

# Prevalence of Primary Infertility and its Associated Risk Factors in Urban Population of Central India: A Community-Based Cross-Sectional Study

Ashwini Katole, Ajeet V Saoji

Department of Community Medicine, NKP Salve Institute of Medical Sciences, Nagpur, Maharashtra, India

## Abstract

**Background:** Primary infertility is a serious health issue that has profound socioeconomic and health implications on both the individual and society. Despite the important consequences of infertility, estimation of its prevalence is limited. **Objective:** The objective of the study is (1) to estimate the prevalence of primary infertility among women of reproductive age group in urban population of Central India and (2) to study its associated risk factors. **Material and Methods:** In a community-based cross-sectional study, all married women between 15 and 49 years of age in urban field practice area were included. The data were collected by face-to-face interview with the help of predesigned and pretested questionnaire. **Results:** The majority of the women (39.3%) belonged to 25–29 years of age group. The overall prevalence of primary infertility among reproductive age group women was 8.9% (51/570). Sociodemographic factors that had statistically significant association with infertility were age at marriage more than 25 years ( $P < 0.05$ ), nuclear family ( $P < 0.05$ ), higher education level ( $P = 0.04$ ), employed women ( $P < 0.05$ ), high socioeconomic status ( $P = 0.01$ ), and family history of infertility ( $P < 0.05$ ). Physiological factors that had statistically significant association with infertility were obesity ( $P = 0.03$ ), age at menarche more than 14 years ( $P < 0.05$ ) and irregular menstruation pattern ( $P < 0.05$ ). Depression ( $P = 0.01$ ) and stress ( $P < 0.05$ ) were the psychological factors significantly associated with infertility. **Conclusion:** The prevalence rate of primary infertility in urban population of Central India was lower than reported trends of infertility from developing countries. Sound knowledge about various factors related to infertility can help health-care providers and policymakers to design and implement various policies.

**Keywords:** Primary infertility, reproductive age group women, socioeconomic factors, urban population, World Health Organization

## INTRODUCTION

Infertility is a serious health issue worldwide, affecting approximately 8%–10% of couples worldwide.<sup>[1]</sup> Of 60–80 million couples suffering from infertility every year worldwide, probably between 15 and 20 million (25%) are in India alone.<sup>[2,3]</sup> According to a report by the World Health Organization (WHO), one in every four couples in developing countries is affected by infertility.<sup>[4]</sup> The magnitude of the problem calls for urgent action, particularly when the majority of cases of infertility is avoidable.

The main challenges in estimating actual burden of infertility are the paucity of population-based studies and the varying definitions used in the few high-quality published studies. In less developed countries, the 12-month prevalence rate ranges from 6.9% to 9.3%. Substantial geographical

differences in the prevalence are noted, and these differences are largely explained by different environmental, cultural, and socioeconomic influences, and access to health-care system.<sup>[5]</sup> In sub-Saharan Africa, the prevalence differs widely from 9% in Gambia to 11.8% in Ghana compared with 21.2% in northwestern Ethiopia and between 20% and 30% in Nigeria.<sup>[6–11]</sup> There is paucity of data from countries of Asia to Latin America. According to the WHO, the prevalence of

**Address for correspondence:** Dr. Ashwini Katole,  
Department of Community Medicine, NKP Salve Institute of Medical  
Sciences, Nagpur, Maharashtra, India.  
E-mail: ashwini.katole@gmail.com

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infertility in these regions is between 8% and 12% in couples of reproductive age.<sup>[1,12]</sup>

India is a country with a wide diversity. There is diversity in customs, traditions, quality of living, accessibility to health-care systems, and also climatic conditions. Due to these factors, infertility rate varies widely not only among various states but also across tribe and castes within the same region of India. In addition, the definition used to define infertility varies between various studies, making it difficult to compare prevalence among them. Moreover, data regarding infertility are limited in India and none from Central India.<sup>[13]</sup> In addition to the core prevalence of infertility due to physiological conditions, additional cases are caused by the incidence of preventable conditions such as infection, menstrual hygiene, lifestyle factors, advancing maternal age, age at marriage, postponement in childbearing for more than 1 year or more, socioeconomic status, and occupational hazards. Hence, we planned this study with the primary objective of estimation of prevalence rate of primary infertility among women of the reproductive age group in urban population of Central India. Secondary objective was to analyze its association with sociodemographic factors in urban population of Central India.

