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The Impact of Obesity on Fertility Outcomes: Insights from a Cross-Sectional Evaluation of Reproductive Aged Women

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ABSTRACT

Obesity, recognized as a global health concern, affects myriad health aspects. The influence of obesity on cardiovascular and metabolic health has been well-documented but its relationship with fertility remains underexplored. This research aims to decipher the interplay between obesity and fertility outcomes among 300 reproductive-aged women. In this cross-sectional study, 300 reproductive-aged women, aged 18-40 years, were evaluated. Participants were stratified based on their body mass index (BMI) into four groups underweight, normal weight, overweight and obese. Parameters like menstrual regularity, ovulatory status, time taken to conceive and miscarriage rates were meticulously recorded. Statistical tools were employed to discern correlations between BMI classifications and fertility indicators. Obese participants demonstrated a pronounced tendency for irregular menstrual cycles and anovulatory events compared to women in the normal BMI bracket. The duration to achieve conception was conspicuously prolonged among obese participants. A conspicuous observation was the augmented miscarriage rates in the obese group relative to the normal BMI segment. Obesity markedly modulates fertility outcomes in reproductive-aged women. This underscores the imperative for medical professionals to prioritize weight management when counseling on reproductive health. Proactive interventions focusing on weight regulation could potentially ameliorate fertility results and curtail reproductive challenges in this demographic.

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Key Words
Obesity, fertility outcomes, Reproductive aged women

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INTRODUCTION

Obesity, a multifaceted and escalating global health concern, has witnessed a dramatic rise over the past few decades, influencing an array of health outcomes[1]. As of the last global assessment, more than 650 million adults were categorized as obese, placing a significant burden on healthcare systems worldwide[2]. While the repercussions of obesity on cardiovascular health, diabetes, and metabolic disorders have been extensively researched,[3,4] its association with fertility, particularly in reproductive-aged women, remains an area warranting detailed exploration.

Reproductive-aged women, typically defined as those between the ages of 18-44, represent a significant proportion of the female population[5]. For these women, fertility outcomes not only determine their potential to conceive but also have overarching implications on their psychological and physical well-being[6]. Preliminary studies suggest that obesity may influence menstrual regularity, ovulation, and other factors pivotal to fertility[7,8]. However, a comprehensive understanding of how obesity modulates fertility parameters, especially in this age bracket, is vital for informed clinical decision-making and counseling.

Aim: This study aims to comprehensively assess the impact of obesity on fertility outcomes, specifically focusing on menstrual regularity, ovulation patterns, time taken to conceive, and miscarriage rates, among reproductive-aged women aged between 18-40 years.

Objectives:

- To categorize the study participants based on their body mass index (BMI) into predefined groups (underweight, normal weight, overweight and obese) and analyze the distribution of fertility outcomes across these categories
- To determine the association between obesity and specific fertility indicators, including menstrual cycle regularity, ovulatory status, time to conceive and miscarriage rates, among reproductive-aged women
- To provide evidence-based recommendations for healthcare professionals regarding weight management and its potential implications on reproductive health, derived from the observed associations between BMI and fertility outcomes

MATERIALS AND METHODS

Study design and setting: A cross-sectional evaluation was conducted in a large urban tertiary care center with a dedicated reproductive health and endocrinology unit. The study was carried out over a period of 12 months from January to December 2022.
Sample size: The study included 300 reproductive-aged women aged between 18-40 years who visited the center either for routine check-ups or fertility-related concerns.

Participant stratification: Upon recruitment, participants were stratified based on their body mass index (BMI) using the World Health Organization's (WHO) classification:

- Underweight (<18.5 kg m^{-2})
- Normal weight (18.5-24.9 kg m^{-2})
- Overweight (25.0-29.9 kg m^{-2})
- Obese ($\geq$30 kg m^{-2})

Data collection: A structured questionnaire was administered to collect demographic details, medical history, menstrual patterns, fertility history and other relevant information. Furthermore Menstrual regularity was determined based on cycle length and variation over the past six months. Ovulatory status was inferred through basal body temperature charts, mid-luteal serum progesterone levels and menstrual cycle regularity. Time taken to conceive was collated from participants who were actively trying to conceive. Miscarriage rates were computed from self-reported pregnancy losses before 20 weeks of gestation.

Statistical analysis: Data were analyzed using the SPSS statistical software (version 27). Descriptive statistics (frequencies, percentages, means and standard deviations) were used to describe the study population. Chi-square tests were employed to explore associations between categorical variables, while ANOVA and t-tests were used for continuous variables. A $p>0.05$ was considered statistically significant.

Ethical considerations: The study was approved by the institutional review board of the tertiary care center. Informed consent was obtained from all participants, ensuring that they understood the study's purpose, procedures, potential risks and benefits. Confidentiality of personal and medical information was strictly maintained throughout the study.

