ISSN NO. 2320-5407

Journal homepage: http://www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH

RESEARCH ARTICLE

SONOGRAPHIC ASSESSMENT OF THE FOLICLECULAR SIZE AND ENDOMETRIAL THICKNESS IN APPERENTLY NORMAL WOMEN AND AMONG WOMEN WITH INFERTILITY.

Ochie Kalu[1], G.C Okoye[2], Luntsi Geofery[3], Charles Ugwoke Eze[1], Ochie Micheal[1], Nkubli F.B[3], Abubakar M.G[3].

1: Department of Radiography and Radiological Sciences, Faculty of Health Sciences and Technology University of Nigeria Enugu Campus.
2: Department of Medical Rehabilitation, Faculty of Health Sciences and Technology, University of Nigeria Enugu Campus.
3: Department of Medical Radiography, College of Medical Sciences University of Maiduguri, Borno State

Manuscript Info

Manuscript History:

Received: 18 March 2015
Final Accepted: 25 April 2015
Published Online: May 2015

Key words:

Endometrium, Follicles, Ultrasonography, Infertility

Corresponding Author

Ochie Kalu

Abstract

The aim of this study was to determine by sonography the normal dimensions of the endometrium and follicles in normal subjects with those of women with infertility. A Convenience sample of one hundred and forty (140) subjects participated in the study between February 2012 and November 2013, consisting of seventy (70) apparently normal women and seventy (70) women with history of infertility. All the subjects selected where of child bearing age with age ranged from 20 to 40 years, who were married. Ethical clearance was obtained from the ethical committee of the hospital and informed consent was obtained from the study participants. The study was carried out using Concept Model Dynamic Imaging Incorporated ultrasound system with a curvilinear transabdominal transducer (3.5MHz). Statistical analysis was done using the statistical package for social sciences (SPSS), version 17.0. Where descriptive statistics like mean, frequencies and percentages were calculated and inferential statistics like the student T-test was used to compare the mean values in both groups. The endometrial thickness among the normal group was 43 (61.4%) highest frequency with endometrial thickness of 9.5-11.4mm. The lowest group is the 11.5m-13.4mm. The mean endometrial thickness in the normal group is 10.5mm with a range of 7.5 to 13.4mm.The endometrial thicknesses of the group with secondary infertility were 25(35.7%) with highest frequency. The least was 2 (2.9%) with an endometrial thickness of 13.5-15.4mm.The mean follicular size is 20.0mm (standard deviation, 1.2mm, with a range of 17.5mm to 23.4mm).The follicular size ranged from 19.5-21.4mm among the normal group. The follicular sizes among the infertility group ranged from 2.0 - 27.5mm. The largest frequency was the <2.0-5.4mm follicular size group, 32 (45.7%). The mean follicular size of 10mm was found among the secondary infertility group with a range of 2mm to 27.5mm. Conclusively, Sonography is a veritable diagnostic tool in the investigation of the pelvic organs (endometrium and the follicles) among normal women and women with secondary infertility, showing a varying pattern of sizes among them.

INTRODUCTION

The endometrium is the inner lining of the uterus, it consists of a constant basal layer (Basalis), and a cyclical functional layer (functionalis). The functional layer includes a thin compactum layer and a thick spongiosum layer. The myometrial/endometrial interface is usually a hypoechoic layer created by the basal (Basalis) and inner compactum (functionalis) layers, which represent the deepest endometrial layers which is the basalis is constant through the menstrual cycle. The thickest portion of the bi-layer of the active endometrium is the spongiosum, which present varying degrees of hyperechogenicity during the cycle. It is this hyperechoic portion that is typically included in ultrasound measurements of endometrial thickness. The measurement of endometrium is taken across the thickest portion of the bi-layer endometrium in a mid sagittal (longitudinal) view. The measurement is from the anterior hyperechoic border to the posterior hyperechoic border. Thus it represents a double layer thickness and predominantly includes the outer compactum and spongiosum portion of the functionalis layer[1].

