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RESEARCH ARTICLE

BIO-SOCIAL CORRELATES OF PRIMARY INFERTILITY IN RURAL FIELD PRACTICE AREA OF KEMPEGOWDA INSTITUTE OF MEDICAL SCIENCES (KIMS), BANGALORE

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ABSTRACT

Objective: 1) To estimate the prevalence of primary infertility in the study population. 2) To describe the socio demographic characteristics prevailing among couples with primary infertility in the study population. 3) To identify the probable medical conditions associated with primary infertility.
Design: Cross- sectional descriptive study.
Setting: Rural field practice area of tertiary hospital, Bangalore.
Sample: Complete enumeration of entire Kumbalgodu Primary Health center area covering 26, 190 populations.
Methods: In depth interview using a pretested pre-structured questionnaire was conducted for a period of 18 months (January 2012 to August 2013) to enumerate all couples with primary infertility in the entire Kumbalgodu Primary Health Centre area. Review of investigation reports available with couples at the time of study.
Results: In the present study area, prevalence of primary infertility was 4.5%. The most common cause of primary infertility among females was pelvic inflammatory disease followed by polycystic ovarian disease and among males it was oligospermia.
Conclusion: This study has yielded important information regarding the prevalence and risk factors influencing primary infertility. Efforts to raise awareness in the population about the causes of primary infertility are needed and facilities should be made available for early diagnosis and treatment.

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INTRODUCTION

Infertility is a public health problem. The main patterns in infertility is primary and secondary infertility (Abdalla, 2011). Infertility is divided into primary and secondary infertility. The operational definition, put forth by World Health Organization (WHO), using a two year reference period, defines primary infertility as the lack of conception despite cohabitation and exposure to the risk of pregnancy (in the absence of contraception) for a period of two years or more (Kumar, 2007). WHO estimates the overall prevalence of primary infertility in India to be between 3.9 and 16.8 percent (Paul *et al.,* 2011). According to DLHS survey Karnataka, women who had primary infertility constitute 5.9 of ever married women between 15-49 years. Infertility in rural area is 6.1% as compared to urban area which is 5.5%.

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Percentage of women who sought treatment for primary infertility in urban and rural areas are 76.9% and 85% respectively (International Institute for Population Sciences, 2010). Infertility has been attributed to male factors 25%, female ones 58% and unexplained in 17% couples; sometimes both male and female factors are present simultaneously. However in our country the infertility is a hidden social problem where the females and not the males are solely held responsible for this lifetime problem of having no child (Shireen, 1998). The biological and social factors including stress due to economic status, religious attitudes, age at marriage, urbanization leading to modernization, higher literacy, contraceptive usage and nuclear families play a significant role in lowering fertility (Shamila and Sasikala, 2011). Sexually transmitted infections (STIs) are generally considered the leading preventable cause of infertility worldwide, especially in developing countries (Shireen, 1998). From the medical perspective, infertility is a complication resulting from some disease related to reproductive health, such as reproductive tract infection and sexually transmitted

diseases (Erick *et al.,* 1996). In this background present study was undertaken to estimate the prevalence and also to describe the bio-social correlates of primary infertility in rural practice area of Kempegowda Institute of Medical Sciences, Bangalore.

Objectives

- To estimate the prevalence of primary infertility in the study population.
- To describe the socio demographic characteristics prevailing among couples with primary infertility among the study population.
- To identify the probable medical conditions associated with primary infertility.