OBSERVATION AND RESULTS

The table presents a comparative analysis of fertility outcomes across different BMI categories. Underweight, Normal Weight, Overweight, and Obese. For menstrual regularity, a vast majority of women, except those in the obese category (66.7%), had regular cycles. Ovulation patterns indicated a pronounced reduction in ovulatory women in the obese category (73.3%) compared to nearly 98% in the

Table 1: Associations between BMI categories and fertility outcomes in reproductive-aged women: A comparative analysis

Variable/outcome	Underweight (n = 50)	Normal weight (n = 100)	Overweight (n = 75)	Obese (n = 75)	Odds ratio (OR) 95%	Confidence interval (95% CI)	p-value
Menstrual regularity							
Regular	45 (90%)	95 (95%)	70 (93.3%)	50 (66.7%)	Ref.		<0.01
Irregular	5 (10%)	5 (5%)	5 (6.7%)	25 (33.3%)	5.0	2.5-10.0	
Ovulation patterns							
Ovulatory	48 (96%)	98 (98%)	73 (97.3%)	55 (73.3%)	Ref.		<0.01
Anovulatory	2 (4%)	2 (2%)	2 (2.7%)	20 (26.7%)	8.0	3.5-18.5	
Time taken to conceive							
<6 months	40 (80%)	85 (85%)	60 (80%)	40 (53.3%)	Ref.		<0.01
>6 months	10 (20%)	15 (15%)	15 (20%)	35 (46.7%)	2.5	1.5-4.0	
Miscarriage rates							
No miscarriage	49 (98%)	98 (98%)	73 (97.3%)	58 (77.3%)	Ref.		<0.01
Misca							
rriage	1 (2%)	2 (2%)	2 (2.7%)	17 (22.7%)	7.5	4.0-14.0	

normal weight category. When observing the time taken to conceive, 53.3% of obese women took less than 6 months, in contrast to 85% in the normal weight group. Regarding miscarriage rates the obese category had a notably higher rate (22.7%) compared to just 2% in the normal weight category. All observed differences had statistical significance with p>0.01.

DISCUSSIONS

The presented table illustrates the relationship between BMI categories and specific fertility outcomes among reproductive-aged women. A clear pattern emerges, wherein obesity is associated with adverse fertility outcomes, consistent with existing literature on the topic.

Starting with menstrual regularity, the data show that obese women have a considerably higher percentage of irregular menstrual cycles (33.3%) compared to their normal weight counterparts (5%). This finding aligns with a study by Wise *et al.*[6] which demonstrated a strong link between obesity and menstrual irregularities, attributing it to disruptions in hormonal balance.

Regarding ovulation patterns the anovulatory rate jumps significantly in the obese category to 26.7%. A study by Kalhor *et al.*[7] similarly underscored the influence of obesity on ovulation, suggesting that excessive adiposity can interfere with the normal ovulatory process, leading to anovulatory cycles.

In the context of the time taken to conceive, obese women tend to take longer, with only 53.3% conceiving in less than 6 months. This delayed conception aligns with findings from the study by Grieger *et al.*[8] where obesity was identified as a significant disruptor of female fertility, extending the time to conception.

Lastly, our data regarding miscarriage rates reveals a concerning trend, where 22.7% of obese women experience miscarriages. This echoes the outcomes of a research piece by DesJardin *et al.*[9] which associated elevated BMI with an increased risk of first-trimester and recurrent miscarriages.

CONCLUSION

The cross-sectional evaluation of reproductive-aged women highlights the profound impact of obesity on various facets of fertility. Our findings underscore that obesity is significantly associated with menstrual irregularities, altered ovulation patterns, extended time taken to conceive, and elevated miscarriage rates. Given the rising prevalence of obesity globally, these insights emphasize the pressing need for medical practitioners to integrate weight management strategies into reproductive health counseling. Addressing obesity can not only enhance fertility prospects but also contribute to the holistic well-being of women. It is paramount for both public health initiatives and clinical interventions to prioritize this nexus between obesity and reproductive health, aiming for a healthier future generation.

LIMITATIONS OF STUDY

Cross-sectional design: Given the cross-sectional nature of the study, it allows for the observation of associations but does not provide insights into causality or the temporal sequence of events. Longitudinal studies would be more apt in determining cause-and-effect relationships.

Recall bias: Since some data, especially concerning menstrual patterns and time taken to conceive, were self-reported by participants, there's potential for recall bias which could affect the accuracy of the reported information.

Single center evaluation: Data was collected from asingle urban tertiary center, which may not be representative of broader populations, especially those from rural areas or diverse geographical and cultural backgrounds.

Potential confounders: Other potential confounding factors, like dietary habits, lifestyle factors, stress levels and genetic predispositions, which could influence fertility outcomes, were not comprehensively accounted for in this study.

BMI as the sole measure: While BMI is a widely recognized measure for obesity, it doesn't account for muscle mass, bone density, overall body composition, and racial and sex differences. A comprehensive evaluation could have included other metrics like waist-to-hip ratio or body fat percentage.

Limited age bracket: The study focuses solely on reproductive-aged women between 18-40 years, potentially missing out on insights from women on the borderlines of this age range.

Variability in fertility interventions: The study did not account for women who might be on certain fertility treatments or interventions, which could influence the outcomes.

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