQ-R	**BMI<25**	**BMI≥25**	**Total**	**BMI<25**	**BMI≥25**	**Total**
Time 1	2.5(44)	2.8(18)	2.7(64)	2.5(54)	2.9(20)	2.6(81)
1st FU	2.5(28)	2.9(11)	2.7(40)	2.7(16)	2.9(10)	2.6(29)
2nd FU	2.7(27)	3(11)	2.8(39)	2.9(19)	2.8(8)	2.9(30)
3rd FU	2.9(26)	2.8(9)	2.9(35)	3(18)	2.9(6)	2.8(27)
4th FU	2.7(28)	2.6(5)	3(34)	2.3(18)	2.9(7)	2.5(27)
DEBQ-Em						
Time 1	2.1(42)	2.3(16)	2.2(60)	2.1(54)	2.5(20)	2.3(81)
1st FU	2(26)	2.7(10)	2.2(36)	2.2(15)	2.3(10)	2.3(28)
2nd FU	2.3(27)	2.8(11)	2.4(39)	2.5(19)	2.6(8)	2.4(30)
3rd FU	2.2(26)	2.5(9)	2.3(35)	2.2(18)	2.6(5)	2.3(27)
4th FU	2.1(28)	2.2(5)	2.1(34)	2.2(18)	2.8(17)	2.3(27)
DEBQ-Ex						
Time 1	3(45)	3(16)	3(64)	2.8(55)	2.8(20)	2.8(81)
1st FU	3(28)	3.2(10)	3.1(41)	2.8(15)	3.2(9)	2.8(27)
2nd FU	3.1(27)	3(11)	3(39)	3.1(19)	2.9(8)	3(27)
3rd FU	3.2(26)	2.9(9)	3.1(35)	3(18)	2.8(6)	2.7(27)
4th FU	3.1(28)	3(5)	3(34)	3.1(18)	3(7)	3(27)

Time 1-pregnanccy; DEBQ (Dutch Eating Behaviours Questionnaire. R-Restraint; Em-Emotional; Ex-External) ; ≤25 (healthy weight), >25 ((United Kingdom) UK,(Obese +Overweight

Table 3: Fixed effects for model 1,2 and 3.

		Model 1		Model 2		Model 3	
RSEQ	Fixed effects	**B**	**SE**	**b**	**SE**	**b**	**SE**
	BMI	**0.118*** **	0.035	**0.118*** **	0.035	**0.119*** **	0.035
	time			-0.016	0.075	-0.015	0.074
	country					-0.272	0.393
BIS	Fixed effects						
	BMI	**0.083*** **	0.013	**0.083*** **	0.013	**0.082*** **	0.013
	time			**0.067***	0.028	**0.066***	0.028
	country					0.140	0.134
BIDQ	Fixed effects						
	BMI	0.0119	0.009	0.012	0.009	0.012	0.009
	time			**-0.032***	0.015	**-0.031***	0.015
	country					-0.242	0.14
DEBQ-R	Fixed effects						
	BMI	0.015	0.012	0.016	0.012	0.016	0.012
	time			-0.014	0.023	-0.014	0.023
	country					0.004	0.153
DEBQ-Em	Fixed effects						
	BMI	0.019	0.011	0.019	0.011	0.0185	0.011
	time			0.008	0.019	0.008	0.019
	country					0.092	0.156
DEBQ-Ex	Fixed effects						
	BMI	-0.002	0.009	-0.002	0.009	-0.022	0.009
	time			0.03	0.018	0.03	0.018
	country					-0.12	0.099

*** P < 0.05, ** P < 0.01, ** P < 0.001; RSEQ (Rosenberg** Body Image) BIS ,(esteem questionnaire-selfImage scale);BIDQ (Body **Disturbance Questionnaire), DEBQ (Dutch Eating Behaviours Questionnaire. R-Restraint; Em-Emotional; Ex-External).**

All models included participant as a random effect. Model one added only the fixed effect of BMI, model two added in the fixed effect of time, and the final model added in the fixed effect of country.

Discussion:

This investigation tracked changes in self-esteem, body image and eating behaviours in Israeli and UK women from early pregnancy until two years postpartum. As participants were recruited from Israel and from the UK and varied by BMI, an additional aim of the study was to explore whether differences in self-esteem, body image and eating behaviours were associated with maternal BMI or with country. The main findings from this study suggests that overall levels of self-esteem, body image and eating behaviours remained stable from pregnancy until two years postpartum.
The literature suggests that eating behaviours tend to vary during and after pregnancy with most women following a healthy lifestyle while pregnant compared to a less healthy lifestyle in the postpartum (Laria et al., 2015). The British Nutrition Foundation (https://www.nutrition.org.uk/healthyliving/nutritionforpregnancy.html) provides general guidelines on the types of food women should avoid during pregnancy .
Ferraro et al (2011) explored the ways pregnant women obtain information on nutrition and noted that women are not informed of appropriate pregnancy-specific energy intake or are made aware of their own personal healthy gestational weight gain targets. A more recent systematic review (Lucas et al., 2015) explored the nutrition advice women receive during pregnancy and health professionals' ability to provide it. The authors concluded that women were not receiving adequate nutrition education during pregnancy and that although healthcare practitioners perceived nutrition education to be important, lack of time, resources and relevant training affected the ability to provide such advice. Hillier and Olander (2017) reviewed the literature on women's dietary changes before and during pregnancy. Most studies reported an increase in energy intake during pregnancy, a decrease in egg consumption, fried and fast food consumption and a decrease in coffee and tea consumption from before to during pregnancy. Interestingly, the characteristics of the women suggest that age, education and pregnancy intention are associated with healthier dietary changes.

