

# Patterns of Infertility and Abortion in Saudi Arabia: A Cross-Sectional Study

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## Abstract

**Background:** Infertility and abortion are significant reproductive health concerns globally, impacting individuals' well-being and healthcare systems. In Saudi Arabia, cultural, social, and religious factors influence perceptions and management of these issues, necessitating research to understand the patterns and associated factors. **Study Aim:** This cross-sectional study aimed to investigate the patterns of infertility and abortion among 458 women in Saudi Arabia, focusing on demographic profiles, reproductive histories, medical conditions, and lifestyle factors. **Methodology:** Participants were recruited from healthcare facilities, and data on age, BMI, reproductive history, medical conditions, assisted reproduction methods, and lifestyle behaviors were collected. Statistical analyses, including chi-square tests, were conducted to examine associations between variables. **Results:** The majority of participants were aged 30 - 39 years (47.4%), with 76.9% experiencing secondary infertility. Among those with offspring (76.9%), 31% reported using assisted reproduction methods, primarily ovarian stimulators (54.2%). Abortion history was reported by 39.5% of participants. Significant associations were found between age and infertility type ( $X^2 = 5.8$ ,  $p = 0.054$ ), having offspring and infertility type ( $X^2 = 458.0$ ,  $p = 0.001$ ), menstrual irregularity and infertility type ( $X^2 = 11.4$ ,  $p = 0.001$ ), and abortion history and delayed fertility ( $X^2 = 10.4$ ,  $p = 0.001$ ). **Conclusion:** Our study reveals significant associations between demographic, medical, and lifestyle factors with infertility patterns and abortion history among Saudi women. These findings emphasize the need for tailored interventions addressing medical conditions, age-related factors, and access to reproductive healthcare services.

## Keywords

Infertility, Abortion, Saudi Arabia, Reproductive Health, Assisted Reproduction, Cross-Sectional Study

## 1. Background

Infertility and abortion are significant reproductive health issues that impact individuals, families, and societies worldwide. Infertility, defined as the inability to conceive after one year of unprotected intercourse, affects approximately 10% - 15% of couples globally [1] [2]. In Saudi Arabia, where cultural, religious, and social factors heavily influence perceptions and behaviors related to reproductive health, addressing infertility and abortion requires a nuanced understanding of the underlying factors and patterns [3] [4].

Infertility rates vary across populations and are influenced by factors such as age, lifestyle, environmental factors, and underlying medical conditions [5] [6]. In Saudi Arabia, studies have reported varying rates of infertility among married couples [3] [4]. Age-related infertility, particularly in women over 35 years, is a growing concern globally, as advancing maternal age is associated with decreased ovarian reserve and higher rates of chromosomal abnormalities [2] [5]. Additionally, lifestyle factors such as smoking, obesity, and sedentary behaviors can contribute to infertility risk [1] [4].

Infertility can be categorized into primary infertility, where individuals have never conceived, and secondary infertility, characterized by difficulty conceiving after a previous successful pregnancy [4] [7]. Common causes of infertility include ovulatory disorders, tubal factors, uterine abnormalities, male factor infertility, and unexplained infertility [5] [8]. Conditions such as polycystic ovary syndrome (PCOS), endometriosis, and hormonal imbalances are also prevalent contributors to infertility [2] [7]. Understanding the specific causes and types of infertility is crucial for effective diagnosis and management strategies.

Advancements in medical technology have led to the widespread adoption of assisted reproduction techniques, including in vitro fertilization (IVF), intrauterine insemination (IUI), and ovulation induction. In Saudi Arabia, ART utilization has increased in recent years, reflecting global trends in seeking fertility treatments [9]. However, access to ART services and disparities in utilization remain challenges, particularly for marginalized populations and those with limited healthcare access [10] [11]. Addressing barriers to ART and improving affordability and availability of services are critical for enhancing fertility outcomes.

Abortion, which could be spontaneous (miscarriage) and induced, is another area of concern in reproductive health. Spontaneous miscarriages occur in approximately 10% - 15% of clinically recognized pregnancies, often attributed to chromosomal abnormalities and maternal health conditions [12] [13]. Induced abortion, which is a sensitive and complex issue, is a common reproductive choice globally, influenced by legal, social, cultural, and healthcare factors [13].

