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Psychosocial factors associated with broadly defined bulimia nervosa during early pregnancy: findings from the Norwegian mother and child cohort study

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Abstract

Objective—The purpose of this study was to investigate the relation between psychosocial characteristics and broadly defined bulimia nervosa during early pregnancy, including factors associated with continuation, incidence and remission.

Method—41,157 women completed questionnaires at approximately gestation week 18, including items on eating disorders and psychosocial characteristics as a part of Norwegian Mother and Child Cohort Study conducted by the Norwegian Institute of Public Health.

Results—Incident bulimia nervosa during the first trimester was significantly associated with symptoms of anxiety and depression and low self-esteem and life satisfaction, whereas remission was significantly associated with higher self-esteem and life satisfaction. Continuation was not significantly related to any of the psychosocial variables tested.

Conclusion—Onset of bulimia nervosa during pregnancy is associated with mood and anxiety symptoms. Remission of bulimic symptoms and new onset of bulimia nervosa are associated with opposite profiles of self-esteem, and life satisfaction measures.

Keywords

Bulimia nervosa; Pregnancy; Psychosocial characteristics

INTRODUCTION

Bulimia nervosa (BN) during pregnancy can have serious consequences for both mother and child [1–3]. Although the relation between psychosocial characteristics and BN has been investigated extensively in non-pregnant women [4] little is known about the relation between such factors and BN during pregnancy. In particular, the association between psychosocial variables and patterns of continuation, incidence and remission of BN in pregnancy has not been investigated.

The Norwegian Mother and Child Cohort Study (MoBa), is a prospective birth cohort study designed to recruit a sample of 100,000 pregnant women. Information on eating disorders during and prior to pregnancy are collected. Using data from the first 41,157 mothers enrolled, we investigated the association between psychosocial characteristics and continuation, incidence and remission of broadly defined BN during pregnancy.

MATERIAL AND METHODS

Participants

The data collection was conducted as a part of the MoBa study, directed by the Norwegian Institute of Public Health [5]. The study was approved by the appropriate regional ethics committees for medical research and the Norwegian National Data Inspectorate.

In brief, MoBa is a prospective pregnancy cohort, that started in 1999 and it is estimated that the goal of 100,000 pregnancies will be reached by the end of 2008 [5]. Pregnant women are recruited through a postal invitation after registering for a routine prenatal ultrasound examination in their local hospital at about 17 weeks' gestation. Participating women sign informed consent to take part in a longitudinal study, donate blood and urine samples, and receive a questionnaire. The present study is based on the first questionnaire (Q1). Overall, from 1999 to 2006, approximately 42% of invited mothers have agreed to participate in MoBa.

The MoBa cohort is linked to Norwegian health registries, particularly the Medical Birth Registry of Norway (MBRN) to capture pregnancy outcome variables. Since MBRN was established in 1967, all stillbirths and live births in Norway after 12 weeks of pregnancy have been reported through mandatory notification [6]. Data from the MBRN have been used for prior biomedical research [6–9].

The analysis population for this report included MoBa participants who: a) had identification information from both the MBRN and Q1, b) did not complete an early pilot version of the Q1 (n=2,599), c) had valid values for self-reported age, weight, and height, d) returned Q1 before delivery and e) had a singleton birth. If a woman enrolled in MoBa more than once (due to additional pregnancies), only the first pregnancy was included. Of the initial 54,714 pregnancies enrolled in MoBa, 41,157 (75%) met the five criteria above and were included in this report. Respondents completed Q1 at a median of 18.1 weeks gestation with inter-quartile range of 16.7–20.1 weeks, and range 5.3–41.9 weeks.

Measures

Data for the present study come primarily from Q1, which includes assessment of a range of exposures and health outcome variables. Demographic data were obtained both from Q1 and MBRN.

Eating disorders—Q1 includes a number of items on eating disorders that were designed in accordance with the criteria for BN in DSM-IV [10], and have previously been used for studies of eating disorders in the Norwegian Institute of Public Health Twin Panel [11–13]. The binge eating item was designed to capture the two key features of binge eating: eating an unusually large amount of food and experiencing a sense of loss of control. Diagnostic algorithms were constructed from the questionnaire items to define the presence of broadly defined BN with a frequency of binge eating and compensatory behaviours of minimum once per week. Broadly defined BN was assessed both 6 months prior to pregnancy (retrospective assessment) and at the time of survey completion (i.e. first trimester of pregnancy) [14]. Lifetime BN was not assessed. The BN diagnosis was classified as missing if at least one of the diagnostic criteria was missing and if there were no affirmative responses to any of the other criteria.