## MATERIAL AND METHODS

After institute ethics committee clearance, community-based cross-sectional study was done between December 2013 and July 2015. The study was conducted at Urban Health Training Center (UHTC) area, which is an adopted area under the administrative control of tertiary care teaching hospital. All married women between 15 and 49 years of age in urban field practice area were included in this study. We excluded women who were unmarried, divorced, menopausal, and not willing to give consent. As per the WHO data, the estimated prevalence of primary infertility among reproductive age group women in India is 11.8%.<sup>[14]</sup> Using the prevalence of 11.8% and considering 20% chance of nonrespondent and incomplete data, the calculated sample size was 570.

The total population of the area was approximately 23,365. According to health survey done by UHTC in 2012, around 3985 women were within reproductive age group, i.e., 15–49 years. A list of women was prepared to calculate the sampling interval. As per the calculation, it came to 7. The first woman was selected by lottery method, and further women were selected by systematic random sampling method by taking every 7<sup>th</sup> woman from the list. If the house was locked, then two more visits were made on different days.

The data were collected by face-to-face interview with the help of predesigned and pretested questionnaire. Required data were collected 2 days/week. A pilot study was undertaken in the field practice area of the department of community medicine to pretest the questionnaire. Informed consent was taken from the study participants after explaining them the objectives of the study and ensuring the confidentiality of the data.

The questionnaire was designed to obtain information regarding age, religion, socioeconomic status, education of women, duration of marriage, age at marriage, occupation status, type of family, menstruation pattern, age of menarche, first child born after marriage, family history of infertility, height, weight, body mass index (BMI), depression, anxiety, and stress. BMI was calculated according to Asian classification by the WHO.<sup>[15]</sup> History of menstruation pattern was seen for the time span of 10 years since marriage. The socioeconomic class of the sample group was determined by modified BG Prasad's classification. Direct-attached storage scale was used to determine depression, anxiety, and stress. The interview took approximately 15–20 min per participant.

The following definitions were used in this study:

1. Epidemiological definition of primary infertility<sup>[16,17]</sup>  
Women of reproductive age (15–49 years) at risk of becoming pregnant (not pregnant, sexually active, not using contraception, and not lactating) who report trying unsuccessfully for a pregnancy for 2 years or more is labeled as primary infertile
2. The definition of reproductive age group women by the WHO<sup>[16,18]</sup>  
Women of reproductive age (or women of childbearing age) refer to all women age 15–49 years
3. Regular menstrual cycle<sup>[19]</sup>  
Cyclic menstruation persists throughout the reproductive era of life with an average rhythm of 28 plus minus 7 days, inclusive of 4–6 days of bleeding.

## Statistical analysis

The data were analyzed using IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. (Armonk, NY: IBM Corp). The association of variables was done by Chi-square test with 95% confidence interval (CI). Odds ratio (OR) was used to compare variables of normal and infertile reproductive age group women. Chi-square tests were two-sided, and  $P < 0.05$  was considered statistically significant.

## RESULTS

In this community-based cross-section study, we included 570 married reproductive age group women from urban field practice area of Central India. The majority of the women (39.3%) belonged to 25–29 years of age group followed by 20–24 years (12.6%) and 30–34 years (13.6%) [Table 1].

Of 570 eligible women, primary infertility was found in 51 (8.9%) women. Various factors associated with primary infertility were divided into three groups: sociodemographic, physiological, and psychological factors. Sociodemographic factors that had statistically significant association with infertility were age at marriage, type of family, socioeconomic status, literacy, occupation, and family history of infertility [Table 2]. Religion of women was not significantly associated with primary infertility. Women who married after 25 years of age had 11.9 times more risk of infertility as compared to women married before 25 years of

age (OR: 11.98; 95% CI: 5.12–28.01,  $P = 0.0001$ ). Women living in nuclear family had 8.3 times more risk of infertility as compared to those living in joint and three-generation family (OR: 8.35; 95% CI: 2.00–34.83,  $P = 0.0005$ ). Likewise, women with high socioeconomic status had 2.54 times more risk of infertility than low socioeconomic status (OR: 2.54; 95% CI: 1.21–5.33,  $P = 0.01$ ). The odds of being infertile in women with education level of middle school or above was 2.4 times more as compared to women with education level below middle school (OR: 2.4; 95% CI: 1.00–5.76,  $P = 0.04$ ). Similarly, odds of being infertile in employed women was 4.9 times more as compared to homemaker (OR: 4.99; 95% CI: 2.74–9.06,  $P = 0.001$ ). In addition, risk to being infertile in women with positive family history was almost six times more as compared to women without history (OR: 5.91; 95% CI: 3.91–10.96,  $P = 0.0001$ ).

