

Study on Infertility—Etiology, Medication Therapy Management, and Outcomes at a Tertiary Care Hospital

¹Purvi K Khanuja, ²Juby A Sunny, ³Sunita B Pawar, ⁴Vandana Nimbargi

ABSTRACT

Aim: The aim of the article is to study infertility—etiology, medication therapy management, and outcomes in a tertiary care hospital.

Objectives: The purpose of this study was to compare the outcomes of standard aetiology wise treatment protocols of infertility and the various causes which may be a contributing factor to infertility.

Materials and methods: A prospective observational study was conducted for 6 months at a tertiary care hospital. Couples diagnosed with infertility, aged 18 to 49 years were enrolled in the study. Details like couple's sociodemographic data, etiology, risk factors associated with infertility, management with current medications, procedures, and outcomes were documented using predesigned infertility proforma.

Results: Females had an age group of 19 to 38 years with an average age and standard deviation (SD) of 25.64 ± 4.07 years, whereas male patients had an age of 24 to 43 years with a mean age and SD of 30.59 ± 4.17 years. Primary infertility was 59.13% and secondary infertility 40.86%. In women with infertility, ovulatory disorders were the chief cause, followed by unexplained factor, uterine tubal, and more than one cause, whereas in males semen abnormalities were the major cause of both primary and secondary infertility, followed by unexplained, anatomical, more than one cause. Medical therapy involving drugs like clomiphene, gonadotropins, and a combination was administered to females. Males received lycopene, L-carnitine, ubidecarenone, zinc, and astaxanthin. Intrauterine insemination (IUI) was performed in 28 patients. From the available data of 100 couples undergoing management for infertility in the 6 months study period, 19 patients conceived, i.e., 19% showed conception.

Conclusion: The present study shows etiological and pathological causes of infertility. The study highlights positive results with standard treatments.

Clinical significance: To identify hidden social, medical, pathological, and other confounding causes leading to infertility.

Keywords: Clomiphene, Gonadotropins, Intrauterine insemination, Observational study, Ovulation induction, Primary infertility, Secondary infertility.

How to cite this article: Khanuja PK, Sunny JA, Pawar SB, Nimbargi V. Study on Infertility—Etiology, Medication Therapy Management, and Outcomes at a Tertiary Care Hospital. *Int J Infertil Fetal Med* 2017;8(3):106-112.

Source of support: Nil

Conflict of interest: None

Date of received: 09/07/2017

Date of acceptance: 12/08/2017

Date of publication: November 2017

INTRODUCTION

A dandelion is a universal symbol of fertility—the dozens of seeds released by each flower head represents fertility and abundance. The seeds journey illustrates a time of letting go, of starting something new [World Health Organization (WHO) 2009].¹

We are verbose when expressing bereavement of a parent, child, companion but no language can describe the agony of an absence. For those who want children and are deprived of it, those missing babies linger like tacit transitory voids over their lives. None can describe the touch of a tiny hand, i.e., never held.

Parenthood is irrefutably the most common desired objective and a fundamental event in adulthood where most people have life plans that include offspring. Human subsistence reaches comprehensiveness through a child, therefore, fulfilling the individual's requirement for reproduction associated with the ultimate goals of wholeness, contentment, and family amalgamation. Conversely, not all couples who desire gravidity will achieve one, and a fraction will need medical aid to resolve underlying fertility glitches.² Infertility affects the reasonably large number of couples, i.e., approximately 8 to 10% couples worldwide. The WHO estimates that 60 to 80 million couples worldwide currently suffer from infertility. One in every four couples in developing countries has been found to be infertile.³ Infertility affects one in seven (14%) couples in the UK, and in the US about 10% of women aged 15 to 44, i.e., about 6.1 million women have difficulty getting pregnant or carrying a baby to term.^{4,5} It is a complex multidimensional malady with considerable medical, psychosocial, societal, cultural, and economic problems.