Continuation of BN was defined as fulfilling criteria for BN both in the period 6 months prior to pregnancy and during the first trimester of pregnancy. Incidence refers to new cases of BN during early pregnancy in mothers who reported no BN in the 6 months period prior to pregnancy. Since lifetime BN was not assessed, incidence in this paper refers to onset of symptoms during pregnancy that were not reported to exist in the 6 months prior to pregnancy, but not necessarily first lifetime onset. Remission was defined as BN before pregnancy and the absence of both binge eating and compensatory behavior during pregnancy, whereas partial remission refers to BN prior to pregnancy, continued presence of binge eating during pregnancy, but absence of compensatory behaviors.

Psychological variables—A five item version of the Hopkins Symptom Checklist- 25 was used to measure symptoms of anxiety and depression [15]. The short form has been shown to correlate highly with the total score of the original scale and have good psychometric properties [15,16]. Self-report symptom scales like the Hopkins Symptom Checklist have considerable temporal stability and seem to approximate the trait- like aspects of psychological functioning [17]. Items are scored according to a scale ranging from 1 – 4.

The cognitive component of subjective well-being was measured using the Satisfaction With Life Scale [18,19]. This widely-used 5-item scale has been shown to be a valid and reliable measure of life satisfaction, suited for use in a wide range of ages and applications [20]. Each item is scored from 1 – 7.

Self-esteem was measured by a short version of the Rosenberg Self-Esteem Scale [21], widely used in eating disorder research [22–25]. It consist of four items and correlates well ($r=0.95$) with the original 10 item scale [26]. Answers on each item were scored from 1 – 4.

Relationship satisfaction was assessed using Relationship Satisfaction Scale. This 10 item scale is partially based on the Marital Satisfaction Scale [27], and has been shown to correlate highly with the Quality Marriage Index [28] and have good psychometric properties [Røysamb E: personal communication]. Each item was scored from 1 – 6.

The variables for each of the scales were constructed by adding the scores on all items and dividing this sum by the number of items in the respective scales.

Lifetime history of major depression was assessed using 6 questions designed to reflect the diagnostic criteria for the disorder in the Diagnostic and Statistical Manual [29]. This method has previously been used for self-report purposes [30].

Sexual and physical abuse—Physical abuse was assessed at three different time points (during this pregnancy, last 6 months before pregnancy, and earlier). The various response categories were collapsed into a dichotomous yes/no variable reflecting lifetime abuse with women reporting physical abuse at any time point in the yes category.

Sexual abuse was assessed by a question with 4 alternative answers reflecting severity (from “no, never” to “yes, have been raped”), at three different time points (during this pregnancy, last 6 months before pregnancy and earlier). A dichotomous variable reflecting lifetime sexual abuse was created. Women responding yes to any of the questions at any time point were included in the yes category.

Health behaviors—Q1 included one item assessing lifetime smoking (yes/no) and one item assessing smoking during pregnancy. The latter item had three response categories “no”, “sometimes” or “daily,” The last two categories were collapsed, and a dichotomous yes/no variable was created.

Frequency of alcohol consumption in the 3 month period prior to pregnancy was assessed by a question with several response categories. In order to capture potential problematic drinking behavior, rather than simply alcohol use, the categories were collapsed into a dichotomous variable. “Yes” included drinking alcohol 2 or more times a week (about 7 %) and “no” included drinking alcohol once a week or less.

Statistical analysis

For this report we had three analytic goals: First, to compare psychosocial characteristics in women with BN in early pregnancy (continuation and incidence) and in women without eating disorders in the 6 months prior to pregnancy. Second, to investigate psychosocial characteristics associated with the presence of BN during first trimester of pregnancy. Third, to investigate psychosocial characteristics associated with continuation, incidence and remission of BN during early pregnancy.

A Poisson regression model is considered suitable for the analysis of rates, both required for the second and third analytic goals, because it produces estimates of discrete counts, which can be divided by units of exposure [31]. What is called an ‘offset’ in these models enables the division of events by units of exposure. The Poisson regressions specified in this paper

use generalized estimating equations (GEE) for variance estimation and a description and justification of its usage in this context have been discussed before [14].

