Nisreen Mansour Omar et al, 2025;9(4):936–942.
DOI: 10.24911/IJMDC.51-1742946446

ORIGINAL ARTICLE

Prevalence and major causes of female infertility in Jeddah, Saudi Arabia: a retrospective analytical study

Nisreen Mansour Omar[1]*, Judy Saleh Abbas[2], Sabah Akram Mandely[2], Rahaf Osama Malaka[2], Aisha Yousef Bafuleh[2], Ahlam Attaullah Mohammad[2], Jana Saleh Abbas[2], Joud Hesham Badokhon[2], Mohammad Othman[3]

ABSTRACT

Objective: This study aimed to examine the prevalence and key contributors to infertility among women in Jeddah, Saudi Arabia.

Methods: A retrospective cross-sectional study was conducted on 895 females attending the fertility unit at Dr. Soliman Fakeeh Hospital between 2017 and 2022. Data collected included age, body mass index (BMI), menstrual cycle regularity, type of infertility (primary or secondary), and reproductive health conditions such as polycystic ovarian syndrome (PCOS), anovulation, tubal pathology, endometriosis, and unexplained infertility.

Results: The participants' mean age was 36 years (SD = 6), with a mean BMI of 29.18 (SD = 15.78). Primary infertility was found in 31.2% of cases, while secondary infertility accounted for 28.0%. A significant association was found between infertility type and menstrual cycle regularity ($\chi^2 = 4.585$, p-value = 0.032); 59.3% of women with primary infertility had irregular cycles, whereas 80.4% of those with secondary infertility had regular cycles. However, BMI showed no significant association with infertility type (p-value = 0.837) or duration ($r = 0.023$, p-value = 0.484). Regression analysis identified age as the only significant predictor of infertility duration ($B = 0.123$, $p < 0.001$), with other factors showing no significance ($p > 0.05$).

Conclusion: Age was the primary predictor of infertility duration, emphasizing early fertility screening and intervention. The link between menstrual irregularity and primary infertility underscores the need for hormonal and metabolic evaluations. Further research should explore psychological stress and partner-related factors.

Keywords: Infertility, menstrual cycle irregularity, infertility duration, fertility predictors, Saudi Arabia.

Introduction

Infertility is defined as the inability of a couple to conceive after 1 year of regular, unprotected intercourse [1]. It is a global health challenge worldwide that affects about 13%–15% of couples [2]. For women under 35 years, infertility is typically diagnosed after 12 months of unsuccessful attempts to conceive, while for women aged 35 years and older, it is considered after 6 months [1].

Infertility is categorized into two types: primary infertility, where a couple has never conceived, and secondary infertility, where a couple has previously achieved pregnancy but is unable to conceive again [3]. The underlying causes can be attributed to female

Correspondence to: Nisreen Mansour Omar
*Physiological Sciences Department-MBBS Program, Fakeeh College for Medical Sciences, Jeddah, Saudi Arabia.
Email: nmomar@fcms.edu.sa
Full list of author information is available at the end of the article.
Received: 25 March 2025 | **Accepted:** 07 April 2025

factors, male factors, or a combination of both, with approximately 15% of cases still unexplained despite thorough evaluation.

In women, infertility is often linked to hormonal imbalances or reproductive health conditions. Disorders such as hyperprolactinemia, hypothyroidism, and hyperthyroidism can disrupt ovulation, reducing the likelihood of conception. Polycystic ovary syndrome (PCOS) is among the most common causes, affecting ovulation in approximately 70% of women with irregular cycles. Other contributing factors include endometriosis, uterine fibroids, and sexually transmitted infections. Additionally, lifestyle factors and environmental factors - such as advanced maternal age, obesity, smoking, alcohol consumption, and chronic conditions such as diabetes and depression - can further impact fertility [2].

Male infertility is typically associated with conditions affecting sperm production or function, including undescended testes, varicocele, orchitis, testicular torsion, premature ejaculation, and erectile dysfunction [4]. Despite infertility being a shared challenge, women often face a disproportionate emotional and social burden, encountering stigma, societal pressure, and psychological distress, which can further complicate their experience [2].

