

Primary Infertility: A Rural-based Study of Associated Risk Factors in North-west Part of India

Ashish Bijaykrishna Banerjee¹, Prerna Jain², Kavita Choudhary³, Anita Banerjee⁴

Received on: 18 January 2022; Accepted on: 10 November 2022; Published on: xxxx

ABSTRACT

Background: The inability to conceive is experienced as a stressful situation and has an impact on multiple dimensions of health for both individual and society. Despite the significant concerns of infertility, estimation of its prevalence is limited.

Infertility is seen as a stressful situation and affects many aspects of life for the individual and the community. Despite the remarkable trepidations of not having children, estimation of its prevalence is limited.

Objectives: To estimate the prevalence and establish a relationship with sociodemographic factors of primary infertility.

Materials and methods: The study was a community-based cross-sectional descriptive study conducted from April to May 2021 in a rural health training center (RHTC) area among 1860 eligible couples aged 18–49 years. A complete enumeration of all the houses was done to list all the eligible couples residing in the area. Data were collected by a face-to-face interview on a house-to-house visit by interns posted in RHTC using a predesigned, pretested semi-structured data collection tool. The data collected were compiled and entered in an MS Excel sheet and analyzed using Statistical Package for the Social Sciences (SPSS) program version 23 (SPSS Inc., New York, USA). Categorical variables were expressed in actual numbers and percentages. Categorical variables were compared using Pearson's Chi-square.

Result: The overall prevalence of primary infertility in our study was found to be 7.25%. The percentage of women with primary infertility increased with higher age-groups. Sociodemographic factors which had a statistically significant association with primary infertility were age at marriage ($p < 0.01$), religion ($p < 0.01$), literacy ($p < 0.03$), occupation ($p < 0.01$), socioeconomic status ($p < 0.001$), family history of infertility ($p < 0.02$), and addiction ($p < 0.03$). Physiological factors that had a statistically significant association with infertility were body mass index (BMI) ($p < 0.001$), age of menarche ($p < 0.03$), and menstrual pattern ($p < 0.01$).

Conclusion: The findings of this study can benefit healthcare providers and policymakers in providing enhanced reproductive services to the rural population.

Keywords: Primary infertility, Prevalence, Rural, Sociodemographic.

International Journal of Infertility and Fetal Medicine (2022): 10.5005/jp-journals-10016-1298

INTRODUCTION

Infertility in developing countries is a relatively unpopular subject for sex and reproductive health, yet its effects can be surprising. The inability to conceive or have children can lead to stigma or divorce, and it may have economic, psychological, or other health consequences. Although men and women have an equal chance of not having children, women are often blamed, and infertility has been linked to close partner violence.¹

India is the second largest population country in the world, with 1.3 billion people. The United Nations predicts India will surpass China (1.4 billion) in population later in 2022. But the unexpected problem facing Indian youths is that they are unable to reproduce. These stories have two sides; on one hand, it is a heavily populated country, and on the other hand, couples are infertile.²

Presently, the infertility rate among the Indian population is 10–14% higher in urban areas, where one in six couples is affected.³ This issue has never been properly addressed, although it is a public health problem.

There is scarce data on the prevalence of infertility in rural communities, especially in north-west India. With this background, this study was designed to find out the prevalence of primary infertility and associated factors in rural areas of Jaipur district of Rajasthan. Secondly, we aimed to assess its correlation with sociodemographic and physiological aspects. Lastly, we intend to

^{1,3}Department of Community Medicine, Shri Kalyan Government Medical College, Sikar, Rajasthan, India

²Department of Obstetrics and Gynecology, Autonomous State Medical College, Firozabad, Uttar Pradesh, India

⁴Health Specialist-Pediatric, Central Government Health Scheme, Polyclinic, Jaipur, Rajasthan, India

Corresponding Author: Ashish Bijaykrishna Banerjee, Department of Community Medicine, Shri Kalyan Government Medical College, Sikar, Rajasthan, India, Phone: +91 9968491125, e-mail: ashishbanerjee50@gmail.com

How to cite this article: Banerjee AB, Jain P, Choudhary K, *et al.* Primary Infertility: A Rural-based Study of Associated Risk Factors in North-west Part of India. *Int J Infert Fetal Med* 2022;xx(xx):1–5.