Sterile females are considered a bane to the culture and family. The unawareness about infertility is such that it is

^{1,2}Student, ³Assistant Professor, ⁴Professor

¹⁻³Department of Clinical Pharmacy, Bharati Vidyapeeth Deemed University, Pune, Maharashtra, India

⁴Department of Obstetrics and Gynecology, Bharati Hospital & Research Centre, Bharati Vidyapeeth University Medical College & Hospital, Pune, Maharashtra, India

Corresponding Author: Purvi K Khanuja, Student, Department of Clinical Pharmacy, Bharati Vidyapeeth Deemed University Pune, Maharashtra, India, Phone: +912024368227, e-mail: purvi1993@gmail.com

not unusual to find a male practicing polygamy, in order to continue his progeny.⁶

As the use of infertility medications is on a rise, the pharmacist's role too needs to be considered. The pharmacists can serve as an outstanding source to assist patients with their infertility medication education and counseling and management of any adverse drug reactions in a compassionate atmosphere. They too must be educated about the treatment options, causes, and risk factors that can lead to infertility.⁷

In India where traditionally having children is obligatory in terms of family contentment and many people still think of infertility as a "woman's problem," this problem acquires crucial social practicality.⁴ The present study is an endeavor to expand knowledge and increase the understanding of factors associated with male infertility, risk factors, and social habits causing infertility. To understand the magnitude, there is a need to search for various factors causing male and female infertility. The study also includes various cause-specific treatments given to both male and female partners and outcomes of the treatment in terms of conception.

MATERIALS AND METHODS

A prospective observational study was conducted between September 2015 and February 2016 at infertility outpatient department (OPD) of Bharati Hospital and Research Centre, Pune, India, to identify the etiologies and risk factors associated with infertility, to study the medical therapy, and assess outcomes of the treatment. During this 6-month period, 22,756 patients attended the gynecology OPD; from these 22,756 patients, 240 couples attended the fertility OPD. Out of those 240 couples, 100 consenting couples fulfilling the inclusion criteria were enrolled in the study. Couples diagnosed with either primary or secondary infertility, aged 18 to 49 years were registered. Unmarried, those aged above 49 years, patients recommended *in vitro* fertilization (IVF), and those diagnosed with infertility not willing to avail the treatment were excluded from the study. Ethical approval was obtained for the study from the Institutional Ethics Committee of Bharati Medical College and Research Centre, Pune (Institutional Ethics Committee Reg. No: ECR 518, REF: BV DU/MC/98). Patients' informed consent was taken for the study. The details like couple's sociodemographic data, which included age, gender, annual income, height, weight, body mass index (BMI), educational status, occupation, diagnosis, etiology, past medical, and medication history, along with current medications for management, procedures IUI, and outcomes were documented using a self-predesigned pro forma at the time of each follow-up.

The data gathered were tabulated in Microsoft Excel 2010 and IBM Statistical Package for the Social Sciences version 20 statistical software analyzed by appropriate statistical methods, where SD was calculated for age and p value, McNemar Chi-square test and t-test were applied for comparisons and percentage to evaluate conception rates.

Study Criteria

Inclusion

- Couples diagnosed with infertility and referred to the infertility clinic (outpatient basis)
- Couples aged 18 to 49 years
- Couples diagnosed with primary or secondary infertility.

Exclusion

- Unmarried/single
- Couples recommended and undergoing IVF as setup was not accessible during the study period at the hospital
- Couples diagnosed with infertility but not willing to avail the treatment
- Couples aged above 49 years

RESULTS

In the study duration of 6 months, 100 patients were enrolled, diagnosed with either primary or secondary infertility. The parameters, such as sociodemographic age, BMI, social habits, education, and occupation were calculated using percentages (Table 1), SD, and arithmetic mean evaluation (Table 2). A t-test was used to compare age in males and females with primary and secondary infertility. Mean, SD, and t values were evaluated with no significant difference in age-wise infertility rate (Table 3).

The social habits compared in case of males were alcoholism, tobacco, smoking, and occupational hazards if any and there was no significant effect on fertility rates in our study ($t = -0.65$, $t^* = 1.94$, $p = 0.26$).

