

Evaluation of Sonographically Detectable Causes of Female Infertility in Reproductive Age

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Abstract:

Ultrasound is often used as a non-surgical method of determining certain fertility problems in both women and men. Pelvic ultrasound uses high-frequency sound waves to create an image of the organs and structures of the pelvis. For women, the ultrasound is used to look at the ovaries, uterus, cervix, fallopian tubes, and bladder to determine possible causes of infertility. Specifically, ultrasound is used to determine the size and condition of the ovaries, view the uterus to check the condition of the lining and for structural defects and monitor ovulation by checking the growth of follicles in the ovary.

Key words

Key words are Hypothalamic-pituitary factors; Hypothalamic, Hyperprolactinemia. Ovarian factor; Chemotherapy, genetic defects, Polycystic, Anovulation.

Material and Methods

In this study we studied 100 Pakistani females of reproductive age with complaint of infertility ultrasonographically using 3.5MHz transducer by abdominal scan.

Results

In this study, the detectable causes of female infertility with transabdominal ultrasound of 3.5MHz transducer were 15% uterine fibroids, 12% PCOS (Polycystic ovarian syndrome), 12% ovarian cysts, 7% PID (Pelvic inflammatory disease), 3% Turner syndrome, 2% septate uterus, 1% pelvic varices, 1% cervical fibroids, while 47% were undetectable with 3.5MHz transducer.

Conclusion

By using 3.5MHz transducer for transabdominal pelvic ultrasound scan, 47% females were found to have undetectable cause of infertility while 53% females could be diagnosed.

1. Introduction

Female infertility depends on social and physical characteristics which may vary by culture and situation. NICE guidelines state that: "A woman of reproductive age, who has not conceived after 1 year of unprotected vaginal sexual intercourse, in the absence of any known cause of infertility, should be offered further clinical assessment and investigation along with her partner. It is recommended that a consultation with a fertility specialist should be made earlier if the woman is aged 36 years or over, or there is a known clinical cause of infertility or a history of predisposing factors for infertility.¹ According to the World Health Organization (WHO), infertility can be described as the inability to become pregnant, maintain a pregnancy, or carry a pregnancy to live birth.² A clinical definition of infertility by the WHO and ICMART is "a disease of the reproductive system defined by the failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse."³ Infertility can further be broken down into primary and secondary infertility. Primary infertility refers to the inability to give birth either because of not being able to become pregnant, or carry a child to live birth, which may include miscarriage or a stillborn child. Secondary infertility refers to the inability to conceive or give birth when there was a previous pregnancy or live birth.⁴

Prevalence: Female infertility varies widely by geographic location around the world. In 2010, there was an estimated 48.5 million infertile couples worldwide, and from 1990 to 2010 there was little change in levels of infertility in most of the world. The

prevalence of primary infertility has increased since 1990, but secondary infertility has decreased overall.⁵

Causes of infertility:

Acquired, according to the American Society for Reproductive Medicine (ASRM), Age, Smoking, Sexually Transmitted Infections, and Being Overweight or Underweight can all affect fertility.⁶ In broad sense, acquired factors practically include any factor that is not based on a genetic mutation, including any intrauterine exposure to toxins during fetal development, which may present as infertility many years later as an adult.

Genetic factors, there are many genes wherein mutation causes female infertility, as shown in table below. Also, there are additional conditions involving female infertility which are believed to be genetic but where no single gene has been found to be responsible, notably Mayer-Rokitansky-Küstner-Hauser Syndrome (MRKH). Finally, an unknown number of genetic mutations cause a state of subfertility, which in addition to other factors such as environmental ones may manifest as frank infertility. Chromosomal causing female infertility include Turner syndrome. Oocyte donation is an alternative for patients with Turner syndrome some of these gene or chromosome abnormalities cause intersexed conditions, such as androgen insensitivity syndrome.⁷

By location: Hypothalamic-pituitary factors; Hypothalamic, Hyperprolactinemia.

Ovarian factor; Chemotherapy, genetic defects, Polycystic, Anovulation. Diminished reserve, Premature, Menopause, Luteal dysfunction, Gonadal dysgenesis (Turner syndrome), and ovarian cancer.⁸

Tubal (ectopic)/peritoneal factors; infertility, Endometriosis, Pelvic adhesions, Pelvic (PID, usually due to Chlamydia), occlusion, Tubal dysfunction, Previous ectopic pregnancy. A randomized study in 2013 came to the result that the rates of intrauterine pregnancy 2 years after treatment of ectopic pregnancy are approximately 64% with radical surgery, 67% with

medication, and 70% with conservative surgery.⁹ In comparison, the cumulative pregnancy rate of women under 40 years of age in the general population over 2 years is over 90 %.

