Title

Prevalence and clinical characterisation of pregnant women with eating disorders

Running title

Prevalence of eating disorders in pregnant women

Authors

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Acknowledgments

The authors are grateful for the advice received regarding the WENDY study from the Patient and Public Advisory Group, the Programme Steering Committee (Professor Rona McCandlish (Chair), Dr Heather O'Mahen, Dr Pauline Slade, Ceri Rose and Rosemary Jones) and the Data Monitoring and Ethics Committee (Roch Cantwell (Chair), Liz McDonald-Clifford, Marian Knight, Stephen Bremner). The authors also want to take the opportunity to thank the women who participated in this study.

Conflict of Interest statement

AB, SN, EGR, DB, AE and NM have no conflict of interest. LMH (joint senior author and chief investigator) chaired the National Institute for Health and Care Excellence CG192 guidelines development group on antenatal and postnatal mental health in 2012-14. No other conflicts of interest.

Funding

This paper summarises independent research funded by the National Institute for Health Research (NIHR) under the Programme Grants for Applied Research programme (ESMI Programme: grant reference number RP-PG-1210-12002) and the NIHR/Wellcome Trust King's Clinical Research Facility and the NIHR Biomedical Research Centre and Dementia Unit at South London and Maudsley NHS Foundation Trust and King's College London. LMH also has salary support from an NIHR Research Professorship (NIHR-RP-R3-12-011). Tommy's Baby Charity provided salary support for AB. DB is supported by NIHR CLAHRC South London. AE is funded through a King's Improvement Science (KIS) Fellowship award. KIS is part of the NIHR CLAHRC South London and its work is funded by King's Health Partners (Guy's and St Thomas' NHS Foundation Trust, King's College Hospital NHS Foundation Trust, King's College London and South London and Maudsley NHS Foundation Trust), Guy's and St Thomas' Charity, the Maudsley Charity and the Health Foundation. The views expressed are those of the author(s) and not necessarily those of the NIHR or the Department of Health and Social Care.

Abstract

Objective

To estimate prevalence of lifetime and current eating disorders (ED) in a sample of pregnant women in South-East London, and to describe their socio-demographic and clinical characteristics.

Method

Secondary analysis of data from a cross-sectional survey. Using a stratified sampling design, 545 pregnant women were recruited. Diagnostic interviews were administered to assess lifetime and current ED, depression, anxiety and borderline personality disorder. Data were extracted from maternity records to assess identification of ED in antenatal care. Estimates of population prevalence of ED were obtained using sampling weights to account for the stratified sampling design.

Results

Weighted prevalence of lifetime ED was 15.35% (95% CI, 11.80-19.71%) and current ED was 1.47% (95% CI, 0.64-3.35%). Depression, anxiety and history of deliberate self-harm or attempted suicide were common in pregnant women with ED. Identification of ED in antenatal care was low.

Conclusions

Findings indicate that by early pregnancy, a significant proportion of pregnant women will have had ED, although less typically during pregnancy, and psychiatric comorbidity is common. Yet ED were poorly recognised in antenatal care. The findings highlight the importance of increasing awareness about maternal ED to improve identification and response to the healthcare needs of pregnant women with ED.

Three key highlights

- Weighted prevalence of lifetime eating disorders was 15.35% (95% CI, 11.80-19.71%) and current eating disorders was 1.47% (95% CI, 0.64-3.35%) in a UK inner-city antenatal sample, however, eating disorders were poorly recognised in antenatal care.
- Depression, anxiety and a history of deliberate self-harm or attempted suicide are common amongst pregnant women with eating disorders.
- Findings highlight the clinical importance of increasing awareness about maternal eating disorders in maternity professionals to improve identification and response to the healthcare needs of pregnant women with ED.

Key words

Eating disorders, epidemiology, pregnancy

Introduction

Eating disorders (ED) are a heterogeneous group of mental illnesses characterised by severe disturbances in eating behaviour and often associated with significant distress, functional impairment and adverse health outcomes (Kessler et al., 2013; Preti et al., 2009; Stice, Marti, Rohde, Nathan Marti, & Rohde, 2013). Pregnancy can be a highly emotive period for women with a current or prior history of ED as they encounter changes to their body and appetite (Fogarty, Elmir, Hay, & Schmied, 2018; Koubaa, Hällström, & Hirschberg, 2008). Most women will adjust as pregnancy progresses with the motivation to ensure optimum health of the unborn infant, often experiencing temporary relief from their ED symptoms during this time (Fogarty et al., 2018; Micali, Treasure, & Simonoff, 2007). However, there is evidence of symptoms persisting for some women, new onset of ED and high risk of postnatal relapse (Blais et al., 2000; Micali, Treasure, et al., 2007; Watson et al., 2013).

Symptoms of depression and anxiety during pregnancy are common amongst women with current and remitted ED (Easter et al., 2015). Pregnant women with ED are also known to have heightened risk of adverse pregnancy and birth outcomes, with risks varying between ED categories and persisting among those in remission, including impaired fertility, unplanned pregnancy and delivering low birth weight babies in women with lifetime anorexia nervosa (Linna et al., 2013, 2014; Micali et al., 2014; Solmi, Sallis, Stahl, Treasure, & Micali, 2014), and miscarriage and delivering large for gestational age babies in women with lifetime binge eating disorder (Linna et al., 2013, 2014; Watson et al., 2017). Although there is limited research assessing the impact of Other Specified Feeding and Eating Disorders (OSFED) on pregnancy and birth outcomes, evidence indicates that sub-threshold ED similarly reflect heightened risk (Eik-Nes et al., 2018; Linna et al., 2013; Watson et al., 2017).

