



## Prevalence of Infertility among Iranian Women: An Overview of Systematic Reviews and Meta- Analyses

Shima Imannezhad<sup>1</sup>, Maryam Mirzaei<sup>2</sup>, Behnaz Khodadadi<sup>3</sup>, Omolbanin Heydari<sup>4</sup>, \*Neda Dehghani<sup>5</sup>

<sup>1</sup>Pediatric Neurologist, Department of Pediatric, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.

<sup>2</sup>Department of Obstetrics and Gynecology, Jiroft University of Medical Sciences, Jiroft, Iran.

<sup>3</sup>Department of Nursing, Mashhad Branch, Islamic Azad University, Mashhad, Iran.

<sup>4</sup>Student of Midwifery Counseling, Kerman Nursing Research Center, Razi School of Nursing and Midwifery, Kerman University of Medical Sciences, Kerman, Iran.

<sup>5</sup>Department of Midwifery, Firoozabad Branch, Islamic Azad University, Firoozabad, Iran.

### Abstract

**Background:** Understanding the magnitude of infertility is critical for monitoring, assessing, and improving equitable access to fertility care services, as well as for addressing the risk factors associated with infertility. This study aims to estimate the prevalence of infertility and its associated factors among Iranian women.

**Materials and Methods:** In this overview, the online databases Medline, EMBASE, Web of Science, Scopus, Cochrane Library, CINAHL, CIVILICA, and Google Search Engine were searched for relevant systematic reviews and meta-analyses published up to January 2024. Two independent scholars conducted the screening, selection, and quality assessment of the selected studies using the AMSTAR tool.

**Results:** A total of five systematic reviews, comprising 95 studies with a total of 279,717 women, were included. The results indicated that the current prevalence of infertility in Iran is 10.5% (ranging from 7.8% to 13.2%). The prevalence of primary infertility is 10.6% (ranging from 3.09% to 18.3%), while secondary infertility is 2.6% (ranging from 2% to 3.2%). Additionally, the prevalence of current infertility is 2.9% (ranging from 2.2% to 3.7%). The rates of primary and secondary infertility were significantly higher in women than in men (6% and 3%, respectively;  $p < 0.05$ ). Primary infertility was more common in women under the age of 35 ( $p < 0.05$ ). Subgroup analysis revealed significant differences in the prevalence of current infertility based on the year ( $p < 0.05$ ). The prevalence of causes related to ovulation, uterine tubes, and endometriosis among infertile women was estimated at 54.0%.

**Conclusion:** The prevalence of infertility among women from 1990 to 2019 has decreased over time. Primary infertility is more common than secondary infertility and is particularly prevalent in women under the age of 35. However, for both women and men, lifestyle factors such as smoking, excessive alcohol intake and obesity are associated with an increased risk of infertility.

**Key Words:** Infertility, Iran, Prevalence, Primary, Secondary, Women.

\*Please cite this article as: Imannezhad Sh, Mirzaei M, Khodadadi B, Heydari O, Dehghani N. Prevalence of Infertility among Iranian Women: An Overview of Systematic Reviews and Meta-Analyses. Health Provid 2024; 4(1): 1-8. doi: [10.22034/HP.2024.451486.1043](https://doi.org/10.22034/HP.2024.451486.1043)

### \*Corresponding Author:

Neda Dehghani, Department of Midwifery, Firoozabad Branch, Islamic Azad University, Firoozabad, Iran.

Email: [nedi\\_1360@yahoo.com](mailto:nedi_1360@yahoo.com)

Received date: Jan. 15, 2024; Accepted date: Jun.12, 2024

## 1- INTRODUCTION

Infertility is a global public health issue defined as the failure to establish a clinical pregnancy after 12 months of regular and unprotected sexual intercourse among heterosexual couples, or due to an impairment of an individual's capacity to reproduce, either alone or with their partner (1-4). It is estimated that 80 to 168 million people worldwide are affected by infertility (5). The World Health Organization (WHO) has reported that over 25% of couples in developing countries experience infertility (6). In a systematic analysis of 277 studies conducted globally, Mascarenhas et al. (2012) reported a prevalence of 12.5% for infertility among women of childbearing age, with the highest rates observed in Middle Eastern countries (7).