The thickness of the endometrial stripe as measured by ultrasound has been a diagnostic technique in determining the need for curettage. Ultrasound is the modality of choice for the initial imaging evaluation of pelvic organs. Ultrasound is widely available in many regions of the world, it is relatively inexpensive, non invasive and does not use ionizing radiation. Typical examinations include transabdominal sonography (TAS) and transvaginal sonography (TVS). Transabdominal sonography transducers are needed to penetrate abdominal wall and adequately visualize pelvic organs with lower frequency. Transvaginal sonography probes are placed close to area of specific interest with higher resolution images[2].

During menstruation, the functional layer of the endometrium disintegrates and is discharged through the vagina and the thickness of the endometrium is least at this point. No pregnancy also takes place at this time. Menstruation is followed by the follicular/proliferative phase. This phase is named for two simultaneous processes; maturation of an ovarian follicle and proliferation of the endometrium. While the follicle is developing, its granulosa cells secrete oestrogen, which causes cells of the endometrium to proliferate. By the time the ovarian follicle is mature, the endometrial thickening is restored and ready for implantation again. At this point ovulation can occur. Ovulation marks the beginning of the luteal/ secretory phase [3]. Ultrasound allowed precise measurement of ovarian follicles on the mare[4]. The developing follicles are first seen by ultrasound as a group of 4-8 antral follicles 3-5mm in size by day 6-7 of the menstrual cycle, within a given ovary one of the developing follicles develops to become dominant mature Graafian follicle which will ovulate. The size of follicle will eventually reach a mature size of 18-24mm on day 14 prior to ovulation on a 28-day cycle. Optimal endometrial thickness occurs at same time as the follicle mature to optimal size for ovulation. A comparison of the endometrial thickness and follicular size in the ultrasound study of female infertility patients may therefore be necessary to determine the relationship or the pattern of changes that occur in infertility among them. Using measurement of size and counting number of follicles, ultrasound can verify normal sequences or in many cases, diagnose ovulation failure by recording at what point the follicle development is arrested[1].

Infertility is of social and public health importance in Nigeria and many other nations of the world because of its serious social implications and high prevalence [5]. It is well recognized that infertility has many potential psychological consequences for a couple which bring about frustration, anger, depression and relationship that lack peaceful co-existence[6].

The aim of this study was to determine by sonography the normal dimensions of the endometrium and follicles in normal subjects with those of women with infertility.

MATERIALS AND METHODS

A Convenience sampling method was used to select one hundred and forty (140) subjects between February 2012 and November 2013, consisting of seventy (70) apparently normal women and seventy (70) women with history of infertility. All the subjects selected where of child bearing age with age ranged from 20 to 40 years, who were married. Women selected for the normal group were those with regular 28 days menstrual cycle who had a baby a year ago, who were interviewed and found to have no history of infertility, and were not on any family planning pills and with no history of gynaecological problems. The group with infertility was selected among women who have not been pregnant at least a year ago and presented to gynaecology clinic due to infertility. Ethical clearance was obtained from the ethical committee of the hospital and informed consent was obtained from the study

participants. The study was carried out using Concept Model Dynamic Imaging Incorporated ultrasound system with a curvilinear transabdominal transducer with frequency of 3.5MHz.

The ultrasound scans were carried out with the subject in supine position with urinary bladder filled with urine to serve as acoustic window and displaces the bowel loops upward away from the pelvic cavity. The mid sagittal planes of the uterus were obtained and the anterior posterior (AP) diameter of the endometrium was measured from the posterior border of the anterior part of the endometrium to the posterior border of the second part of the bilayer endometrium. The widest portion of the endometrium was measured perpendicular to the interface of the bilayer endometrium. Statistical analysis was done using the statistical package for social sciences (SPSS), version 17.0. Where descriptive statistics like mean, frequencies and percentages were calculated and inferential statistics like the student T-test was used to compare the mean values in both groups.