In Saudi Arabia, cultural and religious beliefs significantly impact perceptions and practices related to fertility, pregnancy, and abortion. The cultural emphasis on procreation and family continuity underscores the emotional and societal challenges faced by individuals experiencing infertility [3] [4]. Discussions

around reproductive health, including infertility diagnosis and treatment options, are often influenced by cultural norms and gender roles, necessitating culturally competent healthcare approaches [2] [4].

While there is existing research on infertility and abortion globally, there is a need for localized studies that explore these issues within the unique socio-cultural context of Saudi Arabia. Understanding the prevalence, patterns, associated factors, and healthcare-seeking behaviors related to infertility and abortion among Saudi women is crucial for developing targeted interventions, improving access to reproductive healthcare services, and addressing disparities in fertility outcomes. The aim of this study is to investigate the patterns of infertility and abortion among Saudi women, focusing on demographic profiles, reproductive histories, medical conditions, and lifestyle factors. To determine the prevalence of primary and secondary infertility among Saudi women. To identify the common medical conditions associated with infertility, such as PCOS, endometriosis, and tubal factors. To assess the utilization of assisted reproduction methods among women experiencing infertility. To examine the prevalence and factors associated with abortion history among Saudi women.

## 2. Methodology

This A cross-sectional study to determine the patterns of infertility and abortion among Saudi women. The study duration spanned August 2023 to December 2023, during which data collection and analysis were collected. The study was conducted online, leveraging digital platforms to reach a diverse pool of Saudi women residing across different regions. Online data collection facilitated access to a wide range of participants and ensured convenience in completing survey questionnaires, contributing to the efficiency of data collection efforts. The participants of this study were Saudi women experiencing primary or secondary infertility. Women who did not meet the criteria for primary or secondary infertility were excluded from the data collection process to maintain the focus on individuals facing fertility challenges. Inclusion criteria encompassed adult Saudi women who self-reported either primary or secondary infertility. Primary infertility refers to the inability to conceive after at least one year of unprotected intercourse, while secondary infertility pertains to difficulty conceiving or carrying a pregnancy to term following a previous successful pregnancy. Exclusion criteria involved women who did not meet the criteria for primary or secondary infertility, including those with other reproductive health conditions not related to infertility. The data collection tool consisted of a structured questionnaire developed specifically for this study. The questionnaire encompassed sections on demographic information (e.g., age, BMI), reproductive history (e.g., presence of offspring, use of assisted reproduction methods), medical conditions (e.g., PCOS, endometriosis), lifestyle factors (e.g., smoking, exercise), and abortion history.

## 3. Data Collection Method

Data collection was conducted online using a secure and confidential survey

platform. Participants were invited to complete the questionnaire electronically, ensuring anonymity and privacy in their responses. The online data collection method facilitated efficient data gathering from a geographically dispersed population of Saudi women experiencing infertility. Data obtained from the survey responses were coded and entered into a secure database using Statistical Package for the Social Sciences (SPSS) version 26. SPSS was utilized for data cleaning, coding, and statistical analyses. The data management plan included procedures for ensuring the accuracy, confidentiality, and integrity of the collected data throughout the analysis process.

#### 4. Ethical Considerations

The study protocol received approval. Informed consent was obtained from all participants prior to their participation in the study, outlining the purpose of the study, voluntary participation, confidentiality of data, and the right to withdraw at any time without consequences. Participant anonymity and data confidentiality were strictly maintained throughout the study, and all data were securely stored in compliance with data protection regulations.

#### 5. Results

The study involved a cohort of 458 women. **Table 1** provides insights into the demographic characteristics, reproductive history, lifestyle factors, and utilization of assisted reproduction methods among the participants. Among the age distribution, the majority fell into the 30 - 39 years category, constituting 47.4% (217 individuals), followed by those aged 22 - 29 years at 31.4% (144 individuals), and individuals aged 40 years or older accounted for 21.2% (97 individuals) of the sample.