Source of support: Nil

Conflict of interest: None

suggest recommendations based on study findings, particularly to benefit the needy population in the area.

MATERIALS AND METHODS

The study was a community-based cross-sectional descriptive study conducted from April to August 2021 in an RHTC, Sankh Shyopuri, Bassi, Jaipur, Rajasthan, under the administrative control of the principal of Jaipur National University Institute of Health Sciences

and Research Center, Jaipur for the training of students in community medicine. RHTC covers a population of 14,542 based on the 2011 census. All married women, cohabiting women, premenopausal women, and women without the use of contraceptives from 18 to 49 years who presented on the day of the survey and were willing to participate were enrolled in the study. Those not found in the house at the time of the visit, divorced/separated, couples using contraceptives, HIV serodiscordant couples, and temporary visitors/guests to the house were excluded from the study. A complete enumeration of all the houses was done to list all the eligible couples residing in the area. Data were collected by a face-to-face interview on a house-to-house visit by interns posted in RHTC using predesignated, pretested semi-structured data collection tool.

Data collection comprised initial interaction with the respondents. The respondents were assured about the confidentiality and ethical principles that would be followed and the background and purpose of the visit. Data collected were monitored by the supervisors from time to time. The data documented the following information—sociodemographic details, BMI, menstrual history, infertility history including history of any previous treatment taken, surgical history, and coital history. The socioeconomic class was calculated using the modified BG Prasad socioeconomic classification–2020 version. Infertility was defined as the failure to achieve a pregnancy after 12 months or more of regular unprotected sexual intercourse.

The data collected were compiled and entered in an MS Excel sheet and analyzed using the SPSS program version 23 (SPSS Inc., New York, USA). Categorical variables were expressed in actual numbers and percentages. Categorical variables were compared using Pearson’s Chi-square.

No ethical issues were involved as no intervention was carried out; however, verbal consent was obtained to proceed with the survey.

RESULT

In this cross-sectional study, out of 1924 women between 18 and 49 age-groups, 1860 women were found to be eligible for the study.

The majority of the women (35.75%) belonged to the 18–25 years age-group, followed by 26–35 years (33.44%) and 36–49 years (30.80%), as shown in Table 1. Among the eligible couples, primary infertility was found in 135 (7.25%) women.

The result of this study is discussed broadly under two headings: sociodemographic and physiological factors. Sociodemographic factors which had a statistical correlation with primary infertility were: age at marriage, religion, literacy, occupation, socioeconomic status, family history of infertility, and addiction. It was observed the odds of an infertile woman who got married at ≥ 21 years of age are twice compared to a woman who got married at ≤ 20 years of age-group [odds ratio (OR): 1.57; 95% confidence interval (CI): 1.1038–2.2351, $p = 0.0121$]. The religion of women was significantly associated with primary infertility. The incidence of infertility among Hindu women was greater compared to women of other religions. The majority of the women in the rural population were illiterates. In the literacy level of the participants sampled, primary infertility was found to be higher among literate women compared to illiterates which is statistically significant ($p < 0.091$). In addition, the risk of being infertile was found to be one and half times more in employed women compared to homemakers (OR: 1.54; 95% CI: 1.0883–2.1982, $p = 0.015$). Similarly, the odds of being infertile in the higher socioeconomic group are almost two times than that of women living in lower socioeconomic conditions (OR: 1.7924; 95% CI: 1.2603–2.5491, $p = 0.012$). Women who had a family history of infertility carried 2.3 times more risk of being infertile as compared to those without such a family history. Addiction was found to affect infertility too. Women who were addicted to tobacco/alcohol carried a 1.63 times higher risk of being infertile compared to women who were teetotalers (OR: 1.63; 95% CI: 1.0235–2.6274, $p = 0.0397$) (Tables 2 and 3).