MATERIALS AND METHODS

The study was conducted in the rural field practice area of Kempegowda Institute of Medical Sciences, Bangalore, India. The study was approved by the institutional review board. The study place is situated 21.2 km from Bangalore, covering a population of 26190.The study was conducted from January 2012 to August 2013. The study protocol was approved by the institutional ethics committee. Simple random sampling technique was used to choose one PHC among the three primary health centres in the rural field practice area of Department of Community Medicine, Kempegowda Institute of Medical Sciences, Bangalore. Complete enumeration of the entire Kumbalgodu PHC area was done. Preliminary discussions were held with medical officer of Kumbalgodu Primary Health Centre, junior health assistant male and female, ASHA (Accredited Social Health Activist) and Anganwadi workers of Kumbalgodu PHC. Medico social workers of the department of Community Medicine (Kempegowda Institute of Medical Sciences) were also involved in the study. Discussions were held explaining them the objective of the study and assuring them that the identity of the couples will be kept confidential. Area map of PHC with details of two sub centre (Kumbalgodu and H. Gollahalli) and 16 villages was obtained.Pre-designed, pretested, structured proforma in English was translated to local language Kannada with the consultation of Department of Kannada (V V Puram College of Arts and Commerce) and back translation was done from Kannada to English with consultation of Department of English (V V Puram College of Arts and Commerce). Informed consent was obtained from study subjects ensuring them that all the information will be kept strictly confidential and will be used only for research purposes. A total of 26,120 people were accessed from 6,335 households. Kumbalgodu sub centre was covered first and then H Gollahalli sub centre was covered. House to house survey was done covering all the villages coming under these sub centers so as to completely enumerate the eligible couples. Among these eligible couples those who are exposed to the risk of pregnancy were considered and couples with inability to conceive despite cohabitation and exposure to the risk of pregnancy (in the absence of contraception) for two years or more (as per WHO Epidemiological definition) were included and considered to have primary infertility. These couples were included in the study after they fulfilled inclusion criteria.

Data regarding socio-demographic, biological and social factors were collected using a pre-designed, pretested, structured proforma. Data regarding medical conditions associated with infertility were collected based on the investigation reports that were available with the couples with at the time of survey. The socioeconomic status was assessed based on the Standard of Living Index (SLI). In case a house was locked or a respondent was not available, the interviewer noted it as such, and returned at a subsequent date at a time convenient to the respondent to fill the questionnaire. If three such attempts at meeting residents of a household were unsuccessful, the household was dropped from the list. The data was compiled and analyzed. The statistical analyses done in this study by computing Descriptive Statistics like Mean, Standard Deviation and Inferential Statistics like Odds ratio, Chi-square (χ^2) test, SPSS version 16.0 software.

$$\text{Prevalence of primary infertility} = \frac{\text{Total number of couples with inability to conceive despite cohabitation and exposure to risk of pregnancy in the absence of contraception for a period of two years or more.}}{\text{Total number of couples exposed to risk of pregnancy}}$$

$$= (62/1379) \times 100$$
$$= 4.5\%$$

RESULTS

Total population covered under the study is 26,190. Among them number of couples were 5210. Among 5210 couples, total number of eligible couples were 4120. Among the eligible couples only 1379 were exposed the risk of pregnancy.

Table 1. Distribution of couples with primary infertility according to age

Age	Males	Females
15-19	-	04(6.5)
20-24	04(06.5)	26(41.9)
25-29	21(33.9)	12(19.4)
30-34	14(22.6)	08(12.9)
35-39	10(16.1)	09(14.5)
40-44	11(17.7)	03(04.8)
45-49	02(03.2)	-
Education	Males	Females
Graduate	08(12.9)	02(3.2)
Intermediate	05(08.1)	04 (6.5)
High school	16(25.8)	18(29.0)
Middle school	13(21.0)	12(19.4)
Primary school	09(14.5)	11(17.7)
Illiterate	11(17.7)	15(24.2)
Unemployed	03(04.84)	44(70.96)
Occupation	Males	Females
Labourer	27(43.55)	08(12.90)
Business	13(20.97)	04(06.45)
Farmer	10(16.13)	04(06.45)
Government Service	05(08.06)	01(01.61)
Professional	04(06.45)	01(01.61)
Total	62(100.00)	62(100.00)

Note: Figures in parenthesis indicates percentages.

