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## Etiology of infertility among women undergoing *in vitro* fertilization treatment

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### Abstract

Infertility is a prevalent condition impacting many women globally, prompting an increasing number to seek assisted reproductive technologies such as *in vitro* fertilization (IVF). This study aims to investigate the etiological factors of infertility among women undergoing IVF treatment. Through snowball sampling 142 women (i.e., 74 from Telangana and 68 from Karnataka regions) with *in vitro* fertilization treatment recruited from fertility care centres located at Telangana and Karnataka states. A self-structured questionnaire to obtain demographic details and Socio-economic scale to assess socio economic status were the tools used. The clinical measures retrieved from secondary medical records to identify causes. The findings reveal that majority of participants are with 30-39 age range, married at 25-29 years, possessed higher education as well as decent occupation with high and upper middle socio-economic status. The findings reveal that the major causes for infertility among women with *in vitro* fertilization were female factors such as ovulatory (58.45%) and tubal problems (16.19%), followed by male factors such as hormonal imbalance (21.12%) and varicocele (14.78%), unknown (20.42%) and mixed (19.01%). These insights emphasize the need for a personalized approach in infertility treatment, considering the diverse etiological factors and associated risks. By understanding these elements, healthcare providers can better tailor interventions, improve IVF outcomes, and offer more targeted advice to women seeking fertility treatment.

**Keywords:** Infertility, *in vitro* fertilization, etiology, fertility care

### Introduction

Infertility is a global issue affecting millions of people, it also impacts individuals, their families and communities. According to the World Health Organization (2023), it 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 and secondary infertility are the two categories of infertility. Women who are considered primary infertile are those who have never given birth. There is at least one conception in secondary infertility, but it does not result in further conceptions. An estimated one in six individuals globally who are of reproductive age will become infertile at some point in their lives (WHO, 2023). The World Health Organization (WHO, 2020) [4] estimates that 80 million people worldwide suffer from infertility. In their lifetime, 10 to 15 percent of couples experience it. When it comes to infertility, the prevalence is considerable (up to 21.9%): 3.5 percent for main infertility and 18.4 percent for secondary infertility. It is widely acknowledged that inaccurate estimates of infertility rates exist.

Potential obstacles to determining the prevalence include suboptimal methods of measurement and unidentified forms of infertility stemming from cultural prejudices (Hazlina *et al.* 2022) [6]. As a result, fertility care includes assisted reproductive technologies as well as the diagnosis, prevention, and treatment of infertility (WHO, 2020) [4].

One form of assisted reproduction that puts a financial, psychological, emotional, and physical strain on women, their partners, and their families is *in vitro* fertilization. The term *in vitro* fertilization defined as a "method of assisted reproduction that involves combining an egg with sperm in a laboratory dish". The developing embryo is placed into the woman's uterus where it is hoped to implant in the uterine lining and continue to grow if the egg fertilizes and starts cell division. According to the American Society for Reproductive Medicine, IVF, which avoids the fallopian tubes, is typically the treatment option for women who have severely damaged or missing tubes (ASRM, 2022) [3].

In earlier times, gonorrhoea and other STDs were the main causes of infertility; however, in the present day, stress, male factor, and other factors have taken their place. Nevertheless, despite all of our efforts, a sizable percentage of infertility remains unexplained. Consequently, the goal of the current study is to determine the aetiology of infertility in women undergoing *in vitro* fertilization.

**Objective:** To explore the causes of infertility among women undergoing *in vitro* fertilization.

## Materials and Methods

### Study design

An exploratory and descriptive study was conducted during 2022-2024.

### Participants

The study comprises of N=142 women with *in vitro* fertilization treatment recruited from fertility care centres located at Telangana (74) and Karnataka (68) regions recruited through snowball sampling method.

## Tools used for the study

**Self-structured questionnaire:** To elicit demographic profile of the participants a self-structured questionnaire was designed. It includes age of the participant, age of the spouse, age at marriage, type of marriage, education, occupation and family type included in demographic profile. In addition, clinical measures retrieved from secondary medical records to identify causes.

**Socio-Economic Status (SES) Scale:** To assess education, occupation, monthly per capital income from all sources, family possessions, possession of agricultural land and non-agricultural land and social status of the family. Higher the score indicates high socio economic status.

## Statistical analysis

Frequency and percentages were employed for descriptive analysis of data by using IBM SPSS statistic 27 software.

## Results and Discussion

**Table 1:** Socio demographic characteristics of the study sample (N=142)

Socio demographic characteristics		n	(%)
Age of the participant	25-29	39	27.46
	30-34	55	38.73
	35-39	48	33.80
Age of the spouse	30-34	38	26.76
	35-39	63	44.36
	40-45	41	28.87
Age at marriage	20-24	41	28.87
	25-29	91	64.08
	30-34	10	7.04
Type of marriage	Consanguineous	33	23.23
	Non consanguineous	109	76.76
Education	Professional degree	75	52.81
	Post graduation	11	7.74
	Graduation	56	39.43
Occupation	Works in central/state/public sector	31	21.83
	Service in private sector	70	49.29
	Business/ house wife	41	28.87
Family type	Nuclear family	98	69.01
	Joint family	44	30.98
SES	Upper High	-	-
	High	76	53.52
	Upper Middle	66	46.48
	Lower middle	-	-
	Poor	-	-
	Very poor (Below Poverty Line)	-	-

Table 1 presents socio demographic characteristics of the study participants. Most of the participants were in age range of 30-34 (38.73%) and 35-39 (33.80%) years, only 27.46 percent were in 25-29 years of age. Similarly, with respect to spouse age majority are in 35-39 (44.36%) years of age, followed by 40-45 (28.87%) and 30-34 (26.76%) years of age. With respect to age at marriage more than half reported that they had marriage at 25-29 (64.08%) years of age, 28.87 percent had at 20-24 years of and a very least percent (i.e., 7.04%) had at 30-34 years of marriage. While type of marriage is concerned 76.76 percent women said non consanguineous type of marriage and remaining were

with consanguineous marriage (23.23%). With regards to education 52.81 per had professional qualification, 39.43 percent had graduation and 7.74 percent had post-graduation level of education. Almost half of the participants were occupied in private sector (49.29%), followed by self-employed/house wife (23.23%), service at central/state/public (21.83%) and with business (5.63%). Majority were from nuclear families (69.01%) and 30.98 percent from joint family. The participants were with high (53.52%) and upper middle (46.48%) socio-economic status.

