Women Infertility In USG An Overview In Management

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Abstract

Background: Infertility is described as a lack of ability to achieve pregnancy after a long time of unprotected sexual intercourse. Infertility also known as sterility means incapable to conceive a pregnancy after a long time of intimacy. The first imaging modality of choice for evaluating possible causes of female infertility is ultrasound.
Objective: The aim of the study is to evaluate female infertility by using ultrasonography.
Methods: All the articles included in this study was taken from the PubMed, Google Scholars and   Research gate was published after 2010. The selection criteria of these articles were based on the use of ultrasonography in the evaluation of infertility in women.
Results: As a result, this review noted that polycystic ovarian syndrome (PCOS) was the most common cause of infertility that was found with ultrasound imaging.
Conclusion: This review of literature concluded that in the diagnosis of female infertility, ultrasound is the most accessible and practical method for identifying female reproductive system abnormalities. Furthermore, when combined with transvaginal sonography, it can improve accuracy and be a useful screening tool**.**

Keywords: Infertility, USG, Transvaginal ultrasound, Sonography

INTRODUCTION

Infertility is described as a lack of ability to achieve pregnancy after a long time of unprotected sexual intercourse. Infertility also known as sterility means incapable to conceive a pregnancy after a long time of intimacy[1]. Infertility is recognized as a psychological and social condition that impacts a wide spectrum of people globally as well as in India. Female infertility may be a frequent issue that contributes significantly to women in search of gynecologic services[2].

In developed nations, after a year, 80–90% of infertility-seeking couples are successful, and after a period of two years, 95% succeed. The prevalence of infertility worldwide is not accurately estimated. From 10% to 20% of women experience infertility, and the rate is increasing[3]. According to epidemiological research, between 10 and 15 percent of all couples will have trouble getting pregnant (primary infertility) or having the number of children they desire (secondary infertility).[4]

Types of Female Infertility:
Women commonly experience one of two basic types of infertility:

Primary infertility	Secondary infertility
Refers to the circumstance where a couple has been successful in conceiving.	Refers to circumstances in which a couple has at least one successful pregnancy but fails to conceive again.

Table 1.1

Primary infertility is defined differently in different studies, but the operational definition provided by the WHO is as follows: "Inability to conceive within two years of exposure to pregnancy (i.e., actively sexually engaged, non-contraceptive, and non-lactating) among women 15 to 49 yrs. old." The majority of infertile couples worldwide face primary infertility.[1,5]

Secondary infertility is the inability to conceive after successfully conceiving once before (either carrying the pregnancy to term or experiencing a miscarriage). Recently the demand for female infertility imaging has increased along with the demand for infertility services and it has become a crucial tool in the investigation of secondary female infertility.[6]Assessment of infertility requires a less invasive, reliable diagnostic modality of imaging.[7]

Figure 1.1: Ultrasound unit

It is the initial investigation and can be combined with 3D/4D scans and color Doppler imaging.[8] An imaging technique called ultrasound (US) employs high-frequency sound waves to describe tissue. In comparison to alternative modalities like conventional radiography or CT, it frequently provides an additional or distinctive characterization of tissues. It is a helpful and adaptable modality in medical imaging.[9] it takes relatively less time, is inexpensive, non- invasive, radiation-free, widely available, and is repeatable.[8]
The first imaging modality of choice for evaluating possible causes of female infertility is ultrasound (mainly transvaginal/endovaginally) [10].