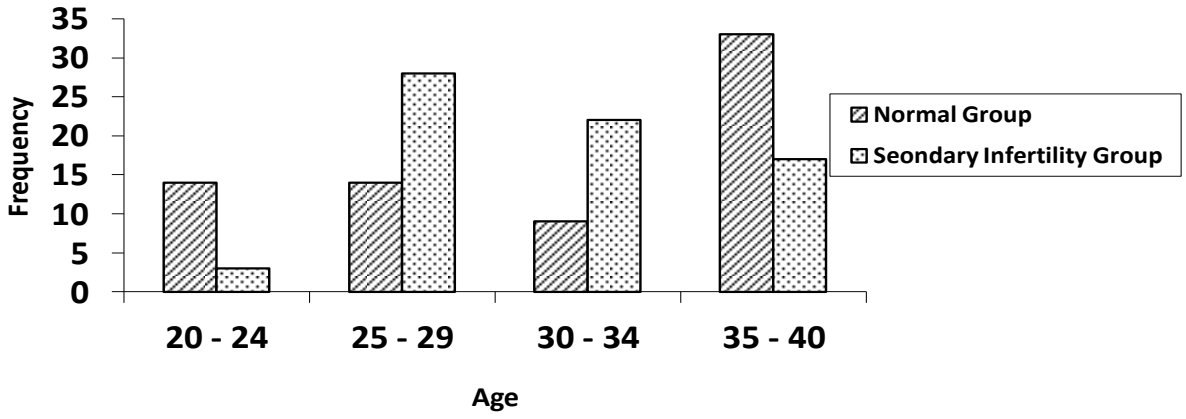
REULTS

A total of 140 participants who consented to the study where scanned using ultrasound with ages range from 20 to 40 years among both the apparently normal and the group with infertility.

The age group 25-29 years had the highest frequency among participants with secondary infertility with 28(40%) and those within the age group of 20-24 years were least 3(4.3%). In the normal group, 35-40 years were highest with 33(47.2%) and 30-34 years were least with 9 (12.8%) (fig. 1).

The mean endometrial thickness in the normal group was 10.5mm with a range of 7.5-13.4mm. The highest frequency of 43 (61.4%) had the endometrial thickness of 9.5-11.4mm. The endometrial thicknesses among the secondary infertility group ranged from 2.0mm to 18mm. The highest frequency of 25 (35.7%) had endometrial thickness of 2.0mm to 3.4mm, and the least frequency of 2 (2.9%) with an endometrial thickness of 13.5-15.4mm (fig. 2).

The mean follicular size was 20.0mm with a range of 17.5mm-23.4mm. The follicular size with the highest frequency in the normal group was the 19.5-21.4mm with 34(48.6%), and the least frequency was 21.5-23.4mm with 8 (11.4%). The mean follicular size was 10mm among the secondary infertility group with range of 2mm to 27.5mm. The follicular sizes of <2.0-5.4mm had the highest frequency with 32 (45.7%). The least was 1 (1.4%) with follicular sizes of 13.5-15.4mm.



Figure; 1: Age Distribution among the Normal group and those with Secondary Infertility