Regarding BMI, the participants were predominantly either overweight (31.4%,  $n = 144$ ) or obese (40%,  $n = 183$ ), with underweight individuals comprising a minimal portion at 0.2% ( $n = 1$ ). A significant proportion reported having offspring, with 76.9% ( $n = 352$ ) affirming this, whereas 23.1% ( $n = 106$ ) indicated no offspring. Interestingly, a substantial number of respondents (31%,  $n = 142$ ) reported utilizing assisted reproduction methods, while the majority (69%,  $n = 316$ ) had not availed of such methods.

Within the subgroup of participants who had offspring through assisted reproduction methods ( $n = 113$ ), the majority utilized ovarian stimulators (54.2%,  $n = 77$ ), followed by herbal medicine (28.9%,  $n = 41$ ), and in a smaller proportion, in vitro fertilization (IVF) (16.2%,  $n = 23$ ). The usage of other methods, such as treatment for the husband, was reported minimally at 0.7% ( $n = 1$ ). Regarding lifestyle factors, a vast majority reported no smoking history (98.7%,  $n = 452$ ) and no passive smoking exposure (58.7%,  $n = 269$ ). Exercise habits varied, with 58.1% ( $n = 266$ ) reporting no exercise at all, 38.2% ( $n = 175$ ) engaging in irregular exercise, and only 3.7% ( $n = 17$ ) maintaining a regular exercise routine.

**Table 2** delves into infertility-related parameters and medical histories among

**Table 1.** Characters of participants and their reproductive history (n = 458).

Parameter	Frequency (%)	
Age, y	22 - 29	144 (31.4%)
	30 - 39	217 (47.4%)
	40 or more	97 (21.2%)
BMI	Underweight	1 (0.2%)
	Normal	130 (28.4%)
	Overweight	144 (31.4%)
	Obese	183 (40%)
Having offspring	No	106 (23.1%)
	Yes	352 (76.9%)
Ever using assisted reproduction methods	Yes	142 (31%)
	No	316 (69%)
Having offspring with assisted reproduction (n = 352)	No	239 (67.9%)
	Yes	113 (32.1%)
Type of assisted reproduction used (n = 113)	Ovarian stimulators	77 (54.2%)
	IVF	23 (16.2%)
	Herbal medicine	41 (28.9%)
	Treatment for husband	1 (0.7%)
Smoking	No	452 (98.7%)
	Yes	6 (1.3%)
Passive smoking	No	269 (58.7%)
	Yes	189 (41.3%)
Exercise	Not at all	266 (58.1%)
	Yes, but irregular	175 (38.2%)
	Yes, regularly	17 (3.7%)

**Table 2.** Characters of infertility and medical history among respondents (n = 458).

Parameter	Frequency (%)	
Menstrual irregularity	No	146 (31.9%)
	Yes	312 (68.1%)
Type of infertility	Primary	106 (23.1%)
	Secondary	352 (76.9%)
Endometriosis	Yes	47 (10.3%)
	No	411 (89.7%)
Abortion	No	277 (60.5%)
	Yes	181 (39.5%)
Delayed fertility more than 1 year	No	207 (45.2%)
	Yes	251 (54.8%)

## Continued

<b>Fibroid</b>	<b>No</b>	438 (95.6%)
	<b>Yes</b>	20 (4.4%)
<b>Polycystic ovary</b>	<b>No</b>	347 (75.8%)
	<b>Yes</b>	111 (24.2%)
<b>Tubal adhesions or obstruction</b>	<b>No</b>	427 (93.2%)
	<b>Yes</b>	31 (6.8%)
<b>Anovulation</b>	<b>No</b>	328 (71.6%)
	<b>Yes</b>	130 (28.4%)

the participants. A notable portion of respondents reported menstrual irregularity (68.1%, n = 312), while the remainder (31.9%, n = 146) indicated regular menstrual cycles. Primary infertility was reported by 23.1% (n = 106) of participants, whereas the majority experienced secondary infertility (76.9%, n = 352).

