

Original Research Article

Epidemiology of female infertility in Sonapat district of Haryana: a community based cross-sectional study

Deepika Kataria*, Babita Rani, Anita Punia, S. K. Jha, M. Narendran, Jagmohan Singh

Department of Community Medicine, BPS GMC for Women, Khanpur Kalan, Sonapat, Haryana, India

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*Correspondence:

Dr. Deepika Kataria,

E-mail: deepikakataria93@gmail.com

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ABSTRACT

Background: Infertility is a global reproductive health problem and the prevalence rate increased by 0.37% per year for females. There are many such risk factors which are avoidable. Thus the purpose of the study is to identify and quantify the burden of infertility and associated risk factors for infertility.

Methods: This observational community based cross-sectional study was conducted among 444 reproductive age group (18-49 years) women residing in district Sonapat, from August 2021 to May 2022. Simple random sampling technique was used to select the study subjects. The categorical data were analyzed statistically using Chi-Square test and Odds ratio with 95% confidence interval. Continuous variables were analyzed using independent t-test.

Results: Out of 444 study population majority of women were fertile (88.7%), while 6.3% of women were secondary infertile and 5% women were primary infertile. Most women were aged between 30-39 years. The difference of occurrence of infertility in relation to time since marriage, male age at marriage, number of family members, thyroid, PCOD, tuberculosis and height were statistically significant.

Conclusions: Almost all the factors came out to be responsible for infertility were modifiable. Awareness generation and provision of infertility care services at primary health care facilities will be of use in addressing infertility in Haryana.

Keywords: Epidemiology, Female infertility, Prevalence, Reproductive age group

INTRODUCTION

Infertility is a disease of the male or female reproductive system defined by the failure to achieve a pregnancy after 12 months or more of regular unprotected sexual intercourse. Primary infertility is the inability to have any pregnancy, while secondary infertility is the inability to have a pregnancy after previously successful conception.¹

Infertility is a global reproductive health problem and the prevalence rate increased by 0.37% per year for females and the global disease burden of infertility had increased from 1990 to 2017.² Estimates suggest that around 48 million couples and 186 million individuals live with

infertility globally.³ In 2007, international estimates of the prevalence of infertility in developed countries ranged from 3.5 to 16.7%, while in developing countries the prevalence ranged from 6.9 to 9.3%.⁴ Prevalence of infertility vary widely among Indian states from 3.7% in Uttar Pradesh, Himachal Pradesh and Maharashtra, to 5% in Andhra Pradesh and 15% in Kashmir.⁵⁻⁷

In Haryana the prevalence of infertility is 11.1% as per district level household survey 3 report, infertile women make up 10.6% of the rural population and 12.5% of the urban population. Out of 11.1% have infertility problem, among whom 8.5% and 2.6% had primary and secondary infertility respectively.⁸ As a result of the infertile status, women suffer physical and mental abuse, depression,

anxiety, low self-esteem, neglect, abandonment, economic deprivation and social ostracism as well as exclusion from certain social activities and traditional ceremonies. Infertility has much stronger negative consequences in developing countries compared with those in Western societies.⁹

There are many such risk factors which are avoidable; we can prevent a female from becoming infertile. 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 such situations, education and awareness-raising interventions to address understanding of the prevalence and determinants of fertility and infertility is essential. Thus, the purpose of the study is to identify and quantify the burden of infertility and associated risk factors for infertility.

METHODS

This observational cross-sectional study was conducted among the reproductive age group women who were resident of district Sonapat, Haryana between August 2021 to May 2022. Consenting married reproductive age group (18-49 years) women who were residents of district Sonapat for at least 6 months were considered eligible to participate in the study. Separated/divorced women, Married women with marriage duration <12 months, Menopausal (natural/artificial) women and those with any debilitating medical or related condition like mental illness (dementia or psychotic illness), end-stage cancer, blindness rendering them unable to be interviewed were excluded from the study.

