EVALUATION OF INFERTILE WOMEN USING TRANSVAGINAL ULTRASOUND IN A TERTIARY HEALTH FACILITY

Kolade-Yunusa HO, Abdullahi HI, Salaam AJ
Department of Radiology, University of Abuja Teaching Hospital Gwagwalada, Abuja FCT
Department of Obstetrics and Gynaecology,
University of Abuja Teaching Hospital, Gwagwalada, Abuja FCT
Department of Radiology, Jos University Teaching Hospital

CORRESPONDING AUTHOR:
Kolade-Yunusa, HO
Department of Radiology, University of Abuja Teaching Hospital Gwagwalada, Abuja FCT
Email: hadijat.kolade@uniabuja.edu.ng
Phone Number: +2348023570645
Disclosure No conflict of interest

ABSTRACT

Background

Ultrasound is one of the first imaging modalities in evaluation of infertile women and generally all women undergo an initial pelvic ultrasound to detect any probable cause of infertility. The aim is to document transvaginal ultrasound findings in women being evaluated for infertility.

Materials and methods

This was a descriptive cross-sectional study conducted at the radiology department, University of Abuja teaching hospital, between May 2015 and April 2016. All patients who were being evaluated for infertility and had a trans-vaginal scan within the study period were documented.

Result

The mean age of two hundred and three infertile patients evaluated with mean age of 32±19 years and age range of 15-49years. The predominant age group was 25-34 years accounting for 86(42.4%). Primary infertility constituted 85(41.9%) while secondary infertility was 118(58.1%).Out of 203 patients, 110(54.2%) had normal findings on TVS while the remaining 93(45.8%) of patients had abnormal ultrasound. This was statistically significant p=0.02.Uterine fibroid, fluid in POD, polycystic ovary were the common pathologies seen on TVS with uterine fibroid the most common. The commonest combined TVS findings were fluid in POD, endometritis and hydrosalphinx. There was significant difference between right and left ovarian volume among infertile patients with polycystic ovaries.

Conclusion

The study has showed high yield of sonographicabnormalities detected on TVS among patients with infertility further buttressing the pivotalrole of TVS as an invaluable tool for investigating infertile women.

Keywords: Infertility,transvaginal,ultrasound, women

Introduction

Infertility is a global problem and affects 8-12% of couples[1]. It is a major cause of visitation to the gynaecology clinic in Nigeria constituting about fifty percent (50%) of gynecological clinic attendance[2]. It is defined as 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]

The incidence of infertility varies from one region of the world to another, being highest in the so-called infertility belt of Africa which includes Nigeria[4]. Hospital-based study incidence of infertility reported in Nigeria are 4.0%, 15.4%, 48.1%, 23.9% and 15.7% from Ilorin (North central)[5], Abakaliki (South east)[6], and Oshogbo (South west)[7], Bauchi (North-east)[8] and Sokoto (North west)[9] respectively.

Infertility is quite a sensitive issue and can be quite challenging for the women especially in the African setup. Proper evaluation of women with infertility is necessary in order to detect any structurally abnormalities which may necessitate treatment. Ultrasound is one of the first imaging modalities in evaluation of infertile women and generally all women undergo an initial pelvic ultrasound to detect any probable cause of infertility[10]. This is so because ultrasound is readily available, accessible, non-invasive, relatively cheap, and does not use ionising radiation. It provides useful information and can characterize lesions in the uterus, ovaries, adnexa, and the cervix which may likely be responsible for infertility[10,11]. Transvaginalsonography (TVS) which was designed in 1985 to overcome the limitations of transabdominalsonography (TAS) and has gained wide acceptance as a reliable tool for solving diagnostic problems in women with gynaecological symptoms[11-13]. TVS provides greatly improved resolution due to the higher frequencies employed and proximity to the pelvic organ and as such provide better image quality of uterus, ovary and the fallopian tube however the fallopian tubes can be visualised only when there is fluid in the tubal lumen or outside the tubes[11].Due to these TVS has become a very invaluable tool in evaluation of women being investigated for infertility[11,14]. This study is aimed at documenting the transvaginal ultrasound findings in women being evaluated for infertility.

METHODOLOGY

Study Design: This was aprospective descriptive cross sectional study which spanned from May 2015-Aprill 2016.

Study Area: This study was carried out at the Radiology Department of University of Abuja teaching hospital, Gwagwalada, (F.C.T). The Hospital is located in Gwagwalada whose geographical coordinates are 8° 56' 29" North and 7° 5' 31" East.