Uterine factors; malformations, Uterine, Syndrome, Implantation without any known primary cause. It results in negative pregnancy test despite having performed e.g. transfer, previously, a bicornuate uterus was thought to be associated with infertility but recent studies have not confirmed such an association.¹⁰

2. Objectives

1. To evaluate sonographically detectable causes of female infertility in reproductive age.

3. Literature Review

The organs of the reproductive systems are concerned with the general process of reproduction, and each is adapted for specialized tasks. These organs are unique in that their functions are not necessary for the survival of each individual. Instead, their functions are vital to the continuation of the human species. The female reproductive system consists of internal organs and external organs. The internal organs are located in the pelvic cavity and are supported by the pelvic floor. The external organs are located from the lower margin of the pubis to the perineum. The appearance of the external genitals varies greatly from woman to woman, since age, heredity, race, and the number of children a woman has borne determines the size, shape and color.

4. Material and methodology

This study is conducted with the permission of institutional Review Board. Written consent was taken from the selected patients on consent form and their privacy was sure.

Non probability sampling technique was applied; study design was prospective cross sectional. This study conducted at Zoya ultrasound center chistian road bahawalnagar in four month from 15-Oct-2015 to 15-Feb-2016. Sample size was 100 Pakistani female of reproductive age. The inclusion criteria were only females of reproductive age having infertility.

Aloka SSD-1700 and Aloka SSD-1000 ultrasound machines with convex probe of frequency 3.5MHz were used. Ultrasound scanning was performed with the patient lying on supine position on an examination table, with the sonographer seated at the patient's right side. According to the scanning protocol, appropriate full urinary bladder was confirmed before scan. Scanning started by placing convex probe at pubis symphysis in transverse and longitudinal plane to visualize pelvic optimally, Sweep, compressing, sliding and tilting techniques to Assess the Uterine echo texture, Endometrial thickness, Uterine size , Shape , position, Uterine contour ,Endometrium , myometrium, Ovarian echo texture, Ovarian size , shape, Ovarian follicles ,cysts, Pouch of Douglas, Adnexal regions, Cervix, Kidneys if mass seen in pelvis. Standard documentation of transabdominal was considered. Longitudinal views of uterus right, midline, left. Transverse views of uterus inferior, middle, fundus, Cervix. Ovarian measurement longitudinal, Transverse, Zoomed view of Endometrium with measurement of thickness. Any kind of pathology found during scanning was recorded, confirmed by the seniors then included in the study. Ultrasound findings and diagnosis were recorded in predesigned questionnaire form and the data received from the patients was carried out by data collection sheets and convert in word excel. All data collected during the study was stored on computer and analyzed using statistical package for social sciences (SPSS) software. Mean, Frequency and percentages calculated and their graphs were developed.

5. Results

In selected 100 patients the mean age 29year and minimum age 19year, maximum age 40year. Table: I-II

Among the 100 patients 63(63%) infertility, 13(13%) infertility and pelvic pain, 9(9%) infertility

and painful menses, 6(6%) infertility and obesity, 5(5%) infertility and spotting, 2(2%) have complaints of infertility and PV bleeding, 2(2%) infertility and amenorrhea. Table: III

Out of 100 patients following ultrasound findings were noted, 12(12%) small multiples cysts in ovaries, 7(7%) a large fibroid in anterior wall of uterus, 7(7%) mild fluid in anterior and posterior Cul de Sac and hypervascularity of Endometrium, 5(5%) multiples uterine fibroids, 5(5%) left adnexal simple cyst, 3(3%) left adnexal complex cyst, 3(3%) a large fibroid in posterior wall of uterus, 3(3%) small in size uterus and ovaries, 2(2%) right adnexal simple cyst, 2(2%) septate uterus, 2(2%) right adnexal cyst and hydrosalpinx, 1 (1%) dilated pelvic vessels, 1(1%) left adnexal mass, 47(47%) were found normal on ultrasound with abdominal scan of transducer frequency 3.5MHz. Table: IV