The relationship between BMI values of women at childbearing age and the incidence of infertility were as follows: the odds of an infertility incidence in preobese and obese women were twice compared to women with underweight and normal women. (OR: 1.83; 95% CI: 1.2635–2.6611, $p = 0.001$). At the same time, we found

Table 1: Distribution of women by age

Age in years	Women with primary infertility (n = 135)	Fertile women (n = 1725)	Total (n = 1860)
18–25 years	23 (17.03)	642 (37.28)	665 (35.75)
26–35 years	58 (40.74)	567 (32.70)	622 (33.44)
36–49 years	54 (42.22)	516 (29.91)	573 (30.80)

Table 2: Sociodemographic profile of study group

Variables	Category	Infertile women	Fertile women	p	OR	95% CI
Age of marriage	≤ 20 years	58	1008	0.0121	1.5707	1.1038, 2.2351
	≥ 21 years	77	852			
Religion	Hindu	129	1653	0.0195	2.6924	1.1726, 6.1820
	Others	6	207			
Literacy	Literate	58	628	0.0306	1.4777	1.0371, 2.1055
	Illiterate	77	1232			
Occupation	Employed	71	784	0.0150	1.5467	1.0883, 2.1982
	Housewife	63	1076			
Socioeconomic status	I and II	62	598	0.0012	1.7924	1.2603, 2.5491
	III, IV, and V	73	1262			
Family history of infertility	Yes	9	56	0.0246	2.3010	1.1126, 4.7590
	No	126	1804			
Addiction	Yes	23	207	0.0397	1.6399	1.0235, 2.6274
	No	112	1653			

Table 3: Physiological characteristics of study group

BMI	Underweight and normal	89	1451	0.0014	1.8336	1.2635, 2.6611
	Preobese and obese	46	409			
Age of menarche	≤14 years	61	1014	0.0366	0.6877	0.4842, 0.9770
	≥15 years	74	846			
Menstrual pattern	Abnormal	51	558	0.0119	1.6081	1.1105, 2.3287
	Normal	74	1302			

women who attained menarche ≤14 years had a lower incidence of infertility than those who had menarche at a later age of ≥15 years.

The other important risk factor is the menstrual pattern. We divided the sampled women in relation to menstrual patterns into two groups: abnormal and normal. Our results showed that the group with the normal menstrual pattern exhibited the lowest prevalence of infertility, and abnormal menstrual patterns led to an increase in infertility incidence.

DISCUSSION

Infertility is defined as the inability to conceive after 12 months or more of regular unprotected sexual intercourse due to failure of either the male or female reproductive organ or both. In some studies, the duration for non-conceive is taken as 2 years or more.⁴ Infertility is broadly divided into two categories—primary and secondary. In primary infertility, pregnancy never happened, whereas, in secondary infertility, pregnancy took place earlier, at least once.

Infertility affects millions of couples worldwide which has got a tremendous bearing on their families and societies. Although both women and men may be infertile, women in male relationships are often blamed for being infertile, whether they are infertile or not. Infertility has a devastating effect on society in the lives of barren couples, especially women, who often face violence and are divorced, socially excluded, emotionally tortured, depressed, anxious, and self-conscious.⁵

In spite of the encumbrance and bearing of infertility on affected couples, estimations regarding its prevalence are limited. Reports from different studies around the world showed prevalence of infertility between 3.5 and 22% based on the different methodologies of study.⁶⁻⁹

In industrialized countries, the possibility of primary infertility is estimated to be 10–15%.⁶ Primary infertility in Canada stands at 15.7% compared to 3.9 and 9.1%, respectively, for Pakistan and Nepal.

World Health Organization (WHO) reports estimate the prevalence of India's primary infertility to be between 3.9 and 16.8%. The percentage of infertility varies widely across different states, with a mere 3.7% in Uttar Pradesh, Maharashtra, and Himachal Pradesh to 5% in Andhra Pradesh and 15% in Kashmir.⁹ This wide variation could be because of differences in the methodology of the study. As per the Indian Council of Medical Research study, in which a sample from 13 districts with 37,570 women participants, the prevalence of infertility was found to be 4% in urban and 3.7% in rural.¹⁰

The prevalence of primary infertility in the current study was found to be 7.26% which is within mentioned WHO range.