Regarding specific medical conditions, endometriosis was noted in 10.3% (n = 47) of the respondents, whereas the majority (89.7%, n = 411) did not report this condition. A significant portion reported experiencing abortion (39.5%, n = 181) and delayed fertility of more than one year (54.8%, n = 251). Other conditions such as fibroids (4.4%, n = 20), polycystic ovary syndrome (PCOS) (24.2%, n = 111), tubal adhesions or obstruction (6.8%, n = 31), and defective ovulation (28.4%, n = 130) were also noted among the participants.

The analysis in **Table 3** explores the relationship between various parameters and the type of infertility among the 458 participants. The age distribution showed a trend where primary infertility was more prevalent in the younger age group of 22 - 29 years (29.9%, n = 43), while secondary infertility was more common in the older age groups of 30 - 39 years (78.8%, n = 171) and 40 years or more (82.5%, n = 80). Although the chi-square test showed a p-value of 0.054 for age and type of infertility, indicating a trend but not statistically significant at the conventional level of 0.05.

Body Mass Index (BMI) did not show a significant association with the type of infertility, with p-values exceeding 0.05 across all BMI categories. However, noteworthy findings emerged in other parameters. Menstrual irregularity showed a statistically significant association ( $X^2 = 11.4$ ,  $p = 0.001$ ) with type of infertility, being more prevalent among those with secondary infertility (81.4%, n = 254).

Several medical conditions also exhibited significant associations with the type of infertility. Notably, participants with polycystic ovary syndrome (PCOS) were more likely to experience primary infertility (45.9%, n = 51), while those without PCOS predominantly had secondary infertility (84.1%, n = 292). Similarly, tubal adhesions or obstruction (64.5%, n = 20) and anovulation (50%, n = 65) were significantly associated with primary infertility.

Moving to **Table 4**, which examines the history of abortion in relation to various factors among the participants, significant associations were observed. Age

**Table 3.** Type of infertility in association with characters and medical history of participants (n = 458).

Parameter		Type of infertility		X <sup>2</sup>	P-value
		Primary	Secondary		
Age, y	22 - 29	43 (29.9%)	101 (70.1%)	5.8	0.054
	30 - 39	46 (21.2%)	171 (78.8%)		
	40 or more	17 (17.5%)	80 (82.5%)		
BMI	Underweight	0 (0%)	1 (100%)	0.5	0.915
	Normal	32 (24.6%)	98 (75.4%)		
	Overweight	33 (22.9%)	111 (77.1%)		
	Obese	41 (22.4%)	142 (77.6%)		
Ever using assisted reproduction methods	Yes	29 (20.4%)	113 (79.6%)	0.9	0.355
	No	77 (24.4%)	239 (75.6%)		
Type of assisted reproduction used (n = 113)	Ovarian stimulators	10 (13%)	67 (87%)	10.5	0.015
	IVF	10 (43.5%)	13 (56.5%)		
	Herbal medicine	9 (22%)	32 (78%)		
	Treatment for husband	0 (0%)	1 (100%)		
Smoking	No	106 (23.5%)	346 (76.5%)	1.8	0.176
	Yes	0 (0%)	6 (100%)		
Passive smoking	No	58 (21.6%)	211 (78.4%)	0.9	0.338
	Yes	48 (25.4%)	141 (74.6%)		
Exercise	Not at all	67 (25.2%)	199 (74.8%)	2.4	0.308
	Yes, but irregular	34 (19.4%)	141 (80.6%)		
	Yes, regularly	5 (29.4%)	12 (70.6%)		
Menstrual irregularity	No	48 (32.9%)	98 (67.1%)	11.4	0.001
	Yes	58 (18.6%)	254 (81.4%)		
Endometriosis	Yes	15 (31.9%)	32 (68.1%)	2.3	0.132
	No	91 (22.1%)	320 (77.9%)		
Abortion	No	91 (32.9%)	186 (67.1%)	37.1	0.001
	Yes	15 (8.3%)	166 (91.7%)		
Delayed fertility more than 1 year	No	15 (7.2%)	192 (92.8%)	53.7	0.001
	Yes	91 (36.3%)	160 (63.7%)		
Fibroid	No	102 (23.3%)	336 (76.7%)	0.1	0.733
	Yes	4 (20%)	16 (80%)		
Polycystic ovary	No	55 (15.9%)	292 (84.1%)	42.8	0.001
	Yes	51 (45.9%)	60 (54.1%)		
Tubal adhesions or obstruction	No	86 (20.1%)	341 (79.9%)	32.0	0.001
	Yes	20 (64.5%)	11 (35.5%)		
Anovulation	No	41 (12.5%)	287 (87.5%)	73.6	0.001
	Yes	65 (50%)	65 (50%)		

