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

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Abstract

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

Materials and Methods: In this overview, online databases Medline, EMBASE, Web of Science, Scopus, Cochrane Library, CINAHL, CIVILICA, and Google search engine were searched for related systematic and meta-analysis studies published up to January 2024. Two independent scholars undertook the screening, selection, and quality assessment of selected research (using the AMSTAR tool).

Results: A total of five systematic reviews (including 95 studies, n= 279717 women) were included. The results indicated that the current prevalence of infertility in Iran is 13.2% (ranged 7.8-13.2%), primary infertility is 10.6% (ranged: 3.09-18.3%), secondary infertility is 3.2% (ranged: 2-3.2%), and current infertility is 3.7% (ranged: 2.2-3.7%). The prevalence of primary and secondary infertility by gender was higher in women than in men (6% and 3%, respectively, $p<0.05$). The prevalence of primary infertility was more common in women under the age of 35 ($p<0.05$). Subgroup analysis of current infertility prevalence was significant based on year ($p<0.05$). The prevalence of causes related to ovulation, uterine tubes, and endometriosis in infertile women was estimated at 54.0%.

Conclusion: The prevalence of infertility among women (1990 to 2019) has decreased over time. Primary infertility is higher than secondary infertility and more common in women under the age of 35. For both women and men, however, lifestyle factors such as smoking, excessive alcohol intake, and obesity have been associated with higher chances of infertility.

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

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1- INTRODUCTION

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

Infertility in couples is divided into two main groups: primary and secondary. Primary infertility is the inability to have any pregnancy, while secondary infertility is the inability to have a pregnancy after a previous successful conception. Based on some research, primary or secondary infertility occurs in almost 15% of all women worldwide (8-10). In a study by the WHO, 43% of women and 30.7% of men suffered from secondary infertility, most of which are preventable (11). Based on the results of another study (2000), the infertility rates for different countries range from 5 to 30% (12). In another study (2006), the prevalence of primary infertility was 2.5%, with secondary infertility being 24% in the world (13).

In the Iranian culture, fertility is an important concept. A national study in 2004-2005 in all 28 provinces of Iran aimed to estimate the prevalence of primary infertility. The results showed that lifetime primary infertility was present in 24.9% of the subjects, and the prevalence of current primary infertility was 3.4% (14). The WHO has indicated infertility as an important reproductive health problem that, although not a disease, can lead to emotional disorders among couples and numerous social and psychological complications (15). Furthermore, due to the emotional differences between women and men, the pressure and tension caused by infertility is more on women than on men (16). Health systems need a correct estimation of health problems in society to know the volume of problems related to public health and to plan more precisely for future actions (17). In the past years, there have been many studies on the prevalence of infertility in different areas of the country, and the results show different infertility rates (11, 14-19).

The most important approach to 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 can be effective in the decision-making of health providers. Due to different results in estimating the prevalence of infertility and unclear factors associated with infertility, we decided to conduct an overview of published systematic reviews. This overview can determine the prevalence of primary and secondary infertility and the factors associated with infertility. It can help policymakers design a program for infertile people. This overview aimed to estimate the prevalence of infertility and associated factors among Iranian women according to the 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 Persian or English, were considered for inclusion. The search included 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 used 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). The tool consists of 11 items, involving prospective design, study selection and information abstraction, study search, grey literature, list of primary studies, study characteristics, quality assessment, combination of study results, publication bias, and conflicts of interest. The answers for these 11 items are "Yes", "No", "Cannot Answer", and "Not Applicable." An AMSTAR of 8 to 11 is considered high quality, 4 to 7 is medium, and 0 to 3 is low quality (22-24).

2-3. Data extraction

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

2-4. Ethics

Approval of a research ethics committee was not necessary as the study analyzed only publicly available articles.

3- RESULTS

A total of five systematic reviews (involving 95 studies, n=279717 women) were selected. The studies were published between 2012 and 2023. Based on the existing literature, the prevalence of infertility in Iran (1990-2019) is 13.2% (ranged: 7.8-13.2%), while primary infertility is 10.6% (ranged: 3.09-18.3%), and secondary infertility is 3.2% (ranged: 2-3.2%). It means the prevalence of infertility among women has decreased over time. Based on the AMSTAR checklist, the minimum and maximum acquisition scores of the reviewed articles were 4 to 7 (i.e., medium quality, **Table 1**). The main characteristics of the selected studies are summarized in **Table 1** and the following:

1. A systematic review and meta-analysis (2012 and before) on 12 related studies aimed to assess the incidence and etiologic factors for 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), primary infertility is 10.6% (95% CI; 5.3-16.0), secondary infertility is 2.7% (95% CI; 1.9-3.5), and current infertility is 3.3% (95% CI: 2.7-3.8). The prevalence rate of lifetime infertility in Iran was 10.9%, and current infertility was 3.3%. The male factor was responsible for 34.0%, the female factor for 43.5%, and both factors for 17.1%, and 8.1% were unexplained (25).

