Burden of Infertility, Its Risk Factors, Perceptions and Challenges Faced by Women of Peri-urban Community from Ahmedabad City: Mixed Method Study

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Abstract

Background: Infertility is globally prevalent and India accounts for 25% of the global burden, but it is still a neglected reproductive health issue. To estimate the prevalence of infertility, its determinants, perception and challenges faced by couples from the peri-urban area of Ahmedabad City. **Materials and Methods:** A community-based cross-sectional study was conducted in peri-urban areas of Ahmedabad City. For quantitative data collection, 689 couples were selected through probability proportion-based sampling (PPBS). Data was collected through a questionnaire during (1) phase I for socio-demographic details of the community and identification of eligible couples, (2) phase II for assessing the presence of infertility and its risk factors along with the assessment of depression and anxiety, and (3) phase III for Clinico-social profiling of all infertile couples (detected during second phase). Some of these women were involved in qualitative components to know the perceptions, challenges, etc. faced while seeking infertility treatment. **Result:** Study population of 917 families (*n* = 3891) yielded 689 women of reproductive age group (RAG) with a period prevalence of 7.4% (5.5%–9.4%); separately being 3.5% and 3.9% for primary and secondary type respectively. Socio-demographic determinants like age, education, occupation, addiction, and lifestyle-related illnesses like diabetes and hypertension exhibited no significant association with infertility. However, asthma, mental illnesses, and hormonal diseases like polycystic ovarian disease (PCOD) were associated and exhibited a significant association with infertility. Preventable risk factors like reproductive tract/sexually transmitted infections (RTI/STI) showed a significantly positive association with infertility. **Conclusion:** The period prevalence of infertility was 7.4%, with the secondary type being more common. Asthma, mental illness, RTI/STI and age at menarche showed significant association. Screening and treatment for RTI/STI can prevent complications like infertility. Stigma associated with infertility and lack of treatment facilities in the government sector makes it difficult to deal with and neglected health problems.

Keywords: Infertility, peri-urban community, prevalence, reproductive age group, risk factors

INTRODUCTION

Infertility, a disease of the reproductive system, is defined as "failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse."[1] It includes primary and secondary type infertility. Primary means when a couple has never conceived and secondary means when a couple has experienced a pregnancy before but failed to conceive later. Globally, primary type is more common than secondary infertility.[1] Estimated Global lifetime prevalence of infertility is 17.5% (17.8% in high income and 16.5% in low- and middle-income countries).[2] Out of 60–80 million couples suffering from infertility globally, 15–20 million (25%) are in India.[3,4] Prevalence of infertility in India varies between 3.9 and 16.8%.[5] It is as low as 3.7%

in Uttar Pradesh, Himachal Pradesh and Maharashtra,[6] to 5% in Andhra Pradesh[7] and very high (15%) in Kashmir.[8] Substantial geographical differences in the prevalence can largely be explained by different environmental, cultural and socioeconomic influences, as well as access to the health care system. It further varies within state based on regions, religion, caste and ethnicity.[9] The main challenges in

Access this article online

Quick Response Code:

Website: www.ijcm.org.in

DOI: 10.4103/ijcm.ijcm_428_23

estimating the community burden of infertility are (1) paucity of population-based studies (2) varying definitions of infertility used in them, and (3) stigma associated with infertility whereby the couples do not easily share the information with survey teams.

Infertility is on the increase, more so in urban settings where women either marry late or plan their first child at a later age, which reflects the increasing prevalence of infertility among married (consummated marriage) women above 18 years of age. It is evident that there has been a 20% fall in general fertility rates in India over the past decades. Dr. Tedros Adhanom Ghebreyesus, Director-General World Health Organization (WHO), confessed that the sheer proportion of people affected with infertility shows the need for wide access to fertility care.[10] Despite this, infertility is a neglected reproductive health issue in our country, as no governmental program focuses on detection/management of infertility. Apart from this, it carries a stigma associated more with female partners making much-needed treatment-seeking, difficult. The prevalence of infertility, along with the risk factors of infertility has been extensively studied.[11,12]

Understanding the magnitude of infertility, its risk factors, and the treatment-seeking behavior is critical for developing appropriate interventions, ensuring access to quality care, and mitigating risk factors for and consequences of infertility. In view of this, the present study has been undertaken with objectives to (1) estimate prevalence of infertility among married women residing in the catchment area of Urban Health Training Centre (UHTC) Ognaj and (2) identify the risk factors for infertility and strength of association along with the perception of challenges by the affected women. An additional objective was to find out the couple protection rate (CPR) along with the incidence of reproductive tract/sexually transmitted infections (RTI/STI).