Given the risks associated with maternal ED, early identification and response to healthcare needs is imperative to promote optimum maternal and infant outcomes. The UK National Institute for Health and Care Excellence (NICE) recommends clinicians should routinely enquire about past and current mental illness with all women at their first contact with NHS maternity services (NICE, 2014). NICE recommends clinicians should offer women with ED enhanced monitoring and support throughout pregnancy into the postnatal period (NICE, 2014, 2017). However, clinicians often lack confidence in identifying maternal ED due to inadequate training and public stigma (Bye, Shawe, et al., 2018).

Identifying ED during pregnancy is challenging given typical fluctuations in ED symptoms during this time (Blais et al., 2000; Easter et al., 2015; Micali, Treasure, et al., 2007; Watson et al., 2013) and the

need to distinguish ED symptoms from pregnancy symptoms, including nausea and vomiting. Currently, there is insufficient and conflicting research to accurately determine how many women in pregnancy have a current or prior history of ED. It is suggested that between 1.9-7.6% of pregnant women may be affected by ED during pregnancy (Easter et al., 2013; Howard et al., 2018; Maihara dos Santos et al., 2017; Watson et al., 2013) and 4.5-9.2% pre-pregnancy (Easter et al., 2013; Watson et al., 2013). To our knowledge, no studies have reported the prevalence of lifetime ED in pregnant women using structured clinical interviews. The inconsistencies in reported prevalence between studies are largely due to variations in screening tools in the absence of a validated antenatal screening tool, and operationalised ED definitions, especially given the recently revised ED criteria in the latest edition of the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5; American Psychiatric Association [APA], 2013). This has had important implications for prevalence studies (Lindvall Dahlgren, Wisting, & Rø, 2017).

Easter et al (2013), using an adapted version of a standardised self-report instrument and classifications pre-emptive but not directly in accordance with DSM-5 (APA, 2013), found 7.5% of pregnant women met criteria for current ED and 9.2% met criteria in the period before pregnancy. A mother and child cohort study, using a non-standardised self-report instrument and broadly defined ED categories, reported a lower prevalence of 5.0% during pregnancy and 4.5% before pregnancy (Watson et al., 2013). More recently, two studies (Howard et al., 2018; Maihara dos Santos et al., 2017) were the first to use diagnostic interviews to establish prevalence of current ED during pregnancy in accordance with DSM-5 (APA, 2013). Diagnostic interviews are considered to produce more reliable diagnoses than self-report instruments as they enable the interviewer to seek clarification where there is ambiguity and given the challenge for self-report instruments to assess criterion that are frequently denied i.e. intense fear of weight gain or becoming fat in individuals with anorexia nervosa (Stice, Telch, & Rizvi, 2000). Maihara dos Santos et al (2017) reported a prevalence of 1.9% for active ED amongst pregnant women, though this study did not assess OSFED. Howard et al (2018) reported an overall estimated prevalence of 2% for current ED during early pregnancy although it did not include estimates of prevalence for the different types of ED.

This paper presents further secondary analysis of data presented by Howard et al (2018) to expand on the reported findings with respect to ED. As ED are a highly heterogeneous group of disorders with differing risk profiles between categories and enhanced healthcare needs in women with lifetime as well as current ED, it is important to estimate the prevalence of the different types of ED, according to lifetime and current diagnoses to ensure these diagnoses receive equal attention.

Aims

To estimate the prevalence of lifetime and current ED in a sample of pregnant women in South-East London, using structured clinical interviews to establish diagnoses consistent with DSM-5 (APA, 2013), and to describe these women's socio-demographic and clinical characteristics.

Method

Study design

Data were obtained from the WEll-being in pregNancy stuDY (WENDY). WENDY is a cross-sectional survey using a sampling design stratified according to women being positive or negative on the Whooley questions. The Whooley is a two-item questionnaire to identify symptoms of depression: (1) "During the past month, have you often been bothered by feeling down, depressed or hopeless?"; (2) "During the past month, have you often been bothered by little interest or pleasure in doing things?" (Whooley, Avins, Miranda, & Browner, 1997). "Whooley positive" is determined by an answer of "yes" to either of the questions and "Whooley negative" is determined if responses to both questions are "no". Current NICE recommendations are that all women attending NHS maternity services in England and Wales are screened using these questions at their antenatal booking appointment, which occurs around 10 weeks gestation (NICE, 2014). The primary research aim of WENDY was to establish the effectiveness of the Whooley questions to identify antenatal depression. For further detail on the rationale, sampling, and representativeness in WENDY see Howard *et al* (2018).

Ethical approval

Ethical approval for WENDY was granted by the National Research Ethics Service, London Committee - Camberwell St Giles (ref no 14/LO/0075).

Study population and recruitment

Between November 2014 and June 2016, the WENDY study recruited women attending their antenatal booking appointment at an inner-city NHS maternity service in South-East London. All Whooley positive women and a random sample of Whooley negative women were selected to be approached for participation in the study. Women were eligible to participate if they were 16 years old or above and had a response to the Whooley questions recorded on their electronic maternity record. Women were ineligible to participate if they had already attended an antenatal booking appointment at another maternity service in the UK or had a miscarriage or termination of pregnancy prior to the study interview. Eligible women who agreed to participate were recruited within a maximum of three weeks from their antenatal booking appointment. Women provided written informed consent before the start of the research interview, which also asked for permission to extract information from their electronic maternity record. See Figure 1 for the flow chart of women through WENDY and the sample used in the current analysis.

