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Prevalence of Pre-Pregnancy Obesity and Its Relationship with Sociodemographic Characteristics in Jordan

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Abstract

Purpose: This study investigates the sociodemographic factors influencing pre-pregnancy body mass indeks (BMI) among Jordanian women, aiming to identify at-risk groups and inform tailored public health strategies.
Methodology: A cross-sectional design was employed to analyze pre-pregnancy BMI of a representative sample from two major hospitals. Participants completed a structured questionnaire assessing sociodemographic factors, including age, income, education, employment status, smoking status, and obstetric history. BMI was calculated using self-reported height and weight, with statistical analyses identifying relationship between pre-pregnancy BMI and these variables.
Results: The study found that 47.0% of pregnant women were classified as obese, while 17.2% were overweight, and only 34.3% had a normal weight. Significant correlations were identified between pre-pregnancy BMI and age ($r = 0.307$, $p < 0.001$), parity number ($r = 0.269$, $p < 0.001$), and previous cesarean sections ($r = 0.131$, $p = 0.017$).
Value: These findings highlight the high prevalence of obesity among pregnant women in Jordan and underscore the need for targeted public health interventions to improve maternal health outcomes.

Introduction

Since 1980, the prevalence of obesity has more than doubled globally, making it a significant public health concern. It has reached epidemic levels, contributing to a wide range of chronic diseases and adverse health outcomes. The World Health Organization (WHO) estimated that more than 1.5 billion individuals were overweight in 2008, with nearly 300 million women and over 200 million men classified as obese based on Body Mass Index (BMI) criteria (World Health Organization, 2008). If this trend persists, projections indicate that by 2030, there will be approximately 2.16 billion overweight adults and 1.12 billion obese adults worldwide, emphasizing the urgent need for intervention.

In Jordan, obesity rates reflect this global trend, with national studies indicating that 75.6% of women are overweight or obese (Ajlouni et al., 2021). Research specifically focusing on pregnant Jordanian women during their 24th to 28th weeks of gestation revealed that only 23.1% had a normal BMI, whereas 39.0% were overweight and 37.0% were classified as obese (Basha et al., 2019). These alarming statistics suggest that obesity during pregnancy presents a significant challenge for obstetric care in Jordan. The condition not only affects maternal health but also has lasting consequences for fetal development and neonatal outcomes. Additionally, maternal obesity is strongly associated with long-term health complications that may be transmitted across generations, potentially increasing the risk of obesity and metabolic disorders in offspring (Andreu et al., 2023). Several maternal and sociodemographic factors contribute to the increasing prevalence of obesity in pregnant women. Age is a particularly influential factor, as research has shown that older mothers are at a higher risk of obesity due to metabolic changes and reduced physical activity levels (Heslehurst et al., 2019). Another critical determinant is educational attainment; studies indicate that women with lower levels of education tend to have higher obesity rates, likely due to limited access to healthcare resources and nutritional knowledge, which affects their ability to maintain a healthy weight (Badran et al., 2014).

Employment status also plays a significant role in maternal BMI, as working women may experience higher levels of stress, leading to altered eating habits and weight gain. However, they may also have greater access to healthcare services, allowing for better weight management interventions (Bennett et al., 2022). Parity is another

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well-documented factor, with evidence suggesting that women who have had multiple pregnancies are more likely to have a higher BMI due to physiological and lifestyle changes over time (Taghdir et al., 2020). Smoking status can further influence maternal weight, as smoking is commonly associated with lower BMI. However, pregnant smokers may still be at risk for excessive gestational weight gain and obesity-related complications due to metabolic disruptions and unhealthy dietary patterns (Fekadu Dadi et al., 2020).

Despite the increasing number of studies investigating obesity during pregnancy, there is a notable gap in research specifically examining pre-pregnancy BMI in relation to sociodemographic and obstetric factors within the Jordanian context. Studies have shown that maternal weight status before pregnancy is a crucial determinant of maternal and neonatal health outcomes, making it necessary to explore this relationship further (Al Nsour et al., 2020). Previous research has established that obesity is a growing concern in Jordan, but there is limited evidence linking maternal characteristics with BMI trends in pregnant women (Khader et al., 2019). Furthermore, excessive gestational weight gain has been associated with various maternal and neonatal complications, reinforcing the need for targeted interventions and clinical guidance (Al Hourani et al., 2021). The association between maternal obesity and pregnancy-related risks has also been examined in global research, but there is still a need for localized studies to address the specific challenges faced by Jordanian women (El Kishawi et al., 2022).