Infertility in couples is categorized into two main groups: primary and secondary. Primary infertility refers to the inability to achieve any pregnancy, while secondary infertility is defined as the inability to conceive after a previous successful pregnancy. Research indicates that primary or secondary infertility affects nearly 15% of all women worldwide (8-10). A study by the World Health Organization (WHO) found that 43% of women and 30.7% of men experience secondary infertility, most of which is preventable (11). According to the results of another study conducted in 2000, infertility rates in different countries range from 5% to 30% (12). In a subsequent study from 2006, the prevalence of primary infertility was reported at 2.5%, while secondary infertility was found to be 24% globally (13).

In Iranian culture, fertility is a significant concept. A national study conducted from 2004 to 2005 across all 28 provinces of Iran aimed to estimate the prevalence of primary infertility. The results indicated that lifetime primary infertility was present in 24.9% of the participants, while the

prevalence of current primary infertility was 3.4% (14). The World Health Organization has identified infertility as an important reproductive health issue that, although not classified as a disease, can lead to emotional disorders among couples and numerous social and psychological complications (15). Furthermore, due to emotional differences between women and men, the pressure and stress caused by infertility tend to be greater for women than for men (16). Health systems require accurate estimates of health problems in society to understand the extent of public health issues and to plan more effectively for future interventions (17). In recent years, numerous studies have examined the prevalence of infertility in various regions of the country, revealing differing rates of infertility (11, 14-19).

The most important approach to addressing the problem of infertility is to reduce its incidence and promote reproductive health (20). Therefore, accurate information on the frequency of infertility and its causes is essential for effective decision-making by healthcare providers. Given the varying results in estimating the prevalence of infertility and the unclear factors associated with it, we decided to conduct an overview of published systematic reviews. This overview aims to determine the prevalence of primary and secondary infertility as well as the factors associated with infertility. It can assist policymakers in designing programs for individuals facing infertility. The goal of this overview is to estimate the prevalence of infertility and its associated factors among Iranian women based on existing scientific literature.

## 2- MATERIALS AND METHODS

In this overview, all systematic reviews and meta-analyses that focused on the prevalence of infertility among Iranian women, in either Persian or English, were

considered for inclusion. The search encompassed articles from the inception of each database up to January 10, 2024.

### 2-1. Search strategy

The searched databases included Scopus, EMBASE, Cochrane Library, Web of Science, CIVILICA, CINAHL, Medline (via PubMed), and Google Search Engine. This overview focused on the prevalence of infertility and associated factors among Iranian women. The study utilized the following keywords: prevalence, incidence, rate, infertility, etiology, cause, systematic review and meta-analysis, and Iran, combined with 'OR' and 'AND' operators.

### 2-2. Quality assessment

The AMSTAR tool was used to evaluate each systematic review (21). This tool consists of 11 items, which include prospective design, study selection and information abstraction, study search, grey literature, a list of primary studies, study characteristics, quality assessment, combination of study results, publication bias, and conflicts of interest. The responses for these 11 items are categorized as "Yes," "No," "Cannot Answer," and "Not Applicable." An AMSTAR score of 8 to 11 is considered high quality, 4 to 7 is medium quality, and 0 to 3 is low quality (22-24).

### 2-3. Data extraction

Two researchers extracted the required data from all studies based on a data extraction list. The following variables were obtained for each article: I. Study information (authors, publication year, year of study), II. Number of included studies, III. Sample size, IV. Prevalence (primary infertility and secondary infertility), and V. Main results.

### 2-4. Ethical considerations

Approval from a research ethics committee was not necessary, as the study analyzed

only publicly available articles. The research adhered to ethical standards by respecting copyright laws and ensuring transparency in methods and sources.

