Review Article

Issues with Conception Among Women: A Narrative Review

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Abstract

Background: Infertility is a universal barrier affecting people around the world especially women from conception. Globally 48 million couples suffer from getting conceived (WHO 2021) and the global burden of infertility among reproductive-aged couples account for 15% in 2021. The causes of infertility and its significance vary depending on the geographical condition and socio-economic factors around the world. Since fertility rates have been declining for the past 5 decades, factors determining infertility, especially among women, are aimed to be identified and awareness against them to be raised for immediate action.

Method: A literature search was performed in various databases like PubMed, Cochrane, Web of Science, and the resulting articles were then reviewed for analysis. The keywords used were "Infertility determinants among women" AND "Risk factors of female infertility" AND "Factors causing infertility among women in India" OR "Female Infertility in India".

Results: Several socio-demographic lifestyle associated factors like age, educational level, economic status contributed to a majority of cases followed by reproductive health and psychological factors like depression and stress were involved. Hormonal disorders and gynaecological diseases were other factors found to be associated with infertility.

Conclusion: Increased BMI, irregular menstrual patterns, and psychological issues like depression were the key issues in determining infertility among women and thus emphasize the need to understand and maintain their health.

Keywords: Infertility; Risk Factors; Lifestyle; Hormonal Disorders; Treatment; Prevention

Abbreviations

WHO: World Health Organisation; NFHS: National Family Health Survey; IVF: *In-Vitro* Fertilization; CPR: Contraceptive Prevalence Rate; PCOS: Polycystic Ovarian Syndrome; PID: Pelvic Inflammatory Disease; BMI: Body Mass Index; POI: Primary Ovarian Insufficiency

Introduction

Infertility, the clinical diagnosis for decreased ability to conceive and have children within 12 months of regular intercourse, has increased over the years, where globally 48 million couples are reported to suffer. The condition is counteracted with numerous infertility treatments involving hormonal oral medications or injections with or without intrauterine insemination of sperm or other assisted reproductive technologies [1]. Without a certain effective treatment, *in vitro* fertilization (IVF) may result in approximately 30% live birth and seems to be the first option for couples who suffered from infertility. However, the latest evidence showed that the consequences of infertility have a greater impact on a woman's life and can be a lifetime crisis [2].

The average fertility rate in India has decreased since the past decade from 2.6 (2011) to 2.1 (2021) and the latest findings of NFHS V data revealed that the average number of children born to a woman over her lifetime has dropped below the replacement level. In addition, the survey also revealed that the use of condoms in India has increased from 5.6 percent to 9.5 percent and the Overall

Contraceptive Prevalence Rate (CPR) has also seen a substantial increase from 54 percent to 67 percent [3]. The reasons behind infertility in male or female needs to be explained to understand the need for its treatment.

Traditionally, infertility has largely been attributed to the female and it has been a common belief that women are the sole reason. However, in reality, it affects both men and women almost equally. In 40% of cases, the problem is attributable to the male, while another 40% is traced to the female. In about 10% of cases, fertility problems are linked to both partners. The remaining 10% of infertility is unexplained, even after exhaustive testing [4]. The reproductive process is known to have numerous steps involving hormonal regulation, ovulation, good fallopian tube function, fertilization, implantation, and fetal growth. These steps are hindered by various factors among both men and women namely tobacco, alcohol use, and others [5].

In addition to socio-demographic factors, there are also disease causes associated with the reproductive health of women which include Pelvic Inflammatory Disease (PID), Endometriosis, Submucosal fibroids, Polycystic Ovarian Syndrome (PCOS), and other uterine problems. A study in Northern India showed that 47% of women had poor egg quality and problems with a uterine or fallopian tube which caused Infertility [4]. Chronic medications for uterine or hormonal problems are also known to cause primary or secondary infertility. Caffeine, known to have its own positive and negative health effects is being analyzed for its impact in causing female infertility.

Thus, having informed awareness about female reproductive health and risk factors of infertility is highly essential to understand and prevent infertility and this review thus focuses on creating systematic narrative evidence by analyzing the issues with conception in detail.