Measures

Data collected from the research interview and women's electronic maternity records are outlined below.

Structured Clinical Interview for DSM-IV and DSM-IV-TR Axis I and Axis II disorders

Researchers administered the Structured Clinical Interview for DSM-IV and DSM-IV-TR Axis I (SCID-I-Research Version; First, Spitzer, Gibbon, & Williams, 2002) and Axis II disorders (SCID-II; First, Gibbon, Spitzer, Williams, & Benjamin, 1997). The SCID is a widely used semi-structured modular interview to determine diagnoses consistent with DSM-IV and DSM-IV-TR (APA, 1994, 2000) diagnostic criteria. The SCID is a reliable and valid measure for determining diagnoses of mental illnesses (Lobbestael, Leurgans, & Arntz, 2011; Zanarini et al., 2000). Although the SCID was not designed to assess DSM-5 (APA, 2013) diagnostic criteria, we used DSM-5 (APA, 2013) diagnostic criteria to determine diagnoses of interest as the DSM-5 version of the SCID was not available at the time of the WENDY study.

SCID-I ED module was used to determine lifetime and current diagnoses of anorexia nervosa, bulimia nervosa, binge eating disorder and OSFED, including atypical anorexia, purging disorder and a combined category of subthreshold bulimia nervosa or binge eating disorder. As in previous ED research (Micali et al., 2017; Smink, van Hoeken, Oldehinkel, & Hoek, 2014; Solmi, Hatch, Hotopf, Treasure, & Micali, 2015), the SCID-I ED module 'skip rules' were not applied and information on type, frequency and duration of ED symptoms were collected to enable classification of diagnoses consistent with DSM-5 (APA, 2013). This information was obtained in response to the original SCID-I ED module questions without the need for alterations. A current ED diagnosis was determined if all criteria were met in the past month. A lifetime diagnosis was determined if all criteria were met at any time point, including in the past month.

Evidence indicates diagnostic cross-over between ED over the lifetime is common, more often crossing from restrictive to binge/binge-purge types (Anderluh, Tchanturia, Rabe-Hesketh, Collier, & Treasure, 2009; Eddy et al., 2008). In accordance with previous research, a hierarchical approach was used to categorise women who met criteria for more than one lifetime ED diagnosis to ensure diagnostic groups were mutually exclusive: full diagnoses (anorexia nervosa; bulimia nervosa; binge eating disorder) trumped OSFED subtypes; binge eating disorder trumped bulimia nervosa; bulimia nervosa

trumped anorexia nervosa (Micali, Holliday, et al., 2007; Micali et al., 2017). Partial remission of an ED was determined if all the criteria were previously met but not all were met in the past month. Full remission was determined if all the criteria were previously met but none were met in the past month. Age at onset of ED was defined as the age at which a woman first met criteria for an ED as determined in the diagnostic interview.

SCID-I mood episodes, mood disorders and anxiety disorders module was used to diagnose common mental health disorders, specifically current (in the past month) depression and anxiety disorders. Diagnoses of current depression included mild, moderate and severe major depressive episodes and mixed anxiety and depression. Diagnoses of any current anxiety disorder included generalised anxiety disorder, panic disorder, agoraphobia without panic disorder, social phobia and specific phobia, consistent with DSM-5 (APA, 2013) i.e. excluding PTSD and OCD. SCID-II personality disorders sub-section module was used to establish diagnoses of borderline personality disorder. History of deliberate self-harm or attempted suicide was determined from responses to the SCID interview questions, including "Have you tried to hurt or kill yourself or ever threatened to do so?" with a follow up prompt "Have you ever cut, burned, or scratched yourself on purpose?" (personality disorders sub-section). Any disclosed act of deliberate self-harm (with or without attempted suicide) was classified as a history of deliberate self-harm or attempted suicide.

Training and quality control

Researchers (postgraduate researchers and research midwives) were trained to administer the diagnostic interview. All potential ED cases were discussed in regular supervision meetings to achieve consensus on ED diagnoses with NM, eating disorder expert on WENDY, and joint senior author. All other potential diagnoses were discussed in consensus meetings with LMH.

Sample characteristics

Self-reported socio-demographic, obstetric and health information were collected at the research interview. Outcomes of interest included age in years, ethnicity, highest education level, employment status, gross annual household income, relationship status, late booking, parity, whether the current pregnancy had been planned, whether the current pregnancy was conceived using assisted reproductive technology (e.g. in vitro fertilisation), height and pre-pregnancy weight (to calculate pre-pregnancy BMI), current smoking status, and current or chronic medical conditions. Late bookers were defined as women who had their antenatal booking appointment at ≥13 weeks of pregnancy. Self-

reported pre-pregnancy BMI was calculated as weight (kg) divided by height in metres squared (m^2) and categorised in accordance with the WHO classification system; underweight (BMI <18.5 kg/m^2), normal weight (BMI 18.5 - 24.9 kg/m^2), overweight (BMI 25.0-29.9), and obese (BMI≥30.0 kg/m^2) (World Health Organization, 2006).

Information extracted from maternity records

Of the women who consented for information to be extracted from their electronic maternity record (N = 515; 95%), information was extracted on identification of ED at the antenatal booking appointment in response to routinely asked questions about past and current severe mental illness (National Institute for Health and Care Excellence, 2014). Information was extracted from brief free text recorded via the electronic maternity records system by the clinician and categorised dichotomously by combining identification of past and/or current ED.