MATERIALS AND METHODS

Type of study: A community-based, cross-sectional study was conducted in the community residing in the catchment areas of UHTC of a medical college of Ahmedabad catering to a population of approximately 1.68 lakh.

Study population and study sample: Reference Population was women in RAG (18-50 years) with consummated marriage from Ahmedabad City, and the target population was all married women (18-50 years), cohabiting with husbands for ≥12 months and residing at UHTC Ognaj for ≥6 months. Global estimated lifetime prevalence was 17.5% (15.0 – 20.3) (WHO).[2] Considering its lower value of 15% (*p*), sample size was calculated at a 95% level of significance and 20% relative precision. It was 544. Considering a non-response of 25%, the final sample size estimated was 680.

Method of selection: Stratified sampling with probability proportionate to sample size was adopted to obtain sample size.

Strata were geographically defined polio booths (Ognaj 1–12) and slum/non-slum. Sample size per polio booth was estimated based on booth population, which was further divided into slum and non-slum booth samples based on their relative booth populations. As per the micro plans of polio booths, the non-slum population was more (61.6%) than the slum population (38.4%). Most populous areas from slum and non-slum were selected for recruitment of booth samples to saturate 680 women from RAG. Polio booth maps were used to identify areas.

Study Method: Data collection was conducted from March 2022 to October 2022 in different phases.

First phase: In each of the 12 areas, a central point was identified, and the first house was selected randomly with the help of the last digit of a 10 rupee currency note; subsequently, houses were selected continuously till the desired sample size was saturated as per the PPBS estimate. Vacant, locked, or non-consenting houses were excluded. A household survey was conducted by paramedics under the supervision of trained faculties to capture basic socio-demographic details of study population and to identify married women of RAG (RAG), i.e., aged between 18 and 50 years.

Second phase: RAG married women (identified during the first phase) were interviewed in household to enquire about their reproductive health. Inclusion criteria: Married women of reproductive age group (18–50 years), currently cohabiting with husband for ≥12 months and residing in the area for ≥6 months, available at the time of survey and willing to participate were included. Exclusion Criteria were those unwilling to participate, not available at the time of survey, lactating up to 6 months, pregnant and widow.

Third phase: Women facing problems in conceiving (primary or secondary type) were interviewed further to confirm if they were suffering from infertility or not. Data were also collected to perform the social and clinical profiling of such couples.

Data collection tools: Pretested, semi-structured questionnaires (along with checklist/guide) were prepared after several meetings/brainstorming exercises and later validated by practicing gynecologists. For collecting RTI/STI-related information, flipchart books containing photographs of various infections were used. For assessing depression and anxiety, PHQ9[13] and GAD 7[14] scales were used respectively.

Data quality check: Operational definitions for data collection were adopted as per WHO.[1] All study tools were field-tested and modified based on the pilot testing. All investigators were trained to use the study tool, and in case of any missing information during a visit, a second visit/contact was made within 48 hours to complete the information. Frequent review meetings of investigators were held to check for data quality.

Data analysis: While the quantitative data was entered in MS Excel and appropriate statistical tests were applied, qualitative data was categorized into emerging themes and thematic analysis was performed manually.

Ethical Issues: Ethical clearance was obtained from the local Institutional Ethics Committee (IEC) vide GMERSMCS/IEC/01/2022 dated January 29, 2022. For the teams, while collecting information in the field, there was a provision of (1) one female social worker during household survey for RAG women and (2) one lady doctor in each team for interviewing couples with infertility. All interviews were conducted in full privacy and participants were informed about the freedom to withdraw from a study at any point of time. Data Confidentiality and non-disclosure of identity were maintained; data identifiers were removed during analysis. Those who were found in need of counseling or treatment for infertility or RTI/STI or mental health issues were referred to our hospital (tertiary level multi-specialty type) with a referral slip.

Results

Infertility is a disease of the male and/or female reproductive system; however, this study focuses mainly on the female perspective.