Out of 100 selected female of reproductive age with infertility following diagnosis were found; 12 (12%) polycystic ovarian syndrome, 7(7%) large intramural fibroids , 7(7%) Pelvic inflammatory disease, 5(5%) dermoid cyst ,3(3%) subserosal fibroids, 3(3%) hypo plastic uterus and hypo plastic ovaries, 1(1) hydatid cyst, 2(2%) dermoid cyst in right ovary with hydrosalpinx, 2(2%) bicornuate uterus, 2(2%) complex ovarian cyst, 2(2%) intramural and sub mucosal uterine fibroids, 1(1%) pedunculated fibroid, 2(2%) simple ovarian cyst, 1(1%) simple right ovarian cyst with hydrosalpinx, 1(1%) pelvic varices, 1(1%) cervical fibroid, 47(47%) were undetectable on ultrasound with 3.5MHz transducer. Table: V

Following causes of infertility were detected with 3.5MHz transducer; 12(12%) polycystic ovarian syndrome, 7(7%) large intramural fibroids, 3(3%) turner syndrome, 2(2%) bicornuate uterus, 1(1%) cervical fibroid, 1(1%) pelvic varices, and 47(47%) out of 100 were undetectable . Table: VI

Table-I; Age

	Age	Maximum	Minimum	Mean
Variables	100	40	19	
Missing	0			29.0000

Table-II; Age Frequency

Age	Frequency	Percent
19	1	1.0
21	1	1.0
22	2	2.0
23	5	5.0
24	9	9.0
25	14	14.0
26	8	8.0
27	5	5.0
28	9	9.0
29	6	6.0
30	8	8.0
31	3	3.0
32	3	3.0
33	3	3.0
34	2	2.0
35	10	10.0
36	1	1.0
37	4	4.0
38	2	2.0
40	4	4.0
Total	100	100.0

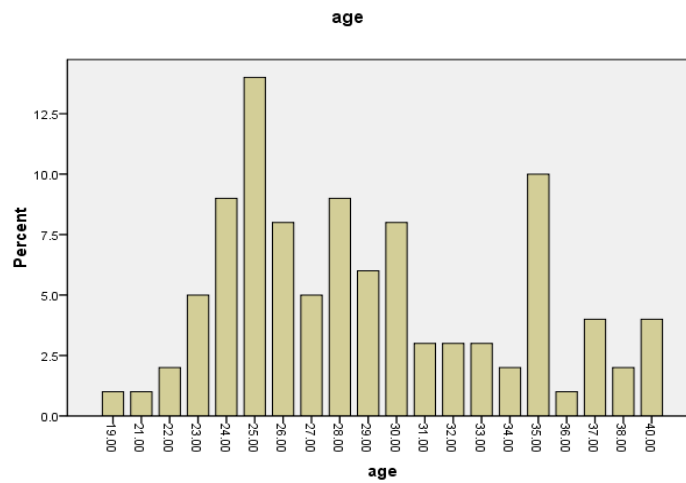


Figure-II; Age Frequency

Table-III; Patient Complaints

Patient Complaints	Frequency	Percent
Infertility/PV bleeding	2	2.0
Infertility/Amenorrhea	2	2.0
Infertility/Spotting	5	5.0
Infertility/Obesity	6	6.0
Infertility/pain full menses	9	9.0
Infertility/Pelvic Pain	13	13.0
Infertility	63	63.0
Total	100	100.0

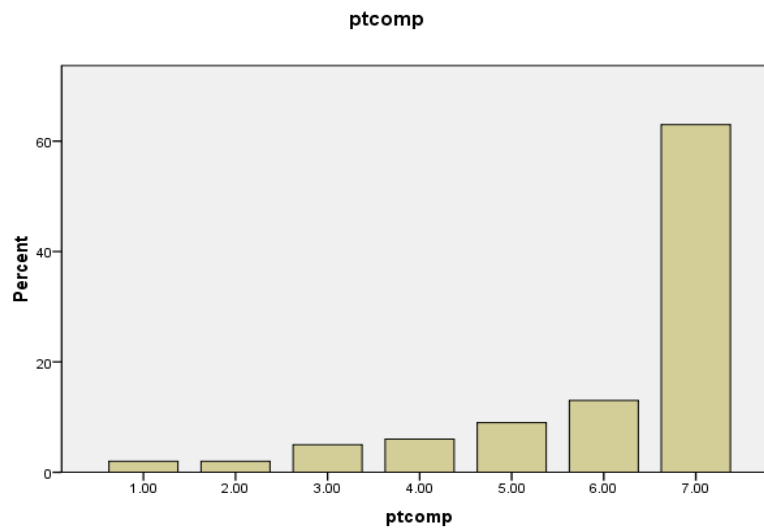


Figure-III; Patient Complaints

Table-IV; USG Findings

USG Findings	Frequency	Percent
Dilated pelvic vessels	1	1.0
Left adnexal mass	1	1.0
Septate uterus	2	2.0
Right adnexal cyst/HS	2	2.0
Small size uterus & ovaries	3	3.0
Right adnexal cyst	2	2.0
Large fibroid in posterior wall	3	3.0
Lt adnexal Complex cyst	3	3.0
Left adnexal cyst	5	5.0
Multiple Fibroids	5	5.0
FI in A/P CDS	7	7.0
Large fibroid in anterior wall	7	7.0
Multicystic ovaries	12	12.0
Normal	47	47.0
Total	100	100.0

