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*Article*

# Eating Behaviors during Pregnancy: A Cross-Sectional Study

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**Abstract:** Background Eating disorders are complex illnesses with serious long-term consequences. They are linked to negative outcomes such as miscarriage, low birth weight, and other obstetric and postpartum difficulties. Our study in Muscat, Oman, examines the eating habits of pregnant women who consult primary care physicians. We aim to understand how eating disorders affect pregnant women and inform more effective interventions. Method We used the Eating Disorder Examination Questionnaire to assess the potential for the presence of eating disorders. Chi-Square and Fisher's Exact tests were used to analyze relationships between improper eating behavior and independent variables. Results The study showed that 1.6% of participants had a potential diagnosis of an eating disorder, with the most common inappropriate behavior being binge-eating at a prevalence of 18.8%. A pre- gestational low Body Mass Index (BMI) was associated with a higher prevalence of binge eating during pregnancy. Additionally, we found that pregnant women who were working were more prone to self-induced vomiting. High BMI before pregnancy was significantly associated with various inappropriate eating behaviors such as restraint behavior ( $p = 0.000$ ), shape concern ( $p = 0.000$ ), weight concern ( $p = 0.040$ ), eating ( $p = 0.045$ ), laxative use ( $p = 0.020$ ), and excessive exercise ( $p = 0.043$ ). Conclusion The study reveals a high prevalence of eating disorders in pregnancy. Less educated women exhibit higher laxative use, while working women show more instances of binge eating and self-induced vomiting. These findings emphasize the critical need to prioritize targeted interventions and support for vulnerable pregnant women.

**Keywords** eating behaviors; pregnant women; socio-demographic factors; Oman

## 1. Introduction

Eating disorders are complex conditions that can harm physical and mental health and can persist over time, with periods of improvement and relapse [1,2]. Although the causes of these disorders remain incompletely understood, a combination of genetic, psychological, and sociocultural factors are believed to be responsible. The main types of eating disorders are anorexia nervosa, bulimia nervosa, and binge-eating disorder. Anorexia is characterized by a fear of weight gain and a distorted body image, resulting in low body mass. Binge-eating disorder involves overeating with a loss of control, while bulimia involves compensatory behaviors like vomiting or excessive exercise [1]. Pregnancy involves significant changes to the body, and body dissatisfaction can impact pregnant women with or without an eating disorder. As a result, eating disorder symptoms may arise or worsen during pregnancy [3].

Pregnant women may still feel societal pressure to maintain a slim body or struggle with obesity. Excessive weight gain during pregnancy can lead to postpartum weight retention and increase the risk of developing obesity [4]. Binge eating is a common form of eating disorder during pregnancy and can cause significant weight gain. Studies showed that 25-44% of women experience regular

binge eating during their first pregnancy [3,5–7]. Women who have a history of restrictive eating patterns or overeating in response to negative emotions are more likely to experience binge eating during pregnancy. Moreover, some women may struggle to determine what constitutes appropriate weight gain during pregnancy and may have distorted perceptions of their body image [8].

Eating disorders can harm pregnancy outcomes, causing miscarriage, premature delivery, low birth weight, and developmental delays in offspring. Women with eating disorders may struggle with lactation and bonding with their newborns [9]. Eating disorders during pregnancy increase the risk of gestational diabetes, preeclampsia, and cesarean delivery. Treating eating disorders during pregnancy is complex and requires a multidisciplinary approach with medical, nutritional, and mental health care [10].

Although eating disorders have negative effects on both maternal and fetal health, there is currently no recommended tool for identifying these disorders in pregnant women. To address this gap, the present study utilizes the Eating Disorder Examination Questionnaire (EDE-Q), a widely recognized instrument for assessing and diagnosing eating disorders in non-pregnant adults [3], to measure the prevalence of eating disorders in pregnant women.