Methodology

We searched in various research databases like PubMed and Cochrane for articles reporting the female infertility and factors causing infertility among women globally and in India.

Our search yielded reviews on the global and national situation of female infertility and factors causing infertility among women.

Search strategy

A search of literature for this systematic review was without any restriction on the date of publication. The initial search was conducted in MEDLINE. The keywords used for specific databases are given in table 1. A search for the published literature was carried out between February and March 2022. Thus, the upper limit of publication time for selecting studies for this review was identified as of February 2022.

Database	Number	Keywords used in search
Medline (PubMed)	1	(Female Infertility*[tiab]) OR (Determinants*[tiab])
	2	(Female Infertility*[tiab]) OR (India*[tiab])
	3	(Risk factors[tiab]) OR (Infertility[tiab]) OR (Women[tiab])
	4	#1 AND #2 AND #3
Cochrane Library	1	("Female Infertility"): ti,ab,kw OR ("Determinants"): ti,ab,kw
	2	("Risk factors"): ti,ab,kw OR ("female infertility"): ti,ab,kw
	3	("Infertility"): ti,ab,kw OR ("Female"): ti,ab,kw OR ("India"): ti,ab,kw
	4	#1 AND #2 AND #3

Table 1: Systematic Review search strategy.

tiab - Title Abstract; ti- Title; ab - Abstract; kw- Keyword; *- Wild-card Search.

The search strategy yielded 938 results.

Inclusion criteria

Studies meeting the following criteria were included in the review.

- Published in peer-reviewed journals.
- Available in electronic databases.
- Conducted in an acute or chronic clinical care setting.
- Studies were included if they described either or all of the following variables.
- Female infertility prevalence,
- Risk factors for female infertility,

- Factors determining infertility,
- Articles available in the English language were only included in the review

Exclusion criteria

Conference abstracts, books and grey literature were excluded.

Screening

The search titles were uploaded in Zotero software and scrutinized for duplicates. Firstly, the titles were read and screened as per their relevance to the topic. Secondly, the abstracts of the relevant titles were read by the reviewer (MR) and screened. Thirdly, the full texts of the screened abstracts were read. The screening processes at both abstract and full-text levels were done independently by the reviewers as per the inclusion criteria.

Data extraction

The data extractions from the screened studies were done in the excel spreadsheet. Details regarding publication, methodology and results were extracted and recoded.

Search results

Search in the databases revealed 938 titles out of which 153 titles were found relevant to the research objective. Those were exported to Zotero software which removed 58 duplicates. We limited to articles published since 2010 which resulted in nearly 52 articles (studies and reviews) explaining the current situation of female infertility worldwide and the factors determining female infertility with some references to Indian lifestyle. Thus, abstracts of 38 studies were read in the second stage, 21 articles were taken for full-text screening, and out of those, 12 studies could be included in the final review. Thus, a total of 12 articles were included for this narrative review that focused on female infertility and risk factors determining infertility among women. All articles were published in English. They were then reviewed in detail for the factors determining infertility among women and the lifestyle modifications we need to be sensitive about.

Results and Discussion

Socio-demographic factors

Demographic and socio-economic characteristics play a vital role in the fertility status of both men and women. Various studies have stated that women of age above 30 years are at higher risk of
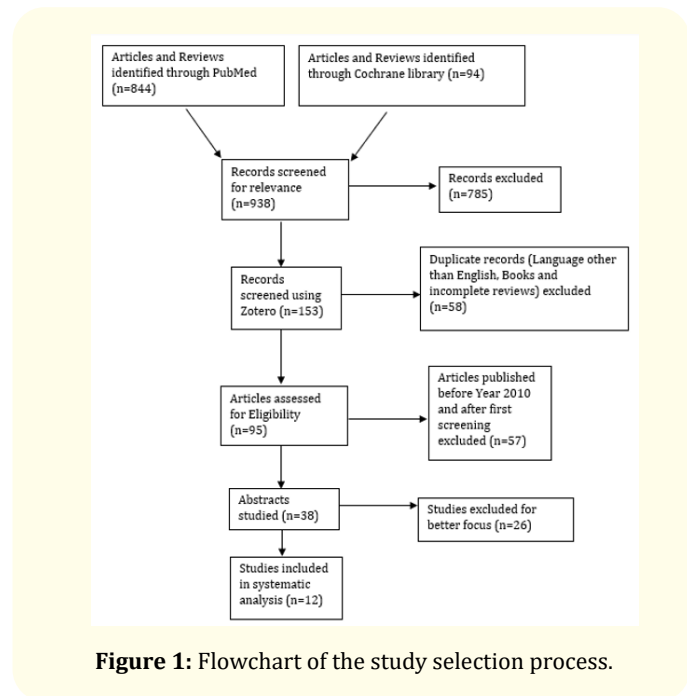

