INTRODUCTION

Infertility being a worldwide health issue affects about 8–10% couples globally [1,2]. According to the World Health Organization (WHO), it was estimated that 60–80 million couples all over the world currently suffer from infertility [3]. Infertility is not only an issue of physical well-being but also a matter of social discrimination and disparity. Infertility can have a grave impact on both the psychological and the social welfare of women in the developing world, as they grieve physical and mental abuse, neglect, desertion, economic deprivation, and social isolation as well as prohibition from certain social activities and traditional ceremonies [4].

The WHO defines primary infertility as the "inability to conceive within 2 years of exposure to pregnancy" (i.e., sexually active, non-contracepting, and non-lactating) among women 15–49 years old. Secondary infertility refers to the inability to conceive following a previous pregnancy. Globally, primary infertility is more predominant [5].

Diagnostic assessment of infertility is done when pregnancy has not been achieved within 1 year of regular noncontraceptive intercourse, by which time 85–90% of couples attempting conception should be successful [6]. Since infertility is not a life-threatening condition, it has not given a due attention in India. Infertility has an extensive range of reasons stemming from three general sources: Physiological dysfunctions, preventable causes, and unexplained matters. The biological and social factors such as stress due to financial status, religious beliefs, age at marriage, higher literacy, contraceptive usage, and nuclear families play an important part in lowering fertility [7]. Sexually transmitted infections are one of the chief preventable causes of infertility worldwide, especially in developing countries [8]. Anatomical, genetic, hormonal, and immunological problems also contribute to infertility [9]. Physiological causes of female infertility (FI) include: Ovulatory dysfunction, congenital malformation, tubal blockage, and endometriosis. The etiology of infertility in males is less understood, though the causes of infertility are anatomical flaws, ejaculatory failures, endocrinopathies, chemotherapy, immunologic problems, gene mutation, radiation, and environmental threats [10].

After a thorough evaluation, the majority of the infertile couples does receive a firm diagnosis. The management of infertility extends from the use of drugs to use of techniques like in vitro fertilization (IVF).

TREATMENT FOR MALE INFERTILITY (MI)

Dopamine agonists can be beneficial in patients with hyperprolactinemia [11]. Erectile dysfunction should be treated if indicated [12]. If block or a varicocele is diagnosed to be concomitant
with seminal fluid abnormalities, surgical treatment can be pursued. Injection gonadotropin, intrauterine insemination (IUI), and IVF with or without sperm injection, using testicular sperm extraction, can be the options for management, based on the causes [13].

**Treatment for FI**

Underlying etiology of abnormal ovulation, such as thyroid dysfunction, should be corrected.

Insulin-sensitizing agents, metformin can increase ovulation and conception rates in patients with polycystic ovary syndrome (PCOS) [14]. If the drug treatment failed, laparoscopic ovarian drilling can be another choice for patients with PCOS. Tubal reparative surgery can be the treatment option for tubal disease [15]. IVF is an alternative choice, mainly in case of distinctly damaged tubes [16]. Laparoscopic ablation or laparotomy can be used in treating endometriosis, based on the condition of the disease. Treatment strategies for unexplained infertility are clomiphene citrate, IUI, and IUI with clomiphene citrate or gonadotropin therapy.

**METHODS**

This prospective study was performed in a tertiary care hospital in Erode, within a period of 6 months, in 200 infertile couples who were undergoing treatment. The study included males of age above 18 years of age and females aged between 18 and 49 years, patients with comorbidities, and the study excluded surrogate women, postmenopausal women, non-adherence of treatment, and unmarried women seeking child.