Males among couples with primary infertility was found to be highest 21(33.9%) in the age group of 25-29 years. Females among couples with primary infertility were highest in the

26(41.9%) in the age group of 20-24 yrs. Most of males 16(25.8%) and females 18(29.0%) among couples with primary infertility had education up to high school. Among males with primary infertility 27 (43.55%) were labourers, 13(20.97%) were in business, 10(16.13%) were farmers, 05(08.06%) were in Government Service, 3(4.84%) were unemployed and 03(04.84%) was professionals. Among females with primary infertility 44(70.96%) were housewives, 8(12.90%) were labourers, 04(06.45%) were farmers and in business and 01(01.61%) were each in government service and 01(01.61%) each professional and in government service.

Table 2. Distribution of couples with primary infertility according to type of family

Religion	Total eligible couples (n=4120)	Couples with Primary infertility (%) (n=62)
Hindu	3237	47(01.45)
Muslim	0662	14(02.11)
Christian	0221	01(0.45)
Family	Total eligible couples(n=4120)	Couples with Primary infertility (%) (n=62)
Nuclear family	2568	41(01.60)
Joint family	0890	17(01.91)
Three generation family	0662	04(0.60)

Note: Figures in parenthesis indicates percentages.

Out of 3237 Hindu couples 47(1.45%) had primary infertility, out of 662 Muslim couples 14(2.11) had primary infertility and out of 221 Christian couples only 1(0.45%) couple had primary infertility. Out of 2568 eligible couples belonging to nuclear family 41(1.60%) had primary infertility, out of 890 eligible couples belonging to joint family 17(1.91%) had primary infertility and out of 662 couples belonging to three generation family 4(0.60%) had primary infertility.

Table 3. Distribution of couples with primary infertility according to socioeconomic status

Socioeconomic Status*	Couples with Primary infertility
Low	07(11.3)
Medium	35(56.5)
High	17(27.4)
Very high	03(04.8)
Total	62(100.00)

*Socioeconomic status measured by standard of living index
Note: Figures in parenthesis indicates percentages.

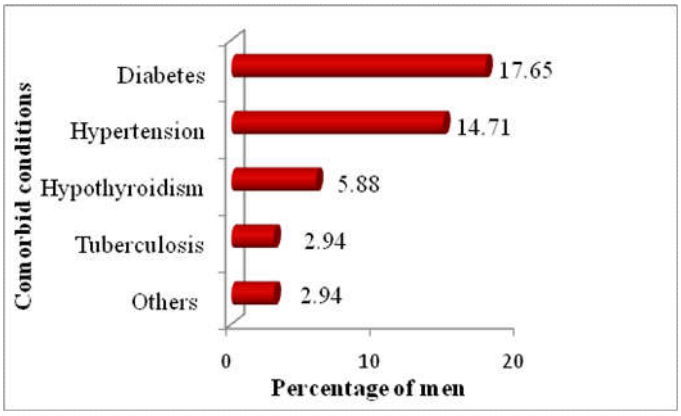
Among couples with primary infertility highest were in 35(56.6%) medium socioeconomic status.

Table 4. Distribution of couples with primary infertility according to period of infertility after marriage

Duration of infertility(years)	Primary infertility
<5	38(61.29)
5-9	11(17.74)
10-20	12(19.35)
>20	01(01.61)
Total	62(100.00)

Note: Figures in parenthesis indicates percentages.

Most of the couples 38(61.29%) with primary infertility had duration of infertility < 5 years. Duration of infertility among couples with primary infertility has median of 3.5 years with interquartile range of 2-9 years.