Sources and methods of selection of participants

Calculated sample size was collected equally from urban and rural areas of district Sonapat. For rural area sampling, one Community Health Center (CHC) was selected by simple random sampling. From the selected CHC, two PHCs were selected randomly. For urban area sampling two Urban Health Centers (UHC) were selected randomly from urban area of district Sonapat. One sub-centre from each PHC and one urban sub-centre from each UHC were selected randomly. Sampling frame containing list of all reproductive age group women (18-49 years) were obtained from MPHW (F) of the selected area. The study participants from sampling frame were chosen randomly by the investigator herself.

Sample size

Sample size was estimated on basis of reference studies which reported the prevalence of infertility to be 11.8%, with 3% absolute precision at 95% confidence interval.¹⁰ The sample size was calculated using the following formula: $N = [(Z^2 \times p \times q) / L^2]$, Where, N = Sample size,

$Z = 1.96$ (95% confidence interval), $p =$ Prevalence, $q = 1 - p$, $L =$ Absolute precision. So, the total calculated sample size was 444 reproductive age group women.

Data collection tools and measurements

The data were collected on a predesigned semi-structured questionnaire which was pre-tested before the start of this study by the investigator herself. The house visit was carried out during the time of the day when all household members are expected to be available. Eligible candidate who was not found at home during at least three successive visits of investigator then adjacent household was selected. After explaining the purpose of the study and taking informed written consent from the participant, a semi-structured schedule was used by the investigator through face-to-face interviews to collect information about general characteristics and socio-demographic profile, relevant medical, menstrual and gynaecological history. Interviews were conducted in the local language.

The primary concern was on quality of data collection. An attempt to minimize recall bias, associated with timing of a particular event, was made by asking questions about the related important events in the respondent's life; e.g., information about age at menarche was not remembered correctly by some of the respondents, in these cases respondents' information was deduced by correlating age of menarche with any important event in past.

Operational definitions

Infertility is a disease of the male or female reproductive system defined by the failure to achieve a pregnancy after 12 months or more of regular unprotected sexual intercourse. Primary infertility is the inability to have any pregnancy, while secondary infertility is the inability to have a pregnancy after previously successful conception.

Statistical analysis

The collected data were entered into a Microsoft Excel spread sheet. Mean and standard deviation (SD) were calculated for quantitative data. Percentages and proportions were calculated for qualitative data. The categorical data were analyzed statistically using Chi-Square test and Odds ratio with 95% confidence interval. Continuous variables were analyzed using independent t-test. All the analysis was done using R software. P value <0.05 was considered as statistically significant.

RESULTS

In the present study we found out that out of 444 study participants, 6.3% of women were having secondary infertility followed by 5% women who were having primary infertility.

Table 1 shows that majority of study population were in age group of 30-39 years, followed by 20-29 years. One fourth of infertile women were in age group of less than 20 years. Husbands of half of the study participants aged

between 30-39 years, but the prevalence of infertility was more among those whose husbands aged between 30-39 years (13.7%).

Table 1: Distribution of study population according to demographic variables.

Variables		Fertile (n=394) (%)	Infertile (n=50) (%)	P - value
Age (years)	Female age	<20	3 (75)	0.376
		20-29	136 (88.3)	
		30-39	162 (87.1)	
		40-49	93 (93)	
		Mean±SD	33.07±7.43	
	Male age (husband)	21-29	69 (88.5)	0.393
		30-39	176 (86.3)	
		40-49	110 (91.7)	
		≥50	39 (92.9)	
		Mean±SD	37.22±8.15	
Time since marriage (years)	1-9	138 (82.6)	29 (17.4)	0.006*
	10-19	160 (92)	14 (8)	
	≥ 20	96 (93.2)	7 (6.8)	0.005*
	Mean±SD	13.47±8.24	10.02±7.57	
Age at marriage (years)	Female age	<18	116 (92.1)	0.058
		18-24	249 (88.9)	
		25-29	24 (77.4)	
		≥30	5 (71.4)	
		Mean±SD	19.59±3.37	
	Male age (husband)	≤20	70 (94.6)	0.010*
		21-24	172 (92)	
		25-29	123 (84.2)	
		≥30	29 (78.4)	
		Mean±SD	23.80±3.54	
Number of family members	2-4	118 (82.5)	25 (17.5)	0.024*
	5-6	158 (92.4)	13 (7.6)	
	7-9	80 (88.9)	10 (11.1)	
	≥ 10	38 (95)	2 (5)	

*Statistically significant.