The age-group is one of the most important infertility factors according to the National Family Health Survey (NHFS)—3

(2005–2006) report. The infertility rate increases with age in the first marriage. In the NHFS-3 data, infertility increased from 1.68 to 2.35% for women whose first marriage was ≤18 years compared to those whose first marriage was over 18 consecutive years. A study similar to the results of our study conducted by Acharya in the state of Rajasthan noted that by marrying at a younger age, she gains a more fertile life, which increases the duration to achieve pregnancy.¹¹

In our study, there was a significant association of infertility with religion. This could possibly be explained by the delayed age of marriage in Hindus compared to other religious groups. Almost all participants during their interview process expressed faith in God. Women to deal with adversity can use their religious/spiritual dogmas to find sense and faith in their anguish.¹² Most infertile women believe infertility is a curse of their past birth conducts. Similar findings were observed in a study by Sheoran and Sarin.¹³ Another study by Berger et al. reported that some infertile women lost faith in God because of the trauma of infertility. Many people believe that the cure for infertility is based on God's will.¹⁴

There is a converse relationship between the level of educational achievement, employment, socioeconomic status, and primary infertility for women. The results of the present study were similar to those quoted in other studies. With increasing levels of access to education among women, the rate of infertility increases. This can be attributed to the fact that in the quest for higher education, women are investing heavily in jobs and other occupations, and thus marriage is delayed.

Working women have a 20% more chance of infertility compared to unemployed women.^{9,11,15-19}

In our study, a relationship exists between family history and primary infertility. Genetic factors play a major role in the pathogenesis of human infertility. This is supported by the fact that certain diseases which run in families can be responsible for having a pregnancy problem, such as polycystic ovarian syndrome—a common cause of anovulation, endometriosis that can lead to blockage of uterine tubes, and uterine fibroids—noncancerous growths of the uterus can also be a case. Male infertility can be considered to be a genetic condition.^{20,21}

A statistically significant association was found in our study between primary infertility and smoking. In a study conducted by Yang et al. in a rural Chinese area, it was found that male smoking may have an adverse impact on couples' infertility.²² Similar results were found in other studies conducted by Sharma et al. and Udgiri et al. in their meta-analysis of women.^{23,24} Most likely, women in rural areas smoke to free themselves from stress and boredom.

Significant statistical correlations were found in our study between primary infertility and smoking. In a study conducted by Yang et al. in rural China, it was found that male smoking may adversely affect infertility in couples.²² Similar results were obtained from other studies conducted by Sharma et al. and Udgiri et al. in their meta-analysis for women.^{23,24} Rural women most likely smoke to relieve stress and frustration.

Our results are similar to previous studies. Many studies have emphasized the relationship between obesity and infertility. Obesity underwrites to anovulation and menstrual irregularities, reducing the rate of pregnancy.

Obese women had four times higher menstrual problems than normal built women.²⁵

In all previous studies such as our studies, the increase in the incidence of infertility was reflected in the increase in the age of menstruation. But it should be noted that different subjects took different age-group criteria for study.^{26,27}

In our study, significant statistical interactions were found between menstrual dysfunction and infertility. The results of our research were similar to a study conducted in Iran by Masoumi et al. and other research conducted in Bangladesh by Papreen et al. Infertility in women was often ascribed to supernatural forces, especially evil spirits, which affected menstruation. The evil spirit is characterized by menstrual problems and thus affects only women. Women are, therefore, often blamed by society for not having children and holding themselves accountable.^{28,29}

LIMITATIONS OF STUDY

Prior instruction was given to the intern students about how to approach participants and get answers to the questionnaires. In spite of the efforts, understanding all instructions by all students was doubtful as some students were from a non-Hindi background. This might have led to the wrong selection of answers because of wrong understanding. Participants might have the unwillingness to provide honest answers stemming from the participant's natural desire to provide socially acceptable answers in order to avoid embarrassment or appease the department/institute conducting the study. As infertility is a socially sensitive topic, the seriousness of taking advice for investigation and treatment given by intern students to primary infertility women was felt doubtful.