Graph 1. Distribution of males with primary infertility according to co-morbid conditions (n=34)

Among 34(54.84%) of males who had undergone investigations 6(17.65%) HAD diabetes, 5(14.71%) had hypertension, 2(5.88%) had hypothyroidism, 1(2.94%) had tuberculosis and others include 1 (2.94%) of fatty liver. Out of 34(54.84%) who had undergone investigations 11(32.35%) found to have abnormality in seminal parameters. 6(9.7%) of males among couples with primary infertility had diabetes as compared to 82(6.5%) of males who were not having infertility and the difference was not found to be statistically highly significant ($p>0.05$). The odds of having diabetes was 1.55 times higher among those with primary infertility as compared to those who were not having infertility. 5(8.1%) of males among couples with primary infertility had hypertension as compared to 53(4.2%) of males who were not having infertility and the difference was not found to be statistically highly significant ($p>0.05$). The odds ratio of having hypertension was 2.01 times higher among those with primary infertility as compared to those who were not having infertility. 1(1.6%) of males among couples with primary infertility had tuberculosis as compared to 10(0.8%) of males who were not having infertility and the difference was not found to be statistically highly significant ($p>0.05$). The odds ratio of having tuberculosis was 2.062 times higher among those with primary infertility as compared to those who were not having infertility. 2(03.2%) of males with primary infertility had hypothyroidism as compared to 8(0.6%) of males who were not having infertility and the difference was found to be statistically highly significant ($p>0.05$).The odds of having hypothyroidism was 5.25 times higher among those with primary infertility as compared to those who were not having infertility. 13 (21.0%) of males with primary infertility had family history of infertility as compared to 5(0.4%) of males who were not having infertility and the difference was found to be statistically highly significant ($p<0.01$).The odds of having family history of infertility was 67.02 times higher among those with primary infertility as compared to those who were not having infertility. 18(42.9%) of females among couples with primary infertility had pelvic inflammatory disease, 13(31.0%%) had polycystic ovarian disease, Hypothyroidism 04(9.5%), hypertension 3(7.1%), diabetes 2(4.8%), endometritis 2(4.8), fibroid 2(4.8), tuberculosis 2(4.8), PID and PCOD 2(4.8) and 4(9.5% of other diseases includes cervical polyp, hemorrhagic cyst, sub mucosal fibroid and herpes genitalis.

Table 5. Association between males among couples with primary infertility and factors influencing primary infertility

Co morbidities		Men among couples with Primary infertility (n=62)	Men among couples without infertility (n=1268)	Odds Ratio	95% CI		Chi-square value	P value
					Lower	Upper		
Diabetes	Present	06(9.7)	82(6.5)	1.55	0.6485	3.703	0.986	0.321
	Absent	56(90.3)	1186(93.5)					
Hypertension	Present	05(08.1)	53(04.2)	2.01	0.7742	5.224	2.139	0.144
	Absent	57(91.9)	1215(95.8)					
Tuberculosis	Present	01(01.6)	10(0.8)	2.06	0.2598	16.37	0.490	0.484
	Absent	61(98.4)	1268(99.2)					
Hypothyroidism.	Present	02(03.2)	08(0.6)	5.25	1.091	25.26	5.334	0.021
	Absent	60(96.8)	1260(99.4)					
Family history of infertility	Present	13(21.0)	05(0.4)	67.02	22.99	195.4	1.874	0.0000001
	Absent	49(79.0)	1263(99.6)					

Note: Figures in parenthesis indicate

Table 6. Association between females among couples with primary infertility and factors influencing primary infertility