**Figure 1.2** (A): Transabdominal   (B) Transvaginal

Table 1.2 Shows difference between transabdominal and transvaginal ultrasound

Transabdominal Ultrasound	Transvaginal Ultrasound
An examination of the pelvic organs using an ultrasound transducer placed on the abdomen is known as transabdominal ultrasonography of the pelvis.	A tiny probe coated in a latex sheath and gel is inserted into the vagina to perform transvaginal ultrasonography of the pelvis, which looks at the female reproductive organs.
An excellent survey image of the pelvis is provided by the transabdominal ultrasonography. It enables a wider view.	The female pelvic organs can be seen more clearly using transvaginal ultrasonography. The uterus, uterine cavity, cervix, ovaries, and any abnormalities can all be seen up close with this procedure.
While it detects certain uterine and ovarian abnormalities, transvaginal ultrasonography is superior at detecting anything else in the pelvis.	Transvaginal ultrasounds frequently reveal more specific abnormalities than transabdominal ultrasound does.[11]

Factor affecting female infertility-

Figure 1.3: shows factor affect women infertility
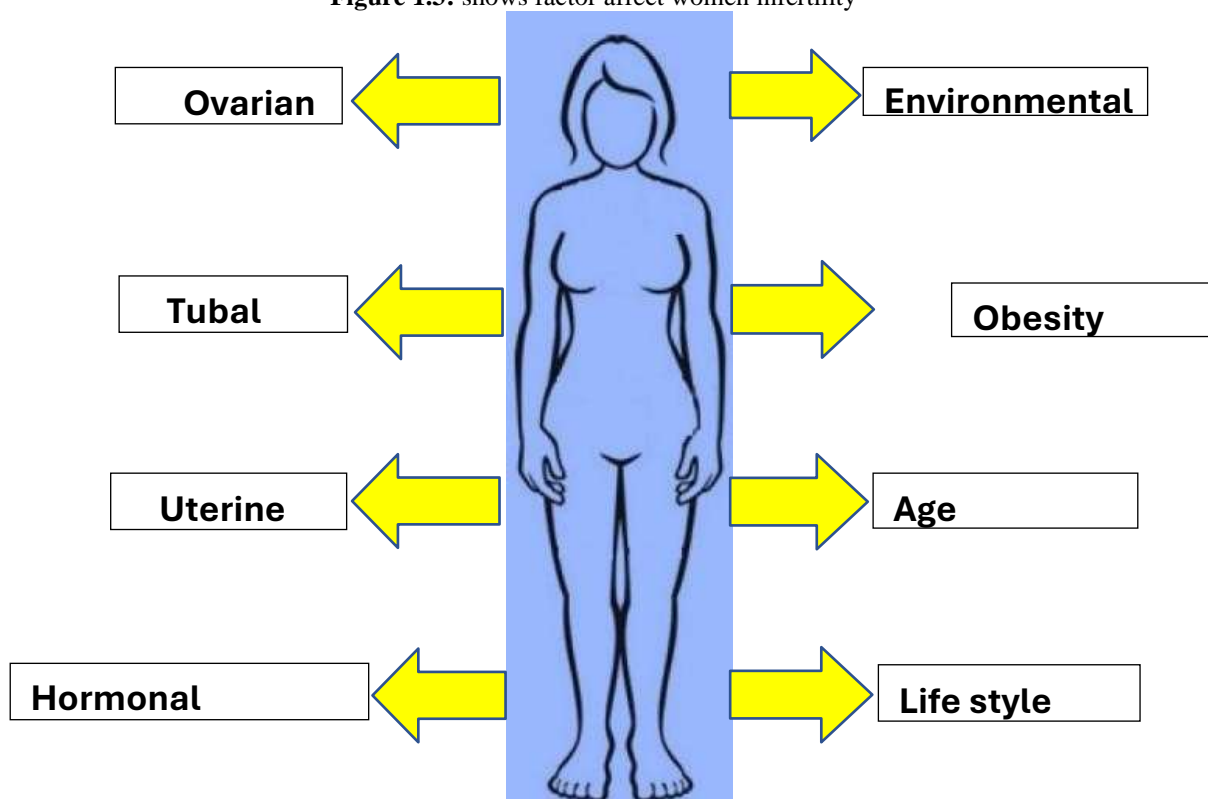
Ovarian factor - PCOS is a complicated endocrine condition called polycystic ovary syndrome which affects 5-10% of women worldwide and is associated with long-term ovulation deficiency and hyperandrogenism.[12] The polycystic syndrome is a major contributor to involuntary cycles and female infertility.[13] The loss of ovarian function before the of 40 is referred to as POF, and it is estimated that 1% of the population is affected by it.[3] the uterus.[16] Patients with endometriosis typically experience pelvic pain, dysmenorrhea, and dyspareunia. endometriosis is most common in young women.[17] More than 30% of women considered infertile are thought to have endometriosis and between 30 and 50 percent of these women experience difficulties in conceiving.[16]