Socio-demographic profile of study population: A total of 917 families ($N = 3891$), with a family size of 4.2 ± 1.2 and sex ratio of 937/1000 males, were covered, which yielded 689 eligible RAG women for the study. Looking to the area profile, there was more non-slum population; therefore, more population (86%) was from upper/upper middle/middle class (social class 1, 2, and 3). Eligible couples (married with female partners aged between 18 and 50 years) were 177/1000 population.

Incidence Rates of RTI/STI for one month period in terms of episode and person were 3.6% and 2.9%, respectively; vaginal discharge was the most typical symptom, followed by lower abdominal pain, painful coitus, and genital ulcers. The annual incidence rate of RTI/STI in terms of episodes and persons were 7.3 and 5.7%, respectively, with similar reported symptoms. There were 629 women eligible for assessment of contraceptive usage (excluding menopausal women and non-responders), and the CPR was 38.8%. It was 36.8% in couples with female partners aged between 18 and 44 years. Only 54 (out of 629) were planning for pregnancy, so the rest (575) were at risk of pregnancy; therefore, unmet contraceptive needs were 57.6%.

A total of 51 couples were suffering from infertility with a period prevalence of 7.4% (5.5%–9.4%), separately being 3.5% and 3.9% for primary and secondary type sterility, respectively. [Table 1]. Age-specific prevalence was highest (17%) among young, newly married women. Thereafter it varied between 5.7% and 7.3%. The secondary type accounted for more cases of infertility in general and more so in couples with female partners in the 25–35 years age group.

There were 58 menopausal and 244 women who were using contraceptives in the RAG group, so the point prevalence of infertility among potential women of RAG (at risk of fertility) was 16.9% (12.6 – 22.2).

Table 1: Age-specific period prevalence rate of infertility among married women of reproductive age group (*n*=689)

Age (years)	Total	Infertility Cases			Prevalence Rate(%)*
		Primary	Secondary	Total	
18–25	53	7	2	9	17.0 (8.1–29.8)
25–35	343	8	17	25	7.3 (4.8–10.6)
35–45	228	6	7	13	5.7 (3.1–9.6)
45–50	65	3	1	4	6.2 (1.7–15.0)
Total	689	24	27	51	7.4 (5.5–9.4)

*Figures in parenthesis indicate 95% confidence interval values

An attempt was made to quantify the association of various risk factors with infertility by calculating odds ratio (OR) with 95% confidence intervals (CI) and their statistical significance with Chi-square tests [Table 2]. OR with a value around 1 and/or where 95% CI includes the value of 1 are indicative of poor association. Due to the nature of the study (field-based), only a limited number of factors could be studied, which fell into four categories, namely (1) socio-demographic, (2) malnutrition-related, (3) coexisting morbidities, and (4) reproductive health-related. Among socio-demographic factors, the current age of the female partner, educational status, working status, substance abuse (assessed through tobacco consumption), age at marriage, and family type showed a poor association, and that too was statistically not significant. The role of religion could not be studied as almost all subjects were Hindus. When social class and caste status were studied, infertility was slightly more common among people from upper or middle social class (based on per capita monthly income)[15] or non-general caste (SC, ST, OBC) as reflected by ORs where the CI range included 1. The OR for caste was statistically not significant, while that for social class was statistically significant. Malnutrition was assessed through body mass index (BMI), absolute waist circumference (AWC), and waist–hip ratio (WHR). Prevalence of overweight/obesity as per BMI (≥ 23) was high (64.6%), and subsequent assessment for central obesity was performed by AWC and WHR only among these overweight or obese women. While studying the association between infertility and malnutrition, it was found that the association between BMI, AWC, and WHR was poor, as reflected by low ORs, and was also statistically not significant. Among coexisting diseases, also for non-communicable diseases like diabetes, hypertension, and thyroid disorders, the association was poor, and not significant. For tuberculosis, calculation of OR and statistical interpretation could not be performed as in one cell (suffering from tuberculosis but not with infertility), there was zero. Among other illnesses, such as asthma and mental illnesses, the association was strong, as reflected by significantly high ORs. Another endocrinal disorder, polycystic ovarian disease (PCOD) also showed a strong and statistically significant association with infertility. Among the reproductive health factors including menstrual history, RTI/STI though preventable, were found to be significantly

Table 2: Strength of association between risk factors (female partner) of infertility