Study Population: This comprising of two hundred and three women evaluated for infertility from the general outpatient clinic and gynaecological clinic who met the inclusion criterion were recruited for the study. Relevant demographics which included age, parity, BMI, duration of infertility comorbidity and ultrasoundfindings were documented using a well-structured questionnaire.

Inclusion Criteria:

i. Women within the ages of 15-49 years.

Exclusion criteria:

i. Huge abdomino-pelvic mass
ii. Those that decline to participate in the study.

Transvaginal Sonography

The procedure was explained to the patients and consent obtained. Patients emptied their urinary bladder before the commencement of the examination and were told to lie on the couch in supine position with legs flexed at the knee. A condom sheath to which coupling gel is added was placed over a high frequency 7MHZ transvaginal probe of EMP G70 ultrasound machine manufactured by Shenzhen Emperor Electronic Technology®, China 2011.The probe was inserted into the vaginal fornix. Both longitudinal and transverse images of the uterus and ovaries were obtained and findings were documented. Pathologies diagnosed on TVS in this study were based on the following sonographic criteria:

Uterine fibroid

Uterine fibroidappeared ashypoechoic,isoechoic, hyperechoic or heterogeneous solid masses within the intramural, subserosal and submuscosal layers of the uterus. They can be multiple or solitary and of varying sizes. The location within the uterus is also classified into fundal, body, lower segment and multiple.

Endometrial polyp

Focal bulge of theendometrialcontour, or focal echogenic mass with presence of entrapped fluid or secretions proximal to polyp or diffuse thickening of the endometrium. Presence of surroundinghypoechoic halo and presence of mobility of the lesion.

Cervical polyps

Hypoechoic or echogenicsessile or pedunculated well-circumscribed masses within the endocervical canal or focal bulge of the cervical contour.

Hydrosalpinx/pyosalpinx

Seen as fluid-filled tubular, thickwalled structures with or without internal echoes in either adnexae.

Endometritis

Seen as marked heterogenous and thickened endometrium (>10mm)

Oophoritis
Enlarged ovaries with ill-defined margins that were adherent to the uterus/

Fluid in pouch of Douglas (POD)
Seen as significant hypo or anechoic collection in the POD

Polycystic ovaries
Enlarged ovaries greater than 10ml in volume with presence of 12 or more follicles in number which are peripherally arranged in each ovary measuring 2-9 mm in diameter as well as increase in central stromal echogenicity and thickness.

Atretic ovaries
Ovarian volume less than $2cm^3$

Data analysis
Data was collated and analysed using SPSS 19.0 software 2010 by IBM^R USA. P-value<0.05 was taken as statistically significant.Pearson correlation test was done to determine the relationship between variables.The results are presented in the form of tables.

Ethical consideration: The study was approved by the Ethical Committee of the

Results
There were two hundred and three patients who presented with infertility and transvaginal scan were performed during the study period. The mean age of study population was 32±19years with age range of 15 and 49 years. . Majority of the patients were in the age group 25-34 years with 86 women representing 42.4% Primary infertility constituted 85(41.8%) while secondary infertility was 118(58.1%). Table I
Out of 203 patients, 110(54.2%) had normal findings on TVS while the remaining 93 women had abnormal ultrasound findings representing 45.8%. This findings using TVS was statistically significant (p=0.02). Uterine fibroid (Fig 1), fluid in POD(Fig 2), polycystic ovary, endometrial polyp and hydrosalpinx constituted the main pathologies detected on TVS scan accounting for 18.7%, 9.4%, 5.4%, 4.4% and 3.4% respectively.Table II.
Among patients with primary infertility, uterine fibroid 17(20.0%), polycystic ovary 10(11.7%), and fluid in POD 8(9.4%) constituted the major abnormalities found, while in patients with secondary infertility uterine fibroid 21(17.8%), fluid in POD 11(9.3%), endometrial polyp6(5.1%), andhydrosalpinx 5(4.2%) were the main pathologies detected on TVS.The commonest combined TVS findings were fluid in POD, endometritis and hydrosalphinx. Table II.
Of the 38 patients with uterine fibroid 25(65.8%) had multiple fibroid nodules while the remaining 13(34.2%) had solitary fibroid nodules. Four womenhad calcified fibroid nodules representing 10.5%. In terms of type of fibroid, 21 infertile women had intramural fibroid nodules representing 55.3% while 8(21.1%) were mixed, 7(18.4%) were submucosal and 2(5.3%) were subserosal. Base on location, in17(44.7%) of the infertile women, the fibroid nodules were of multiple location, 13(34.2%) were within the body of the uterus, 5(13.2%) were at the fundus and 3(7.9%) at the lower uterine segment. Mixed echotexture was the commonest echopattern of the uterine fibroid demonstrated in this study accounting for 19(50.0%) as shown in Table III.
Out of the 19 patients with fluid in the POD 14 patients representing 73.7% gave history of suggestive of genital infection to include lower abdominal pain, vaginal discharge, urinary tract infection and dyspareunia while 5(26.3%) gave history of vaginal discharge and dyspareunia. All had a vaginal swab for microscopy, culture and sensitivity test (MCS).The MCS result of 11 out of the 14 infertile patients representing 78.6% were positive forvarying microorganism and were subsequently diagnosed with pelvic inflammatory disease and managed as such.
Out of the 11 patients with polycystic ovaries, 9(81.8%) had bilateral polycystic ovaries while the remaining 2(18.2%) had left or right polycystic ovary. The mean ovarian volume of patients with polycystic ovaries was 15.3±6.2 for right and 14.5±5.5 for left.The difference in the mean ovarian volume of right and left ovary was statistically significant p=0.004. The mean number of follicles for right and left ovaries was 11.3±5.9 and 10.7±3.7 respectively. The difference in the mean number of follicles of right and left ovary was statistically significant p=0.01. The average size of the right and left follicles was 6.2±3.2 and 5.5±2.9. However the difference in the size of follicles of the right and left ovary was not statistically significant p=0.13. Table 1V.
Results