Graph 1 compares the percentage of primary and secondary infertility, with primary infertility being greater than secondary infertility. We found the presence of both primary and secondary infertility being higher in females than males where the involvement of both was superior to males, indicating the contribution of both males and females to infertility. Out of the available data of 74 couples, 34 cases have both partners affected simultaneously. Out of the remaining 40 cases, 34 were female-related infertility, hence individual female infertility factor was found to be higher than male counterpart [McNemar chi-square = 18.2, $p < 0.001$, highly significant (HS); Table 4].

Table 1: Sociodemographic data

Patient characteristics	Number of patients	Percentage
Couples	100	
Gender		
Female	100	100.00
Male	73	73.00
Age (in years)		
Female	100	
19–23	33	33.00
24–28	42	42.00
29–33	21	21.00
34–38	04	04.00
Male	69	
24–28	25	36.23
29–33	26	37.68
34–38	14	20.29
39–43	04	05.81
Body mass index		
Female	88	
Normal	45	51.13
Underweight	06	06.82
Overweight	37	42.05
Social habits		
Male	49	
Alcohol	09	18.75
Smoking	01	02.08
Tobacco	10	20.83
Tobacco + alcohol	03	06.25
Smoking + alcohol	01	02.08
Tobacco + alcohol + smoking	00	00.00
No addiction	25	52.08
Education		
Female	33	
Primary (up to 10th)	13	39.39
Secondary (up to 12th)	05	15.15
Graduate	12	36.36
Postgraduate	03	09.09
Illiterate	00	00.00
Male	30	
Primary (up to 10th)	10	33.33
Secondary (up to 12th)	07	23.33
Graduate	07	23.33
Postgraduate	04	13.66
CA	01	03.33
Illiterate	01	03.33
Occupation		
Female	69	
Housewife	40	57.97
Job	21	30.43
Student	02	02.89
Business	06	08.69
Male	67	
Job	44	65.67
Engineer	05	07.46
Business	17	25.37
CA	01	01.49

Table 2: Age wise distribution of study subjects

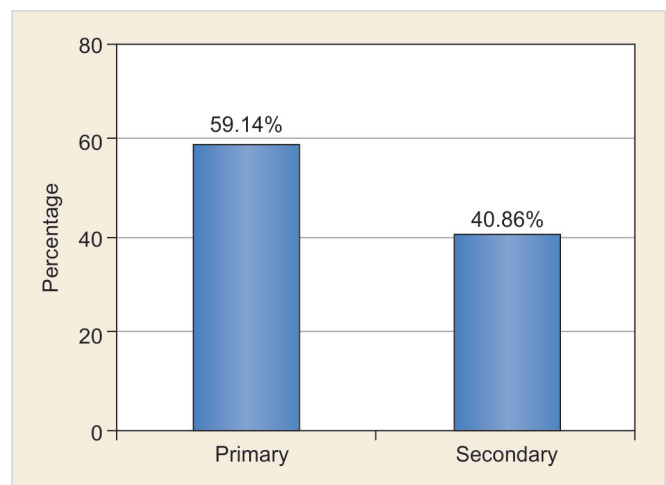
Age and number of patients	Value obtained
Female (100)	
Average age	25.64
Standard deviation	04.03
Male (69)	
Average age	30.57
Standard deviation	04.17

From the age of the couples available, the mean average and standard deviation of both male and female were calculated

Table 3: Comparison of male and female ages in primary and secondary infertility

Group statistics						
Group	n	Mean	Standard deviation	t-value	p-value	
Female age	Primary infertility	27	25.89	3.724	0.253	0.801 NS
	Secondary infertility	73	25.66	4.184		
Male age	Primary infertility	17	29.29	3.424	1.449	0.152 NS
	Secondary infertility	52	30.98	4.372		

H₀: No significant difference in age in primary and secondary infertility; H₁: Significant difference in age in primary and secondary infertility; Result: H₀ is accepted and H₁ is rejected; NS: nonsignificant



Graph 1: Types of infertility

In women with primary infertility, ovulatory disorders [32 (58.18%)] were the commonest cause, followed by uterine factors in 2 (3.64%) and tubal factors in 2 (3.64%), while other factors accounted for 3 (5.45%) and more than one cause in 4 (7.27%) and unexplained infertility in 5 (9.09%).