Given that higher BMI categories are expected to be associated with increased risks of adverse maternal and neonatal outcomes, further research is crucial. The objective of this study is to explore the relationship between maternal sociodemographic characteristics, obstetric history, and BMI among Jordanian women. By identifying key contributing factors, this research aims to provide valuable insights that can guide public health interventions, improve maternal healthcare services, and reduce obesity-related complications during pregnancy. Addressing these issues is essential for enhancing the overall health and well-being of mothers and their children in Jordan.

Method

A cross-sectional study was conducted involving two prominent university hospitals in Jordan. The study took place in the obstetric departments of King Abdullah II University Hospital in Irbid and Jordan University Hospital in Amman. These hospitals were selected due to their strong reputations for providing comprehensive maternity care services, as well as their strategic locations, which ensured access to a diverse population of pregnant Jordanian women from various socioeconomic backgrounds.

King Abdullah II University Hospital, affiliated with Jordan University of Science and Technology, serves as a major referral center in northern Jordan, catering to a large number of patients. Similarly, Jordan University Hospital, associated with the University of Jordan, is one of the leading medical institutions in the capital, offering high-quality maternal and obstetric care. The inclusion of both hospitals was intentional to achieve a broader representation of pregnant women from different regions and backgrounds.

To enhance the study's generalizability, participants were recruited from both hospitals to ensure a varied and representative sample. The study design ensured equitable distribution of participants between the two institutions, which helped minimize selection bias and strengthened the applicability of the findings across Jordan's diverse healthcare settings. By incorporating data from hospitals in different cities, the study was able to capture a more comprehensive understanding of maternal health and pregnancy-related factors, providing valuable insights for improving maternity care services in Jordan.

Samples selection

A sample size of 332 pregnant women in their first trimester was included. To minimize potential confounding factors, the study set inclusion criteria for participants as follows:

1. Aged 18–40 years,
2. No history of chronic illness prior to pregnancy,
3. Documentation of weight within 12 weeks of pregnancy,
4. Singleton pregnancy, and
5. Total number of parities is five.

Study Tool

The tools employed in this study included:

1. A health data sheet that measure sociodemographic and obstetric characteristics were recorded via Google Forms,
2. A calibrated weighing scale, and
3. A standardized height measuring tool.

Data Collection

Equal amounts of data were gathered from both hospitals. Randomly selected pregnant women between week 1 to week 12 of gestations who attended their first antenatal care visit were approached to participate in this study. All participants received research information, and formal informed consent was acquired. Principal investigator interviewed the respondents face to face and a google form was used to enter all relevant informations. To verify the obstetric information, medical record of the respondents was reviewed. The body weight was measured and self-reported pre-pregnancy weight was also recorded. Using WHO respondents were divided into four categories: underweight (BMI < 18.5), normal weight (BMI 18.5–24.9), overweight (BMI 25.0–29.9), and obese (BMI > 30.0) (Weir & Jan, 2023). Ethical approval was obtained from the Jordan University Hospital Ethics Committee.

Variables and operational definitions

Independent variables in the study include sociodemographic characteristics, and past medical/surgical/obstetric history, and dependent variable include BMI, which are defined operationally in table 1 and 2.

Table 1 Operational definition for independent variables

Independent variable		**Operational Definition**
Sociodemographic characteristics	Age	Maternal age at the time that participate for the study, between 18-35years
	Education level	Maternal education level, it will be as one of the following levels: No formal education , Primary education (grade 1-10), Secondary education (grade 11-12), Higher education (Diploma and bachelor's degree) or Postgraduate education (Master or PhD degree)
	Employment status	Maternal employment status will choose one of the following statuses: employed full-time, employed part-time, self-employed, unemployed, student, homemaker, or retired
	Income	Family income as a total of husband and maternal income, it will be as a continues variable.
	Smoking status	Maternal if smoke any type of nicotine (electronic or traditional cigarette), it will be yes/no question.
Past medical/surgical/obstetric history	Number of parities	Number of previous parities without counting the previous parity including miscarriages, only maternal with 5 or less parities will be included.
	Type of previous delivery	While the last delivery normal vaginal delivery, instrumental delivery, planned cesarean or emergency cesarean delivery.
	Previous delivery complications	Any complication in the last delivery, it will be as an open question.