**RESULTS**

Among 200 infertility cases collected, 26% were male factor, 45.5% female factor, 25.5% due to both gender factors, and 6% with unexplained factor. It was observed that 76 (51.35%) females were in the age group of 20–29 years and 76 (69.72%) males in the age group of 30–39 years. 181 (90.5%) were primary infertility, and 19 (9.5%) were secondary infertility. It was found that 53.5% of the couples suffered from infertility for <5 years. It was observed that 38.52% of the males and 51.31% of the females are of blood group O. It is found that 64.86% of males and 68.80% of the females belonged to normal body mass index (BMI) (18.5–25). 61.49% of infertile men were smokers, and 38.53% were non-smokers. 39% of males and 34% of the females had high school education, and all males and 89.5% of the females were employed. It was observed that the most common comorbid disease found in FI was polycystic ovarian syndrome (24.5%). It was followed by menstrual problems (24%), hypothyroidism (7.5%), fibroid (4%), diabetes mellitus (3.5%), endometriosis (3%), uterine polyps (1.5%), adenomyosis (1.5%), UTS (0.5%), appendicitis (0.5%), and tuberculosis (0.5%). The comorbid disease found in MI was found to be varicoceles (6%) and hernia (0.5%), and then, 19.5% of patients were without any comorbidities. 51.5% of couples had positive toward assisted reproductive treatment (ART) and 48.5% of the couples had a negative attitude toward ART. IUI (36.5%) was found to be the most commonly used assisted reproductive technology. The findings on the causes of male and FI are shown in Figs. 1 and 2, respectively. Our study showed that the most prescribed drug for MI was antioxidants and for progesterone for FI (Tables 1 and 2). It was observed that, of 200 infertile couples, 72 (36%) were unable to conceive after 6 months following the first consultation, 57 (28.5%) were unable to conceive within 6 months following the first consultation, 44 (22%) defaulted, lost follow-up, or were still under consultation, 13 (6.5%) were pregnant with the help of ART, 10 (5%) were pregnant with the help of drug treatment, and 4 (2%) had spontaneous pregnancy.

**DISCUSSION**

In this study, the higher occurrence of female factor infertility could be due to the vital role played by females in the process of reproduction and the complex anatomical structure. Adamson et al., [8] in their study on the prevalence and correlates of primary infertility among young women in Mysore, India, found that the mean age of women with infertility was 25.9 ± 3.12 year. The semen analysis reports in the study performed by Samal et al. [17] revealed that those in the age group of 31–40 years were mostly affected. Although patient’s age is said to affect their fertility, our study does not establish a definite relationship in patient’s age and infertility, as most of the couples fit into the reproductive age group which does not expressively affect their fertility. The higher incidence of primary infertility observed in our

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**Figure 1: Causes of infertility in male**

| Causes          | Percentage of males |
|-----------------|---------------------|
| OATS            | 48.42               |
| Asthenozoospermia| 5.26                |
| Oligozoospermia  | 17.89               |
| Azoospermia     | 2.1                 |
| Terminally Ova. | 11.57               |
| Aspermia        | 7.36                |
| Varicocele      | 1.05                |
| Non-spermic     | 1.05                |
| Normal          | 2.1                 |
| Others          | 3.15                |
study is comparable with the study on the prevalence and correlates of primary infertility among young women in Mysore, India, conducted by Paul et al. [8]. Higher the extent of infertility, lesser number was found to approach the health-care facility for treatment seeking. This might be due to the influence of sociocultural factors in different regions of the country as well as the fact that couples present first to general practitioners before seeking specialist care and also wait passively or seek unorthodox care. Khan et al. [18] found that most of the infertile men belonged to blood group O (35.5%), and Huda [19] found that most of the infertile females belonged to the blood group O (41.6%). This finding can be accredited to the fact that women with blood group O have a lesser ovarian reserve and follicle-stimulating hormone (FSH) count above 10, which is indicative of infertility. A study conducted by Shanthakumari et al. [20] stated that the BMI showed a few women (10%) were underweight, some women (83%) were obese, and most of the women (26.7%) had overweight, whereas women (55%) had normal body weight. This might be due to the fact that the estrogen produced by the fat cells, along with that naturally synthesized in the body, is misinterpreted by the body as a birth control signal, which results in failure to achieve pregnancy. Total sperm count was found to be inversely related to BMI in crude analyses. BMI was also linked to sex hormone-binding globulin, lower serum levels of total testosterone and inhibin B, and higher serum levels of estradiol. In addition, FSH levels and the testosterone:luteinizing hormone (LH) ratio were considerably lower among obese men (BMI R35 kg/m$^2$) [21]. Effects of smoking, a lifestyle hazard for both active and passive smokers, on fertility status have been less documented. The sperm abnormality is caused by the potential hazardous chemicals present in cigarette smoke which...
Many of the couples had a positive approach toward ART due to high education, socioeconomic factors. A similar observation was found by Olugbenga et al. [22] in which 76.8% of the couples had a positive attitude toward ART. The reason behind the negative attitude toward ART could be lack of proper awareness regarding the assisted reproductive technologies, inability to afford the treatment expenses, and certain religious aspects. The precise reason for the reduction in semen quality is not well understood, but it might be due to environmental nutritional, and socioeconomic or other unknown causes [23-25]. PCOS is the major cause of infertility, with a wide spectrum of symptoms and clinical and biological manifestations, menstrual irregularities, obesity, and hirsutism. Several factors such as sedentary lifestyle, family history, and hormonal imbalance actively cause PCOS. Numerous antioxidants nutrients such as coenzyme Q10, vitamin C, vitamin E, and glutathione affects the chromosomes. A similar observation was found by Nadeem et al. [13], in which 66.7% of smokers showed below 5% sperm motility and 74.1% showed below 3% normal sperm morphology. We did not see any significant relation between infertility and the educational status of the patients.