Figure 1: Flowchart of the study selection process.

suffering from infertility. The reproductive age of women is reported to have started since menarche and reaches a peak between 22 - 29 years. After 30 years, the fertility rate of women has been reported to start decreasing, eventually increasing the risk of infertility. The physiological, familial, and community pressure in producing a biological child, especially in the age above 30 years also adds to the pressure and stressful situation, leading to infertility [6]. However, women who had early marriage (before 20 years of age) were found to be at higher risk of secondary infertility.

The second most important factor for infertility was estimated to be their educational status, where women who had never attended school or did not receive higher education were at higher risk and this was concluded to be because of their poor awareness regarding their reproductive health. As per a recent study, women with less than 10 years of schooling were 41 percent and women with more than 10 years of schooling were 70 percent less likely to be primary infertile than women with no schooling [6]. Women employed in jobs with longer hours of work or highly stressful jobs were diagnosed to be at higher risk of infertility. The stress levels of work and poor work-life balance were concluded to be the major contributing factors [7].

Residing in an urban locality was another major socio-demographic risk factor for infertility due to modern sedentary lifestyle, poor health choices, poor physical activity, increased

pollution, and stressful lifestyle. Also, another recent study conducted in India has stated that women living in the nuclear family had 8.3 times more risk of infertility as compared to those living in joint and three-generation families [8].

Family history of infertility in both paternal and maternal sides has proven to be one of the important risk factors of infertility. Concerning physiological factors, obese women or women with a high Body Mass Index (BMI) of more than 25 are more likely to become infertile than women with normal BMI (Level 18 - 24). Body Mass Index is an indicator used to determine whether an individual is underweight or overweight which is calculated using their current height and weight. This is because the bodyweight of a woman determines her hormone levels which tend to affect their estrogen production in particular and ability to ovulate. This in turn affects her menstrual pattern and indeed increases the chances of infertility. A recent study has stated that obesity also affects the fertility of men as their semen volume tends to be lower and in turn decreases their sperm count, raising the risk of infertility [9].

One relationship that has been in debate for too many decades is between caffeine and infertility. The effects of caffeine are a double-edged sword as it acts as a protective factor for some diseases like cardiovascular diseases and a risk factor for various other diseases. Recent studies have claimed that caffeine consumption increases the risk of infertility by increasing the chances of tubal disease, endometriosis, or other cervix-related factors [10]. Also, women who smoke do not conceive as efficiently as non–smokers. Infertility rates in both male and female smokers are about twice the rate of infertility found in non–smokers.

Reproductive health

Female reproductive health is under the influence of numerous endogenous and exogenous factors and a major burden of the disease in females is related to their reproductive health and functioning. The various elements of reproductive health are strongly interrelated. Improvements of one element can result in potential improvements in other elements. Similarly, a lack of improvement in one element can hinder progress in another [11].

The reproductive disorders include pelvic infections, ovarian dysfunctions, endometriosis, tubal dysfunction, sexually transmitted diseases, cervix, and vagina-related infections and diseases. They are the major contributors of infertility and is

attributed to several external factors namely – psychological factors like stress from work or family life and internal factors like increased body weight, poor physical activity, poor personal hygiene, and unhealthy diet patterns resulting in exposure to infections and hormonal dysregulation [12]. The most common overall causes for female infertility include –

- Failure to ovulate occurs in 40% of women with infertility issues and it may be due to Ovarian or gynecological conditions, such as Primary Ovarian Insufficiency (POI) or Polycystic ovary syndrome (PCOS), Aging, Lifestyle, and environmental factors, or Endocrine disorders like problems with thyroid or hypothalamus.