Table 2 Operational definition for dependent variables

Dependent variable	Operational Definition
Pre-pregnancy Body Mass Index (BMI)	It is a measure for indicating nutritional status in adults. It is defined as a person's weight in kilograms divided by the square of the person's height in meters (kg/m2) (Heritage, 2008; World Health Organization, 2000). Women will be grouped into four categories according to pre-pregnancy BMI: underweight (<18.5 kg/m2), normal (≥18.5 and <25 kg/m2), overweight (≥25 and <30 kg/m2) and obese (≥30 kg/m2) (World Health Organization, 2000) for descriptive analysis purposes. Further inferential analysis used numerical value of BMI..

Data Analysis

Data was analysed using Statistical Package for the Social Sciences (SPSS) version 25. The sociodemographics, obstetric history, and pre-pregnancy BMI status of the respondents were initially summarised using descriptive statistics. Frequencies and percentages were used to represent categorical variables, such as BMI categories, education level, employment status, income, and smoking status. In view of normally distributed data, mean (SD) was used to decsribe continuous variables.

ANOVA test was used to differentiate the mean of pre-pregnancy BMI between education level and independent t-test was used for obstetric history and smoking status. Pearson's correlation was used to measure the correlation between continuous variables such as age, income, number of parities, and number of cesarean sections with pre-pregnancy BMI. This approach allows for the evaluation of the strength and direction of linear associations between pre-pregnancy BMI and each continuous variable.

Results and Discussion

Sociodemographic characteristics of the respondents

Table 3 showed the distributions of sociodemographic and obstetric characteristics of respondents from both universities. Significant maternal health data can be gleaned from the sociodemographic and obstetric characteristics of women from King Abdullah University Hospital (KAUH) and Jordan University Hospital (JUH). With a mean age of 30, this is consistent with research showing that older mothers are more likely to be at risk for obesity-related problems (Heslehurst et al., 2019). Higher levels of education were seen at KAUH, where a larger proportion of women had undergraduate or graduate degrees. This could have an effect on health literacy and weight-management-related lifestyle choices (Ajlouni et al., 2021; Badran et al., 2014).

Women at KAUH had a higher employment rate (41.6% compared to 33.9% at JUH), which may indicate improved access to healthcare and health-promoting behaviors (Bennett et al., 2022). Furthermore, KAUH had a higher average income, which can have an impact on dietary preferences and obesity prevalence (World Health Organization, 2000). A moderate level of reproduction is indicated by the observed mean parity of roughly 2.36; higher parity is frequently associated with more unfavorable outcomes (Deputy et al., 2015). Although smoking rates were low, they were higher at JUH, which is important because smoking increases risks associated with obesity (Fekadu Dadi et al., 2020). These results emphasised the intricate relationship between obstetric history and sociodemographic characteristics in affecting mother health, indicating the necessity of focused public health initiatives to enhance outcomes in the face of the growing obesity epidemic.

Table 3 Sociodemographic characteristics and Obstetrics history of the respondents at both hospitals. (N= 332)

Variables	JUH (n=171)		KAUH (n=161)	
	n	%	n	%
Age, mean (SD)	29.9	4.30	30.1	4.6
Educational level				
less than high school	21	12.3	17	10.6
high school	21	12.3	15	9.3
Diploma	30	17.5	22	13.7
Undergraduate	85	49.7	88	54.7
Postgraduate	14	8.2	19	11.8
Employment status				
Yes	58	33.9	67	41.6
No	113	66.1	94	58.4
Income, mean (SD)	594.90	240.99	656.56	278.57
Parity Number, mean (SD)	2.36	1.89	2.34	1.79
Smoking status				
Yes	21	12.3	14	8.7
No	150	87.7	147	91.3
Previous Obstetric History				
Number of miscarriages, mean (SD)	0.72	1.27	0.41	1.18
Number of caesarian section, mean (SD)	0.81	1.37	1.07	1.81