In males with primary infertility, semen abnormalities were the commonest cause [15 (27.27%)], followed by anatomical conditions [4 (7.27%)] and other factors [3 (5.45%)], each followed by more than one condition [3 (5.45%)] and unexplained infertility in 4 (7.27%).

Table 4: Comparison of male and female infertility

		Female		Total
		N	Y	
Male	N	0	34	34
	Y	6	34	40
Total		6	68	74

H₀: Contribution of male gender in infertility; H₁: Significant contribution of female gender in infertility; Result: McNemar chi-square = 18.2, p < 0.001 HS; H₀ is rejected and H₁ is accepted

Table 5: Female factors: Etiology

Female factors		
Female factor	Number	Percentage
Available	87	
Tubal factors	4	4.59
Uterine factors	6	6.89
Ovulatory disorders	50	57.47
(1) WHO Class I	0	0
(2) WHO Class II	48	96
(3) WHO Class III	2	4
More than one cause	10	11.49
Unexplained	9	10.34
Others	8	9.19

Table 6: Comparison between ovulatory disorders vs nonovulatory disorders

		Female infertility			Total	Chi-square	p-value
			Primary	Secondary			
Abnormality	Nonovulatory	Count	23	22	45	2.514	0.113 NS
		%	41.8	61.1	49.5		
	Ovulatory	Count	32	14	46		
		%	58.2	38.9	50.5		
Total		Count	55	36	91		
		%	100.0	100.0	100.0		

H₀: Nonovulatory disorders contribute majorly in causing primary and infertility; H₁: Ovulatory disorders contribute majorly to cause primary and secondary infertility; Result: H₀ is accepted and H₁ is accepted

In women with secondary infertility, ovulatory disorder was present in 14 (36.84%), followed by uterine factors in 4 (10.52%), tubal factors in 2 (5.36%), and other factors in 5 (13.15%), more than one cause in 5 (13.15%) and unexplained causes in 6 (15.78%). In males with secondary infertility, semen abnormalities accounted for 4 (10.53%), followed by anatomical abnormality [2 (5.26%)], others [2 (5.26%)], and unexplained causes [4 (10.53%)].

Table 5 depicts risk factors and etiology leading to female infertility along with the ovulatory disorder classification.

Table 6 shows a comparison of ovulatory disorders vs nonovulatory disorders in both primary and secondary infertility [chi-square = 2.514, p-value = 0.113,

nonsignificant (NS)], where ovarian anomalies predominated though were statistically insignificant.

Table 7 portrays the risk factors and etiology leading to male infertility, and Table 8 depicts a comparison of seminal vs nonseminal factors in both primary and secondary infertility (chi-square = 1.42, p = 0.233 NS), where seminal abnormalities predominated though were statistically insignificant.

Table 9 indicates medical therapy involving standard drugs that are calculated in percentage. Males received lycopene, L-carnitine, ubidecarenone, zinc, and astaxanthin combination, whereas females were treated with clomiphene, gonadotropins, and combination therapy. Tubal etiologies of infertility were managed by laparoscopic tubal surgery.

Graph 2 indicates IUI performed in different etiologies. Intrauterine insemination was performed in 28 patients.

Table 10 describes different drug therapies administered to the patients. Strategies included clomiphene alone, gonadotropins alone, and combination of clomiphene and gonadotropins. We found no significant superior efficacy of one treatment strategy over the other.

From the available follow-up data of 100 couples undergoing management for infertility in the 6-month study period, 19 patients conceived, i.e., 19% showed positive outcome. Method of conception among the 19 patients was divided into IUI, medication, and surgery and counseling, and the percentage is calculated from the available data (Graph 3).