Tubal factor - The most frequent cause of female infertility accounting for 30-40% of cases is an abnormality in the fallopian tubes. By physically obstructing the fallopian tube or cervical canal, fibroid might result in infertility. Occlusion may occur anywhere along the tube path. Infection previous surgery and tubal spasm are among the possible differential diagnosis for tubal blockage. When the ampullary section of the fallopian tubes becomes blocked, the proximal tube swells up giving the typical sausage-shaped appearance of hydrosalpinx. The disorder is many bilateral and is ultimately brought by endometriosis, tubal tumors, adhesions by past pelvic surgery, or trauma or inflammation or adhesions of the distal tube by PID.[14,15] Endometriosis is a gynecological condition that depends on estrogen and is characterized by the development of endometrial tissue (glands & stroma) outside of the uterus.[16] Patients with endometriosis typically experience pelvic pain, dysmenorrhea, and dyspareunia. endometriosis is most common in young women.[17] More than

30% of women considered infertile are thought to have endometriosis and between 30 and 50 percent of these women experience difficulties in conceiving.[16]

Uterine factor - It is estimated that between 20-25% of women will develop uterine fibroid also known as a uterine myoma. These benign tumors of the uterus smooth muscle cells are seen to increase with age until the fifth decade, after which they begin to decline and they are divided into three forms based on where they are found: submucosal fibroids (Those that are located on the outside uterus) intramural fibroids (Those that are located inside the muscular walls) and submucosal fibroids (in the middle muscle layer of the uterus). Most women with uterine fibroids are typically asymptotic. Uterine fibroids associated with infertility in women of childbearing age are a relatively common problem today.[18]

Hormonal imbalance - A key contributing factor to anovulation is hormonal imbalance. There are several hormonal disorders that might interfere with ovulation including hyperthyroidism, hypothyroidism, polycystic ovarian syndrome & hyperprolactinemia.[19] Both hyperthyroidism and hypothyroidism can affect ovarian function directly, but they can also affect the levels of the sex hormone binding protein and may also be accompanied by autoimmune. Although compared to parous women of similar age, infertile women have a greater frequency of thyroid autoimmunity (TAI). Women who have endometriosis and polycystic ovarian syndrome are especially influenced by this.[3] The condition known as hyperprolactinemia (HP) is characterized by usually high prolactin levels in the blood. By raising the production and release of dopamine from the hypothalamus, hyperprolactinemia leads to the inhibition of the gonadotrophin-releasing hormone (GnRH), gonadal steroidogenesis, and ultimately sterility. Anovulation is frequently caused by hormonal imbalance. Women with hormonal imbalances fail to produce enough follicles in order to ensure the ovule's development.

Environmental factor - Environmental factors have been emphasized as having a significant etiological role in infertility. Infertility can be due to toxins like glue, silicones, volatile organic solvents, physical agents, chemical dust, and pesticides. The higher risk of spontaneous miscarriage in women has also been linked to other potentially dangerous occupational environmental exposures such as chlorinated hydrocarbons and fungal agents. Therefore, there is a substantial risk of primary or secondary infertility among those who have direct contact with or exposure to such chemicals.[19]