Physiological factors that had statistically significant association with infertility were obesity, age at menarche >14 years, and

irregular menstruation pattern [Table 3]. The odds of being infertile in obese and preobese women were twice as compared to women with normal BMI (OR: 1.88; 95% CI: 1.049–3.37,  $P = 0.03$ ). Age at menarche more than 14 years had five times more risk of infertility compared to women with the age of menarche <14 years (OR: 4.99; 95% CI: 2.68–9.29,  $P = 0.0001$ ). Similarly, women with irregular menstruation pattern had 2.5 times more risk of having infertility (OR: 2.54; 95% CI: 1.42–4.56,  $P = 0.001$ ).

Depression and stress were the psychological factors significantly associated with infertility [Table 4]. OR of being infertile in women with depression was 2.08 (OR: 2.08; 95% CI: 1.16–3.74,  $P = 0.01$ ) whereas in women with stress, it was 2.66 (OR: 2.66; 95% CI: 1.49–4.76,  $P = 0.0006$ ).

## DISCUSSION

In the present study, of 570 women of reproductive age group, 51 (8.9%) had primary infertility. Hence, the prevalence of primary infertility is 8.9% in women of reproductive age group (15–49 years) in urban population of Central India. This calculated prevalence rate in our study is lower than the reported trends of infertility from developing countries. This could be because of better health-care facility available in this region. According to the WHO report, the prevalence of primary infertility in India was 3.9% (age-standardized to 25–49 years) and 16.8% (age-standardized to 15–49 years) using the “age but no birth” definition.<sup>[19]</sup> In large population survey by Boivin *et al.*, the prevalence rate of primary infertility ranged from 3.5% to 16.7% in more developed nations and

**Table 1: Distribution of women according to age (n=570)**

Age	Frequency (%)
15-19	3 (0.5)
20-24	72 (12.6)
25-29	224 (39.3)
30-34	70 (12.3)
35-39	91 (16.0)
40-44	77 (13.5)
45-49	33 (5.8)
Total	570 (100.0)

**Table 2: Sociodemographic factors associated with primary infertility**

Sociodemographic factors	Infertile women (n=51), n (%)	Normal women (n=519), n (%)	$\chi^2$	P	OR	CI (at 95% confidence limit)
Age at marriage						
>25	12 (48.0)	13 (52.0)	48.94	0.0001	11.98	5.122-28.010
<25	39 (7.2)	506 (92.8)				
Religion of women						
Hindu	37 (9.8)	341 (90.2)	0.97	0.32	1.38	0.726-2.619
Others (Muslims, Christian, Buddhist and Sikh)*	14 (7.3)	178 (92.7)				
Type of family						
Nuclear	49 (11.2)	387 (88.8)	11.95	0.0005	8.35	2.005-34.830
Joint and three generation	2 (1.5)	132 (9.5)				
Socioeconomic status						
I and II	42 (11.1)	336 (88.9)	6.44	0.01	2.54	1.210-5.338
III, IV, and V	9 (4.7)	183 (95.3)				
Literacy status of women						
Middle school and above	45 (10.3)	393 (89.7)	4.08	0.04	2.40	1.002-5.769
Below middle school	6 (4.5)	126 (95.5)				
Occupation						
Employed	31 (20.1)	123 (79.9)	32.39	0.001	4.99	2.746-9.069
Homemaker	20 (4.8)	396 (95.2)				
Family history of infertility						
Yes	22 (27.2)	59 (72.8)	38.44	0.0001	5.91	3.915-10.960
No	29 (5.9)	460 (94.1)				

\* Religion of women was not significantly associated with primary infertility. OR: Odds ratio, CI: Confidence interval

**Table 3: Physiological factors associated with primary infertility**

Physiological factors	Infertile women (n=51), n (%)	Normal women (n=519), n (%)	$\chi^2$	P	OR	CI (at 95% confidence limit)
BMI						
Obese and preobese	30 (11.8)	224 (88.2)	4.61	0.03	1.88	1.049-3.374
Normal and underweight	21 (6.6)	295 (94.4)				
Age at menarche						
>14	35 (18.1)	158 (81.9)	30.23	0.0001	4.99	2.688-9.294
<14	16 (4.3)	361 (95.7)				
Menstruation pattern						
Irregular	29 (14.1)	177 (85.9)	10.42	0.001	2.54	1.422-4.563
Regular	22 (6.0)	342 (94.0)				

OR: Odds ratio, CI: Confidence interval, BMI: Body mass index

**Table 4: Psychological factors associated with primary infertility**

Psychological factors	Infertile women (n=51), n (%)	Normal women (n=519), n (%)	$\chi^2$	P	OR	CI (at 95% confidence limit)
Depression among women						
Depression	30 (12.4)	211 (87.6)	6.28	0.01	2.08	1.162-3.741
Normal	21 (6.4)	308 (93.6)				
Anxiety among women						
Anxiety	23 (12.7)	158 (87.3)	4.60	0.031	1.87	1.048-3.36
Normal	28 (7.2)	361 (92.8)				
Stress among women						
Stress	27 (14.9)	154 (85.1)	11.6	0.0006	2.66	1.491-4.768
Normal	24 (6.2)	365 (93.8)				