Table 7: Male factors: Etiology

Male factor	Number	Percentage
Available	73	
Nothing significant	38	52.05
Semen abnormality	21	28.73
(1) Asthenospermia		9.52
(2) Oligozoospermia		23.81
(3) Azoospermia		28.57
(4) Teratozoospermia		4.76
(5) Oligoasthenospermia		23.81
(6) Oligoazoospermia		9.52
Mild varicocele	01	01.37
Erectile dysfunction	02	02.73
Lack of coital activity	05	06.85
Infections	02	02.73
More than one condition	04	05.48

Table 8: Comparison between seminal vs nonseminal causes

			Male infertility			Chi-square	p-value
			Primary	Secondary	Total		
Abnormality	Nonseminal abnormality	Count	30	20	50	1.424	0.233 NS
		%	66.7	83.3	72.5		
	Seminal abnormality	Count	15	4	19		
		%	33.3	16.7	27.5		
Total	Count	45	24	69			
	%	100.0	100.0	100.0			

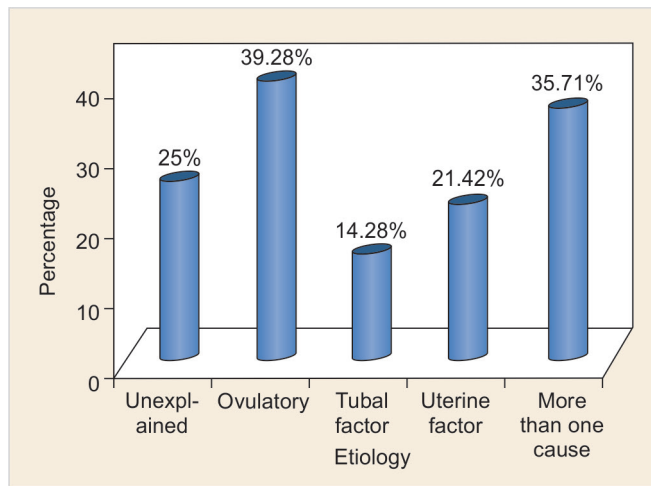
H₀: Nonseminal factors contribute majorly in causing primary and infertility; H₁: Seminal factors contribute majorly to cause primary and secondary infertility; Result: H₀ is accepted and H₁ is accepted

Table 9: Medical therapy

Medical therapy			
Etiology	Clomiphene (%)	Gonadotropins	Clomiphene + gonadotropins
Unexplained	22.58	19.35	16.13
Ovulatory disorders	31.25	15.00	13.00
Uterine factors	0	37.50	50.00

DISCUSSION

The study was carried out at the Fertility Clinic of OBGYN at Bharati Hospital and Research Centre. In our study, 22,756 couples visited the gynecology OPD of Bharati Hospital in 6 months, i.e., from September 2015 to February 2016; from these 22,756 patients, 240 couples visited the infertility OPD. Out of those 240 couples, 100 couples were included in the study. The age of female patients was 19 to 38 years with a mean and SD of 25.64 ± 4.03 years. The males had an age of 24 to 43 years with a mean and SD of 30.57 ± 4.17 years. Higher % of females (42%), i.e., 42, was in the age group 24 to 28 years and 26 (37.68%) males were in the age group of 29 to 33 years. This result is similar to a study conducted by Upadhyay et al, which established that age of female patients was 22 to 40 years with a mean and SD of 28.14 ± 3.78 years. The males had an age of 23 to