Table 2: Distribution of study population according to history of any chronic diseases.

Variables		Fertile (n=394) (%)	Infertile (n=50) (%)	P - value
Thyroid disorder	No	369 (90)	41 (10)	0.004*
	Yes	25 (73.5)	9 (26.5)	
Diabetes mellitus	No	385 (88.9)	48 (11.1)	0.462
	Yes	9 (81.8)	2 (18.2)	
Hypertension	No	352 (88.4)	46 (11.6)	0.561
	Yes	42 (91.3)	4 (8.7)	
PCOD	No	388 (89.6)	45 (10.4)	< 0.001*
	Yes	6 (54.5)	5 (45.5)	
Tuberculosis	No	391 (89.3)	47 (10.7)	0.003*
	Yes	3 (50)	3 (50)	

*Statistically significant.

Majority of the study subjects were married for 10-19 years but the infertility was observed more in women who were married for 1-9 years (17.4%) indicating a significantly decreasing prevalence with increase in time since marriage (p value =0.006).

Majority were married at the age between 18-24 years but, one fourth of infertile women were married at the age 30 years or above. The prevalence of infertility significantly increases as the age increases (p value ≤0.001).

Significantly maximum prevalence of infertility (17.5%) seen among those with 2-4 family members (p value =0.024).

Table 2 shows that prevalence of infertility was 26.5% among those thyroid disorder, 18.2% among those with diabetes mellitus, 11.6% hypertensives, 45.5% among those with PCOD and 50% of those having tuberculosis of which the difference observed in relation to thyroid disorder (p value =0.004), PCOD (p value ≤0.001) and tuberculosis (p value =0.003) were statistically significant.

In Table 3 the prevalence of infertility among various anthropometric parameters were observed to be 14.1% among those weighing between 50-59 kg, 23.3% among those with 150 cm or less height, 13.2% among those with BMI between 18.5-22.9, 15% among those with waist circumference between 35-39cm, 14.3% each among those with hip circumference less than 35cm and more than 45cm and 12.1% of those with waist/hip ratio equal or less than 0.81.

Table 3: Distribution of study population according to anthropometry.

Variables	Fertile (n=394) (%)	Infertile (n=50) (%)	P - value
Weight (kg)	<50	9 (11.4)	0.763
	50-59	19 (14.1)	
	60-69	12 (9)	
	70--79	7 (10.4)	
	≥ 80	3 (10.3)	
	Mean±SD	59.42±11.49	0.532
Height (cm)	≤ 150	14 (23.3)	0.014*
	151-155	17 (11)	
	156-160	15 (10.3)	
	161-165	3 (4.2)	
	≥ 166	1 (7.7)	
	Mean±SD	154.38±5.32	0.005*
BMI (kg/m²)	< 18.5	2 (6.3)	0.711
	18.5-22.9	18 (13.2)	
	23.0-27.4	18 (10.8)	
	≥ 27.5	12 (10.9)	
	Mean±SD	24.94±4.77	0.669
Waist circumference (cm)	≤ 29	24 (13.2)	0.241
	30-34	12 (7.5)	
	35-39	12 (15)	
	≥ 40	2 (9.5)	
	Mean±SD	30.94±5.25	0.948
Hip circumference (cm)	< 35	18 (14.3)	0.540
	35-39	16 (9.7)	
	40-44	12 (9.6)	
	≥ 45	4 (14.3)	
	Mean±SD	37.34±4.82	0.956
Waist/hip ratio	≤ 0.81	23 (12.1)	0.627
	> 0.81	27 (10.6)	

*Statistically significant.

