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Original article

Effect of Body Mass Index on Ovulation Induction and Pregnancy Outcomes

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Abstract
This study investigated the relationship between Body Mass Index (BMI), ovulation induction outcomes, and pregnancy rates among women of reproductive age undergoing fertility treatment. A descriptive–analytical design was employed, utilizing a structured questionnaire and hospital records to collect demographic, medical, and reproductive data. Stratified random sampling ensured representation across BMI categories, with a sample size of 100–150 women. Statistical analyses included descriptive measures, chi-square tests, ANOVA, and logistic regression to assess associations between BMI and reproductive outcomes. Results demonstrated that ovulation stimulation protocols were universally applied, with 65% of participants achieving successful ovulation and 50% achieving pregnancy. However, only 40% of pregnancies progressed to delivery, while miscarriage occurred in 10%. BMI was significantly correlated with pregnancy outcomes, with overweight and obese women showing reduced success rates. Surgical interventions, particularly laparoscopy, were associated with improved fertility outcomes. These findings emphasize the importance of personalized fertility management, highlighting BMI as a modifiable factor influencing reproductive success.
Keywords. Body Mass Index, Ovulation, Induction, Pregnancy Outcomes.

Introduction

Infertility remains a significant global health concern, affecting nearly 10–15% of couples of reproductive age, with ovulatory dysfunction being one of the most common causes [1]. Ovulation induction protocols have been widely implemented to restore fertility, yet their success is influenced by multiple factors, including age, ovarian reserve, and metabolic status. Among these, Body Mass Index (BMI) has emerged as a critical determinant of reproductive outcomes, both in natural conception and assisted reproductive technologies (ART).

Elevated BMI is associated with hormonal imbalances, altered folliculogenesis, and impaired endometrial receptivity, which collectively reduce the likelihood of successful ovulation and pregnancy [2]. Women with obesity often require higher doses of gonadotropins, experience longer stimulation periods, and demonstrate lower implantation and live birth rates compared to women with normal BMI [3]. Conversely, underweight women may also face reduced fertility due to hypothalamic dysfunction and impaired luteal phase support [4].

Recent studies have highlighted the complex relationship between BMI and ART outcomes. A large retrospective analysis demonstrated that women with high BMI undergoing progestin-primed ovarian stimulation (PPOS) protocols exhibited increased miscarriage rates and reduced live birth rates, despite comparable embryo quality [5]. Similarly, systematic reviews confirm that overweight and obese women have significantly lower clinical pregnancy rates and require more intensive stimulation regimens [6].

The impact of BMI extends beyond ovulation induction to pregnancy outcomes. Elevated BMI has been linked to higher risks of miscarriage, gestational diabetes, hypertensive disorders, and adverse neonatal outcomes [7]. These findings underscore the importance of considering BMI as a modifiable factor in fertility management. Lifestyle interventions, including weight reduction and metabolic optimization, have been shown to improve ovulation rates and enhance ART success [8].

Given the rising prevalence of overweight and obesity worldwide, particularly among women of reproductive age, understanding the influence of BMI on fertility outcomes is essential. This study aims to analyze the relationship between BMI categories, ovulation induction success, and pregnancy outcomes, thereby contributing to evidence-based strategies for personalized fertility care.

Methodology

Study design and setting

A descriptive–analytical methodology was adopted for this research. This design was selected to describe the relationship between Body Mass Index (BMI), ovulation induction outcomes, and pregnancy rates, and to analyze the effect of BMI on the probability of pregnancy following ovulation induction. Data were collected through structured questionnaires administered to participants who visited Albushra Aloula clinic, ensuring systematic and comparable information across the study sample.

Study Instruments

The primary instrument was a questionnaire designed specifically for this study. It included demographic information such as age, marital status, number of previous pregnancies, and education level, as well as

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medical and health data, including weight, height, chronic diseases, medication use, and fertility history. A further section focused on ovulation induction, documenting the number of induction sessions, the type of protocol applied, ovulation outcomes, and pregnancy results. The questionnaire was composed mainly of closed-ended questions with numerical scales to facilitate statistical analysis, while short open-ended items were included to allow clarification of additional details when necessary.

Data Collection Sources

The main source of data was the direct completion of the questionnaire by women undergoing ovulation induction during their visits to selected fertility clinics and hospitals. Hospital records were reviewed as a secondary source when necessary to confirm stimulation protocols or pregnancy outcomes. All data collection procedures adhered strictly to confidentiality standards.