Obesity - Female fertility is negatively impacted by obesity. The hypothalamic-pituitary-ovarian (HPO) axis is dysregulated in obese women, increasing their risk of developing ovulatory dysfunction. It has been associated with anovulation, irregular periods, infertility, challenges with assisted reproduction, miscarriage, and poor pregnancy outcomes. Leptin levels rise while those of the sex hormone-binding globulin (SHBG), growth hormone (GH), and insulin-like growth factor binding proteins (IGFBP) fall. As a result, the neuroregulation of the HPG axis (hypothalamic-pituitary- gonadal) declines. These changes could be the cause of reduced ovulatory function and consequently poor reproductive health. Due to reduced chances of implantation and pregnancy, greater rates of miscarriage, and more fetal and maternal problems during pregnancy.[20,21]

Age - With aging, fertility decreases. Between the ages of 18 and 24 years, female fertility reaches its peak. Around age 27, it starts to diminish, and around age 35, it starts to decline considerably more quickly. A typical woman has 12% of her ovarian reserve at age 30 and only 3% of her reserve at age 40. Age is the most significant contributing factor to female infertility because it accounts for 81% of the variation in ovarian reserve. Ovulatory dysfunction is more prevalent in young couples than in older ones.[19]

Lifestyle - An individual's lifestyle choices may affect their fertility. Drinking alcohol and the use of tobacco products both affect fertility. Every phase of the reproductive cycle as well as every component of the reproductive system, including folliculogenesis, steroidogenesis, embryonic development and transport, endometrial maturation, implantation and early placentation, uterine vascular velocity, and myometrial activity, are all negatively impacted by cigarette smoke exposure.[19,21]

MATERIAL & METHODOLOGY

This was a literature review-based study. we searched articles from platforms such as PubMed, and Google Scholar, and research gate for the English language studies of the evaluation of female infertility.

Inclusion criteria-: Article which are published after 2010 are included.

Exclusion criteria-: Article which are published before 2010 are excluded.

DISCUSSION / RESULT

Failure to fall pregnant healthily after a minimum of twelve months of proper timed sexual conduct without protection or therapeutic insemination via a donor subsequently is known as infertility. The management of fertility treatments and the detection of female infertility in the present day both depend on ultrasound.[13] The study by **Shahzad H et al.** state that a severe health problem that millions of people face is infertility. Due to its low cost, great sensitivity, and little invasiveness, ultrasound is the most ideal modality. Their study's objectives were to examine the prevalence of female infertility and its frequent ultrasonographic manifestation. The study included 75 participants in total. In terms of age, 28% were between the ages of 20 and 25, 25.3% between the ages of 26 and 30, 26.7% between