## 3- RESULTS

A total of five systematic reviews (involving 95 studies with a combined sample size of 279,717 women) were selected. The studies were published between 2012 and 2023. According to the existing literature, the prevalence of infertility in Iran from 1990 to 2019 is 10.5% (ranging from 7.8% to 13.2%), with primary infertility at 10.6% (ranging from 3.09% to 18.3%), and secondary infertility at 2.6% (ranging from 2% to 3.2%). This indicates that the prevalence of infertility among women has decreased over time. Based on the AMSTAR checklist, the minimum and maximum scores for the reviewed articles ranged from 4 to 7 (indicating medium quality; **Table 1**). The main characteristics of the selected studies are summarized in **Table 1** and detailed below:

1. A systematic review and meta-analysis conducted on 12 related studies prior to 2012 aimed to assess the incidence and etiological factors of infertility in the Iranian population. The results showed that the prevalence of infertility in Iran is 10.9% (95% confidence interval [CI]: 7.4-14.4), with primary infertility at 10.6% (95% CI: 5.3-16.0), secondary infertility at 2.7% (95% CI: 1.9-3.5), and current infertility at 3.3% (95% CI: 2.7-3.8). The prevalence rate of lifetime infertility in Iran was 10.9%, while the rate for current infertility was 3.3%. The male factor accounted for 34.0%, the female factor for 43.5%, both factors for 17.1%, and 8.1% remained unexplained (25).

2. A systematic review conducted between 2000 and 2012, which included 13 related studies, aimed to examine the prevalence of infertility in Iran. The results indicated that the overall prevalence of infertility

was 13.2%. Specifically, the prevalence of infertility in Iran was 5.2% and 3.2%, respectively, while 2.2% of the participants in the studies reported having primary infertility at that time (26).

**3.** A meta-analysis conducted between 1993 and 2016, which included 45 related studies, aimed to assess the prevalence and etiological factors associated with infertility in Iran. The results indicated that the lifetime prevalence of infertility was 11.3% (95% confidence interval [CI]: 8.6-14.7), while the current infertility rate was estimated at 3.7% (95% CI: 3.2-4.3). The prevalence of primary infertility, based on 45 articles with a total of 51,021 samples, was estimated at 18.3% (95% CI: 15.4-21.6), while secondary infertility, based on 13 articles with a total of 35,683 samples, was estimated at 2.5% (95% CI: 1.6-4.0). The subgroup analysis regarding the prevalence of lifetime infertility by region ( $p = 0.069$ ), year ( $p = 0.069$ ), and study quality ( $p = 0.069$ ) was not significant. However, the subgroup analysis of current infertility prevalence showed significant differences based on year ( $p < 0.001$ ) (27).

**4.** A systematic review and meta-analysis conducted between 2000 and 2019, which

primary and secondary included 14 related studies, aimed to determine the prevalence of infertility in Iran. The results indicated that the overall prevalence of infertility was 7.88% (95% confidence interval [CI]: 5.61-10.51). After sensitivity analyses, the prevalence of primary infertility was found to be 3.09% (95% CI: 2.27-4.02), while the prevalence of secondary infertility was 2.18% (95% CI: 1.56-2.89). The slope of the meta-regression line indicated that the prevalence of both primary ( $p > 0.05$ ) and secondary infertility ( $p > 0.05$ ) was rising, albeit at a slow rate in Iran (28).

**5.** A systematic review conducted between 2000 and 2019, which included 11 related studies, aimed to investigate the prevalence of infertility in Iran. The results indicated that the prevalence of primary infertility was 5.0% (95% confidence interval [CI]: 4.0-6.0%;  $I^2: 98.20\%$ ), while the prevalence of secondary infertility was 2.0% (95% CI: 1.0-3.0%;  $I^2: 98.48\%$ ). The prevalence of primary and secondary infertility was higher in women (6% and 3%, respectively). Additionally, primary infertility was more common among individuals under the age of 35 (29).