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### Table 1: Treatment for males

| Male factors of infertility | Treatment                  | Number of patients receiving treatment (%) |
|----------------------------|----------------------------|---------------------------------------------|
| OATS (n=46)                | Progesterone 29 (63.0)     |                                             |
|                            | Vitamins 31 (67.3)         |                                             |
|                            | Antioxidants 11 (23.9)     |                                             |
|                            | Hormonal treatment 28 (60.8) |                                             |
|                            | Gonadotropin 05 (10.8)    |                                             |
|                            | Antibiotics 05 (10.8)      |                                             |
|                            | Dopamine agonists 01 (2.2) |                                             |
| Asthenozoospermia (n=18)   | Dopamine agonist 03 (16.6) |                                             |
|                            | Antioxidants 09 (50)       |                                             |
|                            | Hormonal therapy 18 (100) |                                             |
|                            | Progesterone 16 (88.8)    |                                             |
|                            | Antibiotics 10 (55.5)      |                                             |
|                            | Vitamins 18 (100)         |                                             |
|                            | Gonadotropin 05 (27.7)    |                                             |
| Oligospermia (n=2)         | Aromatase inhibitors 02 (100) |                            |
| Erectile dysfunction (n=8) | Vitamins 07 (87.5)         |                                             |
|                            | Phosphodiesterase inhibitors 01 (12.5) |                                             |
|                            | Progesterone 07 (87.5)     |                                             |
|                            | Antioxidants 06 (75)       |                                             |
|                            | Gonadotropin therapy 07 (87.5) |                                          |
|                            | Hormonal treatment 04 (50) |                                             |
| Oligoasthenozoospermia (n=5) | Aromatase inhibitors 02 (40) |                                          |
|                            | Hormonal therapy 03 (60)  |                                             |
|                            | Antioxidants 04 (80)       |                                             |
|                            | Vitamins 03 (60)          |                                             |
|                            | Progesterone 03 (60)       |                                             |
| Azoospermia (n=11)         | Progesterone 09 (81.8)     |                                             |
|                            | Gonadotropin 08 (72.7)     |                                             |
|                            | Vitamin 11 (100)          |                                             |
|                            | Antibiotics 02 (18.1)      |                                             |
| Varicocele (n=3)           | Dopamine receptor agonist 01 (33.3) |                      |
|                            | Varicocelectomy 02 (66.6)  |                                             |
| Necrozooospermia (n=2)      | Progesterone 01 (50)       |                                             |
|                            | Vitamins 02 (100)         |                                             |
|                            | Dopamine 01 (50)          |                                             |
|                            | Hormonal therapy 02 (100) |                                             |
| Asthenoteratozoospermia (n=1) | Antioxidants 01 (100) |                                             |