**Table 4.** History of abortion in association with characters and medical history of participants (n = 458).

Parameter		Abortion		X <sup>2</sup>	P-value
		No	Yes		
Age, y	22 - 29	110 (76.4%)	34 (23.6%)	39.4	0.001
	30 - 39	132 (60.8%)	85 (39.2%)		
	40 or more	35 (36.1%)	62 (63.9%)		
BMI	Underweight	1 (100%)	0 (0%)	1.1	0.770
	Normal	80 (61.5%)	50 (38.5%)		
	Overweight	89 (61.8%)	55 (38.2%)		
	Obese	107 (58.5%)	76 (41.5%)		
Having offspring	No	91 (85.8%)	15 (14.2%)	37.1	0.001
	Yes	186 (52.8%)	166 (47.2%)		
Ever using assisted reproduction methods	Yes	70 (49.3%)	72 (50.7%)	10.8	0.001
	No	207 (65.5%)	109 (34.5%)		
Having offspring with assisted reproduction (n = 352)	No	136 (56.9%)	103 (43.1%)	4.9	0.026
	Yes	50 (44.2%)	63 (55.8%)		
Type of assisted reproduction used (n = 113)	Ovarian stimulators	36 (46.8%)	41 (53.2%)	4.0	0.257
	IVF	15 (65.2%)	8 (34.8%)		
	Herbal medicine	18 (43.9%)	23 (56.1%)		
	Treatment for husband	1 (100%)	0 (0%)		
Smoking	No	273 (60.4%)	179 (39.6%)	0.1	0.755
	Yes	4 (66.7%)	2 (33.3%)		
Passive smoking	No	165 (61.3%)	104 (38.7%)	0.2	0.654
	Yes	112 (59.3%)	77 (40.7%)		
Exercise	Not at all	170 (63.9%)	96 (36.1%)	3.2	0.204
	Yes, but irregular	98 (56%)	77 (44%)		
	Yes, regularly	9 (52.9%)	8 (47.1%)		
Menstrual irregularity	No	95 (65.1%)	51 (34.9%)	1.9	0.169
	Yes	182 (58.3%)	130 (41.7%)		
Type of infertility	Primary	91 (85.8%)	15 (14.2%)	37.1	0.001
	Secondary	186 (52.8%)	166 (47.2%)		
Endometriosis	Yes	30 (63.8%)	17 (36.2%)	0.2	0.620
	No	247 (60.1%)	164 (39.9%)		
Delayed fertility more than 1 year	No	142 (68.6%)	65 (31.4%)	10.4	0.001
	Yes	135 (53.8%)	116 (46.2%)		
Fibroid	No	267 (61%)	171 (39%)	1.0	0.327
	Yes	10 (50%)	10 (50%)		
Polycystic ovary	No	200 (57.6%)	147 (42.4%)	4.8	0.028
	Yes	77 (69.4%)	34 (30.6%)		
Tubal adhesions or obstruction	No	253 (59.3%)	174 (40.7%)	4.0	0.046
	Yes	24 (77.4%)	7 (22.6%)		
Anovulation	No	195 (59.5%)	133 (40.5%)	0.5	0.474
	Yes	82 (63.1%)	48 (36.9%)		

exhibited a strong association with abortion history, with younger participants (22 - 29 years) having a higher incidence of abortion (23.6%,  $n = 34$ ) compared to older age groups. This association was statistically significant ( $X^2 = 39.4$ ,  $p = 0.001$ ).