In this paper, events represent the discrete counts, and the number of mothers before pregnancy at risk for the event represents the units of exposure. The association between these estimated rates and psychosocial characteristics occurs with a psychosocial variable included as a covariate in the Poisson regression. Age and education (age only for incident cases) were also included as covariates to correct for any possible confounding.

We estimated the rate ratio of prevalence, incidence, remission and partial remission of BN during pregnancy. The rate ratio can be defined as the ratio of the rate (i.e. prevalence, incidence, remission or partial remission rate during pregnancy) in the exposed group versus the non-exposed group. There were at least nine psychosocial characteristics, thus there were at least nine models for each of the prevalence, incidence, remission and partial remission estimates.

The small number of BN reports during pregnancy required a separate model for each psychosocial characteristic to avoid over fitting the models. Multiple tests were controlled for by the false discovery rate (FDR) [32].

Some of the psychological variables, symptoms of anxiety and depression, life satisfaction, self-esteem, and relationship satisfaction, had more than three percent of responses missing. Consequently, multiple imputation was an approach used in any model evaluating the psychological scale variables. This approach is appropriate for data that are missing at random (MAR) [33] and this is the assumption we make regarding these data. The process of multiple imputation involved three steps: first, generation of five separate data sets with imputation of missing score responses through the SAS MI Procedure using the Markov Monte Carlo method [33], second, there were analyses of each of the five data sets using the methods as previously stated and finally, output from the second step was compiled in SAS MIANALYZE procedure to create parameter estimates with their corresponding p-values and standard errors.

All analyses were done using SAS/STATA® software for Windows and for Solaris (v9.1.3) [34].

RESULTS

Factors associated with BN during pregnancy

Ninety-six (0.2%) of the women in the sample fulfilled the criteria for broadly defined BN in the first trimester of pregnancy. Of these, 67 also reporting having BN during the last 6 months prior to pregnancy, 26 were new cases of BN developed after pregnancy and 3 did not report BN status prior to pregnancy, and were classified as missing.

Table 1 presents descriptive statistics of psychosocial characteristics for women with BN in the first trimester of pregnancy and women with no eating disorder. We include two sub-groups: women who had BN prior to pregnancy and continued to fulfill the diagnostic criteria during pregnancy and new cases of BN in early pregnancy.

Compared to women without eating disorders, women with BN scored on average more than one standard deviation higher on symptoms of anxiety and depression, more than one standard deviation lower on life satisfaction, self-esteem and relationship satisfaction, and reported nearly three times the prevalence of lifetime major depression. Women with BN also reported double the frequency of lifetime sexual abuse and physical abuse, and higher rates of smoking both during pregnancy and lifetime, and higher rates of alcohol use before pregnancy. The greatest differences were observed in women who had BN both before and during pregnancy versus women without eating disorders.

All the psychosocial characteristics tested were significantly associated with BN in early pregnancy, except smoking and alcohol use (see Table 2).

Factors associated with continuation of BN during pregnancy

Continuation of BN from the last 6 months prior to pregnancy to the first trimester of pregnancy was not significantly associated with any of the psychosocial characteristics studied (Figure 1).

Factors associated with incident BN during pregnancy

Figure 2 shows the associations between the psychosocial characteristics and incidence of BN during pregnancy adjusted for mother's age. High scores on symptoms of anxiety and depression, and low scores on life satisfaction, and self-esteem were significantly associated with incidence of BN (FDR $p = 0.003$, FDR $p = 0.003$ and FDR $p = 0.007$, respectively). Lifetime major depression, alcohol consumption before pregnancy and relationship satisfaction were significantly associated with incidence before but not after correcting for multiple testing.

Factors associated with remission and partial remission of BN during pregnancy

Of the 290 women who fulfilled the criteria for BN in the 6 months prior to pregnancy, 77 remitted (i.e. discontinued both binge eating and compensatory behaviors) and 73 partially remitted (i.e. continued binge eating but discontinued compensatory behaviors) in the first trimester of pregnancy.