Risk factor	Infertility		Odds ratio and 95% CI	χ² test, df, *P* and statistical interpretation
	Yes	No		
Socio-demographic factors				
Age (years) (*n*=689)				
18-35	34	362	1.5 (0.8-2.8)	χ²=1.9, df=1, *P*=0.16, NS
35 and above	17	276		
Education (*n*=689)				
Illiterate and up to Higher Secondary	27	300	1.3 (0.7–2.2)	χ²=0.7, df=1, *P*=0.4, NS
Higher Secondary and above	24	338		
Occupation (*n*=688)				
Gainfully employed	11	92	1.6 (0.8–3.3)	χ²=1.9, df=1, *P*=0.16, NS
Housewife	40	545		
Tobacco consumption (*n*=689)				
Yes	1	3	4.2 (0.4–41.5)	χ²=0.15, df=1, *P*=0.7, NS
No	50	635		
Age at current marriage (years) (*n*=629)* 60 women refused to answer				
<25	34	448	0.7 (0.4–1.4)	χ²=0.97, df=1, *P*=0.32, NS
25 and above	14	133		
Type of family (*n*=689)				
Joint	22	229	1.4 (0.8–2.4)	χ²=1.1, df=1, *P*=0.4, NS
Nuclear	29	409		
Caste wise (*n*=689)				
General	26	372	0.74 (.4–1.3)	χ²=2.9, df=3, *P*=0.4, NS
Others (SC, ST, and OBC)	25	266		
Socio-economic class (*n*=659)*30 families refused to answer family income				
Upper, Upper Middle and Middle (Class I, II, and III)	43	516	1.58 (.6–4.0)	χ²=147.3, df=1, *P*=0.0001, HS
Lower (Class IV and V)	5	95		
Malnutrition-related factors				
Body mass index (BMI) (*n*=687)				
<23.0	22	221	1.5 (0.8–2.7)	χ²=1.7, df=1, *P*=0.18, NS
23 or more	28	416		
Waist circumference (cm) (*n*=444)				
<80	1	31	0.7 (.09–5.3)	χ²=0.59, df=1, *P*=0.44, NS
80 and above	27	385		
Waist–hip ratio (WHR) (*n*=444)				
<0.85	8	115	1.05 (0.5–2.4)	χ²=1.1, df=1, *P*=0.91, NS
0.85 and above	20	301		
Co existing illnesses				
Diabetes (*n*=689)				
Yes	2	8	3.21 (0.7–15.6)	χ²=2.3, df=1, *P*=0.12, NS
No	49	630		
Hypertension (*n*=689)				
Yes	2	26	0.96 (0.2–4.2)	χ²=0.002, df=1, *P*=0.95, NS
No	49	612		
Tuberculosis (*n*=689)				
Yes	2	0	Not Applicable	Not Applicable
No	49	638		
Asthma (*n*=689)				
Yes	2	2	12.98 (1.8–94.1)	χ²=10.7, df=1, *P*=0.001, HS
No	49	636		
Any mental illness (*n*=689)				
Yes	3	3	13.2 (2.6–67.3)	χ²=16.02, df=1, *P*=0.00063, HS
No	48	635		
Thyroid (689)				

Contd...

Risk factor	Infertility		Odds ratio and 95% CI	χ^2 test, df, *P*, and statistical interpretation
	Yes	No		
Co existing illnesses				
Yes	4	24	2.18 (0.7–6.5)	χ^2=2.01, df=1, *P*=0.15, NS
No	47	614		
Polycystic ovarian disease (PCOD) (*n*=689)				
Yes	6	9	9.32 (3.2–27.4)	χ^2=23.7, df=1, *P*=0.0001, HS
No	45	629		
Reproductive health-related factors				
RTI/STI current episode or history (*n*=689)				
Yes	8	42	2.6 (1.2–6.0)	χ^2=5.8, df=1, *P*=0.015, HS
No	43	596		
Age (years) at menarche (*n*=667)				
10-13	13	200	0.8 (0.4–1.5)	χ^2=0.07, df=1, *P*=0.39, NS
14 and above	36	418		
Interval (weeks) between 2 menstrual cycles (*n*=689)				
2-4	8	126	0.7 0.3–1.6	χ^2=0.065, df=1, *P*=0.42, NS
4 and above	43	492		
Regularity of cycle (*n*=689)				
Regular	31	553	0.2 (0.1–0.4)	χ^2=29.16, df=1, *P*<0.00001, HS
Irregular	20	75		
Pain during menstruation (*n*=678)				
Painless	28	476	0.27 (0.2–0.5)	χ^2=10.9, df=1, *P*=0.00095, HS
Painful	23	151		
Duration of menstruation (days) (*n*=677)				
1-3	24	281	1.09 (0.6–1.9)	χ^2=0.09, df=1, *P*=0.74, NS
4 or more	27	345		
Average number of pads used/day (*n*=677)				
1-3	49	555	3.13 (0.8–13.2)	χ^2=2.69, df=1, *P*=0.1, NS
4 or more	2	71		