Patient and public involvement and engagement

An advisory group, comprising of women with lived experience of perinatal mental health problems, was established for WENDY and the other related studies undertaken as part of the same programme of work (https://www.kcl.ac.uk/ioppn/depts/hspr/research/CEPH/wmh/projects/A-Z/esmi). The group met regularly throughout the study period to input into various elements of WENDY, including the protocol, study measures, recruitment, participant information sheets and consent forms. No members of the advisory group participated in the study or assisted in recruitment.

Analysis

All data were managed and analysed using STATA 15 (StataCorp, 2017). This study employed a similar analysis approach to previously published work (Howard et al., 2018; Nath et al., 2018). Cross tabulations and chi-square tests (or Fisher's exact where appropriate) were used to describe differences in sample characteristics, comorbid mental disorders and healthcare outcomes between cases and non-cases of lifetime and current ED. Since these were exploratory analyses, we did not perform corrections to the p-values to account for multiple testing. Estimates of population prevalence of ED were obtained using sampling weights to account for the stratified sampling design (Pickles, Dunn, & Vázquez-Barquero, 1995). More specifically, sampling weights were based on the number of Whooley positives and Whooley negatives in the WENDY sample, out of the total number of Whooley positives and Whooley negatives that attended their first antenatal booking appointment

at the study setting during the study period; this consisted of 906/287 for Whooley positives and 9057/258 for Whooley negatives (Howard et al., 2018). Population prevalence of lifetime and current ED were estimated based on responses from diagnostic interviews (weighted) using the survey (svy) command in STATA, which permits stratified sampling and provides robust estimation of 95% confidence intervals (CIs).

Missing data

Among the total sample, 24 (4%) women had some SCID data missing, of which two (0.4%) women had missing data for the SCID-I ED module. Missing data for the SCID-I ED module were treated as missing observations using list-wise deletion performed in STATA. Only women with complete SCID-I ED module data were used to calculate population prevalence estimates.

Results

Sample characteristics

Between 10th November 2014 and 30th June 2016, 10,004 women attended their first antenatal booking appointment at the study setting, 41 of whom had no data available on their responses to the Whooley questions. The base population was therefore comprised of 9,963 women. Of the women identified as eligible to participate (N = 1,647), a total of 545 (33%) women were recruited to WENDY and the sample was similar to the base population in age, ethnicity and parity (Howard et al., 2018). Of the WENDY sample, 543 women provided responses to the SCID-I ED module (see Figure 1). Women with available data for the SCID-I ED module were also similar to the WENDY sample and the base population on age, ethnicity and parity (see Table 1). Table 2 represents a comparison of sample characteristics between cases and non-cases of lifetime and current ED. Significant differences were found between women with lifetime ED (N = 108) and women without lifetime ED (N = 435), with women with lifetime ED more commonly being white (66% vs. 49%), educated to degree level or above (62% vs. 49%), and in a relationship but not cohabiting (21% vs. 14%). Women with current ED (N = 16) and women without current ED (N = 527) differed significantly on the distribution of pre-pregnancy BMI categories (25% vs. 6% underweight; 33% vs. 64% normal weight; 42% vs. 20% overweight; 0% vs. 10% obese, respectively).

Comorbid mental disorders

Table 3 presents a comparison of comorbid mental disorders between cases and non-cases of lifetime and current ED. Women with lifetime ED were significantly more likely to have current depression and anxiety compared to women without lifetime ED (34% vs. 25% and 29% vs. 19%, respectively). Women with current ED were more likely to have current anxiety and borderline personality disorder compared to women without current ED (50% vs. 20% and 19% vs. 2%, respectively). Women with lifetime ED were more likely to have a history of deliberate self-harm or attempted suicide compared to women without lifetime ED (21% vs. 12%), and this trend was reflected in women with current ED compared to women without current ED (31% vs. 13%).

Identification of mental disorders in antenatal care

Table 4 presents data on mental disorders identified in antenatal care for cases and non-cases of lifetime and current ED. Women with lifetime and current ED were more often Whooley positive than the women in the comparison groups (66% and 81% vs. 49% and 52%, respectively). Identification of

ED at the antenatal booking appointment was low compared to the numbers identified using the diagnostic interview (2% vs. 20%).

ED prevalence estimates

Table 5 presents the weighted population prevalence estimates of lifetime and current ED. The weighted lifetime prevalence of ED was 15.35% (95% CI, 11.80-19.71%) and the current prevalence was 1.47% (95% CI, 0.64-3.35%). Of full threshold ED, the weighted lifetime prevalence was 9.37% (95% CI, 6.66-13.03%) and weighted current prevalence 0.61% (95% CI, 0.19-1.96%). Anorexia nervosa was the most prevalent lifetime ED (7.13%; 95% CI, 4.75-10.58%), particularly the subtype restrictive anorexia nervosa (5.14%; 95% CI, 3.17-8.23%). OSFED were also common with a lifetime prevalence of 5.97% (95% CI, 3.83-9.21%), particularly atypical anorexia (2.63%; 95% CI, 1.31-5.21%). Conversely, lifetime prevalence was lowest for bulimia nervosa (0.58%; 95% CI, 0.17-1.97%) and there were no current cases of bulimia nervosa. OSFED were the most common ED during pregnancy (0.87; 95% CI, 0.28-2.69%), particularly purging disorder (0.71; 95% CI, 0.18-2.79%).