Although infertility is a well-documented global issue, there is limited region-specific data regarding its causes and contributing factors in Saudi Arabia. The existing studies on infertility in the Kingdom primarily focus on prevalence rates rather than detailed etiological factors affecting Saudi women. Given the unique genetic, lifestyle, and environmental factors in the region, a deeper understanding of infertility causes is crucial for developing targeted interventions. One of the important known risk factors affecting fertility is obesity, as nearly 40% of Saudi women are classified as obese [2,4].

However, the direct association between obesity, metabolic disorders such as diabetes, and infertility remains underexplored in the Saudi population. Therefore, this study aimed to provide a more comprehensive understanding of the causes and risk factors of female infertility in the local population in Jeddah, Saudi Arabia.

Subjects and Methods

This cross-sectional study was conducted using pooled medical records of female patients who attended the Fertility Unit at Dr. Soliman Fakeeh Hospital between 2017 and 2022. The patients' confidentiality was maintained throughout the research process. The patient's confidentiality was ensured by anonymizing all data before analysis. Due to the retrospective nature of the study, informed consent was waived by the ethics committee.

Cochrane sample size formula was employed to ascertain the sample size. The formula used was $n = Z^2p\ (1 - p)/d^2$. Where n represented the sample size, Z denoted the standard normal deviation corresponding to a 95% confidence level, 50% was the predetermined proportion, and d was the margin of error (5%). The initial calculation yielded a minimum acceptable sample size of 385. However, to enhance the reliability of the results, a larger sample size of 895 participants was included.

The study included medical records of women who sought fertility evaluation or treatment at the fertility unit during the specified period. Inclusion criteria were women aged 18–55 years, diagnosed with primary or secondary infertility, and availability of complete medical records, including age, body mass index (BMI), infertility duration, menstrual cycle characteristics, and relevant reproductive health data. Incomplete records or those with missing important fertility-related data were excluded.

Identified data were extracted from the hospital's electronic medical records system. Key variables included demographic data (age, BMI, etc.), reproductive health data (infertility type (primary/secondary), infertility duration, menstrual cycle regularity, and history of gynecological disorders), metabolic, and hormonal markers (if available) (thyroid function, prolactin levels, androgen levels, and glucose metabolism indicators).

All statistical analyses were performed using IBM Statistical Package for Social Sciences software version 29, with a significance level set at $p < 0.05$. Descriptive statistics were used to summarize continuous variables such as age, BMI, and infertility duration, which were reported as means and SDs. Categorical variables were summarized as frequencies and percentages. To examine associations, a chi-square test was conducted to assess the relationship between infertility type and menstrual cycle regularity. An independent samples *t*-test was used to compare BMI between primary and secondary infertility groups. Pearson correlation analysis evaluated the relationship between BMI and infertility duration. Finally, multiple linear regression analysis was performed to determine significant predictors of infertility duration, incorporating age, BMI, and reproductive health conditions.

Results

The study sample comprised 895 women, with a mean age of 36 years (SD = 6). Most participants (53.2%) were aged between 35 and 44 years. The mean BMI was 29.18 (SD = 15.78). Based on the BMI classification, 34.7% were classified as overweight (25–29.9 kg/m^2). The average duration of infertility among pooled data of participants was 5.2 years (SD = 4.03), with 46.5% experiencing long-term infertility (>5 years). Out of the total sample examined, 52.7% of participants were diagnosed with primary infertility (Table 1).