As shown in Figure 3, only life satisfaction and self-esteem were significantly associated with remission of BN when controlling for mother's age and education and correcting for multiple testing (FDR $p = 0.02$ and FDR $p = 0.02$, respectively), and none of the psychosocial characteristics were significantly associated with partial remission (Figure 4).

DISCUSSION

Psychosocial characteristics associated with BN during pregnancy

To our knowledge, this is the first study exploring psychosocial correlates of BN during pregnancy in a large-scale population-based sample. Compared to women without eating disorders, women who fulfilled the criteria for broadly defined BN during the first trimester of pregnancy had significantly higher rates of lifetime physical abuse, sexual abuse and major depression, and current symptoms of anxiety and depression. They also had lower

scores on measures of life satisfaction, self-esteem and relationship satisfaction. These results reflect all cases of BN during pregnancy, whether continuing or incident cases.

There are no previous studies with which our results can be directly compared. A few studies of eating disorder symptoms in pregnant women have, however, been published. In a study of 359 Chinese pregnant women, poor spousal support was associated with drive for thinness, but neither instrumental spousal support (e.g., assistance in household chores, child care and problem solving) nor emotional spousal support (e.g., nurturance and positive affect sharing) was significantly associated with disordered eating [35]. In a sample of 530 pregnancy women attending an antenatal clinic, eating disorder symptomatology was associated with younger age, previous eating disorders symptoms, lower educational attainment, poorer housing, employment status, and previous miscarriage [36]. In another study based on a community sample of 10 641 pregnant women, antenatal eating disorder symptoms were associated with having been sexually abused before the age of 16 [37].

Our observations during pregnancy parallel observations of general risk factors and psychosocial correlates for BN in non-pregnant women. Significant associations have been reported between BN and lifetime physical and sexual abuse [38–40], major depression [41], low self-esteem [42], and psychological distress [43], suggesting that similar mechanisms are associated with the presence of BN both in general and during pregnancy. It is possible that women with BN who do get pregnant are less severely ill than women with BN who do not get pregnant [44].

Psychosocial characteristics associated with continuation and incidence

In a previous study of the same sample used in this report, we did not identify demographic variables associated with either continuation or incidence of BN during pregnancy [14]. Within this report, although we identified no factors associated with continuation, incident cases of BN during pregnancy were associated with significantly higher scores on symptoms of anxiety and depression and lower scores on self-esteem, life satisfaction and relationship satisfaction. This suggests that pregnant women with a psychological profile with these features may be at increased risk for BN, and professionals should be alert to this possibility. Future studies with larger samples are needed to further explore this relationship.

Psychosocial characteristics associated with remission and partial remission

In contrast, high scores on life satisfaction and self-esteem were significantly associated with remission of BN during pregnancy. Low self-esteem has previously been shown to be related to BN both in both cross-sectional [45] and longitudinal studies [23,42]. Although some researchers have found that women with low self-esteem respond more poorly to treatment [22] others have not found this association [46,47]. Moreover, women who recovered from BN reported an increase in self-esteem [48]. Although, trait like characteristics such as life satisfaction show long term stability, short term fluctuation can occur [49]. The design of the present study does not enable inferences about causal mechanisms, e.g. whether higher self-esteem and life satisfaction increase the probability of remitting from BN when pregnant, emerge secondary to remission, or if some other common factor influences self-esteem, life satisfaction, and BN.

Limitations

These findings must be considered within the context of several limitations. First, although the diagnostic questions used to create our BN diagnosis have been used in previous epidemiologic studies in Norway, they did rely on self-report of symptoms and targeted broadly defined BN. Face to face interviews are impractical with samples as large as the MoBa, although they may but yield more reliable diagnostic information. Although the reliability of self-report of binge eating has been questioned [50], when assessed within the context of salient behavioural markers such as vomiting and laxative misuse (as was the case in our study), the reliability of self-reported diagnosis of BN is equivalent to that of major depression [51].

