

Original research article

A comparative observational analysis of the determinants of primary infertility in women of reproductive age

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Abstract

Aim: to determine the aetiologies for Primary Infertility among women of reproductive age group.

Methods: A comparative observational study was conducted in the Department of obstetrics and gynaecology, VIMS, Pawapuri, Nalanda, Bihar, India, India for 2 years, Total of 1100 women could be interviewed. A type-specific ELISA test was used to detect HSV-2 IgG antibodies. Vaginal swabs were also cultured, using organism specific kits, for *Trichomonas vaginalis*, *Candida* species, and *Neisseria gonorrhoeae*, according to manufacturer's instructions. All diagnostic tests were carried out in the microbiology laboratories.

Results: Prevalence of primary infertility in our study was 100 (9.09%) and prevalence was significantly more in the Upper middle class (43%) and among Hindus (52%). Mean age at menarche (13.97yrs), Mean age at first sexual activity (20.05) and mean number of unprotected sexual acts in previous three months (37.78) was significantly higher in women with primary infertility while mean years of marriage (8.55) significantly higher in fertile women. Overall, lower number of infertile women reported to have abnormal vaginal discharge, burning urination and vaginal itching. The prevalence of genital ulcer was significantly more in infertile group (p 0.0001). Women with genital ulcer were at increased odds of infertility (OR: 2.52; 95% CI: 1.57–3.80) compared to women without genital ulcer. Abnormal vaginal discharge was significantly more in women in the fertile group (p 0.0001). Women with abnormal vaginal discharge were at decreased odds of infertility (OR: 0.39; 95% CI: 0.26 – 0.60) compared to women without abnormal discharge.

Conclusion: Primary infertility is increasing and is emerging as a new public health problem which needs immediate attention before it goes out of hand.

Key Words: Primary infertility, Women, Reproductive age group

Introduction

The World Health Organization (WHO) estimates that 60 to 80 million couples worldwide currently suffer from infertility.¹ Infertility varies across regions of the world and is estimated to affect 8 to 12 per cent of couples worldwide.^{2,3} Underlying these numbers exists a core group of couples, estimated to be 3 to 5 per cent, who are infertile due to unknown or unpreventable conditions. A prevalence of infertility above this level suggests preventable or treatable causes.⁴ Infertility tends to be highest in countries with high fertility rates, an occurrence termed "barrenness amid plenty."⁵ Many studies have been conducted in the Africa, where the reported prevalence of infertility ranges from 9 per cent in Gambia to 30 per cent in Nigeria.⁶ Total infertility is divided into primary and secondary infertility. Definitions of primary infertility vary between studies, but the operational definition, put forth by the WHO, defines primary infertility as the "Inability to conceive within two years of exposure to pregnancy (i.e.

sexually active, non-contracepting, and non-lactating) among women 15 to 49 yr old.⁷ Secondary infertility refers to the inability to conceive following a previous pregnancy. Globally, most infertile couples suffer from primary infertility.⁸ Sexually transmitted infections (STIs) are generally considered the leading preventable cause of infertility worldwide, especially in developing countries.^{2,6} STIs cause approximately 70 per cent of all pelvic inflammatory disease (PID) cases, which often result in tubal damage.^{2,9} A large study conducted by the WHO in 25 countries, with over 5800 couples, found that over 85 per cent of the infertility among African women was attributable to infection, compared to only 33 per cent in women worldwide.^{6,10} Among Indian women reporting primary infertility and PID, STI prevalence was high.³ The WHO estimates the overall prevalence of primary infertility in India to be between 3.9 and 16.8 per cent.¹ Estimates of infertility vary widely among Indian states from 3.7 per cent in Uttar Pradesh, Himachal Pradesh and Maharashtra¹¹, to 5 per cent in Andhra Pradesh¹², and 15 per cent in Kashmir.¹³ Moreover, the prevalence of primary infertility has also been shown to vary across tribes and castes within the same region in India.^{11,14} However, it should be noted that many of these estimates use different definitions of infertility and consider different time periods, which makes direct comparisons difficult between any studies. There are sparse data on the prevalence of primary infertility in India³ and almost none from southern India. The objectives of this study were to estimate the prevalence and describe the epidemiologic correlates of primary infertility within a sample of sexually active reproductive-age women in Bihar.

Materials and methods

A Cross sectional study was conducted in the Department of obstetrics and gynaecology, VIMS, Pawapuri, Nalanda, Bihar, India, India for 2 years, after taking the approval of the protocol review committee and institutional ethics committee.