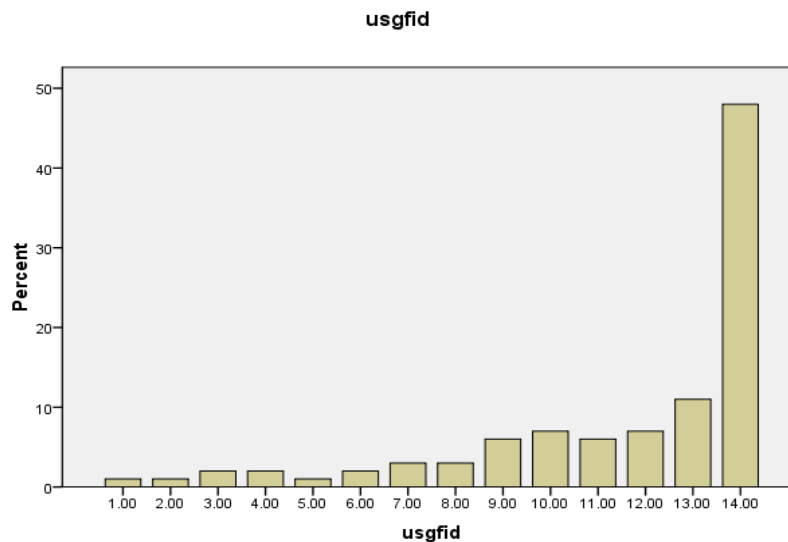


Figure-IV; USG Findings

Table-V; Diagnosis

Diagnosis	Frequency	Percent
Cervical fibroid	1	1.0
Hydatid cyst	1	1.0
Simple ovarian cyst/HS	1	1.0
Dermoid cyst/HS	2	2.0
Pelvic varices	1	1.0
Bicornuate uterus	2	2.0
Intramural/Submucosal fibroids	2	2.0
Pedunculate fibroid	1	1.0
Hypoplastic uterus & ovaries	3	3.0
Simple ovarian cyst	2	2.0
Complex ovarian cyst	3	3.0
PID	7	7.0
Subserosal fibroid	3	3.0
Dermoid cyst	5	5.0
Intramural fibroid	7	7.0
PCOS	12	12.0
Normal	47	47.0
Total	100	100.0

Diagnosis

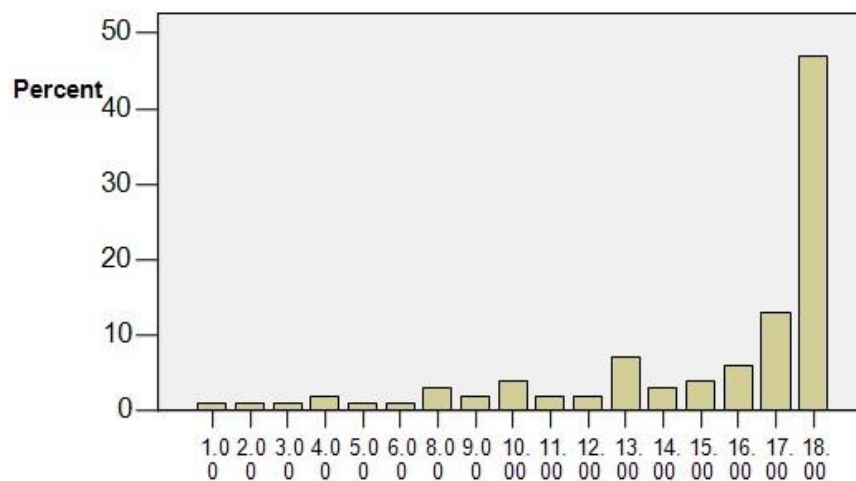


Figure-V; Diagnosis

Table-VI; Causes of infertility

Causes of infertility	Frequency	Percent
Cervical fibroid	1	1.0
Pelvic varices	1	1.0
Turner syndrome	3	3.0
Bicornuate uterus	2	2.0
PID	7	7.0
Ovarian cyst	12	12.0
PCOS	12	12.0
Uterine fibroid	15	15.0
Unknown	47	47.0
Total	100	100.0