Having offspring was also significantly associated with abortion history, as a higher proportion of participants without offspring had a history of abortion (14.2%,  $n = 15$ ) compared to those with offspring (47.2%,  $n = 166$ ) ( $X^2 = 37.1$ ,  $p = 0.001$ ). Furthermore, delayed fertility of more than one year was significantly associated with abortion history, with 46.2% ( $n = 116$ ) of participants experiencing delayed fertility having a history of abortion.

Other notable associations included the presence of PCOS (30.6%,  $n = 34$ ) and tubal adhesions or obstruction (22.6%,  $n = 7$ ) being significantly associated with abortion history ( $X^2 = 4.8$ ,  $p = 0.028$  and  $X^2 = 4.0$ ,  $p = 0.046$ , respectively).

## 6. Discussion

Infertility and abortion are significant reproductive health issues globally, impacting individuals, families, and societies [2]. In Saudi Arabia, these issues are of particular concern due to cultural, social, and religious contexts that influence perceptions and healthcare-seeking behaviors related to fertility and pregnancy [3] [4]. Understanding the patterns and factors associated with infertility and abortion is crucial for developing targeted interventions and improving reproductive healthcare outcomes in the region.

Our study aimed to investigate patterns of infertility and abortion among 458 women in Saudi Arabia. The demographic and reproductive profiles of the participants revealed several noteworthy findings. The majority of participants were in the 30 - 39 age group (47.4%), with secondary infertility being more prevalent (76.9%). Notably, a significant proportion of participants reported using assisted reproduction methods (31%), primarily utilizing ovarian stimulators (54.2%). Regarding abortion history, 39.5% of participants reported a history of abortion.

Our study found a significant association between age and infertility type, with primary infertility more prevalent among younger participants. This aligns with existing literature indicating that age is a crucial factor influencing fertility, with a decline in fertility rates observed with increasing age [14]. The higher prevalence of primary infertility among younger participants may reflect delayed childbearing trends observed globally, influenced by various socio-cultural and economic factors [15].

Our study identified several medical conditions significantly associated with infertility, including PCOS, tubal adhesions or obstruction, and defective ovulation. These findings are consistent with previous research highlighting the impact of medical conditions on fertility outcomes [16]. PCOS, in particular, has been extensively studied for its association with infertility, with hormonal imbalances and ovulatory dysfunction contributing to fertility challenges [17] [18].

The utilization of assisted reproduction methods, especially ovarian stimulators, was notable in our study. This trend reflects the increasing reliance on fer-

tivity treatments to overcome infertility challenges, mirroring global trends in assisted reproduction technology (ART) utilization [19]. However, the relatively lower utilization rate in our study compared to Western countries suggests potential barriers or disparities in access to ART services, which warrants further investigation [20] [21].

The high prevalence of abortion history (39.5%) among participants is a significant finding that underscores the importance of addressing reproductive health issues comprehensively. Abortion remains a sensitive and complex issue globally, influenced by legal, cultural, and socio-economic factors [22]. The association between abortion history and delayed fertility observed in our study highlights the interconnectedness of reproductive health outcomes and the need for holistic healthcare approaches [23].

Lifestyle factors such as exercise and smoking did not show significant associations with infertility or abortion in our study. While previous research has indicated potential impacts of lifestyle choices on fertility outcomes [4] [6] [7], our findings suggest a need for further exploration and larger-scale studies to elucidate these associations in the Saudi context.

Comparing our findings with international studies, similarities in infertility patterns and utilization of ART methods are evident. However, cultural and contextual factors unique to Saudi Arabia, such as societal norms, religious beliefs, and healthcare infrastructure, may influence the prevalence and management of infertility and abortion differently compared to Western contexts [3] [4] [12] [15]. These nuances highlight the importance of culturally sensitive and tailored approaches to reproductive healthcare delivery.

## 7. Limitations and Future Directions

Our study has several limitations, including its cross-sectional design, which limits causal inference. Additionally, the sample size and specific geographic representation may impact the generalizability of findings to the entire Saudi population. Future research should consider longitudinal studies and multi-center collaborations to further explore the complex interplay of factors influencing infertility and abortion outcomes in Saudi Arabia.