OR: Odds ratio, CI: Confidence interval

6.9% to 9.3% in less-developed nations, with an estimated overall median prevalence of 9%.<sup>[5]</sup> This study included women aged 20–44 years and married or living in a consensual union. Another study by Adamson *et al.*, from South India found the prevalence of primary infertility of 12.6%.<sup>[13]</sup> In this study, authors included women with age between 15 and 30 years. Similar prevalence was also found in study from Kashmir region.<sup>[20]</sup> Kumar investigated extensive infertility problem in women aged 15–49 years from Khairwar to non Khairwar tribes in rural area of Central India.<sup>[17]</sup> The total prevalence of primary infertility in study population was 14.2%. The prevalence of infertility was higher in Khairwars (17.2%) than in non-Khairwars (10%). Author has related higher rate of infertility in Khairwar tribe to lack of access to the Indian health delivery system and their belief in local traditional healers (gunias). Thus, the prevalence of primary infertility varies not only between countries but also within country. Another important aspect is the large variation in inclusion criteria between different studies making comparison difficult.

Demographic factors significantly associated with primary infertility were higher educational level, employment, staying in nuclear family and high socioeconomic condition. In the recent past, due to rapid urbanization, elevated standard of living, rise in education status, women are becoming more independent and are following the trends of modern lifestyle. This appraisal of

socioeconomic status of women has contributed to modified dietary habits, physical inactivity, which is considered to be the risk factors of developing primary infertility.<sup>[13,21]</sup> Socioeconomic status is one of the risk factors for infertility.

In addition, we found that the prevalence of primary infertility increases by aging, higher BMI, irregular menstrual pattern, and family history of infertility. As the changing trends of society, the level of education is increasing and also priorities of life are changing which prolongs the age at marriage.<sup>[22,23]</sup> Most of the literature suggested that delayed age at marriage is one of the risk factors for primary infertility.<sup>[21,23]</sup> Obesity is one of the major risk factors for infertility. Hormonal imbalance and menstrual dysfunction can be directly attributed to obesity. This directly affects the reproductive function of woman. History of infertility among first degree of relatives, i.e., mothers and sisters are one of the important risk factors for infertility.<sup>[21,22]</sup> Women having family history of infertility are at higher chances developing infertility problems mainly due to inherent genetic diseases. In addition, menstrual hygiene plays an important role in primary infertility. Unhygienic menstrual practices such as reusing cotton clothes, washing them without soap and with unclean water, social taboos and restrictions force drying indoors, away from sunlight, and open-air predisposes to lower reproductive tract infections, irregular menstrual cycles, and ultimately infertility.<sup>[23]</sup>

Several studies have demonstrated that the anxiety had a negative effect on fertility. The women with long-standing infertility suffer more from nervousness, panic attacks, agitation, and intolerance. Infertility affects psychological well-being of women.<sup>[24-26]</sup> All these factors cause a negative impact on infertility and also aggravate the problem of infertility. As the duration of infertility increase, the level of anxiety among women also increases leading to vicious cycle. In our study, we found stress and depression significantly associated with infertility. As per other studies, the prevalence of stress among infertile women is high.<sup>[25,26]</sup> In traditional country like India, childbearing is an important milestone for healthy marital life. Infertile women experience negative social consequence, including marital instability, stigmatization, and abuse. It could have a serious effect on both psychological well-being and social status of woman.<sup>[25-27]</sup> Various problems such as health issues, sexual distress, frustration, emotional distress, and marital problems increases with infertility and build up the stress. The magnitude of stress increases as the duration of infertility increase.

These are some limitation in our study. In this study, the estimation of prevalence of primary infertility was based on questionnaire-based interview method. Despite extensive data seeking, the current study relied on women's response to these questionnaires; these assumptions may be inaccurate, as women may not reveal accurately on this sensitive topic. Furthermore, some infertile women may say that they do not want pregnancy as a coping mechanism. Contrary, some women might not engage regularly in sexual intercourse and have lower chance of having child. In addition, this study was based on pretested structured epidemiological-based questionnaire; hence, specialized laboratory investigations to ascertain the cause of primary infertility were not evaluated.

## CONCLUSION

The prevalence of primary infertility in urban population of Central India is lower than reported trends of infertility from developing countries. Knowledge about the prevalence of infertility and its associated risk factors is extremely important for health-care providers and policymakers to design and implement various policies related to prevention and treatment of infertility.

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## Conflicts of interest

There are no conflicts of interest.

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