Amongst the pregnant women in the sample with lifetime ED (N = 108), there was considerable diagnostic cross-over during their life course. Of the women with lifetime anorexia nervosa (N = 42; 39%), three (7%) were current cases, four (10%) met criteria previously but were current OSFED (one atypical anorexia; one purging disorder; two subthreshold bulimia nervosa or binge eating disorder) and 35 (83%) were past cases who did not meet criteria for any current ED (34 in full remission; 1 in partial remission). Of the women with lifetime bulimia nervosa (N = 8; 7%), none met criteria for any current ED (six in full remission; two in partial remission). Of the women with lifetime binge eating disorder (N = 22; 20%), six (27%) were current cases, one (5%) met criteria previously but was current OSFED (subthreshold bulimia nervosa or binge eating disorder), and 15 (68%) were past cases who did not meet criteria for any current ED (14 in full remission; 1 in partial remission). Of the women with lifetime atypical anorexia (N = 12; 11%), none met criteria currently (11 in full remission; one in partial remission). Of the women with lifetime purging disorder (N = 7; 6%), one (14%) met current criteria and six (86%) were in remission (five in full remission; one in partial remission). Of the women with lifetime sub-threshold bulimia nervosa or binge eating disorder (N = 17; 16%), one (6%) was a current case and sixteen (94%) were in remission (14 in full remission; 2 in partial remission). Of note, all women in this study who met criteria for lifetime OSFED only met criteria for one OSFED subtype, so it was not necessary to expand the hierarchical approach outlined in the methods section. Amongst the women with lifetime ED, the median age of onset for the first ED diagnosis was lowest for the sub-

threshold bulimia nervosa or binge eating disorder category (16.5, range 14-37) and highest for binge eating disorder (23; range 7-36) and purging disorder (23; range 14-40).

Discussion

In this UK inner-city antenatal sample of women, the estimated population prevalence for lifetime ED was 15.35% (95% CI, 11.80-19.71%) and for active ED during pregnancy was 1.47% (95% CI, 0.64-3.35%). The findings highlight that by early pregnancy, a significant proportion of women will have had ED, although less typically active ED during pregnancy. These findings, together with those of previous studies (Fogarty et al., 2018; Koubaa et al., 2008; Linna et al., 2013, 2014; Micali et al., 2014; Solmi et al., 2014; Watson et al., 2017), suggest a considerable number of pregnant women are vulnerable to adverse pregnancy and birth outcomes and likely to have increased healthcare needs during pregnancy and postnatally.

To our knowledge, this is the first study to use diagnostic interviews to estimate population prevalence of lifetime ED in pregnant women. The estimated lifetime prevalence reported in this study supports a prevalence of 15.33% (95% CI, 13.48–17.42%) reported in a recent study of women who participated in a longitudinal birth cohort study, the majority of whom reported that onset of ED was prior to pregnancy (Micali et al., 2017). There are marginal discrepancies in prevalence estimates for individual ED categories between the studies. Estimated prevalence for lifetime anorexia nervosa of 7.13% (95% CI, 4.75-10.58%) was higher in the current study than the prevalence of 3.64% (95% CI, 2.81-4.72%) reported by Micali et al (2017). Although this may reflect longer follow-up in the previous findings (Micali et al., 2017) as the women were assessed later in life with an average age of 47.78 years compared to 32.88 years in this study, considering typical onset of AN is during adolescence (Hudson, Hiripi, Pope, & Kessler, 2007). Estimated prevalence for lifetime bulimia nervosa of 0.58% (95% CI, 0.17-1.97%) was somewhat lower than 2.15% (95% CI, 1.70-2.74%) reported by Micali et al (2017). The lifetime prevalence estimate for OSFED of 5.97% (95% CI, 3.83-9.21%) was comparable to a prevalence of 7.64% (95% CI, 6.32-9.24%) reported by Micali et al (2017). As evidenced in the study findings, a large proportion of pregnant women would be classified with sub-threshold ED despite the recent changes to DSM to broaden the full threshold ED categories to reduce the predominance of individuals presenting clinically who do not meet full threshold diagnostic criteria (Fairburn & Cooper, 2011).

The findings indicate that ED may not be as common during pregnancy as some previous reports of 5-7.6% (Easter et al., 2013; Watson et al., 2013), though it does parallel 1.9% reported by Maihara dos Santos et al (2017). None of the women in the current study met diagnostic criteria for bulimia nervosa during pregnancy compared to 0.1-0.7% reported previously (Easter et al., 2013; Maihara dos Santos

et al., 2017; Watson et al., 2013). This finding likely relates to previous research indicating that most women stop or decrease disordered eating behaviours during pregnancy, i.e. self-induced vomiting (Micali, Treasure, et al., 2007). Only estimated prevalence for anorexia nervosa during pregnancy (0.09%, 95% CI 0.03-0.30%) was similar to a prevalence of 0.1% reported in the more recent study (Maihara dos Santos et al., 2017). The high rates of remission during pregnancy found in this study indicates that the pre-conception period could be an opportune time for clinicians to identify women with a history of ED to assess their current healthcare needs and provide information about pregnancy planning to promote optimal physical and mental health prior to pregnancy commencement. Though given the increased risk of unplanned pregnancies associated with anorexia nervosa (Micali et al., 2014), this may not always be plausible.

The discrepancies in reported prevalence of current ED compared to previous antenatal prevalence studies may reflect the present study using a more stringent and comprehensive assessment of ED diagnoses consistent with DSM-5 (APA, 2013) and warrants further research to replicate the findings with a larger cohort of pregnant women. This study used the SCID which is considered one of the "gold standard" instruments for establishing ED diagnoses (Lobbestael et al., 2011; Zanarini et al., 2000), though it is not without its limitations given it was not designed to assess DSM-5 (APA, 2013) diagnostic criteria and the lack of validation studies for assessing OSFED or in antenatal samples. The findings highlight the importance of consistency in the diagnostic criteria operationalised in studies and support the validation of suitable instruments for use with antenatal populations (Bannatyne, Hughes, Stapleton, Watt, & MacKenzie-Shalders, 2018). In a recent article by Paslakis and de Zwaan (2019), the lack of appropriate algorithms for identifying ED in pregnant women was highlighted.