**Table-1:** The general characteristics of included studies (n=5).

Authors, published year, Reference	Year of study	Number of included studies	Sample size	Prevalence			Maim results	Quality assessment*
				Primary	Secondary	Total		
Parsanezhad et al., 2013, 25	up to 2012	12	51564	10.6%	2.7%	10.9%	The male factor was responsible for 34.0%, the female factor for 43.5%, both factors for 17.1%, and 8.1% remained unexplained.	Medium
Direkvand Moghadam et al., 2014, 26	2000-2012	13	55658	5.2%	3.2%	13.2%	The prevalence of infertility varies across different regions of Iran; however, the overall prevalence in the country is comparable to global statistics.	Medium
Abangah et al., 2023, 27	1993-2016	45	51021	18.3%	2.5%	11.3%	The current infertility rate was estimated to be 3.7%. Additionally, the subgroup analysis of current infertility prevalence showed significant differences based on year ( $p < 0.001$ ).	Medium
Saei Ghare Naz et al., 2023, 28	2000-2019	14	62728	3.09%	2.18%	7.8%	The slope of the meta-regression line indicated that the prevalence of primary ( $p < 0.05$ ) and secondary infertility ( $p < 0.05$ ) is rising at a slow rate in Iran.	Medium

Maharloui et al., 2021, 29	2000-2019	11	58746	5%	2%	-	The prevalence of primary and secondary infertility was higher in women, at 6% and 3%, respectively. Additionally, primary infertility was more common among individuals under the age of 35.	Medium
----------------------------	-----------	----	-------	----	----	---	---	--------

\* AMSTAR tool (21).

#### 4- DISCUSSION

This overview aimed to estimate the prevalence of infertility among Iranian women based on existing scientific literature. The findings indicate that the prevalence of infertility among Iranian women has decreased over time from 1990 to 2019.

Fertility, or the ability to conceive and successfully bear children, is of essential importance in the lives of couples. In contrast, infertility can lead to numerous negative consequences by disrupting reproduction (1-4). According to the clinical, epidemiological, and demographic definitions provided by the World Health Organization, infertility is defined as the inability to become pregnant after one, two, or five years of exposure to pregnancy (30). Infertility affects millions of people worldwide, often resulting in devastating consequences. In the female reproductive system, infertility may arise from a range of abnormalities affecting the ovaries, uterus, fallopian tubes, and endocrine system, among others (31, 32).

Based on previous studies, approximately 10% of the global population, 13% of women, 10% of men, and 15% of couples of reproductive age suffer from infertility. The prevalence of primary infertility is estimated to be around 12-15% (33-36). Various studies have investigated the prevalence of infertility in Iran. In 2009, the prevalence of lifetime and current primary infertility was reported to be 24.9% and 3.4%, respectively (17). In another study conducted between 2010 and 2011, the prevalence of primary infertility was found to be 20.2% according to clinical definitions, 12.8% according to epidemiological definitions, and 9.2%

according to demographic definitions (30). In 2013, the prevalence of primary infertility was reported to be 20.2% (37). In 2014, the prevalence rates for infertility, primary infertility, and secondary infertility were 13.2%, 5.2%, and 3.2%, respectively (26). A meta-analysis covering the years 1993 to 2016 indicated a lifetime infertility prevalence of 11.3% in Iran, with primary and secondary infertility estimated at 18.3% and 2.5%, respectively (27). A systematic review and meta-analysis conducted between 2000 and 2019 found that the overall prevalence of infertility was 7.88%. After sensitivity analyses, the prevalence of primary and secondary infertility was determined to be 3.09% and 2.18%, respectively (28). Another systematic review from 2005 to 2019 revealed a higher prevalence of primary infertility, likely due to differences in sexual relations patterns in Iran. Additionally, the pooled prevalence of depression among infertile couples was approximately 35.3%, with depression rates among females and males reported at 48.7% and 9%, respectively (38).