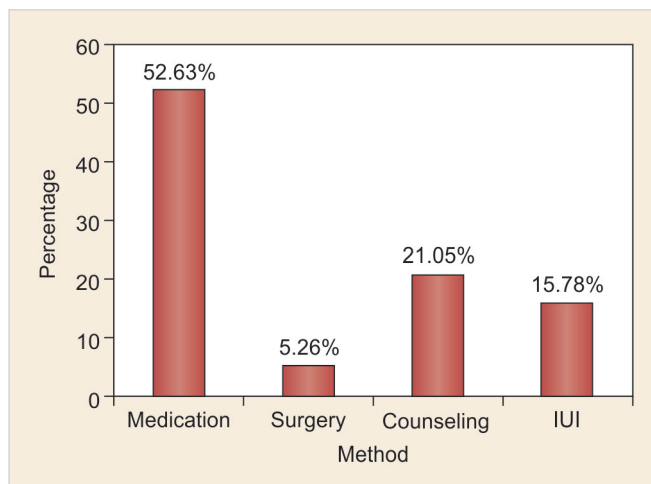
Graph 2: Intrauterine insemination performed for different etiologies

46 years with a mean and SD of 32.74 ± 4.47 years. Higher % of females were from the age group 25 to 29 years (55.2%) and 43% males were in the age group of 30 to 34 years.⁸ Similarly, in the study conducted by Mittal et al, mean age and SD of the wife was 33.19 ± 5.46 years in the age group 22 to 45 years, while husbands' mean age and SD was 37.5 ± 5.82 in the age 24 to 52 years, which is slightly different to our study results.⁴ Results were also comparable to study conducted by Farhi et al.⁹ The study couples had a marital history of 5 months to 12 years.

Table 10: Drug therapy comparison

			Outcome		
			N	Y	Total
Drug therapy	Clomiphene	Count	11	3	14
		% received	78.6	21.4	100.0
	Gonadotropins	Count	7	0	7
		% received	100.0	0	100.0
Clomiphene + gonadotropin	Count	13	2	15	
	% received	86.7	13.3	100.0	
Other	Count	16	4	20	
	% received	80.0	20.0	100.0	
Total	Count	47	9	56	
	% received	83.9	16.1	100.0	

H₀: Single treatment effectiveness H₁: Combination therapy effectiveness; Result: H₀ is accepted and H₁ is accepted



Graph 3: Methods of conception

Incidence of primary infertility was 59.14% and that of secondary infertility was 40.86%, whereas primary infertility was 48.30% and secondary infertility was 27.60% in the study conducted by Upadhyay et al⁸ and when compared with the results by Shamila and Sasikala¹⁰ confirmed the incidence of primary infertility to be 82.48% and secondary infertility to be 17.52%.

Out of 100 male's data on social habits, data of 48 were available in which 9 (18.75%) were alcoholic, 1 (2.08%) was a smoker, 10 (20.83%) consumed tobacco, 3 (6.25%) consumed tobacco plus alcohol, and 1 (2.08%) smoked and consumed alcohol. The present study shows no statistical significance. The study conducted by Samal et al¹¹ confirmed the relationship between consumption of alcohol and smoking with infertility. It was found that addictions like smoking, alcohol, and tobacco chewing, and combinations of these had a detrimental effect on spermatogenesis. Excessive alcohol consumption has been linked to poor reproductive function. Infertility escalates as a result of smoking.

From 100 female's data on BMI, data of 88 females were available where 45 (51.13%) had normal weight, 6 (6.82%) were underweight, and 37 (42.05%) females were overweight. Ovarian dysfunction could be associated with either unwarranted weight loss or excessive weight gain with BMI above 27 kg/m², as explained by Olooto et al.¹² Another study conducted by Manna et al¹³ confirmed 30.89% infertile women were overweight and 6.28% infertile women are underweight comparable to our study results. Obesity proved to be significantly associated with primary infertility in the study conducted by Saoji.¹⁴

Among couples with primary infertility, male factors were responsible in 2 (3.63%), female factors in 31 (56.36%), and both partners were accountable in 22 (40%).

Out of the available data of 74 couples, 34 cases have both partners affected simultaneously. Out of remaining 40 cases, 34 were female-related infertility, hence individual female infertility factor was found to be higher than male counterpart (McNemar chi-square = 18.2, $p < 0.001$ HS).

In women with primary infertility, ovulatory disorders [32 (58.18%)] were the commonest cause followed by uterine factors in 2 (3.64%) and tubal factors in 2 (3.64%), other factors accounted for 3 (5.45%) cases and more than one cause in 4 (7.27%) and unexplained infertility in 5 (9.09%).