2. A systematic review (2000-2012) of 13 related studies aimed to examine the prevalence of infertility in Iran. The results showed that the prevalence of infertility was 13.2%. The overall prevalence of primary and secondary infertility in Iran was 5.2% and 3.2%, respectively, and 2.2% of the participants in the studies had primary infertility at present (26).

3. A meta-analysis (1993-2016) on 45 related studies aimed to assess the prevalence and etiologic factors associated with infertility in Iran. The results showed that the lifetime infertility prevalence was 11.3% (95% confidence interval (CI): 8.6-14.7), and the current infertility was

evaluated to be 3.7% (95% CI: 3.2-4.3). The prevalence of primary infertility (based on 45 articles consisting of 51,021 samples), and secondary infertility (based on 13 articles consisting of 35,683 samples) were estimated at 18.3% (95% CI: 15.4-21.6), and 2.5% (95% CI: 1.6-4.0), respectively. The subgroup analysis regarding the prevalence of lifetime infertility according to the region (p=0.069), year (p=0.069), and study quality (p=0.069) was insignificant. The subgroup analysis of current infertility prevalence was significant based on year (p<0.001) (27).

4. A systematic review and meta-analysis (2000-2019) of 14 related studies aimed to determine the prevalence of infertility in Iran. The results showed that the prevalence of infertility was 7.88% (95% CI: 5.61- 10.51). The prevalence of primary and secondary infertility after sensitivity analyses was 3.09% (95% CI: 2.27- 4.02), and 2.18% (95% CI: 1.56-2.89), respectively. The slope of the meta-regression line showed that the prevalence of primary (p >0.05), and secondary infertility (p >0.05) was rising with a slow slope in Iran (28).

5. A systematic review (2000-2019) of 11 related studies aimed to investigate the prevalence of infertility in Iran. The results showed that the prevalence of primary infertility was 5.0% (95% CI: 4.0, 6.0%; I2: 98.20%), and the prevalence of secondary infertility was 2.0% (95% CI: 1.0, 3.0%; I2: 98.48%). The prevalence of primary and secondary infertility by gender was higher in women (6% and 3%, respectively). The prevalence of primary infertility was more common in people under the age of 35 (29).

Tabale-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%	Male factor was responsible for 34.0%, female factor for 43.5%, both factors for 17.1% and 8.1% were unexplained.	Medium
Direkvand Moghadam et al., 2014, 26	2000-2012	13	55658	5.2%	3.2%	13.2%	The prevalence of infertility is different in various parts of Iran, but the overall prevalence of infertility in Iran is close to the global statistics.	Medium
Abangah et al., 2023, 27	1993-2016	45	51021	18.3%	2.5%	11.3%	The current infertility was evaluated to be 3.7%. Also, subgroup analysis of current infertility prevalence was significant 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 showed that the prevalence of primary (p<0.05), and secondary infertility (p<0.05) is rising with a slow slope in Iran.	Medium
Maharloui et al., 2021, 29	2000-2019	11	58746	5%	2%	-	The prevalence of primary and secondary infertility by gender was higher in women (6% and 3%, respectively). The prevalence of primary infertility was more common in people under the age of 35.	Medium

* AMSTAR tool (21).

4- DISCUSSION

This overview aimed to estimate the prevalence of infertility among Iranian women according to the existing scientific literature. It was found that the prevalence of infertility (1990-2019) among Iranian women has decreased over time.

Fertility or the ability to have a child and success in childbearing is of essential importance in the common life for couples, and its opposite, infertility, causes many unpleasant consequences for couples by disrupting reproduction (1-4). According to the clinical, epidemiological, and demographic definitions of the World Health Organization, infertility is the inability to become pregnant within one, two, or five years of exposure to pregnancy (30). Infertility impacts millions of people worldwide, often with devastating consequences. In the female reproductive system, infertility may be caused by a range of abnormalities of the ovaries, uterus, fallopian tubes, and the endocrine system, among others (31, 32).