Most studies indicate that the prevalence of infertility in the country has decreased in recent years. A study conducted between 2004 and 2005, which investigated the prevalence of infertility among 10,783 Iranian women aged 19 to 49, found that the overall prevalence of infertility in the country was 20.2%, with rates of 19.9% in urban areas and 22% in rural areas (39). A systematic review covering the years 2000 to 2019 reported that the prevalence of primary infertility was 5.0%, while secondary infertility was at 2.0% (29). However, another study conducted in 2019 across 31 provinces involving more than 30,000 married

women revealed that the prevalence of primary infertility was 11.8%, and secondary infertility was 15.7%. The lifetime prevalence of total infertility was found to be 20.3%. Based on this study, among the 16 million married women aged 15 to 49, there are approximately 3,268,000 infertile couples in the country, with this number increasing by about 88,000 couples each year (40). It is worth noting that since the results of this study were published in 2022, they were not included in the systematic reviews.

Based on the current overview, the prevalence of infertility in Iran has decreased over time, and it is now lower than both the global average and the WHO Eastern Mediterranean Region. According to global WHO data from 1990 to 2021, the lifetime prevalence of infertility is estimated at 17.5%, with approximately one in six individuals experiencing infertility at some point in their lives. The results also indicate that the estimated lifetime prevalence of infertility is highest in the WHO Western Pacific Region (23.2%), and lowest in the WHO Eastern Mediterranean Region (10.7%). Furthermore, estimates of infertility prevalence are comparable across countries with varying income levels, with lifetime infertility prevalence at 17.8% for high-income countries and 16.5% for low- and middle-income countries (32). Infertility can be caused by various factors affecting either the male or female reproductive systems. However, in some cases, the causes of infertility may remain unexplained. In the female reproductive system, infertility may result from:

- Tubal disorders, such as blocked fallopian tubes, which can be caused by untreated sexually transmitted infections (STIs), complications from unsafe abortions, postpartum sepsis, or abdominal/pelvic surgery.
- Uterine disorders, which may be inflammatory (such as endometriosis),

congenital (such as a septate uterus), or benign (such as fibroids).

- Ovarian disorders, including polycystic ovarian syndrome and other follicular disorders.
- Endocrine system disorders that lead to imbalances in reproductive hormones. The endocrine system encompasses the hypothalamus and pituitary glands. Common disorders affecting this system include pituitary tumors and hypopituitarism (31, 32).

The relative importance of these causes of female infertility may vary from country to country (41). Lifestyle factors such as smoking, excessive alcohol consumption, and obesity can negatively impact fertility. Additionally, exposure to environmental pollutants and toxins can damage gametes (eggs and sperm), leading to decreased numbers and poor quality (40-43).

#### **4-1. Study Limitations**

Further research is needed to incorporate new findings, as the current systematic reviews only cover articles published up until 2019.

#### **5- CONCLUSION**

The findings of this overview (1990-2019) on the prevalence of infertility among Iranian women indicate that infertility has decreased over time and is now lower than the global average. Additionally, primary infertility is more prevalent than secondary infertility and is particularly common among women under the age of 35. Infertility may arise from male factors, female factors, a combination of both, or remain unexplained. For both women and men, lifestyle factors such as smoking, excessive alcohol consumption, and obesity have been associated with an increased risk of infertility. Furthermore, the prevalence of causes related to ovulation, uterine tubes, and endometriosis in infertile women was estimated to be 54.0%