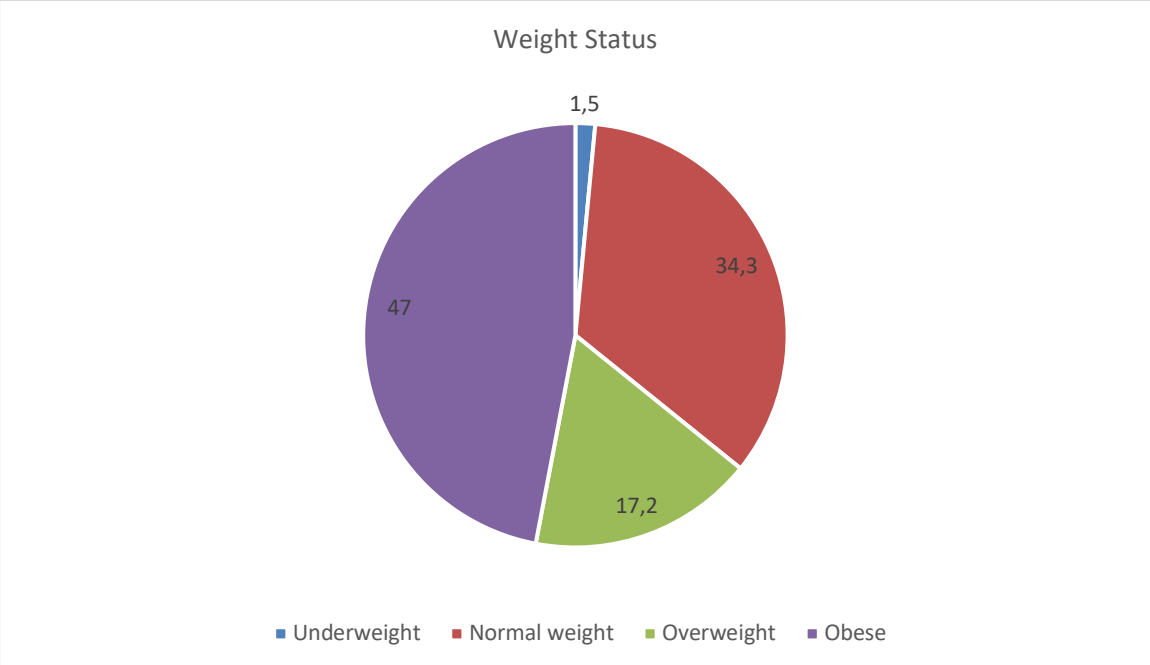

Figure 1 Distribution of Pre-pregnancy Body Mass Index (BMI) among the respondents (N=332)

An important public health concern is shown by the participants' pre-pregnancy Body Mass Index (BMI), which shows that 47% of them were obese, 17.2% were overweight, and only 34.3% were maintaining a normal weight. The percentage of underweight people was only 1.5%. Nearly two-thirds of the women are overweight or obese, which is a concerning development that is correlated with global trends showing rising prevalence of obesity in pregnant populations (WHO, 2014). Given that obesity is linked to a number of adverse maternal and fetal health outcomes, such as gestational diabetes and preeclampsia, its prevalence in this group is especially concerning (Heslehurst et al., 2019). The low percentage of normal-weight women emphasises the critical need for targeted interventions to promote healthy weight management before pregnancy, which is essential for improving maternal and child health outcomes.

Table 4 Comparison of Pre-pregnancy Body Mass Index (BMI) among 1st trimester pregnant women at JUH and KUH (N=332)

BMI category	**Frequency (%)**		
	JUH (n=171)	KUH (n=161)	Total
Underweight	3 (1.8%)	2 (1.2%)	5 (1.5%)
Normal weight	55 (32.2%)	59 (36.6%)	114 (34.3%)
Overweight	32 (18.7%)	25 (15.5%)	57 (17.2%)
Obese	81 (47.4%)	75 (46.6%)	156 (47.0%)

The frequency of obesity among first-trimester pregnant women at Jordan University Hospital (JUH) and King Abdullah University Hospital (KAUH) is alarming, according to a comparison of their pre-pregnancy BMI. In accordance with global trends showing an increasing prevalence of obesity among pregnant women, 47.4% of respondents from JUH and 46.6% from KAUH were categorized as obese, for a total of 47.0% across both institutions (WHO, 2014). At 34.3%, the proportion of women who were normal weight was quite low, whereas 17.2% were classified as overweight. According to these results, almost two-thirds of the participants are either overweight or obese, highlighting a serious public health concern, especially in considering the risks for unfavorable outcomes for both the mother and the fetus (Heslehurst et al., 2019). The low percentages of underweight women (1.5%) indicate that weight-related issues in this population are predominantly focused on overweight and obesity rather than undernutrition. This prevalence emphasises the urgent need for targeted interventions and educational programs aimed at managing weight before pregnancy to improve health outcomes for mothers and their children.