It is important to acknowledge though the estimated prevalence of ED may underestimate the true proportion as some women may have been reluctant to disclose ED symptoms in the research interview, particularly those currently experiencing difficulties, due to fear of being stigmatised and negative judgements of them as a mother (Bye, Shawe, et al., 2018). Fear of negative consequences as a result of a disclosure may have been a particular concern for women in this study given recruitment was via antenatal care, women may have incorrectly assumed that a disclosure could impact on their care, despite reassurances from the researchers. Additionally, given the sampling weights employed in this study were based on a routine depression screen rather than a screening tool for ED, although often comorbid (Easter et al., 2015), this may have resulted in the study not capturing all pregnant women who might have ED. This presents an important opportunity for future research to replicate these results using a validated screening tool for ED.

Our findings support previous research that pregnant women with current and past ED often experience depression and anxiety during pregnancy (Easter et al., 2015). History of deliberate self-harm or attempted suicide have not been studied previously in pregnancy but both are associated with ED in the general population (Keski-Rahkonen & Mustelin, 2016; Udo, Bitley, & Grilo, 2019). These findings highlight the importance for clinicians to assess ED symptoms along with other mental disorders during the pregnancy period. We found that pregnant women with lifetime ED were more commonly white, well-educated, and in a relationship, which are the types of socio-demographics that are often associated with a low risk profile so clinicians may not consider these women to have a psychiatric history. This highlights the need for professional training opportunities aimed at enhancing awareness on maternal ED to dispel any misconceptions about risk profiles. In this study, pregnant women with active ED during pregnancy more commonly presented with pre-pregnancy BMI's outside the healthy weight range. Future research should aim to replicate this finding as it could be a useful indicator for clinicians when assessing pre-pregnancy BMI to trigger exploration about the potential for active ED.

Amongst the women in this study, ED were poorly identified in antenatal care. The disparity in the rate of women identified with ED using a diagnostic interview with those identified at the antenatal booking appointment indicates that some women may have intentionally not disclosed symptoms in the clinic appointment, but also indicates a lack of or in a few cases, inaccurate diagnoses by clinicians (Bye, Shawe, et al., 2018). Recent training initiatives have sought to raise awareness about maternal ED (Bye, Walker, et al., 2018; Easter, Bye, Sandall, & Mackintosh, 2018), however opportunities remain largely limited. There remains a clear need for professional training programmes and maternity and psychiatric services to plan and coordinate efforts to address the deficiencies in clinical recognition of maternal ED. Pregnant women with a current or prior history of ED need to be identified as eligible for enhanced monitoring and support by knowledgeable clinicians to mitigate risks and help prepare women for typical changes, such as reviewing the need for additional growth scans and offering enhanced emotional support and advice about weight gain and nutrition (National Institute for Health and Care Excellence, 2017).

Strengths

The main strength was the novel use of structured clinical interviews to obtain estimates of population prevalence of lifetime and current ED diagnoses consistent with DSM-5 (APA, 2013) amongst women

in early pregnancy. The study sample were diverse and representative of the local inner city population, aided by the use of language interpreters for non-English speaking women, which supports the generalisability of the findings to similar populations. A wealth of data were collected, meaning that we could compare rates of women identified using a diagnostic interview with those identified at the antenatal booking appointment. Furthermore, there was minimal missing data on study outcomes.

Limitations

There are several limitations that warrant consideration. The SCID was not designed to assess DSM-5 (APA, 2013) diagnostic criteria and has not been validated to assess OSFED or for use in antenatal samples. The diagnostic interview relied upon recall of ED symptoms during the woman's life course which may have been susceptible to recall bias. Amongst the women in the present study, there was diagnostic instability in ED over the lifetime as expected, although this was not as common as previously reported (Anderluh et al., 2009; Eddy et al., 2008; Micali et al., 2017). This may be due to the ED module being one part of a research interview collecting a wealth of other data whereby ED was not the predominant focus of the research. The small sample size for current ED diagnoses limited the statistical power to explore group differences and limits the conclusions that can be drawn from this sample. Furthermore, the study sample was recruited from a single inner-city maternity site, with a poor response rate among those identified as eligible to participate.

Conclusion

This study estimated the prevalence of lifetime and current ED in a sample of pregnant women in South-East London, using structured clinical interviews to establish diagnoses consistent with DSM-5 (APA, 2013). The findings indicate that by early pregnancy, a significant proportion of pregnant women will have had ED, although less typically active ED during pregnancy, and psychiatric comorbidity is common. ED were poorly identified in antenatal care, which increases the likelihood of inadequate healthcare provision and adverse outcomes for pregnant women with ED. Future research should aim to replicate these findings with larger cohorts of pregnant women. The findings make an important contribution to the previous research, highlighting the clinical importance of increasing awareness about ED to improve identification and response to the healthcare needs of pregnant women with lifetime and current ED. Planning of professional training programmes and maternity and psychiatric services need to ensure clinicians are able to provide the best standard of healthcare for pregnant women with lifetime and current ED to promote optimum maternal and infant outcomes.