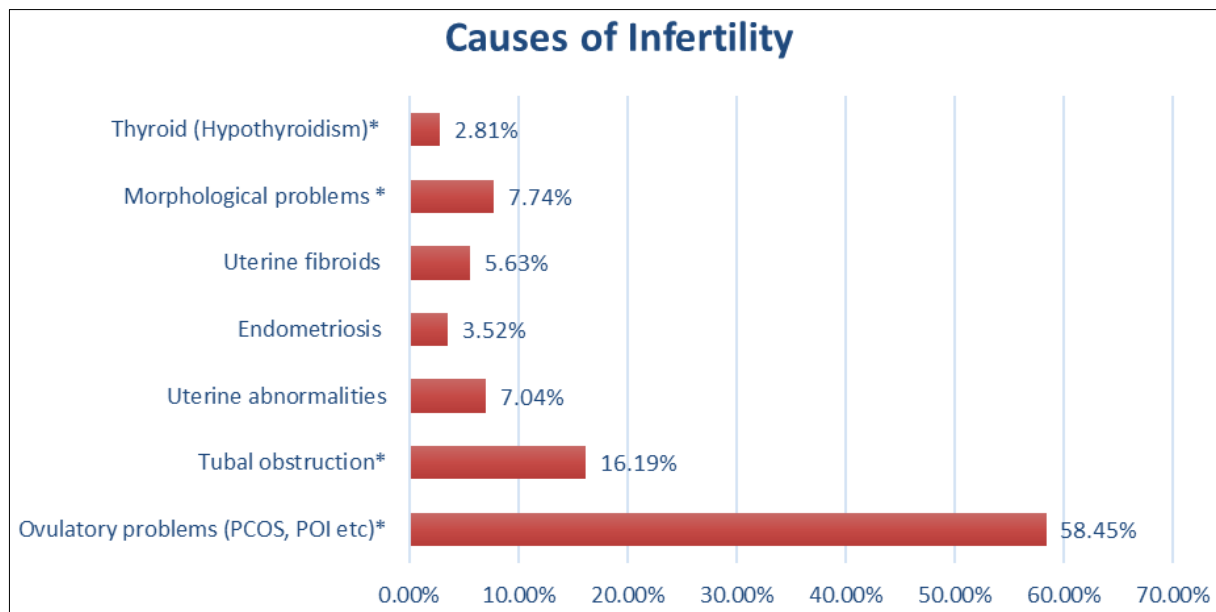
**Table 2:** Causes of infertility among women undergoing IVF

Causes of infertility		n	%
Female causes*	Ovulatory problems (PCOS, POI etc)	83	58.45
	Tubal obstruction	23	16.19
	Uterine abnormalities	10	7.04
	Endometriosis	5	3.52
	Uterine fibroids	8	5.63
	Morphological problems	11	7.74
	Hypothyroidism	4	2.81
Male causes*	Varicocele	21	14.78
	Infections	12	8.45
	Hormone imbalance	30	21.12
Mixed causes*		27	19.01
Unknown causes		29	20.42

\*Multiple responses

The causes of infertility among women undergoing *in vitro* fertilization denoted in table 2. Majority of the causes were female related, followed by male causes, unknown (20.42%), mixed (19.01%). In female related causal factors (Fig.1) were ovulatory problems like PCOS, POI etc (58.45%), tubal obstruction (16.19%), morphological problems (7.74%), uterine abnormalities (7.04%), uterine fibroids (5.63%), endometriosis (3.52%) and hypothyroidism (2.81%). With respect to male related causal factors, majority of participants reported hormonal imbalance (21.12%), varicocele (14.78%) and infections

(8.45%). With critical scientific review of literature, the most of studies report similar causal factors for infertility among women undergoing *in vitro* fertilization. In Magdum *et al.* (2022) [7] study also ovulation failure was the major cause of infertility (35.1%) and unknown factors (30.6%). Similarly, in an observational study by Deshpande and Gupta (2019) [5] the female factor, such as polycystic ovarian syndrome (PCOS) was identified as leading cause of infertility. Especially with respect to tubal factors, the pelvic inflammatory disease attributed as associated risk factors with infertility among women attending tertiary hospital.



**Fig 1:** Percentage distribution of female causes of infertility in women with IVF

**Conclusion**

The etiology of infertility among women undergoing *in vitro* fertilization (IVF) treatment is complex and multifactorial, encompassing a range of medical and demographic factors. The present study has identified ovulatory disorders and tubal factors as the predominant causes of infertility, with significant contributions from conditions like male factors, unknown infertility factors and mixed factors. Therefore, personalized and holistic approach to infertility treatment is recommended by addressing the specific etiological factors which were unique to each patient. Advancements in understanding the underlying mechanisms of infertility will be pivotal in developing more effective and individualized

treatment plans, ultimately aiding more women in achieving successful pregnancies through IVF.

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