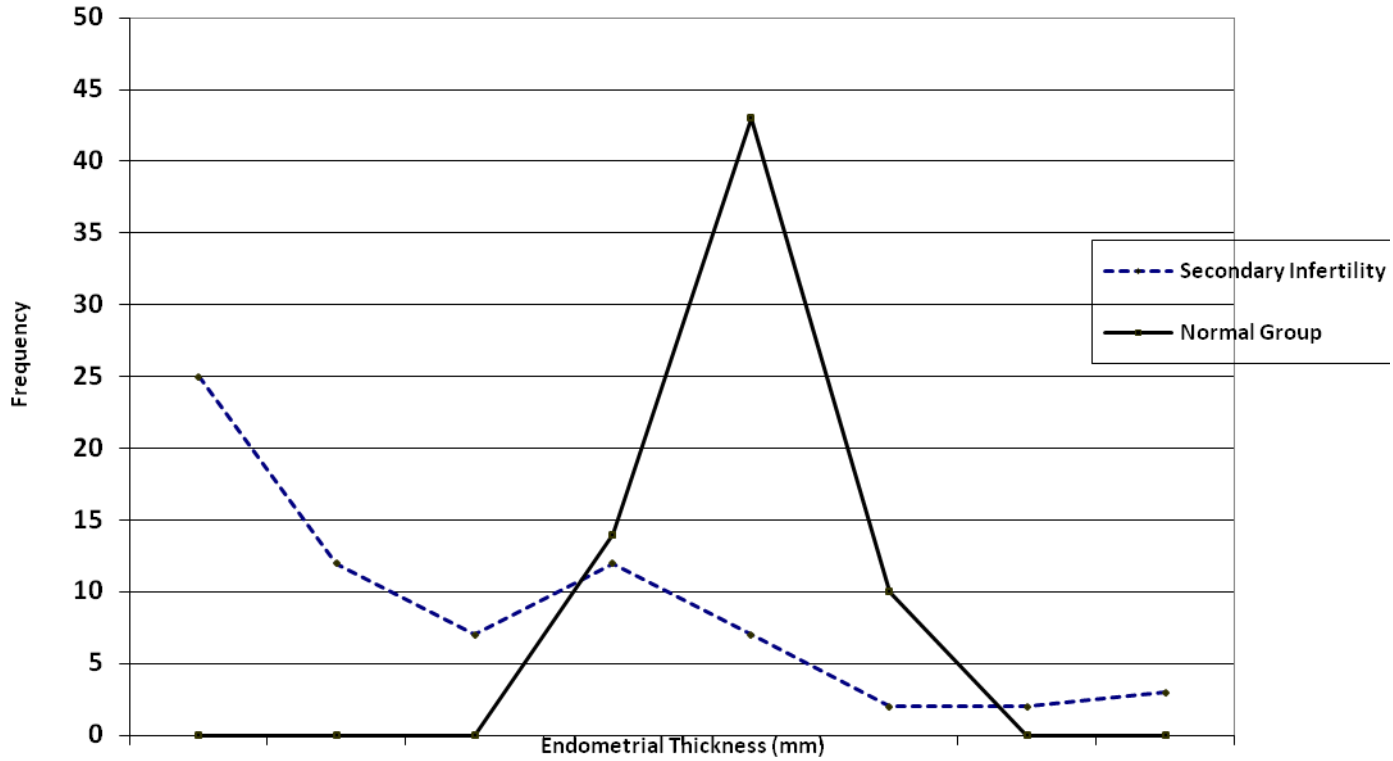


Fig. 2: Graph of distribution of Endometrial Thickness among the Normal Group and Group with Secondary Infertility.