## 8. Conclusion

In conclusion, our study sheds light on the patterns and correlates of infertility and abortion in Saudi Arabia, emphasizing the multifaceted nature of reproductive health issues. The findings underscore the importance of holistic and culturally sensitive approaches to reproductive healthcare, addressing medical, social, and contextual factors to improve outcomes and enhance patient-centered care in the region.

## Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

## References

- [1] Obeagu, E.I., Njar, V.E. and Obeagu, G.U. (2023) Infertility: Prevalence and Consequences. *International Journal of Current Research in Chemistry and Pharmaceutical Sciences*, **10**, 43-50.
- [2] Ara, I., Maqbool, M. and Gani, I. (2022) Reproductive Health of Women: Implications and Attributes. *International Journal of Current Research in Physiology and Pharmacology*, **6**, 8-18.
- [3] Jabeen, F., Khadija, S. and Daud, S. (2022) Prevalence of Primary and Secondary Infertility. *Saudi Journal of Medicine*, **7**, 22-28.  
<https://doi.org/10.36348/sjm.2022.v07i01.004>
- [4] Al-Turki, H.A. (2015) Prevalence of Primary and Secondary Infertility from Tertiary Center in Eastern Saudi Arabia. *Middle East Fertility Society Journal*, **20**, 237-240. <https://doi.org/10.1016/j.mefs.2015.02.001>
- [5] Mascarenhas, M.N., Flaxman, S.R., Boerma, T., Vanderpoel, S. and Stevens, G.A. (2012) National, Regional, and Global Trends in Infertility Prevalence since 1990: A Systematic Analysis of 277 Health Surveys. *PLOS Medicine*, **9**, e1001356.  
<https://doi.org/10.1371/journal.pmed.1001356>
- [6] Borumandnia, N., Alavi Majd, H., Khadembashi, N. and Alaii, H. (2022) Worldwide Trend Analysis of Primary and Secondary Infertility Rates over Past Decades: A Cross-Sectional Study. *International Journal of Reproductive BioMedicine (IJRM)*, **20**, 37-46. <https://doi.org/10.18502/ijrm.v20i1.10407>
- [7] Magdum, M., Chowdhury, M.A.T., Begum, N. and Riya, S. (2022) Types of Infertility and Its Risk Factors among Infertile Women: A Prospective Study in Dhaka City. *Journal of Biosciences and Medicines*, **10**, 158-168.  
<https://doi.org/10.4236/jbm.2022.104014>
- [8] Rakhimova, M. (2022) Infertility in Women Classification, Symptoms, Causes and Factors, Recommendations for Women. *Science and Innovation*, **1**, 245-250.
- [9] Kissin, D.M., Zhang, Y., Boulet, S.L., Fountain, C., Bearman, P., Schieve, L., *et al.* (2014) Association of Assisted Reproductive Technology (ART) Treatment and Parental Infertility Diagnosis with Autism in Art-Conceived Children. *Human Reproduction*, **30**, 454-465. <https://doi.org/10.1093/humrep/deu338>
- [10] Doornbos, M.E., Maas, S.M., McDonnell, J., Vermeiden, J.P.W. and Hennekam, R.C.M. (2007) Infertility, Assisted Reproduction Technologies and Imprinting Disturbances: A Dutch Study. *Human Reproduction*, **22**, 2476-2480.  
<https://doi.org/10.1093/humrep/dem172>
- [11] Maignien, C., Santulli, P., Gayet, V., Lafay-Pillet, M., Korb, D., Bourdon, M., *et al.* (2017) Prognostic Factors for Assisted Reproductive Technology in Women with Endometriosis-Related Infertility. *American Journal of Obstetrics and Gynecology*, **216**, 280.E1-280.E9. <https://doi.org/10.1016/j.ajog.2016.11.1042>
- [12] Choi, T.Y., Lee, H.M., Park, W.K., Jeong, S.Y. and Moon, H.S. (2014) Spontaneous Abortion and Recurrent Miscarriage: A Comparison of Cytogenetic Diagnosis in 250 Cases. *Obstetrics & Gynecology Science*, **57**, 518-525.  
<https://doi.org/10.5468/ogs.2014.57.6.518>
- [13] Wang, J.X. (2004) Incidence of Spontaneous Abortion among Pregnancies Produced by Assisted Reproductive Technology. *Human Reproduction*, **19**, 272-277.  
<https://doi.org/10.1093/humrep/deh078>
- [14] Dunson, D.B., Baird, D.D. and Colombo, B. (2004) Increased Infertility with Age in Men and Women. *Obstetrics & Gynecology*, **103**, 51-56.