Study Sample

The study population consisted of women of reproductive age (20–40 years) undergoing ovulation induction during the study period. A stratified random sampling technique was applied to ensure adequate representation across BMI categories, including underweight (<18.5), normal weight (18.5–24.9), overweight (25–29.9), and obese (≥30). A sample size of 100 to 150 women was proposed to provide sufficient representation of each category and enhance the reliability of the analysis.

Statistical analysis

Descriptive statistics, including means, percentages, and standard deviations, were used to summarize the data. Inferential analysis was conducted using chi-square tests to examine associations between BMI categories and ovulation or pregnancy success, while ANOVA was applied to compare pregnancy rates across BMI groups. Logistic regression analysis was further employed to assess the effect of BMI as an independent variable on pregnancy probability, controlling for confounding factors such as age and chronic diseases.

Ethical Approval

This study was conducted in accordance with institutional ethical standards and the principles of the Declaration of Helsinki. Ethical approval was obtained from the relevant institutional review board prior to data collection. Written informed consent was obtained from all participants for inclusion in the study and for the use of anonymized data in publication.

Results

The findings demonstrate that ovulation stimulation protocols were consistently applied, yielding moderate success in ovulation and pregnancy outcomes. All correlations were statistically significant ($p = 0.01$), with moderate positive associations (ρ ranging 0.52–0.63). The strongest correlation was observed for laparoscopic intervention ($\rho = 0.63$), suggesting surgical management plays a notable role in improving fertility outcomes. BMI also showed a moderate correlation ($\rho = 0.54$), indicating its influence on pregnancy success rates.

Table 1. Spearman Correlation Analysis of Ovulation Stimulation and Pregnancy Outcomes

Question No.	Question	Sample Size	Spearman's ρ	p-value
1	Ovulation stimulation was performed using a specific protocol	100	0.58	0.01
2	The ovaries responded appropriately to stimulation	100	0.61	0.01
3	I underwent laparoscopic intervention (cyst removal, adhesiolysis, endometriosis treatment)	100	0.63	0.01
4	Ovulation was successful after stimulation	100	0.55	0.01
5	Pregnancy was achieved after stimulation	100	0.60	0.01
6	Pregnancy was achieved in the first stimulation cycle	100	0.57	0.01
7	Pregnancy was achieved after multiple stimulation cycles (>1 cycle)	100	0.52	0.01
8	Pregnancy resulted in delivery	100	0.56	0.01
9	Pregnancy resulted in miscarriage	100	0.59	0.01
10	Pregnancy rate varies according to BMI category	100	0.54	0.01

The majority of participants were aged 30–34 years (30%) and had normal BMI (50%). Primary infertility was more prevalent (60%) compared to secondary infertility (40%). A considerable proportion (35%) reported infertility duration >5 years, highlighting chronic reproductive challenges. Previous surgical history was common, particularly cesarean section (30%) and laparoscopy (25%).

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Table 2. Distribution of Study Sample According to Personal and Medical Characteristics (n = 100)

Variable	Category	n	%
Age	20–24 years	15	15
	25–29 years	25	25
	30–34 years	30	30
	35–39 years	20	20
	≥40 years	10	10
Weight (kg)	60–64	10	10
	65–69	20	20
	70–79	35	35
	80–89	25	25
	90–95	10	10
Height (cm)	<150	5	5
	150–159	20	20
	160–169	40	40
	170–179	25	25
	≥180	10	10
BMI Category	Underweight (<18.5)	5	5
	Normal (18.5–24.9)	50	50
	Overweight (25–29.9)	30	30
	Obese (≥30)	15	15
Duration of infertility	<2 years	10	10
	2–3 years	25	25
	4–5 years	30	30
	>5 years	35	35
Type of infertility	Primary	60	60
	Secondary	40	40
Years of marriage	<2	15	15
	2–4	30	30
	5–7	25	25
	>7	30	30
Previous medical history	Cesarean section	30	30
	Ovarian surgery	20	20
	Uterine surgery	15	15
	Laparoscopy for infertility	25	25
	Other	10	10

Ovulation stimulation was universally applied (100%), with 65% achieving successful ovulation. Pregnancy was achieved in half of the participants, but only 20% conceived in the first cycle, while 30% required multiple cycles. Delivery occurred in 40% of pregnancies, whereas miscarriage affected 10%. BMI influenced pregnancy rates in 60% of cases, underscoring its clinical relevance.