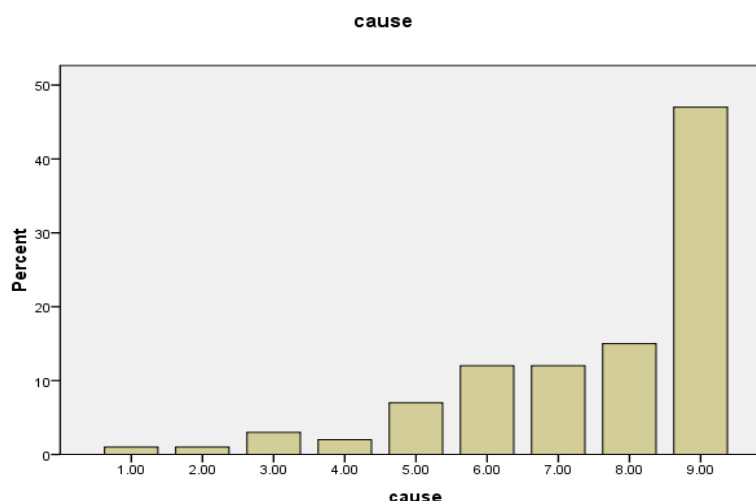


Figure-VI; Causes of infertility

6. Discussion

In this study 53% females have found detectable causes of infertility; Firstly 15(15%) females have uterine fibroids (Most of the fibroid were intramural and subserosal but large in size, range from 5cm-12cm and in 2-3 females have sub mucosal fibroid with spotting and PV bleeding). According to previous studies, it is generally believed that fibroids may interfere with sperm migration, ovum transport and embryo implantation (Richards et al., 1998). Swedish study recruiting 335 unselected subjects from an urban district and who accepted to undergo a transvaginal

ultrasonography showed a prevalence of 3% in women aged 25–32 years and 8% in those aged 33–40 years (Borgfeldt and Andolf, 2000).

Second most prevalent cause of infertility detected was PCOS that was 12% of the selected population. In another study, among the 67 women of the control group, 48 (72%) women had normal ovaries and 19 (28%) had PCO. (E. Kousta, D.M. White, E. Cela, M.I. McCarthy and S. Franks. In 12 (12%) females have ovarian cysts (simple ovarian cyst, dermoid cyst and complex ovarian cyst). In previous study ovarian cysts are found on transvaginal sonograms in nearly all premenopausal women up to

18%. Most of these cysts are functional in nature and benign. Mature cystic teratomas, or dermoids, represent more than 10% of all ovarian neoplasms. (C William Helm).

Less common causes of female infertility found were bicornuate uterus 2%, which prevalence in the general population and in the population of fertile women is approximately 4.3%. (Grimbizis GF et al), 3% hypo plastic uterus and ovaries with amenorrhea (Turner syndrome), Turner's syndrome occurred in 2.38 per 10,000 births in the UK 2002 (University of Ulster, 2003), 1% pelvic varices confirmed with Doppler and 1 % cervical fibroids have found. In this study 47% females have undetectable causes of infertility by using 3.5MHz transducer which may relate to male partner, unpatent fallopian tubes, endometriosis or hormonal imbalance .In correlation to previous conducted studies worldwide on the causes of female infertility there is a close correlation of this study in detectable causes of female infertility with 3.5 MHz transducer.

7. Conclusion

By using 3.5MHz transducer for transabdominal pelvic ultrasound scan, 47% females were found to have undetectable cause of infertility while 53% females could be diagnosed.

8. Limitations

On the basis of our results we can recommend that the modality of ultrasound should be supplemented with modern radiological imaging modalities such as Transvaginal ultrasound or CT and MRI for better and proper evaluation of the patients presenting with infertility.

9. Recommendations

First of all need to identify the population at risk and myopic by screening and proper evaluation of those with any difficulty seeing distant objects clearly such as the TV or the writing on the board. Prescribing correct (concave) glasses to individual suffering from myopia. And health education of general population and high risk population regarding the underlying factors causing myopia and prevention

Whenever close work is done

1. Hold the work as far away as possible.
2. Use as much light as possible in order to reduce the size of the pupil and, consequently, the accommodation.
3. Look into the distance frequently to relax the accommodation.

If symptoms are worsening then consult ophthalmologist for proper evaluation as there are number of visual threatening complication associated with myopia.

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