Findings from our study demonstrate a wide variation in women's weight change. Healthy weight women showed a trend to lose all of their retained pregnancy weight gain whereas overweight and obese women were more likely to retain the additional weight gained during pregnancy. Our findings are in agreement with previous research by Van Poppel et al.(2012). They explored postpartum weight retention in a large multi-ethnic cohort study in the Netherlands (The Amsterdam Born Children and their Development; ABCD). Findings suggested marked differences in weight change during and after pregnancy which were associated with ethnic groups. For example, Turkish women had significantly more weight retention than Dutch women. The authors concluded therefore that in the prevention of postpartum weight retention, different approaches might be applicable to different ethnic groups.

BMI was the strongest predictor of self-esteem and body satisfaction. Heavier women had higher levels of self-esteem Our findings were not in agreement with Kiviruusu et al (2016) exploring self-esteem and BMI from adolescence to mid-adulthood in a 26-year follow-up. The authors noted that among females, higher and increasing BMI was associated with lower and more slowly increasing self-esteem. Durso et al (2016) explored weight bias internalization in overweight men and women and noted that weight bias internalization acted as a significant and independent predictor of body image concern, self-esteem, and depressive symptoms. It is possible that as the Rosenberg self-esteem questionnaire (Rosenberg. 1965) was not originally developed for pregnancy and the postpartum this was not the best tool to assess parameters potentially affecting self-esteem and self-worth. Body dissatisfaction was identified for both healthy-weight and obese women in the postpartum, however as maternal BMI increased, women reported a stronger desire for a smaller body size. Our findings are supported by a recent study by Collings et al (2018) who explored the influence of psychological factors on postpartum weight retention 12 months post-birth. The authors noted that women who felt less attractive 12 months postpartum were more likely to show higher levels of weight retention. Thus body dissatisfaction may contribute to postpartum weight retention as women might feel dissatisfied with their body due to changes which are not solely attributed to weight (Rallis et al., 2007). On the contrary, other research suggest that some women might experience a temporary relief from body image concerns during pregnancy (Rallis et al., 2007; Watson, Fuller-Tyszkiewicz, Broadbent, & Skouteris,

2015). Findings from Collings study suggest on varied experiences of attractiveness during pregnancy and thus pregnancy concluded that this could be an opportunity to educate women about body image concerns that may be experienced in the postpartum.

Eating behaviours varied according to BMI. Heavier mothers had higher levels of restrained eating from pregnancy and until one year postpartum. Similarly, heavier mothers were more likely to eat according to emotional cues compared to healthy weight mothers. No differences were identified for external eating behaviours. The findings are supported by previous research which explored eating behaviours within a non-pregnant population noting that obese individuals tend to overeat in response to negative emotional states (Geliebter and Aversa. 2003; Van Strein. 1995). However, the reason why heavier women tend to eat more emotionally during the postpartum remains unknown. It is possible that for heavier women the postpartum period is a fraught time where failing to lose their pregnancy weight gain contributes to low mood and high levels of dissatisfaction with the body. This has been seen in women with eating disorders, for example Easter et al (2014) noted that high levels of psychopathology were common throughout the antenatal and postnatal periods among women with current and past ED.

Our findings indicate that levels of self-esteem, body-image and eating behaviours did not differ according to country. Previous findings from our cohort suggested that Israeli women showed a higher tendency to restrain their eating during pregnancy compared to women from the UK, with higher levels of body dissatisfaction (Shloim et al; 2014) and it was expected that such differences would continue to be significant following pregnancy as well. previous research has identified relatively high levels of underweight in Israeli women compared with other western countries (Bar Dayan et al., 2005). However, we report no significant difference by country in this investigation suggesting comparable experiences by context.

Limitations:

Limitations of the study relate to the sample size and representativeness of the sample. A significantly larger sample would have allowed further in-depth sub-group analysis within countries according to each follow-up interval and BMI. A second limitation related to participants' socio-economic status: women in this study were not representative of the general UK or Israeli populations (University-educated rates in our study were at least 50%) . An improved study design would include women from a wider socio-economic background, whilst also recruiting a larger sample size and providing a wider distribution of BMI. Another limitation relates to the potential bias in self-reported weight. Previous research has shown that self-reported weight tends to be under-estimated (Elgar et al., 2005; Shields et al., 2011). For this study we conducted a sensitivity analysis and found that the distribution of BMI across categories did not change even when women's BMI were 'artificially' increased or decreased by 2 kg. This suggests that self-reporting is likely to have little impact on our conclusions. The decision to rely on self-report was made in part because measuring women would have highlighted the importance of weight in this study resulting in potential bias in response to the eating behaviours and body image questionnaires. Finally, all the questionnaires used in this study have been previously validated however, they were not originally designed for pregnancy and the postpartum. Exploration as to whether questionnaires which take account of pregnancy status is needed to determine the validity of the tools for this time of life.

Conclusion:

Postpartum is a key time to investigate how well women adjust to motherhood. The current study addressed self-esteem, eating behaviours and body image in a sample of Israeli and UK women from pregnancy until the postpartum. Accepting limitations in sample size and representativeness, nevertheless the findings suggest that BMI was the strongest predictor for self-esteem, eating behaviours and body-image. Differences emerged between those who retained and those who lost pregnancy weight gain, with

healthy weight mothers more likely to return to pre-pregnancy BMI than overweight or obese mothers. Supporting mothers to follow a healthy lifestyle and maintain positive well-being during pregnancy and the postpartum might reduce variation in weight gain, increase satisfaction with body size and contribute to a healthier relationship between mothers and their infants.

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