The mean parameters among those with infertility were weight of 59.42 kg (SD=11.49), height of 154.38 cm (SD=5.32), BMI of 24.94 (SD=4.77), Waist circumference of 30.94cm (SD=5.25) and a Hip circumference of 37.34 cm (SD=4.82).

DISCUSSION

The prevalence of infertility has increased significantly in recent years, the global prevalence of infertility is 10%-15%.¹¹ In our study, the prevalence of infertility is 11.3%

which is well comparable to the global data.

Infertile group's mean age was 31.58±6.59 years, which is concordance with study conducted at Bangalore.¹² Study carried out by Moridi et al and Mittal et al found mean age of infertile women's spouses were 35.7±6.70 years and 38.94±8.53 years respectively which were concordant with our results.^{13,10} Another study conducted by Saoji et al who reveals that, age at marriage >25 years proved to be a significant risk factor for primary infertility.¹⁴ The woman's fertility is at its peak between the ages of 18 and

24 years, then fertility begins to decrease gradually, therefore we recommend standardizing appropriate age for marriage for women. We observed the negative correlation between time since marriage and the prevalence of infertility, the possible explanation for this could be that probability of conceiving increases with increase in period of exposure.

Maximum prevalence of infertility (17.5%) found in those who had 2-4 members in their family which could be due to prioritizing occupation and earning over child bearing and lack of familial pressure to conceive, commonly seen with Joint families in our country.

In Table 2, 45.5% of female who had a history of PCOD were infertile. PCOD is the most common cause of anovulation among infertile women. Similarly, a study conducted at Bangalore revealed that, among (2270) infertile females seen in five years, 46.50% (1057) were PCOS patients and 84.76% of these females had primary infertility.¹⁵ In our study, it was observed that 26.5% of female who had a history of thyroid disorder were infertile which is supported by another study done by Goswami et al.¹⁶ 50% of study participants who were having tuberculosis were infertile. Similarly, Tripathy et al had shown that 13% of pulmonary TB patients have endometrial involvement.¹⁷

In Table 3, no differences were observed in the prevalence of infertility between obese and non-obese women. This might be due to the similar dietary habits of women in the study group and to the efforts of infertile women to lose weight in order to be cured. The finding of study done by Safarinejad et al, was concordant with our findings.¹⁸

In the current study, we observed a negative correlation between height and female infertility. The possible explanation for this association may be some hormonal association which could negatively impact height as well as fertility of a women. There are very few studies which show the relationship between height and fertility. There is a large scope for future research on this topic.

A 12.1% of infertile women were having WHR in low-risk range (≤ 0.81) as compared to 10.6% who had WHR in high-risk range (> 0.81). Study done by Loy et al had demonstrated that central adiposity was not associated with fertility and supports our study.¹⁹

CONCLUSION

A considerable percentage of women experience the problem of infertility in district Sonapat. This study revealed significant potential determinants of infertility among the subject under study, indicating the existence of a positive relationship between age at marriage, thyroid, PCOD, tuberculosis, height and their infertility issues. Adolescent girls can very well be explained earlier about these modifiable factors, such that they may plan their

future fruitfully. Regular health check-ups should be done for the early detection of any chronic disease. Health education programme on the modification ways of those identified factors which will promote fertility. Although the legal minimum age for marriage is 18 years, we must thoroughly implement this rule nationwide. Encouraging age-appropriate marriage and childbearing will also help. Promoting a healthy lifestyle to keep a normal BMI, including adopting a nutritious diet and engaging in frequent exercise.

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Ethical approval: The study was approved by the Institutional Ethics Committee of Bhagat Phool Singh Government Medical College for Women, Khanpur Kalan vide IEC registration number: BPSGMCW/RC633/IEC/2021 dated 26/02/2021

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