There is a dearth of research on eating disorders during pregnancy in Oman and the larger Gulf Cooperation Council (GCC) countries. Furthermore, there is limited knowledge about how women adapt to the changes in their body weight and shape during pregnancy, particularly among those who reported inappropriate eating habits before becoming pregnant. As a result, there is a lack of understanding about the emergence of these behaviors during pregnancy. Thus, in this study, we aim to identify significant sociodemographic factors associated with eating disorders in Oman.

## **2. Methods**

### *2.1. Study Design*

In January and April 2022, we conducted a cross-sectional study among Omani citizen pregnant women who attended antenatal clinics in 15 local health centers and 3 polyclinics in the Muscat governorate.

### *2.2. Sample Size and Study Population*

The prevalence, according to the literature, varies considerably across studies, ranging from 0.6% to 27.8% [3,5,6]. We calculated a sample size of 700 participants based on an 18% prevalence with a precision of 3%. We selected pregnant women who were 18 years old and older, in their second and third trimesters, and attending primary healthcare centers using nonprobability convenient sampling. The study excluded women in their first trimester of pregnancy and those who were not Omani citizen.

### *2.3. Data Collection Tool, Data Collection and Procedures*

We translated a questionnaire into Arabic and conducted a pilot study on a smaller group of 15 pregnant women to assess their comprehension of written text. Competent general practitioners administered the tool effectively. We enlisted general practitioners in primary healthcare and provided them with instructions regarding the study's aims and the data gathering process. We gathered the data through in-person (face-to-face) interviews conducted in Arabic, using a customized structured questionnaire. We obtained the informed consent of the participants in advance. We guaranteed the confidentiality of the gathered information to the participants, and their participation in the research was entirely voluntary. No financial compensation was provided.

We used the Eating Disorder Examination Questionnaire (EDE-Q) 3 to collect sociodemographic data such as age, obstetric information like parity, number of children, planned pregnancy status, single or multiple pregnancy, and gestational diabetes mellitus (GDM). Social variables, including educational level (ranging from illiteracy to completion of college or higher education), employment status (employed, homemaker, student, or retired), family structure (nuclear or extended), household income (classified as low  $\leq$  350 OMR, moderate 500-1000 OMR, high  $>$  1000 OMR), smoking status,

intention of pregnancy, history of prior abortions, as well as the presence of additional medical conditions and concurrent mental health disorders, were also collected. During the visit, we took anthropometric measurements such as weight and height to calculate the body mass index (BMI) in kg/m<sup>2</sup>, and calculated the gestational age based on the last menstrual period (LMP).

The study examined eating behaviors using the self-reporting EDE-Q. Copyright protects the EDE-Q (and its items). You can freely use it for non-commercial research purposes without seeking permission. The EDE-Q questionnaire comprises a total of 28 items, with 22 specifically designed to assess the core symptoms of eating disorders (EDs). We further divide these 22 items into four main areas or subscales, which include dietary restraint (five items), eating concern (five items), weight concern (five items), and shape concern (eight items) over the past 28 days. We evaluate the frequency or intensity of each item using a seven-point Likert scale, which ranges from 0 (absence of the symptom) to 6 (presence of the symptom every day or to an extreme degree). We sum and average the items within each subscale to determine the subscale scores. We use the sum of subscale scores to determine the global score, which reflects the severity of ED symptoms. A higher score on the questionnaire indicates greater ED symptomatology.

2.4. Statistical Analysis

Categorical and numerical variables, prevalence frequencies, and percentages were reported. To determine the associations between inappropriate eating behavior and the independent variables, Chi-Square Tests and Fisher's Exact Test were used. Significant values were considered for  $p < 0.05$ . We performed the statistical analyses using both SPSS v.23 and Stata v.9.2 software.

2.5. Ethical Approval

The study was conducted with the approval of the Ministry of Health ethics committee (MH/DGHS/DPT/62/2021) and adherence to the Declaration of Helsinki. Written informed consent was obtained before administering the questionnaire, and confidentiality was ensured.