Table I: Age distribution of infertile women by type of infertility.

Age group (years)	Primary infertility Freq	(%)	Secondary infertility Freq	(%)	Total Freq	(%)
15-24	11	5.4	17	8.3	28	13.8
25-34	39	19.2	47	23.2	86	42.4
35-44	22	10.8	35	17.2	57	28.1
45-54	13	6.4	19	9.4	32	15.7
	85	41.8	118	58.1	203	100.0

Table II: Distribution of transvaginal ultrasound findings among infertile women

Diagnosis	**Primary infertility**		**Secondary infertility**		**Total**	
(years)	Freq	(%)	Freq	(%)	Freq	(%)
Normal finding	42	49.4	68	57.6	110	54.2
Endometrial polyp	3	3.5	6	5.1	9	4.4
Fibroid	17	20.0	21	17.8	38	18.7
Fluid in POD	8	9.4	11	9.3	19	9.4
Polycystic ovaries	10	11.7	1	0.8	11	5.4
Endometritis	2	2.4	3	2.5	5	2.5
Oophritis	0	0.0	1	0.8	1	0.5
Atretic ovaries	1	1.2	0	0.0	1	0.5
Hydrosalpinx	2	2.4	5	4.2	7	3.4
Ovarian mass	0	0.0	2	1.7	2	1.0
	5	100.0	118	100.0	203	100.0

Table III: Uterine fibroid features among infertile women

Fibroid features	Freq(n-38)	(%)
Types of fibroid		
Intramural	21	55.3
Subserosal	2	5.3
Submucosal	71	8.4
Mixed	8	21.1
Pedunculated	0	0.0
Location of fibroid		
Fundus	5	13.2
Body	13	34.2
Lower segment	3	7.9
Multiple	17	44.7
Echopattern of fibroid		
Hyperechoic	6	15.8
Hypoechoic	10	26.3
Isoechoic	3	7.9
Mixed	19	50.0
Size of fibroid		
< 5cm	25	65.8
≥5cm	13	34.2

Table IV
Ovarian volume, follicular size and number of follicles among infertile patients with polycystic ovaries

Ovarian parameters	mean	sd	p
Volume			
Right ovary	15.3	6.2	0.004
Left ovary	14.5	5.5	
Number of follicles			
Right ovary	11.3	5.9	0.01
Left ovary	10.7	3.7	
Size of follicles			
Right ovary	6.2	3.2	0.13
Left ovary	5.9	2.9	

FIG 1: Transvaginal scan showing hypoechoicsubmucosal fibroid indenting and distorting the endometrial plate

FIG 2: Transvaginalscan showing hypoechoic collection in the pouch of Douglas

Discussion

Imaging plays an important role in the assessment of women with infertility. Although there has not been general consensus work up protocol for infertile patients, however majority of infertile women undergo a baseline pelvic ultrasound (transabdominal or transvaginalsonography) andhysterosaphingography to determine the cause of infertility. TVS was the tool used to determine the cause of infertility in this studybecauseit is cheap, does not use ionization radiation, readily available and provides good image quality of theovaries, uterus, fallopian tube and adnexa because of its proximity to the mentioned organs.