RECOMMENDATIONS

During community medicine posting, giving the students an assignment on the removal of myths and misconceptions of at least five infertile couples would be helpful. Positive initiatives should be encouraged by the press and media for demand generation to establish more treatment centers for infertility. Infertile couples adopting a child should be given adequate returns in the form of monetary and other benefits like insurance and health coverage. Such couples should be publicly felicitated in order to encourage others to adopt a child. This will reduce the burden on orphanages. Treatment for infertility drugs and other health facilities should be available for free or at a subsidized rate from the government. Myths and misunderstandings, misconceptions of social, religious, economic, and health matters should be systematically studied, and infertility awareness should be guided specifically in different areas. Health workers have a great responsibility to involve public opinion on this important issue. All tertiary care centers should develop an ethical obligation to society—well-equipped centers for investigation and treatment of infertility. The inclusion of a chapter on basic reproductive health in the school curriculum may soften the social stigma of infertility.

CONCLUSION

On one hand, we all are concerned about India's "population explosion," and on the other hand, infertility problem exists as a neglected issue, although it is a significant public health problem. Infertile women attributed infertility to supernatural causes, fate, and psychosexual problems. Statistical corollation was found between primary infertility and age, religion, literacy state, occupation, socioeconomic status, addiction (smoking), BMI, age of onset of menarche, and menstrual pattern. Health planners must include programs for dealing with infertility at the community level and at all levels of health care. Further studies on myths and misunderstandings, misconceptions of social, religious, economic, and health matters, should be systematically done so that infertility can be addressed specifically in different areas.

ORCID

Ashish Bijaykrishna Banerjee <https://orcid.org/0000-0002-4457-9611>

REFERENCES

- Polis CB, Cox CM, Tunçalp O, et al. Estimating infertility prevalence in low-to-middle-income countries: an application of a current duration approach to demographic and health survey data. *Human Reprod* 2017;32(5):1064–1074. DOI: 10.1093/humrep/dex025
- FP Staff. World Population Day 2020: India Set to Overtake China by 2027, but Its Population Problem Has a Silver Lining. Firstpost [Internet]. [cited 2020 Jul 11]. Available from: <https://www.firstpost.com/india/world-population-day-2020-india-set-to-overtake-china-by-2027-but-its-population-problem-has-a-silver-lining-8586431.html>
- Manimekalai K, Poulpunitha S, Veeramani P. Infertility: an alarming situation in India. *Int J Sci Technol Res* 2020;9(2):2606–2609.
- Larsen U, Menken J. Individual-level sterility: a new method of estimation with application to sub-Saharan Africa. *Demography* 1991;28(2):229–247. DOI: 10.2307/2061277
- World Health Organization: Infertility [Internet]. [accessed 2022 Jan 10]. Available from: <https://www.who.int/news-room/fact-sheets/detail/infertility>
- Dovom MR, Tehrani FR, Abedini M, et al. A population-based study on infertility and its influencing factors in four selected provinces in Iran (2008–2010). *Iran J Reprod Med* 2014;12(8):561–566.
- Larsen U. Research on infertility: which definition should we use? *Fertil Steril* 2005;83(4):846–852. DOI: 10.1016/j.fertnstert.2004.11.033
- Practice Committee of the American Society for Reproductive Medicine. Definitions of infertility and recurrent pregnancy loss. *Fertil Steril* 2008;90(5):S60. DOI: 10.1016/j.fertnstert.2008.08.065
- Adamson PC, Krupp K, Freeman AH, et al. Prevalence & correlates of primary infertility among young women in Mysore, India. *IJMR* 2011;134(4):440–446.
- Deshpande PS, Gupta AS. Causes and prevalence of factors causing infertility in a public health facility. *J Hum Reprod Sci* 2019;12(4):287–293. DOI: 10.4103/jhrs.JHRS_140_18
- Acharya AK. The influence of female age at marriage on fertility and child loss in India. *Trayectorias* 2010;12(31):61–80.
- Roudsari RL, Allan HT, Smith PA. Looking at infertility through the lens of religion and spirituality: a review of the literature. *Hum Fertil* 2007;10(3):141–149. DOI: 10.1080/14647270601182677
- Sheoran P, Sarin J. Infertility in India: social, religion and cultural influence. *Int J Reprod Contracept Obstet Gynecol* 2015;4(6):1783–1788. DOI: 10.18203/2320-1770.ijrcog20150947
- Berger R, Paul MS, Henshaw LA. Women's experience of infertility: a multi-systemic perspective. *Journal of International Women's Studies*, 2013;14(1). Available at: <https://vc.bridgew.edu/jiws/vol14/iss1/4>
- Ganguly S, Unisa S. Trends of infertility and childlessness in India: findings from NFHS data. *Facts Views Vis Obgyn* 2010;2(2):131–138.
- Mahanta A. Impact of education on fertility: evidence from a tribal society in Assam, India. *Int J Popul Res* 2016;2016(1):1–7. DOI: 10.1155/2016/3153685
- Zhou Z, Zheng D, Wu H, et al. Epidemiology of infertility in China: a population-based study. *BJOG* 2018;125(4):432–441. DOI: 10.1111/1471-0528.14966
- Pal M, Devgun P, Chalana H, et al. A study of prevalence and sociodemographic profile of infertile couples in field practice area of a tertiary care centre, Amritsar, Punjab, India. *Int J Community Med Public Health* 2016;3(6):1472–1476. DOI: 10.18203/2394-6040.ijcmph20161613
- Kazmi S, Prakash S, Parveen K, et al. Prevalence and sociodemographic covariates of infertility in Allahabad district. *Int J Community Med Public Health* 2018;5(8):3372–3376. DOI: 10.18203/2394-6040.ijcmph20183064
- How Much of a Role Do Genes and Family History Play in Fertility? [Internet]. Tennessee Fertility Institute. [cited 2016 Sep 30]. Available