3. Results

We distributed a total of 1000 questionnaires to pregnant women who attended ANC care. Out of these, 712 completed questionnaires (a response rate of 71%). However, the study excluded 78 women because they did not complete the questionnaire, were in the first trimester of pregnancy, or were not Omani citizens. Ultimately, we used the responses of 634 participants who met the inclusion criteria for data analysis.

The mean age of the participants was 30.75 (SD: 5.18), with almost two-thirds of the participants between 26 and 35 years of age (26–32%,  $n = 207$ ; 31–35%,  $n = 192$ ). Most women (77.4%,  $n = 419$ ) had no history of previous abortions. A significant proportion of the sample (82%,  $n = 520$ ) reported having a good family income, while more than half (52.4%,  $n = 277$ ) were unemployed (Table 1). Fifty-five per of the participants, 54.9% ( $n = 348$ ) were in the second trimester of their pregnancy, with 17.5% ( $n = 106$ ) classified as obese and 4.5% ( $n = 27$ ) as underweight. Thirty seven percent of participants ( $n = 273$ ) had a history of gestational diabetes mellitus (GDM).

Table 1. Sociodemographic characteristics of the sample.

| Characteristics                                 | Total n= 634 | %    |
|-------------------------------------------------|--------------|------|
| <b>Age</b>                                      |              |      |
| < 25 Years                                      | 114          | 18   |
| 26-30Years                                      | 207          | 32   |
| 31-35 Years                                     | 192          | 30   |
| >35 Years                                       | 121          | 19   |
| <b>Body mass index (BMI) (before pregnancy)</b> |              |      |
| Underweight                                     | 28           | 4.4  |
| Normal weight                                   | 312          | 29.2 |
| Overweight                                      | 173          | 27.3 |

|                                            |                   |     |
|--------------------------------------------|-------------------|-----|
| <b>Gestational Age</b>                     |                   |     |
|                                            | Second trimester  | 348 |
|                                            | Third trimester   | 286 |
| <b>Previous abortion</b>                   |                   |     |
|                                            | Yes               | 143 |
|                                            | no                | 419 |
| <b>Planed pregnancy</b>                    |                   |     |
|                                            | Yes               | 422 |
|                                            | no                | 211 |
| <b>Gestational diabetes mellitus (GDM)</b> |                   |     |
|                                            | Yes               | 273 |
|                                            | No                | 397 |
| <b>Level of education</b>                  |                   |     |
|                                            | Illiteracy        | 7   |
|                                            | School level      | 205 |
|                                            | Collage and above | 419 |
| <b>Family structure</b>                    |                   |     |
|                                            | Nuclear family    | 493 |
|                                            | Extended family   | 141 |
| <b>Economic level</b>                      |                   |     |
|                                            | Low ≤ 350 OMR     | 32  |
|                                            | Good 500-1000OMR  | 520 |
|                                            | High > 1000 OMR   | 82  |
| <b>Smoking</b>                             |                   |     |
|                                            | Yes               | 10  |
|                                            | No                | 624 |
| <b>Job</b>                                 |                   |     |
|                                            | Working           | 277 |
|                                            | Construction      | 332 |
|                                            | Student           | 22  |
|                                            | Retired           | 3   |
| <b>Diagnosed with psychiatric illness</b>  |                   |     |
|                                            | Yes               | 5   |
|                                            | No                | 629 |

Prevalence of Eating Disorders and Inappropriate Eating Behaviors

1.6% of the women had a probable diagnosis of an eating disorder during pregnancy (Table 2). The most common symptoms of eating disorders observed during pregnancy were binge eating episodes (reported by 18.8% of participants) and self-induced vomiting (reported by 14.4% of participants). None of the participants reported misusing diuretics, and only eleven participants reported engaging in excessive exercise during pregnancy.

