1. INTRODUCTION

The World Health Organization (WHO) estimates that 60 to 80 million couples worldwide suffer from infertility\(^1\). Infertility is a global health issue, affecting approximately 8 - 10% of couples worldwide\(^2,3\). Fertility problems affect one in seven couples in the UK\(^4\). In Sweden, approximately 10% of couples are infertile\(^5\). According to the Global perspective of infertility in the general population, infertility affects 7 – 8% of all couples; in Europe the prevalence of infertility has been estimated at around 14%; women of 30 years of age or younger, the probability of pregnancy has been decreased to about 40% \(^6\). On a worldwide scale, this means that 50-80 million people suffer from infertility. However, the incidence of infertility may vary from region to region. In France, 18% of couples of childbearing age said that they had difficulties in getting conceived\(^6\).

1.1 Infertility

Infertility is an inability of a couple to achieve pregnancy for at least one year of trying to do so without using any means of birth control\(^7\). It is perceived as a problem across virtually all cultures and societies and affects an estimated 10-15% of couples of reproductive age. Infertility is a problem that affects individuals and groups in different cultures. Infertility primarily refers to the biological inability of a man or a woman to contribute to conception. It may also refer to the state of a woman who is unable to carry a pregnancy to full term\(^8\). The population in developed, developing and underdeveloped countries hold different attitudes regarding infertility. In underdeveloped and developing countries,
infertility may be linked to an act of God, punishment for sins of the past, prolonged use of contraceptives, distinct dietary habits, and the result of witchcraft which is causing childlessness whereas people in developed countries viewed infertility as caused by biological and other related factors\textsuperscript{9,10,11}. Individuals who are thought to be infertile are generally relegated to an inferior status, and stigmatized with many labels. As a result, childlessness has varied consequences through its effects on societies and on the lifestyle of individuals. Though in some cases, the childless life style enhances life satisfaction for some individuals, yet it is diminishing for others, for whom parenthood is a personal goal. Parenthood is one of the major transitions in adult life for both men and women. The stress of the non-fulfillment of a wish for a child has been associated with emotional related problems such as anger, depression, anxiety, marital problems, sexual dysfunction, and social isolation. Couples experience stigma, sense of loss, and diminished self-esteem in the setting of their infertility. Among infertile couples, in general, women show higher levels of distress than their male partners. Both men and women experience a sense of loss of identity and have pronounced feelings of incompleteness and incompetence. Couples often suffer from ‘a sense of personal failure as well as social stigma’ as a result to being infertile\textsuperscript{12}.

1.1.1 Causes of infertility

a) General

\begin{itemize}
\item Genetic or hormonal problem
\item Medical conditions (e.g., Diabetes mellitus)
\item Use of tobacco, marijuana or alcohol
\end{itemize}
Sexually transmitted disease (eg., Gonorrhoea)

Use of prescription drugs (eg., Depression, seizure, high blood pressure)

b) Men

- Low sperm count (normally men produce at least 20 million sperms per milliliter of semen i.e., around one sixth of the total ejaculate)
- Poor sperm motility; sperms will then be unable to swim through cervix to meet the egg in the fallopian tube
- Poor shape (morphology), so that an individual’s sperm is unable to penetrate into the outer layer of an egg
- Non production of sperm (because of testicular failure) or complete absence of sperm (perhaps because of an obstruction)
- Coital difficulties, because of ejaculatory failure or impotence

c) Women

- Hormonal disorders; as a result, egg follicles might not grow within the ovary or an egg might not be released (ovulation)
- Damaged or blocked fallopian tubes, which will prevent an egg and sperm meeting
- Endometriosis, in which womb tissue invades and damages neighboring reproductive tissues
- Excessively thick cervical mucus, which prevent sperm passing through
- Being underweight or overweight – may cause problem with ovulation
- Scarring or tumors of the uterus or defects of the uterus from birth
- Inadequate quality of the amount of cervical mucus
Scar tissue or adhesions from previous surgery, endometriosis, infections (eg., pelvic inflammatory diseases, appendicitis)

1.1.2 Investigations

- **Ultrasound**

  Ultrasonography is a basic screening test to image the uterus and ovaries and to evaluate the uterus and fallopian tubes.

![Figure 1: Ultrasound imaging for infertility](image)

- **Blood test**

  Blood test and urine tests reveal the hormonal status and medical problems if any like Gonodotropin Releasing Hormone (GRH), Luteinizing Hormone (LH) and Follicular Stimulating Hormone (FSH).
Rise and fall of women’s hormone levels during a normal menstrual cycle

The first day when the menstrual bleeding start is called day one and the semen analysis can be done at this time. The wife’s blood hormonal tests of prolactin, LH, FSH and Thyroid Stimulating Hormone (TSH) can be done between days 3 and 5 of the cycles followed by hysterosalpingogram (X-ray of the uterus and tubes between days 5 and 7). Ultrasound for ovulation monitoring is done between days 11 and 16 and the results are used for timing the Post coital Test (PCT).

Figure 2: Hormone levels in the menstrual cycle

![Hormone Levels in the Menstrual Cycle](image)

- **Andrology**

  It deals with specialized semen analysis/preparation of semen for Intrauterine Insemination (IUI), and for other procedure. Intercourse has to be avoided 3 days prior to semen analysis. The collection can be done at the semen collection room attached to the lab or the samples can be collected at home and delivered within half an hour of collection.
Doppler

It is an imaging test like ultrasound to evaluate the blood flow. It is used in male and female partners in special conditions.

Radiology

Hysterosalpingography commonly called the tube testing is done to see the contour of the uterus and patency of the fallopian tubes. Radio opaque dye is injected into the uterus under radiological imaging and blocks in the tubes can be detected. It is a day care procedure.
**Figure 5: Radiological imaging for infertility**

![Image of radiological imaging]

*Hysteroscopy*

It is an advanced investigation of the female partner. The interior of the uterine cavity is visualized and abnormalities if any can be detected.

**Figure 6: Visualization of uterine cavity by hysteroscopy**

![Image of uterine cavity visualization]
- **Laparoscopy**

  In this, a pencil thin electrode is passed into the abdomen under anesthesia. Cold light fibrotics enable visualization of the interior of the abdomen on a television monitor. Accurate identification of problems in the female partner becomes feasible. Hysteroscopy and laparoscopy are simultaneously done under anesthesia.

  **Figure 7: Schematic representation of a laparoscopic procedure for infertility**

- **Operative hysterolaparoscopy**

  Certain special problems in the female partner require surgical treatment. Operative hysterolaparoscopy is a “keyhole” surgery to correct such problems. The procedure needs anesthesia and an overnight stay in the hospital.
Interventional Radiology

Blocks in the fallopian tube in the female partner may be released by interventional radiological procedure. A thin catheter is passed into the uterus and fallopian tubes to release the block. It is a day care procedure.

Figure 8: Uterus with septum

Figure 9: Diagrammatic representation of interventional radiological procedure in infertility
Microsurgery

Repair of damaged fallopian tubes, reanastamized of the fallopian tubes/vas deferens through microsurgery is done to reverse sterilization operation in women and men. Patient needs to stay in the hospital for 5 to 7 days.

Figure 10: Schematic representation of repair of damaged fallopian tubes

1.1.3 Treatment

a) Drugs and hormones

Various modalities of treatment are available. Medical treatment helps to produce ova (eggs) in the female partner and to improve the semen parameters in the male (e.g., Bromocriptine, Clomiphene – 25/50/100 mg, Lanozol, Humegon, Nugen – 75 IU, Puregon – 75 IU, Pregnyl – 1000/2000/500 and Buserelin analogues).