There was a significant association between infertility type, primary versus secondary, and the regularity of the menstrual cycle: $\chi^2 = 4.585$, df = 1, p-value = 0.032. Among participants, 22.8% (204 women) reported having an irregular menstrual cycle. Among women with primary infertility, 25.6% had irregular cycles. Among

Table 1. *Descriptive statistics for demographic and medical characteristics (N = 895).*

		Frequency (*N*)	Percentage (%)	Mean	SD
Gender of patients	Female	895	60.4		
	Male	588	39.6		
Age of patients				36	6
Age groups	18–24 years	21	2.3		
	25–34 years	359	40.1		
	35–44 years	476	53.2		
	45–54 years	39	4.4		
	55 years and above	0	0.0		
BMI				29.18	15.78
BMI categories	Underweight (BMI < 18.5)	15	1.7		
	Normal weight (18.5 ≤ BMI < 25)	233	26.0		
	Overweight (25 ≤ BMI < 30)	311	34.7		
	Obesity class 1: (30 ≤ BMI < 35)	208	23.2		
	Obesity class 2: (35 ≤ BMI < 40)	93	10.4		
	Extreme obesity: class 3 (BMI ≥ 40)	35	3.9		
Duration of infertility (years)				5.20	4.03
Duration of infertility: Groups	≤2 years	122	13.6		
	2–5 years	357	39.9		
	>5 years	416	46.5		
Type of infertility	Primary infertility	472	52.7		
	Secondary infertility	423	47.3		
Menstrual cycle regularity	Regular cycle	691	77.2		
	Irregular cycle	204	22.8		
Cause of infertility	Presence of tubal pathology	87	15.6		
	Presence of anovulation	122	21.8		
	Presence of endometriosis	15	2.7		
	Presence of PCOS	97	17.4		
	Unexplained infertility	308	55.1		

BMI = Body mass index.
Duration of infertility is in years.

Table 2. *Association between infertility type and menstrual cycle regularity (N = 895).*

		Menstrual cycle regularity		Total	Chi-square statistic	df	*p*-value
		Irregular cycle	Regular cycle				
Type of Infertility	Primary infertility	121 (25.6%)	351 (74.4%)	472 (52.7%)	4.585	1	0.032
	Secondary infertility	83 (19.6%)	340 (80.4%)	423 (47.3%)			
Total		204 (22.8%)	691 (77.2%)	895 (100%)			

those with secondary infertility, only 19.6% had irregular cycles (Table 2).

The mean BMI for participants with primary infertility was 29.28 ± 21.10, which was comparable to the BMI of those with secondary infertility (29.07 ± 5.52). Statistical analysis using an independent samples *t*-test revealed no significant difference between the two groups ($t = 0.206$, df = 893, p-value = 0.837) (Table 3).

Table 3. *Comparison of BMI by infertility type (N = 895).*

Type of Infertility	*n*	BMI (mean ± SD)	SE of Mean	*t*-value	df	*p*-value
Primary infertility	472	29.28 ± 21.10	0.97			
Secondary infertility	423	29.07 ± 5.52	0.27			
Comparison				0.206	893	0.837

Table 4. *Correlation between BMI and duration of infertility (N = 895).*

Variable	Mean	SD	Pearson correlation (*r*)	*p*-value
Body mass index	29.18	15.78		
Duration of infertility (in years)	5.19	4.04	0.023	0.484

Table 5. *Predictors of duration of infertility (N = 895).*

Predictor	Beta (unstandardized)	SE	Beta (standardized)	*t*-value	*p*-value
Constant	0.505	0.905	—	0.557	0.577
Age	0.123	0.024	0.174	5.184	<0.001
BMI	0.006	0.008	0.024	0.732	0.464
Tubal pathology	0.170	0.453	0.012	0.376	0.707
Anovulation	0.564	0.411	0.048	1.371	0.171
Endometriosis	1.945	1.039	0.062	1.871	0.062
PCOS	–0.211	0.456	–0.016	–0.462	0.644

The results indicated a weak and non-significant correlation ($r = 0.023$, p-value = 0.484) suggesting that BMI was not associated with the duration of infertility in this cohort (Table 4).