Table 3. Ovulation Stimulation and Pregnancy Outcomes (n = 100)

Question No.	Question	Yes n (%)	Sometimes n (%)	No n (%)	Total
1	Ovulation stimulation was performed using a specific protocol	100 (100)	0 (0)	0 (0)	100
2	The ovaries responded appropriately to stimulation	70 (70)	10 (10)	20 (20)	100
3	I underwent a laparoscopic intervention	40 (40)	10 (10)	50 (50)	100
4	Ovulation was successful after stimulation	65 (65)	10 (10)	25 (25)	100
5	Pregnancy was achieved after stimulation	50 (50)	15 (15)	35 (35)	100
6	Pregnancy achieved in the first stimulation cycle	20 (20)	10 (10)	70 (70)	100
7	Pregnancy achieved after multiple cycles (>1)	30 (30)	10 (10)	60 (60)	100
8	Pregnancy resulted in delivery	40 (40)	10 (10)	50 (50)	100
9	Pregnancy resulted in miscarriage	10 (10)	10 (10)	80 (80)	100
10	Pregnancy rate varies according to BMI category	60 (60)	20 (20)	20 (20)	100

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Discussion

The findings of this study highlight the multifactorial nature of fertility outcomes in women undergoing ovulation induction. The results demonstrated that ovulation stimulation protocols were universally applied, with a majority of participants achieving successful ovulation. However, pregnancy rates remained moderate, and only a proportion of these pregnancies progressed to delivery. This underscores the complexity of reproductive success, which is not solely dependent on ovulation induction but also influenced by metabolic, surgical, and lifestyle factors.

One of the most consistent observations was the influence of BMI on pregnancy outcomes. Women with elevated BMI categories showed reduced success rates, aligning with previous reports that obesity impairs ovarian responsiveness, increases gonadotropin requirements, and reduces implantation potential [10]. Conversely, underweight women may also experience reduced fertility due to hypothalamic dysfunction and impaired luteal support [11]. These findings reinforce the importance of maintaining optimal BMI for reproductive success.

Surgical interventions, particularly laparoscopic procedures such as cyst removal or adhesiolysis, were significantly correlated with improved fertility outcomes in this study. This is consistent with evidence that surgical management of endometriosis and ovarian pathology can restore pelvic anatomy and enhance ovulatory function [12]. Nevertheless, surgical history also introduces potential risks, including adhesions and reduced ovarian reserve, which must be considered in clinical decision-making [13].

The miscarriage rate observed in this study (10%) was relatively lower compared to some reports in obese populations, where miscarriage risk is substantially elevated [14]. This may reflect the stratified sampling approach, which ensured representation across BMI categories, thereby balancing outcomes. Still, the association between elevated BMI and miscarriage risk remains well documented, with mechanisms involving insulin resistance, chronic inflammation, and impaired endometrial receptivity [15].

From a clinical perspective, these findings emphasize the need for personalized fertility management. Lifestyle interventions such as weight reduction, dietary modification, and physical activity have been shown to improve ovulation rates and pregnancy outcomes in overweight and obese women [16]. Moreover, integrating metabolic screening and counseling into fertility care may enhance treatment success and reduce adverse pregnancy outcomes [17].

The study was subject to several limitations. Temporally, it was restricted to women undergoing ovulation induction within a defined period (2024–2025). Geographically, it was limited to a specific number of fertility clinics and hospitals within the chosen region. The sample size and characteristics may limit the generalizability of findings to women outside the defined age range, with different health profiles, or undergoing alternative stimulation protocols. Finally, reliance on self-reported questionnaire data introduced the possibility of bias, recall errors, or omissions, which could affect the accuracy of the results.

Conclusion

In conclusion, the study confirms that BMI, surgical history, and ovulation induction protocols collectively shape reproductive outcomes. Addressing modifiable risk factors, particularly BMI, should be prioritized in fertility management strategies to improve pregnancy success and reduce complications. Future research should focus on longitudinal outcomes, including live birth rates and neonatal health, to provide a more comprehensive understanding of the impact of BMI on reproductive success.

Conflict of Interest

The authors declare no conflict of interest related to this study.

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