With regards to type of infertility in this study, secondary infertility constitutes the majority accounting for 58.1%, this corroborates with findings obtained by Nafeesa[14]. The preponderance

of secondary infertility in this study also agrees with studies from Africa[4,15,16]but differs from findings from Western World where primary infertility predominates[4,17]. The high prevalence of secondary infertility in Africa is likely as a result of high prevalence of poorly treated sexual transmitted infection, unsafe abortion and puerperal sepsis from unskilled birth attendance[16].

93(45.8%) of patients had abnormal ultrasound findings. The major TVS findings in this study were uterine fibroid, fluid POD and polycystic ovaries. Our findings differ from what was obtained by Nafeesa[14] and Ikepeme[18]where polycystic ovary was the commonest. The differences may be due to differences in the population studied. Ikpeme[18] inCalabar assessed women presenting with infertility and menstrual irregularity. Although Ikepeme also reported high incidence of uterine fibroid and chronic pelvic inflammatory disease in their study in Nigeria, only 6% of infertile patient were diagnosed with uterine fibroid by Nafeesa[14] in Indian. The differences further buttress the variation of causes of infertility within and among countries.

This study demonstrates high prevalence of uterine fibroid among patients with primary and secondary infertility. The high prevalence of fibroid in this study was probably due to the ability of the TVS probe to provide better resolution in visualization of smaller uterine nodules <5mm which may likely be missed on transabdominal scan. Also majority of the patients were clinically asymptomatic and uterine fibroid was an incidental finding on TVS.

Sonographic examination of fibroid is important in other to characterise the number, types, location and size of the fibroid which is very importantfor fertility work up of patient especially in planning surgery or for assisted reproduction. TVS has shown better characterization of uterine fibroid especially for small nodules less than 5mm[10]. A study by Maria*et al*[19]to demonstrate the effects of the position of fibroids on fertility confirms that location of the fibroid plays an important role in fertilization and in maintaining pregnancy and that submucosal fibroid has a lower pregnancy rate compared to intramural fibroid. In a study toassess the diagnostic value of transvaginalsonography in comparison with hysteroscopy in the evaluation of endometrial cavity in infertile women, Saralа*et al*[20] reported that TVS has a sensitivity of 97.07% and positive predictive value of 99.7% in diagnosing uterine abnormalities. Also Niknejadi*et al*[21] in their own study concluded that TVS is valuable adjunctive to hysteroscopy with high accuracy for identification and characterization of intrauterine abnormalities.

Fluid in the pouch of Douglas was next common finding among patient with infertility. Thou presence of fluid in the POD can be physiological or pathological, however most of the infertile patients with fluid in POD in this study gave history of one or two symptoms to suggest pelvic inflammatory disease to include lower abdominal pain, vaginal discharge, UTI and dyspareunia and were being manage as such after vaginal swabs were taken for laboratory work up. Genital infection is considered as the commonest single most important cause of infertility in Africa due to high prevalence of poorly treated sexual transmitted infection, unsafe abortion and puerperal sepsis from unskilled birth attendance[16].

Polycystic ovaries were the next common finding among patient with infertility in the index study. However prevalence of polycystic ovary was much higher among patients diagnosed with primary infertility compared to patients with secondary infertility. Reason for this may not be known. The transvaginal route improves study of polycystic ovary because good spatial resolution of the cyst and ovarian stroma. In a study in Ibadan by Bello *et al*[22] on polycystic ovaries, the prevalence of polycystic ovaries were much higher using transvaginal route when compared to the prevalence previously reported in the same locality using trans abdominal route and the increase prevalence was liken to improved sensitivity of the diagnostic tool used. However there was no significant difference in the prevalence of polycystic ovaries using transabdominal and transvaginal ultrasound in a study by Farquhar[23]. There were few unilateral polycystic ovaries in our study this is similar to what was reported by Ikepeme[18]. Althoughwe did not sought further to know the prevalence of polycystic ovarian disease among our infertile patient with polycystic ovaries however literature has revealed a possibility of having a polycystic ovaries without the disease[18]. The mean ovarian volume in our study among patient with polycystic disease was much higher than what was obtained by Ikpeme[18].

Conclusion

TVS is an important diagnostic tool in detecting abnormalities in the uterus, fallopian tube, ovaries and cervix of patients with infertility. Uterine fibroid and fluid in POD were the commonest pathology seen in this study among infertile women. Presence of Fluid in the POD may likely be related to pelvic inflammation disease and genital tract infection.