Methodology

As per the WHO definition, women were defined as having primary infertility if they were married (or with their main partner) for longer than two years, sexually active, not using modern contraception, and without children.¹⁵ Total of 1100 women could be interviewed. All the participants were informed about the purpose of the study and consent was taken with their voluntary will to participate. Also they could withdraw from the study anytime they wished. Demographic variables including age in years and education, occupation, socio-economic status, religion and consanguinity were evaluated as categorical variables. Reproductive health variables including years sexually active, age at sexual debut, and number of unprotected sex acts in the prior three months were examined as continuous variables. Specimens were collected and examined for sexually transmitted diseases (STDs).

Lab diagnosis: A type-specific ELISA test was used to detect HSV-2 IgG antibodies. Manufacturer's instructions were followed using an index value of >1.1 as positive HSV-2 specimen. Vaginal swabs were also cultured, using organism specific kits, for *Trichomonas vaginalis*, *Candida* species, and *Neisseria gonorrhoeae*, according to manufacturer's instructions. All diagnostic tests were carried out in the microbiology laboratories.

Statistical analysis

Data was analyzed using Microsoft excel 2007 and Epi info 3.5.3. Chi-square test for categorical variables and t test or Z tests for continuous variables were used to analyze the relationship between the variables.

Results

Of the 1100 women interviewed, Socio-demographic details of the study subjects have been detailed in table 1. Prevalence of primary infertility in our study was 100 (9.09%) and prevalence was significantly more in the Upper middle class (43%) and among Hindus (52%) (Table 1)

Mean age at menarche (13.97yrs), Mean age at first sexual activity (20.05) and mean number of unprotected sexual acts in previous three months (37.78) was significantly higher in women with primary infertility while mean years of marriage (8.55) significantly higher in fertile women (Table 2).

Overall, lower number of infertile women reported to have abnormal vaginal discharge, burning urination and vaginal itching. The prevalence of genital ulcer was significantly more in infertile group ($p=0.0001$). Women with genital ulcer were at increased odds of infertility (OR: 2.52; 95% CI: 1.57–3.80) compared to women without genital ulcer. Abnormal vaginal discharge was significantly more in women in the fertile group ($p=0.0001$). Women with abnormal vaginal discharge were at decreased odds of infertility (OR: 0.39; 95% CI: 0.26-0.60) compared to women without abnormal discharge. Women who were positive for HSV-2 antibodies were at increased odds of infertility (OR: 2.98; 95% CI: 1.93-4.58) compared to women who were seronegative and women who were positive for syphilis antibodies were also at increased odds of infertility (OR: 8.21; 95% CI: 3.87-18.25) compared to women who were seronegative. (Table 3)

The overall prevalence of HSV-2 within this group was 12.45 percent (137/1100). The prevalence of HSV-2 seropositivity among women with primary infertility was 27 percent (27/100), compared to 11 percent (110/1000) among the fertile women showing significant association between HSV-2 infection and primary infertility ($P=0.0001$). The overall prevalence of Syphilis was 1.81 percent (20/1100). The prevalence was significantly high ($P=0.0001$) among women with primary infertility 10% (10/100), compared to 1 percent (10/1000) among the fertile women. The prevalence of BV was 25.73 per cent (183/1100) among the women, but did not differ between the two groups. Similarly, the prevalence of *T. vaginalis* did not differ between the two groups and the overall prevalence was 6.81 per cent (75/1100). The prevalence of Candidiasis was 21.45 per cent (236/1100), and was not significantly different between the two groups (Table 3). No cases of *N. gonorrhoeae* infection were identified.

Table 1: Socio demographic profile of the study population (N=1100)

Age	Primary infertility (n=100)	Fertile (n=1000)	p-value
15-20	10(10)	40 (4)	0.141
20-25	20 (20)	250 (25)	
25-30	40 (40)	480 (48)	
30-35	14 (14)	80 (8)	
35-40	7 (7)	60 (6)	
40-45	5 (5)	50 (5)	
Above 45	4(4)	40 (4)	
Literacy status			0.697
Illiterate	10 (10)	80 (8)	
Primary	7 (7)	80 (8)	
Middle	16 (16)	180 (18)	
High school	47 (47)	420 (42)	
Above high school	20 (20)	240 (24)	
Occupation			0.461
Housewife	67 (67)	650(65)	

Unskilled	23 (23)	220 (22)	
Skilled	10 (10)	130 (13)	
Socio-economic status			
Lower	12 (12)	170 (17)	0.218
Upper lower	15 (15)	260 (26)	
Lower middle	30 (30)	320 (32)	
Upper middle	43(43)	250 (25)	