**6- CONFLICT OF INTEREST:** None.

**7- REFERENCES**

1. Schattman GL, Esteves SC, Agarwal A. Unexplained infertility. Female reproductive dysfunction, 2015. p. 1–13.
2. World Health Organization. Infertility definitions and terminology. Available from: <http://www.who.int/reproductivehealth/topics/infertility/definitions/en/>, Accessed 16th Nov 2018.
3. Babore A, Stuppia L, Trumello C, Candelori C, Antonucci. I Male factor infertility and lack of openness about infertility as risk factors for depressive symptoms in males undergoing assisted reproductive technology treatment in Italy. *Fertil Steril* 2017;107: 1041-17.
4. Wiweko B, Anggraheni U, Elvira SD, Lubis HP. Distribution of stress level among infertility patients. *Middle East Fertil Soc J*, 2017; 22: 145-48.
5. Rasoulzadeh Bidgoli M, Latifnejad Roudsari R. The Effect of the Collaborative Infertility Counseling Model on Coping Strategies in Infertile Women Undergoing In Vitro Fertilization: a Randomized Controlled Trial. *International Journal of Women's Health and Reproduction Sciences*, 2018;6(1):47-54.
6. Messinis IE, Messini CI, Daponte A, Garas A, Mahmood T. The current situation of infertility services provision in Europe. *Eur J Obstet Gynecol Reprod Biol*. 2016 Oct 20:S0301-2115(16)30952-6.
7. Mascarenhas MN, Flaxman SR, Boerma T, Vanderpoel S, Stevens GA. National, regional, and global trends in infertility prevalence since 1990: a systematic analysis of 277 health surveys. *PLoS Med*, 2012; 9: e1001356.
8. Benksim A, Elkhoudri N, Addi RA, Baali A, Cherkaoui M. Difference between primary and secondary infertility in Morocco: frequencies and associated factors. *Int J Fertil Steril* 2018;12(2):142.
9. Kumar D. Prevalence of female infertility and its socio-economic factors in tribal communities of Central India. *Rural Remote Health*. 2007; 7(2):456.
10. Neisani Samani E, Amini L. The relationship between adverse pregnancy

outcomes and secondary infertility. *J Reprod Infertil* 2010;11(2):121-5.

11. Ghahremani F, Ghaem H. The effective factors on men infertility: a case – control study. *J Gorgan Uni Med Sci* 2005; 7(2): 42-5.
12. Larsen U. Primary and secondary infertility in sub-Saharan Africa. *Int J Epidemiol*. 2000 ;29(2):285-91.
13. Kan ASY, Ho PC. IMAP Statement on infertility. *IPPF Medical Bulletin*. 2006;40(4).
14. Vahidi S, Ardalan A, Mohammad K. Prevalence of primary infertility in the Islamic Republic of Iran in 2004- 2005. *Asia Pac J Public Health* 2009 Jul;21(3):287-93.
15. Nourani Sh, Joneidy E, Taghi Shakeri M, Mokhber N. Comparison of Quality of life in Fertile and Infertile Women Referred to the Public Clinics in Mashhad. *IJOGI* 2012; 15(7): 24-31.
16. Heidari P, Latif nezhad R. Relationship between pschosocial factors and marital satisfaction in infertile women. *J Qazvin Uni Med Sci*. 2010;14(54): 26-32.
17. Sadegh Moghadam L, Moslem A, Gharche M, Chamanzari H. Study of women infertility of Gonabad . *Intern Med Today* 2008; 13 (4):82-5.
18. Baruti M, Ramazni F, Heidari S, Khalajabadi F, Mohamad K. Primery infertility in Tehran based on marriage age. *Hakim* 2001 Feb;15(2):88-93.
19. Naghavi M. Demografic and health survey in Iran. *Health Undersecretary of Ministry of Health and Medical Education of Iran* 2002 Nov;26(2):45-7.
20. Wyshak G. Infertility in American college alumnae. *Int J Gynaecol Obstet* 2001;73(3):237-42.
21. Shea BJ, Hamel C, Wells GA, Bouter LM, Kristjansson E, Grimshaw J. AMSTAR is a reliable and valid measurement tool to assess the methodological quality of systematic reviews. *J Clin Epidemiol*. 2009 Oct;62(10):1013-20.
22. Shea BJ, Grimshaw JM, Wells GA, et al. Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews. *BMC Med Res Methodol* 2007;7:10.