In males with primary infertility, the commonest cause is semen abnormality [15 (27.27%)] followed by anatomical conditions [4 (7.27%)] and other factors [3 (5.45%)], each followed by more than one condition [3 (5.45%)] and unexplained infertility in 4 (7.27%).

In women with secondary infertility, ovulatory disorder was present in 14 (36.84%), followed by uterine

factors in 4 (10.52%), tubal factors in 2 (5.36%), and other factors in 5 (13.15%), more than one cause in 5 (13.15%) and unexplained causes in 6 (15.78%). In males with secondary infertility, semen abnormalities accounted for 4 (10.53%), followed by anatomical abnormality [2 (5.26%)] and others [2 (5.26%)] and unexplained causes [4 (10.53%)].

A study conducted by Shamila and Sasikala¹⁰ on risk factors affecting female infertility in South Indian districts of Tamil Nadu and Kerala reports a positive correlation between infertility and menstrual irregularity. Similarly, a study conducted by Upadhyay et al⁸ too confirmed ovulatory disorders as a significant cause of infertility, which is comparable to our study.

Whereas the study results of Mittal et al reported ovulatory disorder as the commonest cause, followed by tubal blockage in females with primary infertility, i.e., 43 (15.75%) and 31 (11.36%) respectively, it was observed that tubal blockage and pelvic inflammatory disease lead to secondary infertility in approximately 20% couples.³

A study by Samal et al¹¹ distributed cases according to semen analysis reports and type of infertility and showed in case of primary infertility, 1,005 (54.03%), 617 (33.17%), 184 (9.89%), 34 (1.83%), and 20 (1.08%) were normozoospermic, oligospermic, azoospermia, asthenozoospermia, and teratoasthenozoospermic respectively. In cases of secondary infertility, 795 (76.15%), 229 (21.93%), 12 (1.15%), and 8 (0.77%) were normozoospermic, oligospermic, azoospermic, and asthenozoospermic respectively. Teratoasthenozoospermia was not found in secondary infertility during the study.

The IUI was performed in 28 patients.

- *Couples with unexplained infertility*: 7 out of 13 cases—25%
- *Couples with ovulatory disorder*: 11 out of 50 cases—39.28%
- *Couples with tubal factor*: 4 out of 4 cases—14.28%
- *Couples with uterine factors*: 2 out of 6 cases—21.42%
- *Couples with other etiology*: 4 out of 10 cases—35.71%

From the available follow-up data of 100 couples undergoing management for infertility in the 6-month study period, 19 patients conceived, i.e., 19% showed positive outcome (conception). The method of conception among the 19 patients was divided into IUI, medication, and surgery and counseling and the percentage is calculated from available data.

- 4 (21.05%) conceived by IUI
- 10 (52.63%) by medications
- 1 (5.26%) by surgery
- 4 (21.05%) by counseling spontaneously.

Eleven female patients conceived by IUI after undergoing ovulation induction with clomiphene citrate, while 5 female patients conceived by ovulation induction only

without IUI in the study conducted by Upadhyay et al⁸ similar to our study.

Tubal Factors (4 cases)

Surgery (laparoscopy/laparotomy/adenosynchiolysis) was performed in these cases to restore the tubal patency once tubal blockage was confirmed by hysterosalpingogram and ultrasonography, and fertility was restored.

LIMITATIONS

- The sample size being small may not be adequate to reflect the exact scenario.
- Couples undergoing IVF were not included as IVF setup was not accessible during the study period at the hospital.
- Further studies with a large sample size and for a longer duration to assess patients on a long-term basis must be carried out for accurate results.
- Consideration of pharmacoeconomic aspects as infertility treatment is exorbitant.