Among the variables analyzed, age was the only significant predictor, with increasing age associated with a longer duration of infertility ($B = 0.123$, $p < 0.001$). Other factors, including BMI (p-value = 0.464), tubal pathology (p-value = 0.707), anovulation (p-value = 0.171), endometriosis (p-value = 0.062), and PCOS (p-value = 0.644), did not contribute significantly to the model. The regression model accounted for only 3.6% of the variance in infertility duration ($R^2 = 0.036$, $p < 0.001$), suggesting that additional unmeasured factors may influence infertility duration (Table 5).

Results were based on linear regression analysis. Coefficients (B), SE, and significance levels (p-values) are reported. Statistical significance is set at $p < 0.05$.

Discussion

Analysis of the pooled data of the sample revealed that among the women in Jeddah, Saudi Arabia, the prevalence of primary infertility was 52.7%, while secondary infertility accounted for 47.3%. Globally, infertility rates vary widely, with estimates ranging from 3.5% to 16.7% in developed countries and 6.9% to 9.3% in less developed regions, averaging approximately 10% worldwide [5,6].

As compared to regional data, infertility prevalence in the Middle East and North Africa is estimated at 17.2%, with primary infertility reported at 3.8% [7]. The higher infertility rates observed in South Asia and the Middle East, compared to high-income countries, suggested that regional factors, such as environmental exposures, genetic predisposition, and access to healthcare, might contribute to infertility prevalence [8].

The risk factors identified in this study, including age, BMI, and conditions of reproductive health conditions, align with existing literature, which highlighted the significant role of hormonal disorders and ovarian dysfunction in infertility. Additionally, lifestyle and socioeconomic factors have been strongly linked to infertility development [6,9].

The results also suggested that women with primary infertility were more likely to experience irregular menstrual cycles compared to those with secondary infertility. The higher prevalence of irregular cycles in primary infertility cases suggested a potential link between menstrual cycle disturbances and difficulties in conceiving for the first time. Indeed, the relationship between irregular menstrual cycles and endocrine disorders, such as PCOS and thyroid dysfunction, is well-documented. Previous studies have demonstrated that these conditions can lead to anovulation and infertility [10,11]. Similarly, irregular cycles have been linked to

an increased risk of metabolic diseases, such as diabetes, which can negatively impact reproductive health [12].

The predominance of secondary infertility among women with regular menstrual cycles suggests that factors other than ovulatory dysfunction, such as tubal disease or male factor infertility, might contribute to fertility challenges [13]. This highlighted the need for further research into the interaction between menstrual cycle regularity and infertility type to better understand the underlying mechanisms.

The impact of BIM on fertility is well documented in the literature, with both underweight and obese individuals experiencing fertility challenges. However, in the present study, no statistically significant difference in BMI was observed between the primary and secondary infertility groups (p-value = 0.837). Similarly, BMI was not a significant predictor of infertility duration (p-value 0.464). These findings contrast with previous research linking obesity to ovulatory dysfunction, prolonged time-to-pregnancy, and reduced conception rates [14,15].

One possible explanation for these results was the heterogeneity of infertility causes among participants. While obesity is widely recognized for its detrimental effects on ovulatory function and endometrial receptivity, its impact on infertility duration might be influenced by additional factors such as genetic predisposition, metabolic conditions, and lifestyle. Previous studies have suggested a J-shaped relationship between BMI and fertility, where both low and high BMI levels negatively affect reproductive outcomes [16]. Furthermore, BMI alone does not fully capture either body composition or metabolic dysfunction; each one of them plays a distinct and critical role in reproductive health.

Since the role of BMI in fertility outcomes is well established, further studies should explore the interaction between BMI and metabolic biomarkers in the etiology of infertility, particularly in Middle Eastern populations where obesity rates are on the rise.

The duration of infertility was the most significant factor influencing treatment success and reproductive prognosis. In the present study, among the factors related to infertility duration, age emerged as a significant predictor ($p < 0.001$), while BMI, tubal pathology, anovulation, endometriosis, and PCOS did not show significance ($p > 0.05$). Additionally, the regression model accounted for only 3.6% of the variance, suggesting that other unmeasured factors might contribute to prolonged infertility.