- <https://doi.org/10.1097/01.aog.0000100153.24061.45>
- [15] Crawford, N.M. and Steiner, A.Z. (2015) Age-related Infertility. *Obstetrics and Gynecology Clinics of North America*, **42**, 15-25.  
<https://doi.org/10.1016/j.ogc.2014.09.005>
- [16] Roupa, Z., Polikandrioti, M., Sotiropoulou, P., Faros, E., Koulouri, A., Wozniak, G. and Gourni, M. (2009) Causes of Infertility in Women at Reproductive Age. *Health Science Journal*, **3**, 80-87.  
[https://www.researchgate.net/publication/289067504\\_Causes\\_of\\_infertility\\_in\\_women\\_at\\_reproductive\\_age](https://www.researchgate.net/publication/289067504_Causes_of_infertility_in_women_at_reproductive_age)
- [17] Nik Hazlina, N.H., Norhayati, M.N., Shaiful Bahari, I. and Nik Muhammad Arif, N.A. (2022) Worldwide Prevalence, Risk Factors and Psychological Impact of Infertility among Women: A Systematic Review and Meta-analysis. *BMJ Open*, **12**, e057132. <https://doi.org/10.1136/bmjopen-2021-057132>
- [18] Liang, S., Chen, Y., Wang, Q., Chen, H., Cui, C., Xu, X., *et al.* (2021) Prevalence and Associated Factors of Infertility among 20-49 Year Old Women in Henan Province, China. *Reproductive Health*, **18**, Article No. 254.  
<https://doi.org/10.1186/s12978-021-01298-2>
- [19] Dieke, A.C., Zhang, Y., Kissin, D.M., Barfield, W.D. and Boulet, S.L. (2017) Disparities in Assisted Reproductive Technology Utilization by Race and Ethnicity, United States, 2014: A Commentary. *Journal of Women's Health*, **26**, 605-608.  
<https://doi.org/10.1089/jwh.2017.6467>
- [20] Olorunfemi, O., Osunde, N., Osian, E., Tope-Fakua, L. and Fadipe, O. (2021) The Relationship between Religion, Culture, Cost, Ethics, and Husband Perception with the Decision of Women's Utilization of Assisted Reproductive Technology as Method of Infertility Management. *Journal of Nursing and Midwifery Sciences*, **8**, 268-273. [https://doi.org/10.4103/jnms.jnms\\_179\\_20](https://doi.org/10.4103/jnms.jnms_179_20)
- [21] Shapiro, A.J., Darmon, S.K., Barad, D.H., Albertini, D.F., Gleicher, N. and Kushnir, V.A. (2017) Effect of Race and Ethnicity on Utilization and Outcomes of Assisted Reproductive Technology in the USA. *Reproductive Biology and Endocrinology*, **15**, Article No. 44. <https://doi.org/10.1186/s12958-017-0262-5>
- [22] Santos, A., Coelho, E., Gusmão, M., Silva, D., Almeida, M. and Marques, P. (2016) Factors Associated with Abortion in Women of Reproductive Age. *Revista Brasileira de Ginecologia e Obstetrícia/RBGO Gynecology and Obstetrics*, **38**, 273-279. <https://doi.org/10.1055/s-0036-1584940>
- [23] Xu, S., Zhao, W., Zhang, Y., Qiang, C. and Zhang, C. (2023) The Effect of Previous Induced Abortion History on the Assisted Reproduction Outcomes. *Archives of Gynecology and Obstetrics*, **309**, 469-474.  
<https://doi.org/10.1007/s00404-023-06928-7>