### Table 2: Treatment regimen for female infertility

| Female factors of infertility | Treatment                  | Number of patients receiving treatment (%) |
|-------------------------------|----------------------------|---------------------------------------------|
| Unexplained factors (n=12)    | Hormonal problems 20 (83.3) |                                             |
|                               | Progesterone (n=24) 14 (58.3) |                            |
|                               | Aromatase inhibitor 08 (33.3) |                                          |
|                               | Ovulation inducers 14 (58.3) |                                             |
|                               | Vitamin supplements 15 (62.5) |                                             |
|                               | Gonadotropin therapy 09 (37.5) |                                          |
|                               | Dopamine agonist 08 (33.3) |                                             |
| Ovulation failure (n=3)       | Tubular block 03 (15.7)     |                                             |
|                               | Antioxidant 12 (63.1)       |                                             |
|                               | Progesterone 03 (15.7)      |                                             |
|                               | Gonadotropin therapy 07 (36.8) |                                        |
|                               | Hormonal treatment 15 (78.9) |                                             |
|                               | Vitamins 02 (10.5)          |                                             |
| PCOD failure (n=57)           | Progesterone 39 (66.1)      |                                             |
|                               | Hormonal therapy 39 (66.1)  |                                             |
|                               | Vitamins 45 (76.2)          |                                             |
|                               | Antidiabetic drugs 16 (27.1) |                                             |
|                               | Antioxidants 03 (5.0)       |                                             |
|                               | Ovarian drilling 05 (8.4)   |                                             |
|                               | Aromatase inhibitors 19 (32.2) |                                        |
|                               | Gonadotropin therapy 15 (25.4) |                                    |
|                               | Fibroid 02 (40)            |                                             |
|                               | Progesterone 04 (80)       |                                             |
|                               | Vitamin 05 (100)          |                                             |
|                               | Ovulation inducers 02 (40)  |                                             |
|                               | Hormonal therapy 04 (80)   |                                             |
|                               | Dopamine agonists 01 (20)  |                                             |
| Endometriosis (n=6)           | Thyroid problems 03 (27.2)  |                                             |
|                               | Progesterone (n=12) 07 (63.6) |                            |
|                               | Antithyroid drugs 04 (36.3) |                                             |
|                               | Hormonal therapy 06 (54.5)  |                                             |
|                               | Vitamins 06 (54.5)         |                                             |
|                               | Ovulation disorder 02 (18.1)|                                             |
|                               | Progesterone 09 (90)       |                                             |
|                               | Vitamins 07 (70)          |                                             |
|                               | Hormonal therapy 06 (60)   |                                             |
|                               | Gonadotropin therapy 02 (20)|                                             |
|                               | Aromatase inhibitor 02 (20) |                                             |
|                               | Ovulation inducers 02 (28.5)|                                             |
|                               | Progesterone 05 (71.4)     |                                             |
|                               | Cyst (n=12) 10 (83.3)      |                                             |
|                               | Hormonal therapy 12 (100)  |                                             |
|                               | Vitamins 12 (100)         |                                             |
|                               | Dopamine agonist 01 (8.3)  |                                             |
|                               | Gonadotropin therapy 02 (16.6) |                            |
|                               | Aromatase inhibitors 01 (33.3)|                                         |
|                               | Vitamins 01 (33.3)        |                                             |
|                               | Hormonal therapy 02 (66.6)  |                                             |
|                               | Aromatase inhibitors 03 (100)|                                           |
|                               | Unexplained factors (n=12) |                                             |
|                               | Progesterone 10 (83.3)     |                                             |
|                               | Vitamins 10 (83.3)        |                                             |
|                               | Hormonal therapy 04 (33.3)  |                                             |
|                               | Ovulation inducers 04 (33.3) |                                         |
have been acknowledged in several studies as having modulatory effects on sperm parameters. The importance of antioxidants in treating male subfertility continues to be questioned. Although there is enough evidence on high oxidative stress and low antioxidant capacity in the seminal plasma, there is little high-quality evidence in substantiating the use of antioxidants in the treatment of infertile men with abnormal semen parameters, including azoospermia [26]. Progesterone is prescribed in women treated with ovulation inducers or going through IVF procedure. The progesterone supplements are required to condense the uterine lining and prepare the body to support the embryo, so the embryo will successfully embed and grow. Compared to IVF/intracytoplasmic sperm injection methods, IUI is easy to execute, less expensive, and has particular advantages such as the minimal equipment required, easy to learn, being less invasive with a reduced psychological burden on the couple. Subsequently, IUI has a good couple adherence (low drop-out rate), a low risk for ovarian hyperstimulation syndrome, and a low rate of multiple pregnancy in natural cycles and clomiphene citrate or low-dose human menopausal gonadotrophins ovarian stimulation protocols [27].

AUTHORS CONTRIBUTION
All the authors have made substantial contribution to conception, design, data collection, analysis and interpretation of data. SSR: developing the concept and final approval, KK: contributed in manuscript overview AB, AAV, CJ: data collection and manuscript writing.

CONFLICTS OF INTEREST
To the best of our knowledge, there are no conflicts of interest exists.

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