the ages of 31 and 35, 16.0% between the ages of 36 and 40, and 4% between the ages of 41 and 45. 36% of people had a high socioeconomic class, 53.33% had a moderate one, and 10.67% had a low one. Primary infertility is more common in the 20–25 age range, but secondary infertility is more common in the 36–46 age group. Compared to secondary infertility, initial infertility has a higher incidence. Female infertility is caused by issues with the uterus, ovaries, and fallopian tubes. However, submucosal disease was frequently the cause of infertility.[22] Similarly, according to a study by **Alka Shanti Prakash Gupta et al.,** the incidence of primary infertility is higher than secondary infertility in the population presenting to a public sector tertiary care center. Female factors influence 46.6% of all infertility cases. PCOS and tubal disease were the most prevalent causes of female infertility among those identified, accounting for 46% and 33.8% of all cases, respectively. They also discovered that there was no statistical difference between patients with PCOS who were either overweight or obese and those with a normal body mass index (P = 0.682), indicating that lean PCOS patients are just as prone to infertility as obese PCOS patients.[23] Study by **Hafiza Iqra Kanwal, MSDU and et.all** PCOS was identified as the most common cause of infertility. Deshpande and Gupta also observed that female infertility was frequently detected as a result of PCOS and tubal pathology.[2] Among another study, **Masoumi et all** discovered that menstruation abnormalities were the most common cause of infertility among women (62.6%). The effect of fibroids discovered with sonography on women's infertility was 43.6% in this study.[24] **Guo and Segars** further stated that the prevalence of fibroid formation in infertile patients is 5%-10%, and that this may be the primary cause of infertility in up to 2.4% of patients. Some professionals could have misconceptions about the topic of whether fibroids might contribute to infertility.[25] **Navarro and et.all** noted that women with endometriosis had a lower chance of conception than those with unexplained infertility. This could explain why women in the early stages of endometriosis had a lower combined pregnancy rate than women with an unknown cause of infertility. In this investigation, it was discovered that an endometrial polyp diagnosed via sonography had a significant impact on infertility.[26] Even in women who had never conceived previously, tubal obstruction was the most common cause of female infertility. This is consistent with the Bauchi study undertaken by **L. Dattijo, N. Andreadis, and et.all.** The study designed by **Luma Naji and et.all** to identify the prevalence of female pelvic causes of infertility and compare it to global norms. The findings indicate that ovarian factors are the most common ultrasonography finding. The prevalence was (35.69%). PCO had the largest percentage, accounting for nearly 74% of the ultrasonography findings. 1.68% of women have ovarian cystic masses. Furthermore, the current study added to prior research regarding the occurrence of uterine factors such as (fibroid tumors, tiny uterus, bicornuate, septate, and thin endometrium) reported in around (10.9, 4.2, 2.5, 1.68, 1.68) % respectively. Other infertility causes, such as endometriosis and PID, are prevalent in very low rates (approximately 1.2%). Endometriosis was found in 2.5% of the ultrasound findings, while PID was found in less than 1% of the cases, keeping in mind that not all of the findings could be considered direct causes of infertility unless other diagnostic methods used in the investigation of the problem ruled out other causes.[27] The significant prevalence of uterine fibroid among patients with primary and secondary infertility is shown by a study conducted by **Kolade-Yunusa HO and et. all**. The elevated rate of fibroid in this study was likely caused by the TVS probe's ability to provide better resolution in visualization of tiny uterine nodules under 5 mm, which may have gone unnoticed on the transabdominal scan. Better characterization of uterine fibroid has been demonstrated by TVS, particularly for tiny nodules smaller than 5mm. Infertility patients can use TVS as a crucial diagnostic tool to find anomalies in their uterus, fallopian tubes, ovaries, and cervix. The most typical pathology among infertile women in the study was uterine fibroid and fluid in POD. Fluid in the POD is probably associated to genital tract infection and pelvic inflammatory disease. However, compared to patients with secondary infertility, patients with primary infertility had a substantially greater prevalence of polycystic ovary.[28]

Based on the earlier discussion of numerous studies, the use of ultrasound is preferred as a beneficial modality to examine the cause of female infertility because it exhaustively shows all the main causes and reasons behind it. The studies discussed above shows that life style does, in some way, affect infertility, thus one must be conscious of their own lifestyle in order to tackle the factors that further promote infertility. In simple terms, that women who smoke or use tobacco increase their chance of unplanned abortion as well as the time it takes for them to conceive Infertility is an intermittent medical condition that affects the mental and physical wellness of two individuals and also their circumstances. Therefore, it must be done to assess the cause properly.

Lack of ovulation, blocked fallopian tubes, endometriosis, or uterine abnormalities can all be symptoms of female infertility. According to this review, there is a significant correlation between infertility and its causes, such as ovarian dysfunction, endometriosis, a person's lifestyle, environmental factors, PCOS, etc. Infertility risks also exist for patients with pelvic diseases. As a result, this review noted that polycystic ovarian syndrome (PCOS) was the most common cause of infertility that was found with ultrasound imaging.

CONCLUSION

Understanding the causes is the first step in resolving the problem of infertility because it has become an indisputable fact. As a first step in the diagnosis of female infertility, ultrasound is the most accessible and practical method. Furthermore, when combined with TV sonography, it can improve accuracy and be a useful screening tool. Infertility patients can benefit from transvaginal sonography since it is painless, quicker, and a crucial diagnostic tool for finding anomalies in their uterus, fallopian tubes, ovaries, and cervix.

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