Indeed, previous research has shown that age was a key factor influencing female reproductive potential, as it is associated with a diminishing ovarian reserve, declining oocyte quality, and increased aneuploidy rates observed with advancing age [17,18]. Notably, it has been shown that women over 35 years' experience a significant decline in fecundability alongside reduced success rates with assisted reproductive technologies (ART) [19]. Additionally, hormonal fluctuations and metabolic changes in older women can further lengthen the infertility duration by impacting fertility and endometrial receptivity [20].

Although previous research has identified BMI, hormonal disorders, and reproductive pathologies as significant contributors to infertility duration, these factors were not found to be statistically significant in this analysis. This discrepancy might be due to population-specific characteristics, clinical factors, or sample size limitations. Additionally, the very low R^2 value of 0.036 indicated that psychosocial, environmental, or partner-related factors might play a more substantial role in the persistence of infertility. Future studies should incorporate factors such as psychosocial stress, male factor infertility, and endocrine markers to develop a more comprehensive predictive model for infertility duration.

Infertility management is multifactorial, ranging from modification of lifestyle to medical treatment to ART [2]. Since age was the only statistically significant predictor of the duration of infertility, early ovarian reserve testing is strongly recommended, particularly for women planning delayed pregnancy [18]. Menstrual cycle irregularities were strongly associated with primary infertility, indicating that an endocrine work-up, including screening for PCOS and thyroid dysfunction, is crucial, as these conditions might impair ovulatory function.

Although BMI was not found to be a significant predictor of infertility duration, previous studies have highlighted its impact on reproductive health. It is the overall metabolic health and hormonal balance rather than the BMI *per se* that necessitated more personalized treatment approaches [14,15]. Further research is needed to explore the role of metabolic markers in infertility outcomes and to update weight management recommendations [16]. Additionally, the low variance explained by the regression model suggested that psychological, genetic, and life course factors might contribute to the persistence of infertility and warrant further investigation through longitudinal studies.

This study highlighted the importance of early fertility screening and timely intervention, particularly concerning the impact of age on infertility duration. Ovarian reserve testing could be integrated into routine fertility assessments alongside individual hormonal analysis to facilitate timely and effective treatment [18]. Given the association between menstrual irregularities and primary infertility, comprehensive endocrine evaluations - including assessments for PCOS, thyroid dysfunction, and metabolic disorders - should be incorporated into infertility investigations [21]. While BMI was not a significant independent predictor, its well-established relationship with fertility-related outcomes supports a focus on weight management strategies aimed at optimizing metabolic and hormonal balance rather than relying solely on BMI [22].

These findings emphasize the importance of early reproductive health screening, targeted lifestyle interventions, and personalized fertility management in clinical practice. There is a lack of research on the psychological and emotional burden of infertility among Saudi women. Infertility in the region often carries a significant stigma, affecting mental health and marital relationships. However, the interaction between psychological stress and biological infertility factors in Saudi Arabia remains under-investigated. Therefore, future research should adopt a longitudinal design, incorporating genetic, hormonal, and psychological variables to develop a more comprehensive predictive model for infertility duration and treatment outcomes. Such an approach would enhance personalized fertility care and improve patient-centered reproductive health strategies.

However, this study had limitations. The retrospective cross-sectional design restricted the ability to establish causality between identified factors and infertility duration. Additionally, unmeasured confounding variables - such as partner fertility, socio-economic status, and psychosocial stressors - might have influenced the infertility outcomes. The study's reliance on BMI as a measure of obesity also presented limitations, as BMI does not account for body fat distribution, muscle mass, or overall metabolic health, which might impact its predictive value [23]. Furthermore, since this study was conducted in Jeddah, Saudi Arabia, the findings might not be generalizable to populations with different genetic backgrounds, environmental factors, or healthcare access [24]. Future research should focus on cohort-based prospective studies incorporating biomarkers, genetic predispositions, and partner fertility assessments to better understand the underlying causes of infertility and develop targeted treatment strategies.