associated. Physiological factors like age at menarche, the interval between two menstrual cycles, duration of bleeding in a cycle, and extent of bleeding (judged by average number of pads used) showed poor and no significant association. However, irregular and/or painful menstrual cycles showed an association with infertility, which was statistically significant as well.

We also tried to study the perceptions of couples facing infertility and the challenges they face while seeking treatment through in-depth interviews of some of the female partners suffering from infertility. Emerged themes were categorized manually using open-ended questions for infertile women [Table 3], and some of their quotes are presented verbatim below.

"It has been only two years since our marriage and we do not have any problem. Therefore, there is no need of seeking treatment" (unaware of).

(Woman unable to conceive after 2–3 years of active married life).

"There is a problem in my husband and we took treatment at village for one year. We do not want any treatment now and

will have a child as and when God will be kind" (Belief and faith, Not seeking treatment).

(Woman suffering from primary infertility possibly with a defect in male partner).

"We have contacted bhuva (quack) who has asked me not to contact any doctor for 3 months and I have full faith in him."(belief and faith).

(Another couple with primary infertility).

There were three cases who had tried for *in vitro* fertilization (IVF) but did not get the result.

"Our entire savings has been used up in this treratment and we can not afford anymore. (Treatment not completed).

(Woman suffering from primary infertility and unable to continue IVF treatment)

"Government hospitals provide treatment for everything except for infertility (IVF). It will be better if something is done. Our entire savings has been used up in this treratment and we can not afford it anymore." (Financial constraints).

Table 3: Perception and challenges faced by women suffering from infertility (n=51)		
Theme	**Perceptions**	**Challenges**
Awareness	Unaware of when to seek treatment for infertility (Not conceived even after 1 year of active married life).	It was difficult to convince the couple to seek the treatment.
Aware but not seeking treatment	Social stigma, Family inertness, Lack of motivation and Prejudicial behavior of male partner	Educate about male factor in causation of infertility, all modes of treatment. Case to case personal/family counseling required
	Financial problem. Wrong perception about costly management	Infertility not covered under any government program
	Personal and social myths, beliefs and rituals	Extreme resistance (influenced by unregistered practitioner) does not allow to intervene effectively
Seeking treatment but poor compliance	Lack of patience/lengthy and sequential case management/long queue and waiting hours	Unguaranteed treatment outcome
	Lack of constant motivation	Adherence compliance
	Lack of (Standard treatment protocol)	Multifactorial treatment guideline and requirement of integrated approach
	Financial problem, Lack of family support	Financial constraints
STI/RTI	Many couples unaware about importance about any kind of previous/present abnormal genital discharge, swelling/ulcers as a cause of infertility	Unreliable and biased history by couple
		Privacy issues
		Incomplete treatment
		Dealing with non-judgmental attitude
Mental Health	Lack of insight about range of mental health issues and paradoxical relationship with infertility	Passive involvement of patient
		Non-acceptance of current mental conditions

(Another woman sufferring from primary infertility and unable to afford IVF treatment).

"My husband used to get frequent itching at genitalia and I also developed itching. We did not consult any doctor and used to take an onintment from local chemist which cured the problem for the time being." (complications of RTI/STI).

(A couple sufferring from infertility and also episode of RTI/STI).

"God gifted us a child which we did not take. Now we want but are unable to get. We regret our decision."

(Couple suffering from secondary infertility).

Discussion

Study population comprises eligible women representing urbanite, educated and upper/upper middle/middle social class.