Table 5 The association between Sociodemographic characteristics with Pre-pregnancy Body Mass index (N=332)

Variables	**Pre-pregnancy BMI Mean (SD)**	**P value**
Educational level		0.23
Less than high school	26.30 (4.60)	
High school	28.19 (5.65)	
Diploma	27.64 (5.84	
Undergraduate	26.51 (4.90)	
Postgraduate	27.85 (6.31)	
Employment status		0.09

Yes	27.61 (5.41)	
No	26.60 (5.16)	
Smoking status		0.83
Yes	27.15 (6.44)	
No	26.95 (5.13)	

The findings of the ANOVA test, which examined the relationship between the respondents' pre-pregnancy Body Mass Index (BMI) and sociodemographic factors, show some interesting patterns. The average BMI differed by educational level, with women with a high school degree having the greatest mean BMI (28.19; SD = 5.65), while those with less schooling had lower mean BMIs (26.30; SD = 4.60; undergraduate; 26.51; SD = 4.90). Though education may have an impact on weight status, other factors may be more important, as seen by the fact that the changes in BMI based on educational degree were not statistically significant (p = 0.23). The mean BMI of working women was also higher (27.61, SD = 5.41) than the counterpart (26.60, SD = 5.16), although this difference was not statistically significant (p = 0.09). With mean BMIs of 27.15 (SD = 6.44) for smokers and 26.95 (SD = 5.13) for non-smokers, smoking status did not appear to have a significant effect on BMI either, with a p-value of 0.83. As noted in the literature, these results imply that although sociodemographic factors might affect pre-pregnancy BMI, the absence of significant associations suggests that more research is necessary to identify other factors that contribute to obesity in this population (Heslehurst et al., 2019; WHO, 2014).

Table 6 Pearson correlation between sociodemographic characteristics and obstetric history with Pre-pregnancy BMI (N=332)

Variables	**Correlation Coefficient**	**P value**
Age	0.307**	<0.001
Income	0.059	0.286
Parity number	0.269**	<0.001
Previous number of Miscarriages	0.074	0.180
Previous number of Cesarean sections	0.131*	0.017

**Correlation is significant at the 0.01 level
*Correlation is significant at the 0.05 level

Several significant correlations are shown by the Pearson correlation analysis that looks at the relationship between pre-pregnancy Body Mass Index (BMI) with obstetric history, and socioeconomic factors. Age and pre-pregnancy BMI showed a significant moderate positive correlation (correlation coefficient = 0.307, $p < 0.001$), suggesting that older women often had higher BMI values. This is in line with previous research that emphasises how maternal age increases the risk of obesity (Heslehurst et al., 2019). Furthermore, there was a strong positive correlation between parity number and pre-pregnancy BMI (correlation coefficient = 0.269, $p < 0.001$), which is consistent with earlier research that relate higher parity to higher weight (Taghdir et al., 2020). This suggests that women who have more children may have higher pre-pregnancy BMI. According to Cnattingius et al. (2013), there was a positive link between the number of previous cesarean sections and BMI (correlation

coefficient = 0.131, p = 0.017). This could suggest that women with higher BMI are more likely to have had cesarean deliveries, which would further complicate their obstetric history. On the other hand, pre-pregnancy BMI did not significantly correlate with financial or prior miscarriages (p = 0.286 and p = 0.180, respectively), indicating that these variables may not have as much of an impact on BMI in this population. All things considered, these results emphasize the multifaceted nature of the variables affecting pre-pregnancy BMI and the necessity of focused measures to combat pregnant women's obesity.

Conclusions

This study provides important insight into the prevalence of obesity among Jordanian women of reproductive age. The findings align with national trends, highlighting the urgent need for targeted public health interventions to address this growing concern. Obesity among this population is a significant health issue that requires comprehensive strategies to promote awareness, prevention, and management.

Our study identified key relationships between pre-pregnancy BMI and various maternal factors, including age, parity, and a history of cesarean section. These factors play a crucial role in determining weight status before and during pregnancy. Understanding these associations can help healthcare providers develop personalized counseling strategies to assist women in maintaining a healthy weight before conception and throughout gestation.

By emphasizing the importance of individualized medical guidance, our research underscores the role of clinicians in mitigating obesity-related pregnancy complications. The findings not only contribute to the growing body of literature on maternal health in Jordan but also serve as a foundation for further research. Future studies can build upon these insights to explore additional determinants of maternal obesity and assess the effectiveness of various intervention programs.

Additionally, this study provides a strong basis for informed discussions aimed at improving maternal healthcare policies in Jordan. Policymakers can use this evidence to design initiatives that promote healthier lifestyles and reduce obesity rates among women of childbearing age. By addressing this critical public health issue, efforts can be directed toward enhancing maternal and neonatal outcomes in the country.

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