CONCLUSION

The risk factors associated with infertility in females were increased BMI (obesity) and those in males were addiction to smoking, alcohol, and tobacco. Our study found no statistical significance pertaining to the above-mentioned risk factors in males and females. Primary infertility was high as compared with secondary infertility. Among the etiologies, the ovulatory disorders were most common followed by unexplained, tubal, and uterine factors. Male factors account for almost half of the cases where sperm abnormalities were a common cause.

The medications used in the study were ovulation induction medications, i.e., clomiphene, gonadotropins, and combination of clomiphene and gonadotropins, whereas males were prescribed lycopene for semen abnormalities.

Conception rates in the study were 19%. This included ovulation induction medications, IUI, and counseling. All aspects relating to the cause, risk factors, management, and outcomes are therefore, addressed in the study.

ACKNOWLEDGMENTS

Authors thank their parents for supporting them through the tough days of their lives. They would like to thank Dr Vandana Nimbargi, Professor, Department of Obstetrics and Gynecology, Bharati Hospital and Research Centre, Pune, Maharashtra, India, for her guidance. They also

thank Mrs. Sunita Pawar, Assistant Professor, Department of Clinical Pharmacy, Poona College of Pharmacy for her warm encouragement. Authors give special thanks to sister nurse Anuradha of the Infertility clinic for her extensive help.

REFERENCES

1. Infertility treatments for women—a review of biomedical evidence full report. The Women's Health Council. Available from http://health.gov.ie/wpcontent/uploads/2014/03/infertBiomedEvid_Summary.pdf
2. Bovin J, Bunting L, Collins JA, Nygren KG. International estimates of infertility prevalence and treatment seeking: potential need and demand for infertility medical care. *IJIMS* 2007 Jun;22(6):1506-1512.
3. Mittal A, Yadav S, Yadav SS, Bhardwaj A, Kaur R, Singh P, et al. An epidemiological study of infertility among urban population of Ambala, Haryana. *IJIMS* 2015;2(4):124-130.
4. National Institute for Health and Care Excellence (NICE). Assessment and treatment for people with fertility problems [Online]; 2013. Available from: <http://www.nice.org.uk/guidance/cg156>
5. Chandra A, Copen CE, National Centre for Health Statistics; Stephen EH. Infertility and impaired fecundity in the United States, 1982–2010: data from the national survey of family growth. *Natl Health Stat Report* 2013 Aug;(67):1-20.
6. Manna N, Pandit D, Biswas S. Infertility and related factors: an experience from a rural community of West Bengal India. *Indian J Prev Soc Med* 2014;45(1-2):30-34.
7. Barnes M and Wiemer D. (2015). Available from <https://www.uspharmacist.com/ce/therapeutic-management-of-infertility-a> (Accessed 30 Sep. 2015).
8. Upadhyay N, Shakya R, Shrivastava U, Paudel P. A study on management of anovulatory infertility in urban Nepalese population. *World J Pharm Sci* 2015;3(5):840-845.
9. Farhi J, Ben-Haroush A. Distribution of causes of infertility in patients attending primary fertility clinics in Israel. *IMAJ* 2011 Jan;13(1):51-54.
10. Shamila S, Sasikala SL. Primary report on risk factors affecting female infertility in South Indian districts of Tamil Nadu and Kerala. *Indian J Commun Med* 2011 Jan-Mar;36(1):59-61.
11. Samal S, Dhadwe K, Gupta NK, Gupta U. Epidemiological study of male infertility. *Indian Med Gazette* 2012 May;146(5):174-180.
12. Olooto and Eniola W. Infertility in male; risk factors, causes and management—a review. *J Microbiol Biotech Res* 2012;2(4):641-645.
13. Manna N, Pandit D, Bhattacharya R, Biswas S. A community based study on infertility and associated socio-demographic factors in West Bengal, India. *IOSR-JMDS* 2014 Feb;13(2):13-17.
14. Shamila S, Sasikala S. Primary Report on the Risk Factors Affecting Female Infertility in South Indian Districts of Tamil Nadu and Kerala. Vol. 36, Indian journal of community medicine: official publication of Indian Association of Preventive & Social Medicine. 2011. pp. 59-61.