- from: <https://tnfertility.com/blog/how-much-of-a-role-do-genes-and-family-history-play-in-fertility/>
21. Meschede D, Lemcke B, Behre HM. Clustering of male infertility in the families of couples treated with intracytoplasmic sperm injection. *Human reproduction* 2000;15(7):1604–1608. DOI: 10.1093/humrep/15.7.1604
 22. Yang F, Li L, Chen J, et al. Couple's infertility in relation to male smoking in a Chinese rural area. *Asian J Androl* 2017;19(3):311–315. DOI: 10.4103/1008-682X.168685
 23. Sharma R, Biedenharn KR, Fedor JM, et al. Lifestyle factors and reproductive health: taking control of your fertility. *Reprod Biol Endocrinol* 2013;11(1):66. DOI: 10.1186/1477-7827-11-66
 24. Udgiri R, Patil VV. Comparative study to determine the prevalence and socio-cultural practices of infertility in rural and urban field practice area of tertiary care hospital, Vijayapura, Karnataka. *Indian J Community Med* 2019;44(2):129–133. DOI: 10.4103/ijcm.IJCM_172_18
 25. Dag Z.O, Dilbaz B. Impact of obesity on infertility in women. *J Turk Ger Gynecol Assoc* 2015;16(2):111–117. DOI: 10.5152/jtgga.2015.15232
 26. Komura H, Miyake A, Chen C, et al. Relationship of age at menarche and subsequent fertility. *Eur J Obstet Gynecol Reprod Biol* 1992;44(3):201–203. DOI: 10.1016/0028-2243(92)90099-k
 27. Guldbrandsen K, Håkonsen LB, Ernst A, et al. Age of menarche and time to pregnancy. *Hum Reprod* 2014;29(9):2058–2064. DOI: 10.1093/humrep/deu153
 28. Masoumi SZ, Parsa P, Darvish N. An epidemiologic survey on the causes of infertility in patients referred to infertility center in Fatemeh Hospital in Hamadan. *Iran J Reprod Med* 2015;13(8):513–516.
 29. Papreen N, Sharma A, Sabin K, et al. Living with infertility: experiences among urban slum populations in Bangladesh. *Reprod Health Matters* 2000;8(15):33–44. DOI: 10.1016/s0968-8080(00)90004-1