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Tables

Table 1 Characteristics of wider base population and study population

N (%)		Base population †	WENDY study sample	Sample with SCID-I ED data
		N=9963	N=545	N=543
Age (in years)		Mean: 31.67 Range: 14-52	Mean: 32.85 Range: 16-47.5	Mean: 32.88 Range: 16-47.5
	<20	232 (2%)	8 (1%)	7 (1%)
	20-29	3048 (30%)	150 (28%)	149 (27%)
	30-39	6240 (61%)	341 (63%)	341 (63%)
	40+	705 (7%)	46 (8%)	46 (9%)
Ethnicity				
	White	4914 (51%)	284 (52%)	284 (52%)
	Black	3162 (33%)	177 (32%)	177 (33%)
	Asian	594 (6%)	25 (5%)	24 (4%)
	Mixed	308 (3%)	23 (4%)	22 (4%)
	Other	646 (7%)	36 (7%)	36 (7%)
Parity				
	0	5077 (50%)	271 (50%)	269 (50%)
	1	3209 (31%)	175 (32%)	175 (32%)
	≥2	1939 (19%)	99 (18%)	99 (18%)

† Missing data not included in the table.

Table 2 Comparison of sample characteristics between cases and non-cases of lifetime and current ED

N (%)		Non-cases of lifetime ED	Cases of lifetime ED	P value	Non-cases of current ED	Cases of current ED	P value	Total
		N = 435	N = 108		N = 527	N = 16		N = 543
Age (in years)								
	16-19	7 (2%)	-	P = 0.387	7 (1%)	-	P = 0.072	7 (1%)
	20–29	116 (27%)	33 (30%)		140 (27%)	9 (56%)		149 (27%)
	30–39	272 (62%)	69 (64%)		334 (63%)	7 (44%)		341 (63%)
	40+	40 (9%)	6 (6%)		46 (9%)	-		46 (9%)
Ethnicity								
	White	213 (49%)	71 (66%)	P = 0.002	277 (53%)	7 (44%)	P = 0.189	284 (52%)
	Black	155 (36%)	22 (20%)		173 (33%)	4 (25%)		177 (33%)
	Asian	21 (5%)	3 (3%)		23 (4%)	1 (6%)		24 (4%)
	Mixed	14 (3%)	8 (7%)		21 (4%)	1 (6%)		22 (4%)
	Other	32 (7%)	4 (4%)		33 (6%)	3 (19%)		36 (7%)
Highest education level								
	None or school qualifications	105 (24%)	14 (13%)	P = 0.020	117 (22%)	2 (13%)	P = 0.670	119 (22%)
	College, diploma, higher national certificate or training	116 (27%)	27 (25%)		139 (26%)	4 (25%)		143 (26%)
	Degree level or above	214 (49%)	67 (62%)		271 (51%)	10 (63%)		281 (52%)

Employment status †								
	Employed	275 (63%)	79 (73%)	P = 0.086	342 (65%)	12 (75%)	P = 0.577	354 (65%)
	Student	12 (3%)	3 (3%)		15 (3%)	-		15 (3%)
	Unemployed	59 (14%)	5 (5%)		64 (12%)	-		64 (12%)
	Homemaker	60 (14%)	14 (13%)		71 (14%)	3 (19%)		74 (14%)
	Not working due to illness or other reason	27 (6%)	7 (6%)		33 (6%)	1 (6%)		34 (6%)
Income ‡								
	< £15,000	60 (19%)	17 (19%)	P = 0.635	74 (18%)	3 (23%)	P = 0.165	77 (19%)
	£15,000 - £30,999	55 (17%)	16 (18%)		68 (17%)	3 (23%)		71 (17%)
	£31,000 - £45,999	51 (16%)	9 (10%)		57 (14%)	3 (23%)		60 (14%)
	£46,000 - £60,999	50 (15%)	13 (14%)		60 (15%)	3 (23%)		63 (15%)
	≥ £61,000	108 (33%)	36 (40%)		143 (36%)	1 (8%)		144 (35%)
Relationship status								
	Single	63 (15%)	7 (7%)	P = 0.021	67 (13%)	3 (19%)	P = 0.063	70 (13%)
	Partner, not cohabiting	59 (14%)	23 (21%)		77 (15%)	5 (31%)		82 (15%)
	Married or cohabiting	313 (72%)	78 (72%)		383 (73%)	8 (50%)		391 (72%)
Parity								
	0	207 (48%)	62 (57%)	P = 0.142	260 (49%)	9 (56%)	P = 0.440	269 (50%)
	1	148 (34%)	27 (25%)		172 (33%)	3 (19%)		175 (32%)
	≥2	80 (18%)	19 (18%)		95 (18%)	4 (25%)		99 (18%)
Late booker								

	Yes	78 (18%)	17 (16%)	P = 0.592	91 (17%)	4 (25%)	P = 0.499	95 (18%)
	No	357 (82%)	91 (84%)		436 (83%)	12 (75%)		448 (82%)
Planned pregnancy								
	Yes	279 (64%)	76 (70%)	P = 0.223	346 (66%)	9 (56%)	P = 0.435	355 (65%)
	No	156 (36%)	32 (30%)		181 (34%)	7 (44%)		188 (35%)
Assisted pregnancy								
	Yes	415 (95%)	103 (95%)	P = 0.989	503 (95%)	15 (94%)	P = 0.535	25 (5%)
	No	20 (5%)	5 (5%)		24 (5%)	1 (6%)		518 (95%)
Pre-pregnancy BMI §		Mean: 23.73 Range: 16.9-53.9	Mean: 24.59 Range: 17.3-47.2		Mean: 23.91 Range: 16.9-53.9	Mean: 23.48 Range: 17.3-29.7		Mean: 23.90 Range: 16.9-53.9
	Underweight	23 (7%)	6 (7%)	P = 0.217	26 (6%)	3 (25%)	P = 0.011	29 (7%)
	Normal	220 (66%)	46 (54%)		262 (64%)	4 (33%)		266 (63%)
	Overweight	62 (19%)	23 (27%)		80 (20%)	5 (42%)		85 (20%)
	Obese	30 (9%)	10 (12%)		40 (10%)	-		40 (10%)
Current smoker								
	Yes	16 (4%)	6 (6%)	P = 0.376	20 (4%)	2 13%)	P = 0.133	22 (4%)
	No	419 (96%)	102 (94%)		507 (96%)	14 (87%)		521 (96%)
Current/ chronic medical conditions ¶								
	Yes	185 (43%)	55 (51%)	P = 0.120	231 (44%)	9 (56%)	P = 0.445	240 (44%)
	No	249 (57%)	53 (49%)		295 (56%)	7 (44%)		302 (56%)