References

1. Inhorn MC. Global infertility and the globalization of new reproductive technologies: Illustrations from Egypt. SocSci Med 2003;56:1837-51
2. OguntoyinboAE, AboyejiAP. Hysterosalpingography(Hsg) Findings: Of Infertile Patients In Ilorin Trop J Obstet Gynaecol,2012; 29: 118-125
3. Infertilitydefinitions and terminology.https://www.who.int/reproductivehealth/topics/infertility/definitions/en/
4. Okonofua FE. Infertility in Sub-Saharan Africa. In: Okonofua FE, OdunsiK(eds). Contemporary Obstetrics and Gynaecology for Developing Countries.1st edition. Women's Health and Action Research Center.Benin City: 2003; 128-156.
5. Abiodun OM, Balogun OR, Fawole AA. Aetiology, clinical features and treatment outcome of intrauterineadhesion in Ilorin, Central Nigeria. West Afr J Med 2007;26:298-301.
6. Obuna JA, Ndukwe EO, Ugboma HA, Ejikeme BN, Ugboma EW. Clinical presentation of infertility in an outpatient clinic of a resource poor setting, South East Nigeria. Int J Trop Disease and Health 2012;2:123-31
7. Adeyemi AS, Adekanle DA, Afolabi AF. Pattern of gynaecological consultations at LadokeAkintola University of Technology Teaching Hospital. Niger J ClinPract 2009;12:47-50.
8. Dattijo LM, Andreadis N, Aminu BM, Umar NI, Black K. The Prevalence and Clinical Pattern Of Infertility In Bauchi, Northern Nigeria. Trop J ObstetGynaecol, 2016; 33: 76-85
9. PantiAA , Sununu YT. The profile of infertility in a teaching Hospital in North West Nigeria. Sahel Med J 2014;17:7-11
10. IraniSH, Ahmadi F, Javam M. Evaluation of the Uterine Causes of Female Infertility by Ultrasound: A Literature Review. Journal of Midwifery and Reproductive Health. 2017; 5: 919-926
11. Moorthy RS. TransvaginalSonography.Med J Armed Forces India. 2000; 56:181–183
12. Anjali S, SurajS, VeenaM. Transvaginalsonography in dysfunctional uterine bleeding its correlation with histopathology. J. of obstetrics and gynaecology of India.2001;51:116-119.
13. Sokalska A,Timmerman D,Testa AC, Van Holsbeke C,Lissoni AA, Leone FPet al. Diagnostic accuracy of transvaginal examination for assigning a specific diagnosis to adnexal masses. USG obstet gynecol. 2009; 34: 462-470.
14. Nafeesa. B, HussainR, Rani D. TransvaginalUltrasound Findings Among the Women Presenting with Infertility.ChattagramMaa-o ShishuHospialMedical College Journal. 2017;16;31-34
15. Obuna JA, Ndukwe EO, Ugboma HA, Ejikeme BN, Ugboma EW. Clinical presentation of infertility in an outpatient clinic of a resource poor setting, South East Nigeria. Int J Trop Disease and Health 2012;2:123-31
16. Bala MA. Alfred AM, Mohammed B. Clinical presentation of infertility in Gombe, North-Eastern Nigeria. Trop J ObstetGynaecol 2003;20:93-6
17. Templeton A, Fraser C, Thompson B. Infertility-epidemiology and referral practice. Hum Reprod 1991;6:1391-4
18. Ikpeme AA, Udo AE, Ani NE. Transvaginal ultrasound assessment of women presenting with infertility and menstrual irregularity in Calabar, Nigeria. Niger Postgra Med J 2014; 21:262 265
19. Maria L.C, Federica R, Riccardo A ,Vittorio U. Effects of the position of fibroids on fertility. Gynaecological Endocrinology Journal 2006;22:106-109.
20. Sarala K, KanakM. Role of TransvaginalSonography and Diagnostic Hysteroscopy in Evaluation of Endometrial Cavity in Infertile Women. International Journal of Contemporary Medical

Research 2018;5:1-3

21. Maryam N, HadiehH, FiroozehA, FatemehN, Mohammad C, Ahmad V*et al*. Diagnostic Accuracy of TransvaginalSonography in the Detection of Uterine Abnormalities in Infertile Women. Iran J Radiol 2012;9:139-144.
22. Bello FA, Odeku AO.Polycystic Ovaries: A Common Feature InTransvaginal Scans Of Gynaecological Patients. Ann Ib Postgrad Med. 2015; 13: 108–109.
23. Farquhar CM, Birdsall M, Manning P, Mitchell M. Transabdominal versusTransvaginal Ultrasound in the Diagnosis of Polycystic Ovaries in a Population of Randomly Selected Women. *Ultrasound inObs&Gynae 1994 ; 4:54-59*