Based on previous studies, 10% of the world population, 13% of women, 10% of men, and 15% of couples of reproductive age suffer from infertility. The prevalence of primary infertility is about 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 24.9 % and 3.4%, respectively (17). In another study (2010-2011), the prevalence of primary infertility was 20.2% for clinical definition, 12.8% for epidemiological definition, and 9.2% for demographic definition (30). In 2013, the prevalence of primary infertility was reported as 20.2% (37). In 2014, the prevalence of infertility, primary infertility, and secondary infertility were 13.2%, 5.2%, and 3.2%, respectively (26). A meta-analysis (1993-2016) showed a lifetime infertility prevalence of 11.3% in Iran. The prevalence of primary and secondary infertility was estimated to be 18.3% and 2.5%, respectively (27). A systematic review and meta-analysis (2000-2019) showed that the prevalence of infertility was 7.88%. The prevalence of primary and secondary infertility after sensitivity analyses was 3.09%, and 2.18%, respectively (28). A systematic review (2005-2019) showed that the pattern of infertility presents a higher prevalence of primary infertility, which is probably due to the differences in the pattern of sexual relations in Iran. Also, the pooled prevalence of depression among infertile couples was about 35.3%, and the prevalence of depression among females and males was 48.7% and 9%, respectively (38).

Most studies show that the prevalence of infertility in the country has decreased in recent years. A study (2004-2005) on 10,783 Iranian women investigating the prevalence of infertility in women aged 19-49 showed that the prevalence of infertility in the whole country was 20.2%, with 19.9% in urban and 22% in rural areas (39). A systematic review (2000-2019) showed that the prevalence of primary infertility was 5.0%, and the prevalence of secondary infertility was 2.0% (29). However, in another study conducted in 2019 in 31 provinces on more than 30,000 married women, the results show that the prevalence of primary infertility was 11.8%. Secondary infertility was 15.7%, and the lifetime prevalence of total infertility was 20.3%. Based on this study, among the 16 million married women aged 15-49, there are 3,268,000 infertile couples in the country, which increases by about 88,000 couples every year (40). It is worth mentioning that as the results of this study were published in 2022, it was not included in the systematic reviews.

Based on the current overview, the prevalence of infertility in Iran has decreased over time, and the current prevalence is lower than the global average

and the WHO Eastern Mediterranean Region. According to the global WHO data from 1990 to 2021, the lifetime prevalence of infertility is estimated at 17.5%, and approximately one in six people have experienced infertility at some stage in their lives. The results also indicate that the estimated lifetime prevalence of infertility is the highest in the WHO Western Pacific Region (23.2 %), and the lowest in the WHO Eastern Mediterranean Region (10.7%). In addition, estimates of infertility prevalence are similar across countries with different income levels. Lifetime infertility prevalence was 17.8% for high-income countries and 16.5% for low- and middle-income countries (32).

Infertility may be caused by different factors in the male or female reproductive systems. However, it is sometimes not possible to explain the causes of infertility. In the female reproductive system, infertility may be caused by:

- Tubal disorders such as blocked fallopian tubes, which are caused by untreated sexually transmitted infections (STIs) or complications of unsafe abortion, postpartum sepsis, or abdominal/pelvic surgery;

- Uterine disorders, which could be inflammatory (such as endometriosis), congenital in nature (such as a septate uterus), or benign (such as fibroids) in nature;

- Disorders of the ovaries, such as polycystic ovarian syndrome and other follicular disorders;

- Disorders of the endocrine system causing imbalances of reproductive hormones. The endocrine system includes the hypothalamus and the pituitary glands. Examples of common disorders affecting this system include pituitary cancers and hypopituitarism (31, 32).

The relative importance of these causes of female infertility may differ from country to country (41). Lifestyle factors such as smoking, excessive alcohol intake and obesity can affect fertility. In addition, exposure to environmental pollutants and toxins can damage gametes (eggs and sperm), resulting in their decreased numbers and poor quality (40-43).

4-1. Study Limitations

Further research is required to add the new research as the current systematic reviews have covered the articles published until 2019.

5- CONCLUSION

The findings of this overview (1990-2019) of the prevalence of infertility among Iranian women showed that infertility has decreased over time, and this prevalence is lower than the global average. Also, primary infertility is higher than secondary infertility and more common in women under the age of 35. Infertility may occur due to male and female factors, a combination of male and female factors, or be unexplained. For both women and men, however, lifestyle factors such as smoking, excessive alcohol intake and obesity have been associated with higher chances of infertility. In addition, the prevalence of causes related to ovulation, uterine tubes, and endometriosis in infertile women was estimated at 54.0%.

6- CONFLICT OF INTEREST: None.

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