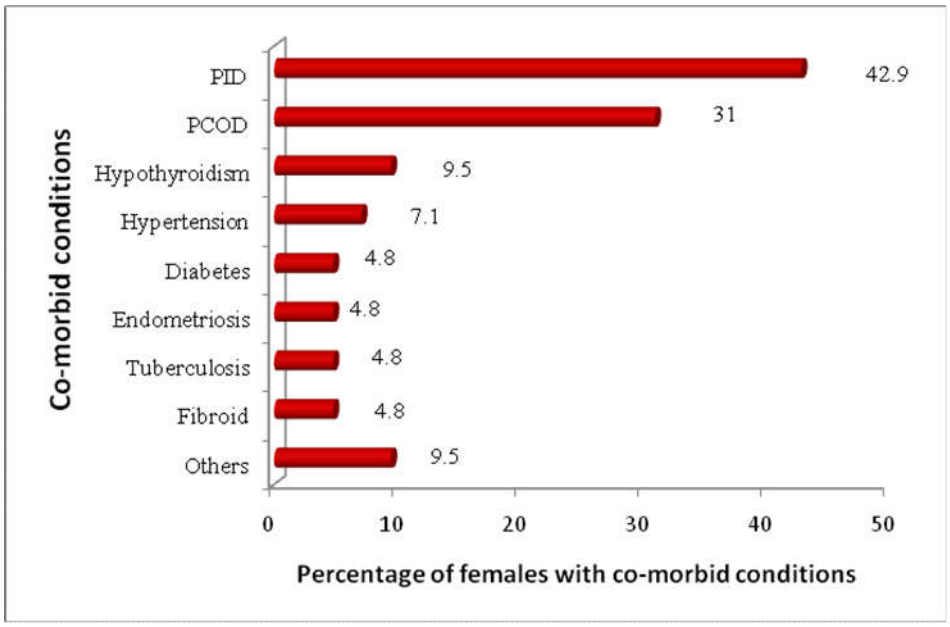
Factors influencing Primary Infertility		Females among couples with Primary infertility (n=62)	Females among couples without infertility (n=1268)	Odds Ratio	95% CI		Chi-square value	P value
					Lower	Upper		
Diabetes	Present	02(3.2)	41(3.2)	0.998	0.2357	4.222	0.00001	0.997
	Absent	60(96.8)	1227(96.8)					
Hypertension	Present	03(6.8)	59(4.6)	1.522	0.458	5.057	0.476	0.490
	Absent	41(93.2)	1227(95.4)					
Tuberculosis	Present	01(1.6)	15(1.2)	1.369	0.178	10.54	0.092	0.762
	Absent	61(98.4)	1253(98.8)					
Hypothyroidism.	Present	04(6.5)	18(1.4)	4.789	1.571	14.6	9.201	0.002
	Absent	58(93.5)	1250(98.6)					
Abnormal Vaginal discharge	Present	16(25.8)	22(1.7)	19.700	9.705	39.99	123.4	<0.0000001
	Absent	46(74.2)	1246(98.3)					
Menstrual Cycle irregularity	Present	17(27.4)	122(9.6)	3.549	1.97	6.399	20.007	0.000007
	Absent	45(72.6)	1146(90.4)					
Family history of infertility	Present	04(6.5)	06(0.5)	14.51	3.984	52.81	28.311	0.0000001
	Absent	58(93.5)	1262(99.5)					

Note: Figures in parenthesis indicates percentages.

Table 7. Distribution of females with primary infertility according to menstrual cycle abnormalities

Menstrual cycle abnormality	Females among couples with primary infertility(n=17)
Oligomenorrhoea	14(82.35)
Hypomenorrhoea	01(05.88)
Polymenorrhoea	01(05.88)
Amenorrhoea	01(05.88)

Note: Figures in the parenthesis indicate percentage.



Graph 2. Distribution of females with primary infertility according to co-morbid conditions

2(3.2%) of females among couples with primary infertility had diabetes as compared to 41(3.2%) of females who were not having infertility and the difference was found to be statistically significant (p>0.05). The odds of having diabetes was 0.998 times higher among those with primary infertility as compared to those who were not having infertility. 3(6.8%) of females among couples with primary infertility had hypertension as compared to 59(4.6%) of females who were not having infertility and the difference was not found to be statistically significant (p>0.05).The odds of having hypertension was 1.522 times higher among those with primary infertility as compared to those who were not having infertility. 1(1.6%) of females among couples with primary infertility had tuberculosis as compared to 15(1.2%) of females who were not having infertility and the difference was not found to be statistically significant (p>0.05). The odds of having tuberculosis was 1.369 times higher among those with primary infertility as compared to those who were not having infertility. 4(6.5%) of females among couples with primary infertility had hypothyroidism as compared to 18(1.4%) of females who were not having infertility and the difference was found to be statistically highly significant (p<0.01).