Second, although our frequency criteria for binge eating differed from DSM criteria, neither the DSM nor our revised criteria have been extensively empirically validated [52]. Third, we only have information about BN symptoms in the first trimester of pregnancy. BN behaviors have been shown to gradually decline throughout the course of pregnancy [53,54]. Fourth, 42% of women invited agreed to participate in MoBa. Although this response rate is low, it is typical of large epidemiologic studies and does not necessarily imply a biased sample [55]. Bias could occur if individuals who chose not to participate in MoBa differed markedly from those who did participate on the variables of interest. A comparison of MoBa to the Norwegian population suggests lower rates of preterm birth and low birth weight (< 2500g) possibly reflecting a socioeconomic gradient associated with participation [5]. MoBa participants are more educated than the general Norwegian population with 58% attending some form of college in comparison to 46% of women between 25–29 years and 43% of women between 30–39 years reported to have higher education in 2005 by Statistics Norway (http://www.ssb.no/utniv_en/). Fifth, the BN status prior to pregnancy is reported retrospectively, but giving the limited time delay until assessment, the impact of retrospective recall should be minimal.

Implications

Continuing and incident BN symptoms during pregnancy are of clinical concern. Given that women who have eating disorders are unlikely to report this to their obstetricians [56], detection efforts are critical. Moreover, those with BN in pregnancy may require assistance not only with BN but also with depression and anxiety- all of which have known adverse consequences for both mother and child [1,2,57].

In future waves of the MoBa we will investigate the role psychosocial factors plays in the course of BN after birth of the child. Most [54,56,58–60]) but not all [53,61] studies suggest that symptom improvement in many women with BN may be limited to the pregnancy period, and that a significant portion of these women return to eating-disorder behaviour after giving birth. Therefore it is important to be able to identify characteristics associated with increased risk of BN during the postpartum period in order to implement therapeutic measures to prevent relapse.

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Figure 1.

Associations between continuation of bulimia nervosa during pregnancy and psychosocial characteristics†

Adjusted for age and education of mother

‡ Lifetime

§ Last 3 months before pregnancy

¶ False discovery rate

Figure 2.

Associations between incidence of bulimia nervosa during pregnancy and psychosocial characteristics†

† Adjusted for mother's age

‡ Lifetime

§ Last 3 months before pregnancy

¶ False discovery rate

Figure 3.

Associations between psychosocial characteristics and remission during pregnancy for women with BN before pregnancy†

† Adjusted for age and education of mother

‡ Lifetime

§ Last 3 months before pregnancy

¶ False discovery rate

Figure 4.

Associations between psychosocial characteristics and partial remission during pregnancy for women with BN before pregnancy†

† Adjusted for age and education of mother

‡ Lifetime

§ Last 3 months before pregnancy

¶ False discovery rate

Table 1

Psychosocial characteristics of women with bulimia nervosa and women without eating disorders in the first trimester of pregnancy

	Women without eating disorders		Women with bulimia nervosa					
	N= 37,687		Total N= 96		Continuation N= 67		Incidence N= 26	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Symptoms of anxiety and depression	1.25	0.38	1.72	0.67	1.81	0.68	1.49	0.53
Life satisfaction	5.63	1.06	4.70	1.48	4.59	1.57	4.98	1.18
Self-esteem	3.30	0.48	2.75	0.77	2.67	0.79	2.95	0.61
Relationship satisfaction	5.31	0.66	4.92	0.99	4.90	0.97	4.98	1.00
	%	n	%	n	%	n	%	n
Major depression [†]	22.4	8216	59.1	52	63.5	40	48.0	12
Sexual abuse [†]	17.6	6574	38.5	35	40.0	26	34.6	9
Physical abuse [†]	14.4	5365	34.7	31	35.4	23	30.8	8
Smoking								
During pregnancy	10.7	4035	18.3	17	25.4	17	0	0
Ever smoked [‡]	49.2	18453	55.9	52	64.2	43	34.6	9
Alcohol use [‡]								
Twice a week	7.5	2679	14.3	13	9.0	6	29.2	7

[†] Lifetime

[‡] Last 3 months before pregnancy

Table 2Prevalence Rate Ratio for bulimia nervosa during pregnancy[†]

	RR	FDR [¶] p-value
Symptoms of anxiety and depression	3.99	<0.001
Life satisfaction	0.61	<0.001
Self-esteem	0.17	<0.001
Relationship satisfaction	0.57	<0.001
Major depression [‡]	5.16	<0.001
Sexual abuse [‡]	2.87	<0.001
Physical abuse [‡]	2.88	<0.001
Ever smoked [‡]	1.26	0.28
Alcohol use [§]	2.23	0.06
Twice a week		

[†]No covariates included[‡]Lifetime[§]Last 3 months before pregnancy[¶]False discovery rate