**Table 2.** Prevalence of eating disorders and inappropriate eating behaviors of the sample and the significant association with demographic characteristic.

|                                | n   | %     | Overweight before pregnancy | Pregnancy at 3 <sup>rd</sup> trimester | School level | Working     |
|--------------------------------|-----|-------|-----------------------------|----------------------------------------|--------------|-------------|
| EDE-Q global score ≥ 4         | 10  | 1.60  |                             |                                        |              |             |
| Subscale restraint ≥ 4         | 28  | 4.40  | $p = 0.000$                 |                                        |              |             |
| Subscale eating concern ≥ 4    | 6   | 0.90  | $p = 0.000$                 |                                        |              |             |
| Subscale shape concern ≥ 4     | 49  | 7.70  |                             |                                        |              |             |
| Subscale weight concern ≥ 4    | 35  | 5.50  | $p = 0.040$                 |                                        |              |             |
| <b>Inappropriate behaviors</b> |     |       |                             |                                        |              |             |
| Binge eating                   | 119 | 18.80 | $p = 0.045$                 | $P = 0.041$                            |              | $p = 0.031$ |

|                       |    |       |             |             |
|-----------------------|----|-------|-------------|-------------|
| Self-induced vomiting | 91 | 14.40 |             | $p = 0.030$ |
| Laxative misuse       | 20 | 3.20  | $p = 0.020$ | $p = 0.027$ |
| Excessive exercise    | 11 | 1.70  | $p = 0.043$ |             |

Inappropriate eating behaviors such as restraint behavior ( $p = 0.000$ ), shape concern ( $p = 0.000$ ), weight concern ( $p = 0.040$ ), eating ( $p = 0.045$ ), laxative use ( $p = 0.020$ ), and excessive exercise ( $p = 0.043$ ) were associated with a high BMI during pregnancy. Furthermore, we found that women with a higher school level of education were more likely to use laxatives ( $p = 0.027$ , 60%). On the other hand, binge eating and self-induced vomiting were higher in working women ( $p = 0.031$  and  $p = 0.03$ , respectively). In addition, all binge eating cases were in the third trimester ( $p = 0.041$ ). As we did not perform bivariate and multivariate analysis statistics, we also do not know the direction of the association.

4. Discussion

In this study, we report a prevalence of 1.6% of a potential diagnosis of an eating disorder, with the most common inappropriate behavior being binge-eating at a prevalence of 18.8%, followed by self-induced vomiting at a prevalence of 14.4%. There is a range of prevalence rates for eating disorders in pregnant women across different studies [2,3,6,11–13]. Using DSM-IV criteria, a recent study in South-East London in 2020 calculated the weighted prevalence of lifetime ED in a pregnant woman as 15.35% and the current ED as 1.47% [12]. In London, a previous study estimated that 4.9% of women attending follow-up antenatal clinic appointments scored above the clinical threshold on the Eating Attitudes Test. <sup>13</sup> In another study in Brazil, 0.6% of pregnant women indicated a probable diagnosis of eating disorder using the Eating Disorder Examination Questionnaire. <sup>3</sup> Using the Eating Disorder Diagnostic Scale, a 2009 study in the United Kingdom discovered that 7.5% of pregnant women met the diagnostic criteria for an ED [6]. Various factors can account for the differences in prevalence rates among studies investigating eating disorders in pregnant women. The stage of pregnancy, the specific type of disordered eating behavior under study, the assessment tool for measuring eating disorder symptoms, and the threshold for identifying clinically significant scores are among these factors. These variations may contribute to the discrepancies in prevalence observed across studies, including our own.