Table 2: Reproductive characteristics of the study population

Characteristic	Primary infertility (n=100)	Fertile (n=1000)	P value
Mean age at menarche (yrs)	13.97	13.51	<0.0001
Mean age at first sexual activity (yrs)	20.05	16.79	<0.0001
Mean years of marriage	5.89	8.55	<0.0001
Mean no. of unprotected sexual acts in last 3 months	37.78	24.36	<0.0001

Table 3: Clinical and laboratory characteristics of the study population (N=1100)

Characteristic	Primary infertility (n=100) (%)	Fertile (n=1000) (%)	Odd's ratio	95% CI	Z Value	P value
Abnormal vaginal discharge	20 (20)	400(40)	0.39	0.2648 – 0.6012	4.327	< 0.0001
Vaginal itching	17 (17)	210(21)	0.76	0.4799 – 1.2397	1.150	0.26
Burning micturition	13 (13)	160 (16)	0.74	0.4196 – 1.2557	1.161	0.23
Genital ulcer	23 (23)	110(11)	2.52	1.5701 – 3.8025	3.978	0.0001
Bacterial vaginosis	23 (23)	260 (26)	0.94	0.5780 – 1.3459	0.613	0.53
Vaginal Candidiasis	26(26)	210 (21)	1.25	0.8101 – 1.8724	0.977	0.37
Trichomoniasis	5 (5)	70 (7)	0.69	0.3215 – 1.5774	0.867	0.41
HSV seropositivity	27 (27)	110(11)	2.96	1.9464 – 4.5897	4.977	< 0.0001
Syphilis	10(10)	10 (1)	8.21	3.8786 – 18.2568	5.301	< 0.0001

Discussion

The WHO estimates of primary infertility in India are 3.9 per cent (age-standardized to 25-49 yr) and 16.8 per cent (age-standardized to 15-49 yr), using the “age but no birth” definition.¹⁶ Prevalence of primary infertility in the present study was 100 (9.09%) which is within the range reported by the WHO.¹⁶ Adamson et. al¹⁷ and similar to estimates from the Kashmir region.¹⁸ Prevalence was significantly more in the Upper middle class (43%) (p value- 0.0001) consistent with previous findings in India. Primary infertility was more in women with higher levels of education which may indicate a delay in marriage and higher age at first sex.¹⁹ Consanguinity was more commonly found in infertile women, 57 %, and was found significantly associated

as also revealed by Shireen J. Jejeebhoy.²⁰ In our study, mean number of unprotected sex acts were significantly associated with primary infertility, possibly because the couples with infertility made active and repeated attempts to conceive, by increasing the number of unprotected sexual acts. This is consistent with the findings of Adamson et. al.¹⁷ was found in our study, previous studies have shown the association of STDs with primary infertility. In particular, previous history of STDs is associated with such conditions as tubal factors in the female partner (in particular tubal occlusion or pelvic adhesions) and obstruction or gland infection in the male partner; the major STDs being gonorrhoea and chlamydial.²¹ Our study also revealed significant association of chlamydial infection (The overall prevalence of Syphilis was 1.81 percent (20/1100). The prevalence was significantly high (P-0.0001) among women with primary infertility 10% (10/100), compared to 1 percent (10/1000) among the fertile women. As it is shown by studies, upto two-thirds of infertile women who have never been pregnant are reportedly infertile because of previous pelvic infection, mostly sexually transmitted infections in Africa and other countries with high risk factors.²² The overall prevalence of HSV-2 within this group was 12.45 percent (137/1100). The prevalence of HSV-2 seropositivity among women with primary infertility was 27 percent (27/100), compared to 11 percent (110/1000) among the fertile women showing significant association between HSV-2 infection and primary infertility (P 0.0001). Cherpes et al.²³ have also demonstrated an association between HSV-2 infection and Primary infertility. Two mechanisms were suggested for infertility caused by HSV-2 infection: lower-genital tract ulcerations caused by HSV-2 infection increase the spread of lower genital tract pathogens to the up- per genital tract, thereby facilitating PID or HSV-2 infections may increase host inflammatory responses in the upper genital tract, leading to tubal damage.²³ Other studies have found HSV-2 DNA associated with low sperm counts and decreased sperm motility in men attending infertility clinics.²⁴⁻²⁶

Conclusion

Primary infertility is increasing and is emerging as a new public health problem which needs immediate attention before it goes out of hand.

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