Conclusion

This study provides essential insights into the prevalence and key contributing factors of female infertility in Jeddah, Saudi Arabia. The findings confirmed that age was the strongest predictor of infertility duration, reinforcing the need for early evaluation and intervention to optimize fertility outcomes. Additionally, the strong association between menstrual cycle irregularities and primary infertility highlighted the importance of comprehensive hormonal and metabolic assessments, particularly for conditions such as PCOS and thyroid dysfunction.

List of Abbreviations

BMI	body mass index
PCOS	polycystic ovary syndrome

Acknowledgment

The authors express their gratitude to Dr. Hanan Bahamamm, Consultant Obstetrician and Gynecologist at Dr. Soliman Fakeeh Hospital, Jeddah, for her invaluable assistance in obtaining the medical records for this study.

Conflicts of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Funding

None.

Consent to participate

Informed consent was obtained from all the participants.

Ethical approval

The study was conducted after approval by the Institutional Review Board of Fakeeh College for Medical Sciences via reference number 300/IRB/2022. Dated: 03/02/2022.

Author details

Nisreen Mansour Omar[1], Judy Saleh Abbas[2], Sabah Akram Mandely[2], Rahaf Osama Malaka[2], Aisha Yousef Bafuleh[2], Ahlam Attaullah Mohammad[2], Jana Saleh Abbas[2], Joud Hesham Badokhon[2], Mohammad Othman[3]

1. Physiological Sciences Department-MBBS Program, Fakeeh College for Medical Sciences, Jeddah, Saudi Arabia
2. Bachelor of Medicine, Bachelor of Surgery Program, Fakeeh College for Medical Sciences, Jeddah, Saudi Arabia
3. Clinical Sciences Department-MBBS Program, Fakeeh College for Medical Sciences, Jeddah, Saudi Arabia

References

1. Penzias A, Azziz R, Bendikson K, Cedars M, Falcone T, Hansen K, et al. Fertility evaluation of infertile women: a committee opinion. Fertil Steril. 2021;116(5):1255–65. https://doi.org/10.1016/j.fertnstert.2021.08.038
2. Carson SA, Kallen AN. Diagnosis and management of infertility. J Am Med Assoc. 2021;326(1):65. https://doi.org/10.1001/jama.2021.4788
3. World Health Organization. Female infertility. Geneva, Switzerland: WHO; 1998.
4. Irvine DS. Epidemiology and aetiology of male infertility. Hum Reprod. 1998;13(suppl 1):33–44. https://doi.org/10.1093/humrep/13.suppl_1.33
5. Boivin J, Bunting L, Collins JA, Nygren KG. International estimates of infertility prevalence and treatment-seeking: potential need and demand for infertility medical care. Hum Reprod. 2007;22(6):1506–12. https://doi.org/10.1093/humrep/dem046
6. Direkvand-Moghadam A, Sayehmiri K, Delpisheh A, Direkvand-Moghadam A. The global trend of infertility: an original review and meta-analysis. Int J Epidemiol Res. 2014;1(1):35–43.
7. Eldib A, Tashani O. Infertility in the Middle East and North Africa region: a systematic review with meta-analysis of prevalence surveys. Libyan J Med Sci. 2018;2(2):37. https://doi.org/10.4103/LJMS.LJMS_24_18
8. Borumandnia N, Haghparast Majd H, Khadembashi N, Alaii H. Worldwide trend analysis of primary and secondary infertility rates over past decades: a cross-sectional study. Int J Reprod BioMed. 2022;20(1):37. https://doi.org/10.18502/ijrm.v20i1.10407
9. Safarinejad MR. Infertility among couples in a population-based study in Iran: prevalence and associated risk

factors. Int J Androl. 2008;31(3):303–14. https://doi.org/10.1111/j.1365-2605.2007.00764.x