Variations in the prevalence of infertility in population-based studies are due to the variations in inclusion criteria and the operational definition adopted in different studies, thus making comparison difficult. In a global analysis of infertility rates in large population surveys, prevalence rate of primary infertility ranged from 3.5% to 16.7% in more developed nations and 6.9% to 9.3% in less-developed nations, with an estimated overall median prevalence of 9%.[16] Observed period prevalence of infertility in our study was 7.4%, lower than observed in central India (8.9%).[17] After applying more exclusion criteria (menopausal and those using contraceptives), point prevalence in our study too was 16.9%. Prevalence was highest in newly married couples, mostly due to their primary inability to conceive, similar to other studies.[18] Our study reported a slightly high proportion of secondary infertility, while the study from South India in 2011 found more cases due to primary infertility. It can be because of the nature of our study being community-based rather than other studies being hospital-based.

Total fertility rate (TFR) in India has declined between 1992–1993 and 2019–2021, from 3.4 to 2.0. Current TFR in urban areas is less (1.6) than in rural areas (2.1).[19] Reasons for falling TFR in urban areas are many such as steady falling birth rate and hesitancy to bring a child is a common phenomenon among the elite and educated couple, which include aspiration for self and for the child, falling income, financial strain, and uncertainty.[20] Cases of infertility have doubled and tripled in recent years due to a variety of factors like late marriages, life style, unhealthy food, obesity, and environment in urban areas. Rising level of education and changing priorities in life are reasons that delay the age of marriage.[6,17] They also found socio-demographic factors like literacy and socio-economic status significantly associated with infertility, but in the current study, this association was poor (OR being around 1) and also statistically not significant. For lifestyle-related conditions/diseases like obesity, diabetes, hypertension, and thyroid disorders, in the present study, the association was poor and not significant. Sexually transmitted/reproductive tract infections (STIs/RTIs), though preventable, are the leading cause of infertility, more so of secondary type, as they account for 70% of pelvic inflammatory diseases, which lead to infertility by causing tubal damage/blockage.[11,12,21] Annual incidence rate of RTI/STI in terms of episodes and persons were much lower, being 7.3 and 5.7%, respectively, than in a study from Surat urban (69%) and Surat rural (53%),[22] however the later study was performed among high-risk behavior population. The present study showed a strong and significant association of RTI/STI with infertility.

In most cultures, "being childless" is undesired socially.[23] However, women, whether or not the cause of infertility, typically experience mental breakdowns.[24] Some researchers

have indicated the existence of psychological problems in both partners. Despite its impact on both sexes, females experience higher levels of stress and emotional turmoil.[25] Mental illnesses exhibited a strong and significant association with infertility in the present study, but this association may not mean causation and can be bidirectional (anxiety and depression may contribute to infertility while distress of infertility/treatment may lead to anxiety/depression). Elsewhere, up to 40% of women with infertility have a psychiatric diagnosis of depression or anxiety.[26] Altered hormonal levels caused by polycystic ovarian disease (PCOD) in the present study showed a strong and significant association with infertility.

Currently, no national program in our country neither records nor addresses this problem of infertility. Such couples, on their own, go from one clinic to the other for treatment including visits to faith healers, quacks, and practitioners of alternative health systems. These challenges, the influence of quacks, and financial strain have emerged very well while doing the interviews of some infertile couples.

Limitations: It was a community-based study conducted using a structured questionnaire; therefore, many important determinants/biomarkers could not be evaluated. We relied on women's responses, and at times, they were not ready to talk on this sensitive topic. The male component of infertility could not be assessed due to their poor participation. We studied merely the association between risk factors and infertility, and there is no way it should be considered a causation. The inability of the male investigator (in the absence of a female investigator) to take the history from women, mainly infertile ones, and difficulty in obtaining prior permission from housing societies, especially in non-slum areas, made our task difficult and extended.

Conclusion and Recommendations

Period prevalence of infertility was 7.4%, and the secondary type was more common. Asthma, PCOD, mental illness, and RTI/STI showed significant association. There should be a provision for screening of reproductive health and mental health. Case of RTI/STI should be counseled for completion of treatment to prevent complications like infertility but for mental illness as well. Fertility treatment needs to be provided at government facilities to those who cannot afford it at private hospitals, or the couples seeking the treatment of infertility must be covered under some governmental schemes like PMJAY.

Conflicts of interest

There are no conflicts of interest.

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