Being-eating behavior was the most reported behavior, with rates ranging from 8.8% to 17.3% [3,6]. Several factors contribute to the high prevalence of binge eating disorder (BED) during pregnancy, which our study found to be 18.8%. Firstly, the hormonal changes and physiological adaptations that occur during pregnancy can lead to increased appetite and cravings, which may contribute to episodes of excessive eating characteristic of BED. In Oman, similar to many other regions, pregnant women may experience a range of hormonal changes, physiological adaptations, and emotional challenges that could potentially influence the prevalence of binge eating disorder (BED) during pregnancy. Moreover, the emotional and psychological changes experienced during pregnancy, such as increased stress, anxiety, and concerns about body image, may also contribute to the development or exacerbation of binge eating behaviors. In Oman, societal expectations and cultural norms surrounding pregnancy, along with the pressures of balancing traditional roles and modern expectations, could further amplify these emotional stressors.

The current study found that a high pre-gestational BMI was associated with a high total score for possible eating disorders and binge eating during pregnancy. This stands in contrast to a previous Brazilian study that linked a pre-gestational low BMI to a higher prevalence of binge eating during pregnancy. Additionally, our study found that pregnant women who were working were more prone to self-induced vomiting, possibly due to stressors associated with their jobs. Surprisingly, age was not found to be significantly associated with a potential diagnosis of an eating disorder in this study, even though most of the sample was young (26-30 years old), and this is the age at which eating disorders are typically diagnosed. We conducted a 7-month survey to understand the experiences of expectant and postpartum women with a history of eating disorders, in contrast to our reported

findings. We conducted the survey via Netmums, a national parenting website based in the UK with over 1.7 million members.

The survey showed that younger age, a previous eating disorder, a low educational level, and previous miscarriage were significantly associated with the development of disordered eating behavior in pregnant mothers [13]. One possible explanation for the lack of age-related significance in our study could be the relatively narrow age range of our sample (26-30 years old). It is plausible that a broader age range, encompassing adolescents or older women, might reveal different patterns. Furthermore, societal shifts in body image ideals, as well as increased awareness and acceptance of eating disorders across age groups, could influence these dynamics. Moreover, the absence of a significant association between age and eating disorders in our study raises questions about the complex interplay of various risk factors. While age may play a role, it seems to interact with other variables such as socioeconomic status, psychological well-being, and prior medical history.

*Study Limitations*

Our study has some limitations that need to be considered. Firstly, we collected data on eating behavior retrospectively, potentially leading to recall bias. Another potential limitation is the use of screening tools to identify possible eating disorder symptoms rather than structured interviews. This approach could lead to false-positive results, as screening tools may not always accurately identify eating disorder symptoms in all individuals. In addition, the use of screening tools may not provide a comprehensive understanding of the complexity and severity of eating disorder symptoms in pregnant women. Therefore, to further investigate the prevalence and impact of eating disorders during pregnancy, we may need to conduct future studies that utilize structured interviews and assessments. Furthermore, our study did not assess for the presence of other psychological disorders, such as depression and anxiety, which may be associated with eating disorder-like behaviors.

**5. Conclusion and the Way Forward**

The study identifies a high prevalence (1.6%) of probable eating disorders during pregnancy. A high pre-pregnancy BMI is significantly associated with various inappropriate eating behaviors. Laxative use is higher in less educated women, while eating and self-induced vomiting are more common in working women. Notably, all cases of eating occur in the third trimester. Future research could delve deeper into these interactions to elucidate the nuanced factors contributing to the development of eating disorders during pregnancy. Longitudinal studies tracking women from preconception through pregnancy and postpartum could provide valuable insights into the temporal dynamics of these disorders, as well as help inform targeted interventions and support strategies for expectant mothers at risk.

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**Data availability:** The data used for this study is available and will be shared by the corresponding author upon request.

**Conflicts of Interest:** None declared by the authors.

**Abbreviations**

|               |                                           |
|---------------|-------------------------------------------|
| EDE-Q         | Eating Disorder Examination Questionnaire |
| GCC countries | Gulf Cooperation Council countries        |
| GDM           | Gestational diabetes mellitus             |
| BMI           | Body mass index                           |
| LMP           | Last menstrual period                     |
| ANC           | Antenatal care                            |
| BED           | Binge eating disorder                     |

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