23. Pieper D, Koensgen N, Breuing J, et al. How is AMSTAR applied by authors - a call for better reporting. *BMC Med Res Methodol* 2018;18:56.
24. Pieper D, Mathes T, Eikermann M. Can AMSTAR also be applied to systematic reviews of non-randomized studies? *BMC Res Notes* 2014;7:609.
25. Parsanezhad M, Jahromi B, Zare N, Keramati P, Khalili A, Parsa-Nezhad M. Epidemiology and etiology of infertility in Iran, systematic review and meta-analysis. *J Womens Health, Issues Care*. 2013;2(6):2.
26. Direkvand Moghadam, A., Delpisheh, A., Sayehmiri, K. The Prevalence of Infertility in Iran, A Systematic Review. *The Iranian Journal of Obstetrics, Gynecology and Infertility*, 2013; 16(81): 1-7.
27. Abangah GH, Rashidian T, Parizad Nasirkandy M, Azami M. A Meta-Analysis of the Prevalence and Etiology of Infertility in Iran. *Int J Fertil Steril*. 2023;17(3):160-73.
28. Saei Ghare Naz M, Ozgoli G, Sayehmiri K. Prevalence of Infertility in Iran: A Systematic Review and Meta-Analysis. *Urol J*. 2020 Jun 23;17(4):338-45.
29. Maharlouei N, Morshed Behbahani B, Doryanizadeh L, Kazemi M. Prevalence and pattern of infertility in Iran: A systematic review and meta-analysis study. *Women's Health Bulletin*. 2021 Apr 1;8(2):63-71.
30. Akhondi MM, Ranjbar F, Shirzad M, Ardakani ZB, Kamali K, Mohammad K. Practical difficulties in estimating the prevalence of primary infertility in Iran. *Int J Fertil Steril*. 2019;13(2):113-17.
31. Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion. Last Reviewed: April 26, 2023.
32. World Health Organization, 2023. Infertility Prevalence Estimates 1990–2021.
33. Deshpande PS, Gupta AS. Causes and Prevalence of Factors Causing Infertility in a Public Health Facility. *J Hum Reprod Sci*. 2019;12(4):287-93.
34. Sun H, Gong TT, Jiang YT, Zhang S, Zhao YH, Wu QJ. Global, regional, and national prevalence and disability-adjusted life-years for infertility in 195 countries and territories, 1990–2017: results from a global burden of disease study, 2017. *Aging (Albany NY)*. 2019;11(23):10952-991.
35. De D, Mukhopadhyay P, Roy PK. Experiences of Infertile Couples of West Bengal With Male Factor, Female Factor, and Unexplained Infertility Factor: A Qualitative Study. *Journal of Psychosexual Health*. 2020;2(2):152-7.
36. Doryanizadeh L, Morshed-Behbahani B, Parsanezhad ME, Dabbaghmanesh MH, Jokar A. Calcitriol Effect on Outcomes of in Vitro Fertilization in Infertile Women with Vitamin D Deficiency: A Double-Blind Randomized Clinical Trial. *Z Geburtshilfe Neonatol*. 2020. doi: 10.1055/a-1206-1064.
37. Akhondi MM, Kamali K, Ranjbar F, Shirzad M, Shafeghati S, Ardakani ZB, et al. Prevalence of primary infertility in Iran in 2010. *Iran J Public Health*. 2013;42(12):1398-404.
38. Alimohamadi, Y., Mehri, A., Sepandi, M. et al. The prevalence of depression among Iranian infertile couples: an update systematic review and meta-analysis. *Middle East Fertil Soc J*, 2020;25:16.
39. Vahidi S.A.D., Ardalan A., Mohammad K.. The Epidemiology of Primary Infertility In The Islamic Republic of Iran in 2004-5. *Journal of Reproduction and Infertility*, 2006;7(3 (28)):243-51.
40. Taheri Panah R, Haghdoost AA, Baneshi MR, Safari R, Younesian M, Barekati SH, et al. Prevalence of Infertility in Iran in 2019. Ministry of Health and Medical Education: Tehran, 2022.
41. Rutstein SO, Shah IH. Infecundity infertility and childlessness in developing countries. Geneva: World Health Organization, 2004.
42. Gore AC, Chappell VA, Fenton SE, et al. EDC-2: The Endocrine Society's Second Scientific Statement on Endocrine-Disrupting Chemicals. *Endocrine Reviews* 2015;36(6):E1-E150.
43. Segal TR, Giudice LC. Before the beginning: environmental exposures and reproductive and obstetrical outcomes. *Fertility and Sterility* 2019;112(4):613-21.