- Structural problems with the reproductive system are another major causative factor for infertility which involves the presence of abnormal tissue in fallopian tubes or uterus. They include endometriosis (when tissue growth blocks fallopian tubes), uterine fibroids, polyps, scarring in the uterus from previous injury or infection, or abnormally shaped uterus by birth.

- Sexually Transmitted infections include untreated gonorrhea and chlamydia that can lead to pelvic inflammatory disease, any chronic infections in the cervix, and surgical treatment of cervical lesions associated with human papillomavirus (HPV) infection can also reduce the amount or quality of cervical mucus, and in turn, increase the risk of infertility [13].
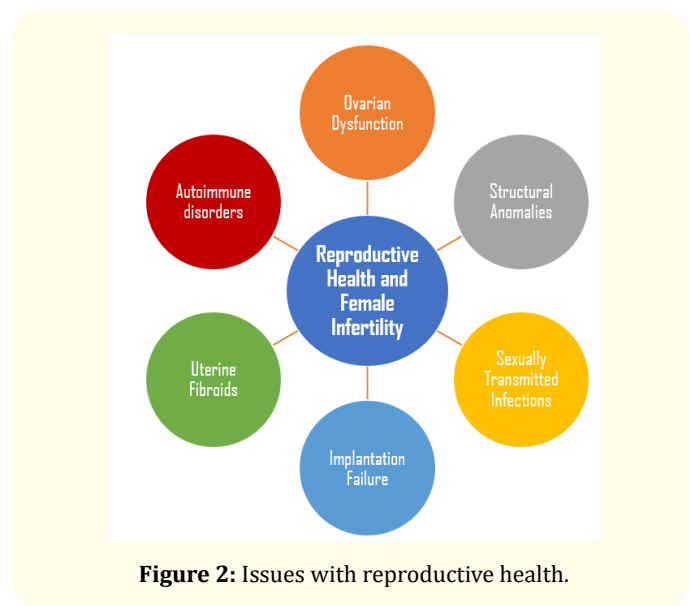

Figure 2: Issues with reproductive health.

Psychological health

Infertility due to no known causative factors are usually explained by the role of mental disorders like stress, depression, sleep disorders, eating disorders, and addictions. Various studies have shown that the problem scores of depression, stress, and anxiety are found to be significantly higher among infertile people than normal fertile couples. Psychological factors like stress disturb reproductive health by inducing the generation of reactive oxygen species (ROS) and thereby oxidative stress (OS). The increased OS may affect the physiology of the ovary, oocyte quality and cause female reproductive health disorders [14].

The major reason explained behind the relationship between psychological factors and infertility is their impact on the hormonal cycle. The secretion of gonadotropin-releasing hormone (GnRH) pulses from the hypothalamus stimulates the pituitary gland to secrete luteinizing hormone (LH) and follicle-stimulating hormone (FSH). Both the amplitude and frequency of GnRH pulses are crucial for the proper secretion of gonadotropins. LH secretion is stimulated by high-frequency GnRH pulses, while low-frequency pulses stimulate FSH. During the follicular phase of the menstrual cycle, increased estrogen levels lead to an increased frequency of GnRH pulses. This results in increased LH secretion and ovulation and increased levels of stress, anxiety, or depression significantly affect this secretion, effectively blocking the process of ovulation and in turn fertility [15].

Conclusion

Female fertility is bound to be disrupted by a variety of factors involving their socio-demographic environment, their reproductive health, and psychological factors. However, a vast majority of them are modifiable which can have a great influence on overall health and well-being, preventing infertility. Lifestyle factors like weight, physical activity, diet patterns, smoking, alcohol, caffeine consumption, psychological stress, environmental and occupational exposures are found to be the key issues that negatively influence fertility. This is important to be understood in order to minimize complications and by active modification of lifestyle behaviors, women are highly capable of maximizing their chances of conception and controlling their fertility potential.

Acknowledgements

Conflict of Interest

Nil

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