The odds of having hypothyroidism was 4.789 times higher among those with primary infertility as compared to those who were not having infertility. 16(25.8%) of females among couples with primary infertility had abnormal vaginal discharge as compared to 22(1.7%) of females who were not having infertility and the difference was found to be statistically highly significant (p<0.01). The odds of having vaginal discharge was 19.700 times higher among those with primary infertility as compared to those who were not having infertility. 17(27.4%) of females among couples with primary infertility had irregular menstrual cycles as compared to 122(9.6%) of females who were not having infertility and the difference was found to be statistically highly significant (p<0.01). The odds of having menstrual irregularity was 3.549 times higher among those with primary infertility as compared to those who were not having infertility. 4(6.5%) of females among couples with primary infertility had family history of infertility as compared to 6(0.5%) of females who were not having infertility and the difference was found to be statistically highly significant (p<0.01). The odds of having family history of infertility was 14.51 times higher among those with primary infertility as compared to those who were not having infertility. 17(27.42) of females with primary infertility had menstrual cycle irregularities. Among the menstrual cycle irregularities most common was oligomenorrhoea 14(82.35%) followed by hypomenorrhoea 1(5.88%), polymenorrhoea 1(5.88%) and amenorrhoea 1(5.88%).

Table 8. Frequency of intercourse among couples with primary infertility

Frequency of intercourse	Primary infertility
Daily	18(29.03)
Thrice a week	27(43.54)
Twice a week	10(16.12)
Once a week	-
Occasionally	07(11.29)
Total	62(100.00)

Note: Figures in parenthesis indicates percentages.

Among couples with primary infertility majority of them 27(43.54%) of them had frequency of intercourse thrice a week, 18(29.03%) of couples with primary infertility had frequency of intercourse daily, 10(16.12%) of them had intercourse twice a week and 7(11.29%) of them had frequency of intercourse occasionally.

DISCUSSION

Prevalence of infertility

Prevalence of primary infertility in the present study is 4.5%.The estimate of infertility in the present study area is higher than NFHS 3 survey which reported the prevalence of infertility in Indian women to be 4% (Shireen *et al.,* 1998). According to DLHS survey Karnataka, women who had primary constitute 5.9% of ever married women between 15-49 years (International Institute for Population Sciences, 2007). Study conducted by Paul et al. on prevalence and correlates of primary infertility among young women in Mysore, India showed the prevalence of primary infertility to be 12.2% which is much higher than the prevalence in the present study (Paul *et al.,* 2011).

Socio demographic profile

In the present study couples with primary infertility were common in 20-24 years age group 41. 94% which is almost similar to study conducted by Paul et al in Mysore on prevalence of primary infertility where majority 55.8% were found in this age group (Paul *et al.,* 2011). The highest prevalence of the infertility was among the highly reproductive age group. Primary infertility was found highest 2.11% among Muslims which is different from study conducted by Paul CA et al on prevalence and correlates of primary infertility among young women in Mysore, India where they found prevalence of primary infertility to be maximum among Hindus (Paul *et al.,* 2011). In the present study couples educated till high school had highest prevalence of infertility which is similar to study conducted by Nicole *et al* on consequences of infertility in developing countries where 39% had education till high school (World Health Organization, 1983). With increase in level of education among women, total fertility rate decreases, however, infertility rate increases (Ganguly *et al.,* 2010). In the present study it was found that primary infertility was highest among housewives. Study conducted by Paul et al in Mysore also showed prevalence of primary infertility to be maximum 81% among housewives, the reason to this is most women in the present study area were housewives (Paul *et al.,* 2011). This also contradicts the fact that working women are 20 percent more likely to be infertile compared to non-working women stated in NFHS data (Ganguly *et al.,* 2010).