10. Nasir S, Khan MM, Ahmad S, Alam S, Ziaullah S. Role of thyroid dysfunction in infertile women with menstrual disturbances. Gomal J Med Sci. 2016;14(1):20–24.
11. Rahman R, Jan F, Faisal N, Aftab L, Salman A, Waheed A. Correlation of menstrual irregularities with thyroid disorders in infertile women. Ann Punjab Med Coll. 2023;17(4):533–9. https://doi.org/10.29054/apmc/2023.1509
12. Dovom MR, Ramezani Tehrani F, Djalalinia S, Cheraghi L, Behboudi Gandavani S, Azizi F. Menstrual cycle irregularity and metabolic disorders: a population-based prospective study. PLoS One. 2016;11(12):e0168402. https://doi.org/10.1371/journal.pone.0168402
13. West S, Lashen H, Bloigu A, Franks S, Puukka K, Ruokonen A, et al. Irregular menstruation and hyperandrogenaemia in adolescence are associated with polycystic ovary syndrome and infertility in later life: Northern Finland Birth Cohort 1986 study. Hum Reprod. 2014;29(10):2339–51. https://doi.org/10.1093/humrep/deu200
14. Kumari MK, Rani D, Naik AY. Association between body mass index and infertility among women: an age-matched case-control study. Asian J Interdiscip Res. 2024;7(1):13–9. https://doi.org/10.54392/ajir2412
15. Turner F, Powell SG, Al-Lamee H, Gadhvi A, Palmer E, Drakeley A, et al. Impact of BMI on fertility in an otherwise healthy population: a systematic review and meta-analysis. BMJ Open. 2024;14(10):e082123. https://doi.org/10.1136/bmjopen-2023-082123
16. Hernáez Á, Rogne T, Skåra KH, Håberg SE, Page CM, Fraser A, et al. Body mass index and subfertility: multivariable regression and Mendelian randomization analyses in the Norwegian Mother, Father and Child Cohort Study. Hum Reprod. 2021;36(12):3141–51. https://doi.org/10.1101/2021.06.21.21259264
17. West CP. Age and infertility. Br Med J. 1987;294(6576):853–4. https://doi.org/10.1136/bmj.294.6576.853
18. Bhattacharya S, Maheshwari A, Mollison J. Factors associated with failed treatment: an analysis of 121,744 women embarking on their first IVF cycles. PLoS One. 2013;8(12):e82249. https://doi.org/10.1371/journal.pone.0082249
19. van Loendersloot LL, van Wely M, Limpens J, Bossuyt PMM, Repping S, van der Veen F. Predictive factors in *in vitro* fertilization (IVF): a systematic review and meta-analysis. Hum Reprod Update. 2010;16(6):577–89. https://doi.org/10.1093/humupd/dmq015
20. Cai QF, Wan F, Huang R, Zhang HW. Factors predicting the cumulative outcome of IVF/ICSI treatment: a multivariable analysis of 2450 patients. Hum Reprod. 2011;26(9):2532–40. https://doi.org/10.1093/humrep/der228
21. Livshits A, Seidman DS. Fertility issues in women with diabetes. Women's Health. 2009;5(6):701–8. https://doi.org/10.2217/WHE.09.47
22. Zain MM, Norman RJ. Impact of obesity on female fertility and fertility treatment. Women's Health. 2008;4(2):183–94. https://doi.org/10.2217/17455057.4.2.183
23. Huniadi A, Bimbo-Szuhai E, Botea M, Zaha I, Beiusanu C, Pallag A, et al. Fertility predictors in intrauterine insemination (IUI). J Pers Med. 2023;13(3):395. https://doi.org/10.3390/jpm13030395
24. Al-Omar HA, Alshehri A, Alqahtani SA, Alabdulkarim H, Alrumaih A, Eldin MS. A systematic review of obesity burden in Saudi Arabia: prevalence and associated co-morbidities. Saudi Pharm J. 2024;32(11):102192. https://doi.org/10.1016/j.jsps.2024.102192