† Two women had missing data on employment status (2 non-cases of lifetime/current ED).

‡ 128 women had missing data on gross annual household income (111 non-cases of lifetime ED, 17 cases of lifetime ED; 125 non-cases of current ED, 3 cases of current ED).

§ 123 women had missing data on pre-pregnancy BMI (100 non-cases of lifetime ED, 23 cases of lifetime ED; 119 non-cases of current ED; 4 cases of current ED).

¶ One woman had missing data on current or chronic medical conditions (1 non-case of lifetime/current ED).

Table 3 Comparison of comorbid mental disorders between cases and non-cases of lifetime and current ED

N (%)		Non-cases of lifetime ED	Cases of lifetime ED	P value	Non-cases of current ED	Cases of current ED	P value	Total
		N = 435	N = 108		N = 527	N = 16		N = 543
Current depression								
	Yes	109 (25%)	37 (34%)	P = 0.054	142 (27%)	4 (25%)	P = 1.00	146 (27%)
	No	326 (75%)	71 (66%)		385 (73%)	12 (75%)		397 (73%)
Current anxiety								
	Yes	84 (19%)	31 (29%)	P 0.032	107 (20%)	8 (50%)	P = 0.009	115 (21%)
	No	351 (81%)	77 (71%)		420 (80%)	8 (50%)		428 (79%)
Borderline personality disorder †								
	Yes	8 (2%)	5 (5%)	P = 0.149	10 (2%)	3 (19%)	P = 0.005	13 (2%)
	No	426 (98%)	103 (95%)		516 (98%)	13 (81%)		529 (98%)
History of deliberate self-harm or attempted suicide ‡								
	Yes	52 (12%)	23 (21%)	P = 0.012	70 (13%)	5 (31%)	P = 0.056	75 (14%)
	No	382 (88%)	85 (79%)		456 (87%)	11 (69%)		467 (86%)

† One woman had missing data for the SCID-II personality disorders sub-section module (one non-case of lifetime/current ED).

‡ One woman had missing data for history of deliberate self-harm or attempted suicide (one non-case of lifetime/current ED).

Table 4 Comparison of identification of mental disorders in antenatal care between cases and non-cases of lifetime and current ED

N (%)		Non-cases of lifetime ED	Cases of lifetime ED	P value	Non-cases of current ED	Cases of current ED	P value	Total
		N = 435	N = 108		N = 527	N = 16		N = 543
Whooley status								
	Positive	215 (49%)	71 (66%)	P = 0.002	273 (52%)	13 (81%)	P = 0.022	286 (53%)
	Negative	220 (51%)	37 (34%)		254 (48%)	3 (19%)		257 (47%)
Identification of ED †								
	Yes	3 (1%)	9 (9%)	P < 0.001	10 (2%)	2 (13%)	P = 0.047	12 (2%)
	No	393 (99%)	92 (91%)		472 (98%)	13 (87%)		485 (98%)

† 46 women had missing data on the identification of ED at the antenatal booking appointment or did not consent for information to be extracted from their electronic maternity record (39 non-cases of lifetime ED, 7 cases of lifetime ED; 45 non-cases of current ED, 1 case of current ED).

Table 5 Weighted population prevalence estimates of lifetime and current eating disorders

Diagnostic category	Subtype	N	Weighted lifetime prevalence, % (95% CI)	N	Weighted current prevalence, % (95% CI)
Any ED		108	15.35 (11.80-19.71)	16	1.47 (0.64-3.35)
Any full threshold ED		72	9.37 (6.66-13.03)	9	0.61 (0.19-1.96)
Anorexia nervosa		42	7.13 (4.75-10.58)	3	0.09 (0.03 – 0.30)
	Restrictive subtype	30	5.14 (3.17-8.23)	2	0.06 (0.02 – 0.26)
	Binge-purge subtype	12	1.99 (0.91-4.30)	1	0.03 (0.00 – 0.23)
Bulimia nervosa		8	0.58 (0.17-1.97)	-	-
Binge eating disorder		22	1.67 (0.79-3.46)	6	0.51 (0.13-2.02)
OSFED		36	5.97 (3.83-9.21)	7	0.87 (0.28-2.69)
	Atypical anorexia	12	2.63 (1.31-5.21)	1	0.03 (0.00 – 0.23)
	Purging disorder	7	1.51 (0.60-3.74)	2	0.71 (0.18-2.79)
	Sub-threshold bulimia nervosa or binge eating disorder	17	1.83 (0.85-3.90)	4	0.13 (0.05 – 0.34)

Figures

Figure 1 Flow chart of women through the WEll-being in pregNancy stuDY (WENDY) (n=545) and women with complete data on the SCID-I eating disorder module (N = 543; 99%).