Factors influencing infertility

In the present study 17.65% of males with primary infertility had diabetes. The association between diabetes and infertility was not found to be statistically significant in the present study but study conducted by Bener *et al.,* 2009 found that there was a significant statistical association between diabetes and the prevalence of male infertility and they have attributed it to the

reason that diabetes can cause retrograde ejaculation and subsequent infertility (Bener *et al.,* 2009). In the present study no association was found between females with diabetes among infertile couples and infertility but study conducted by Ulla Larsen et al showed that odds of diabetes was 4.55 times higher among infertile women (OR=4.55; 95% CI, 1.23-16.83) (Ulla Larsen, 2003). In the present study 6.8% of females with primary infertility had hypertension while in study conducted by Samiha *et al.,* 2006 4.7% of females with primary infertility had hypertension. Similar to the findings of the present study no significant association was found between infertility and diseases like diabetes and hypertension (Samiha *et al.,* 2006). In the present study menstrual irregularity was present in 27.4% of females with primary infertility and significant association was found between menstrual irregulariries and primary infertility while in a study conducted by Samiha *et al.,* 2006 menstrual cycle irregularity was reported among 27.3% of females with primary infertility. Females with menstrual irregularity had a significant higher risk of primary infertility relative to females with regular cycles (Samiha *et al.,* 2006).

In the present study 4.8% of females with primary infertility had endometriosis while in a study conducted by Samiha *et al.,* 2006 showed that 4.7% of females with primary infertility had endometriosis and endometriosis has a significant effect on fertility. (OR=17.6, 95%CI = 1.9-156.0) (Samiha *et al.,* 2006). In the present study 4.8% of females with primary infertility had fibroid uterus. Study conducted by Ulla Larsen et al showed that odds of fibroid was 4.45 times higher among infertile females (OR=4.45; 95% CI, 1.95-10.16) (Ulla Larsen, 2003). 1.7% of females with primary infertility suffered from uterine fibroid according to study conducted by (Samiha *et al.,* 2006). In the present study 42.9% of females with primary infertility had PCOD while in a study conducted by Samiha *et al.,* 2006 showed PCOD was observed in 38.4% of females with primary infertility. In the present study 25.8% of females with primary infertility had abnormal vaginal discharge and the association between abnormal vaginal discharge and infertility was found to be statistically highly significant. Genital infections have significant effect on infertility (Samiha *et al.,* 2006). In the present study conditions associated with female primary infertility most common was pelvic inflammatory disease (42.90%) followed by polycystic ovarian disease (31.00%), hypothyroidism (9.5%), hypertension 7.1%, diabetes (4.8%), endometritis (4.8%) tuberculosis (4.8%) fibroid(4.8%) and others include cervical polyp, haemorrhagic cyst, submucosal fibroid and herpes genitalis. Study conducted by Nathalie Dhont on results of infertility investigations and follow up among 312 infertile women and their partners in Kigali, Rwanda showed 69.9% had tubal pathology due to pelvic inflammatory disease, 9% had fibroid, 3.6% had PCOD, 4.3 % had ovarian cyst and 1.6% had congenital uterine abnormalities, unilateral corneal block was present in 3.7% and bilateral cornual block was present in 10.9% (Dhont *et al.,* 2011). In the present study 21.0% of males and 6.5% of females among couples with primary infertility had family history of infertility. It was observed in the present study that statistically significant association was found between infertility and family history of infertility which is similar to findings of the study done by Samiha *et al.,* 2006 where 23.8% of cases with infertility had reported positive family history and a statistically significant risk association was found (Samiha *et al.,* 2006).

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