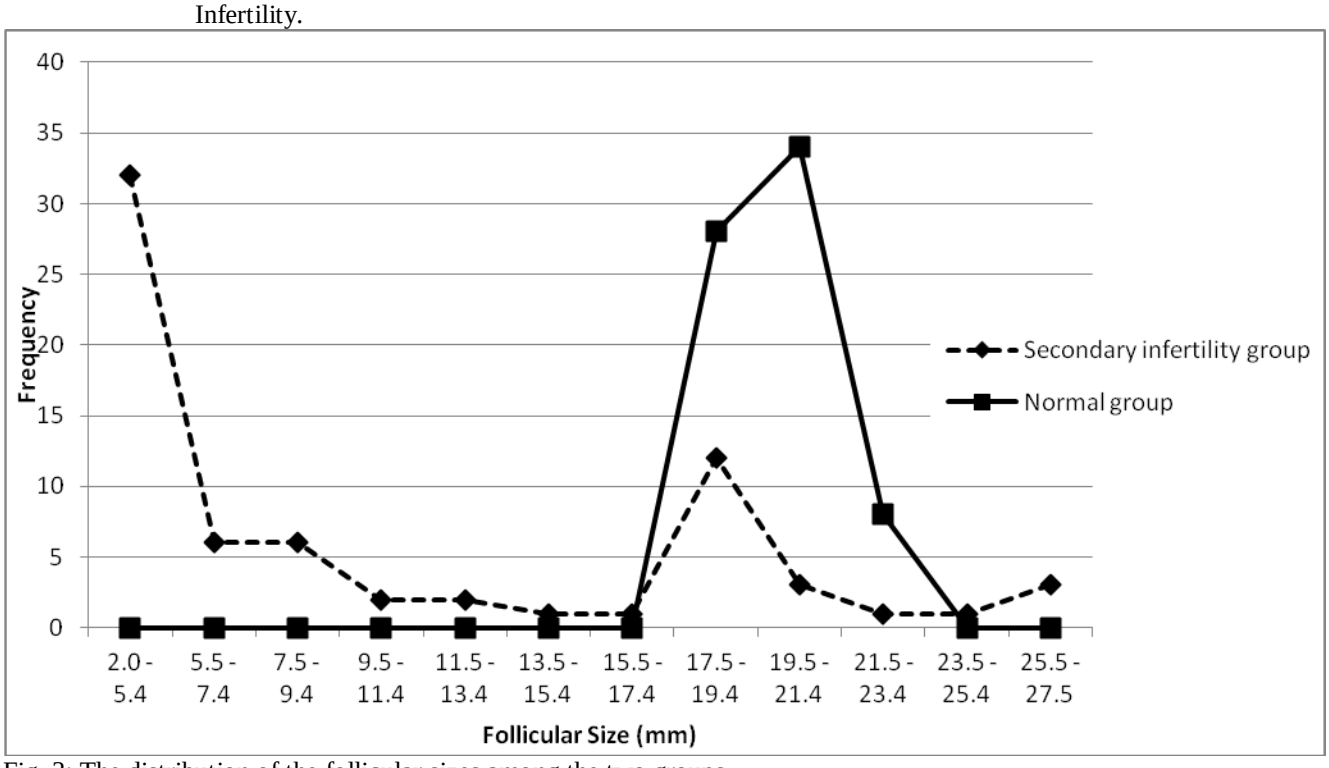


Fig. 3: The distribution of the follicular sizes among the two groups.

5.1 DISCUSSION

About one hundred and forty (140) subjects participated in the study which included seventy women for normal group and seventy women with secondary infertility.

The age group 25-29 years had the highest frequency among the secondary infertility group with 28(40%), while those in the normal group age group of 35-40 years were highest frequency with 33(47.2%).

Participants within the age group of 20-24 years, showed a marked difference in frequency between the normal women and women with secondary infertility, normal subjects had frequency of 14 (20%) while those with secondary infertility had lower frequency of 3(4.3%). This may probably be an indication that secondary infertility is not a common medical phenomenon in this early age group because many in this age group may be newly married or not yet be married or may not yet have need to present for medical checkup due to infertility. The age of 25-34 years group have the highest rate of those seeking medical checkup due to secondary infertility.

Endometrial Thickness

Majority of subjects in the normal group 43 (61.4%) had endometrial thickness of 9.5mm - 11.4mm, 13(18.6%) had endometrial thickness of 11.5-13.4mm, and 14(20%) with endometrial thickness of 7.5-9.4mm. The mean endometrial thickness in this group was 10.5mm ($\pm$ 1.3). This range of endometrial thickness is similar to the works of Creighton[1,6,7,&8], who found that no pregnancy occurred when endometrial thickness was less than 7mm. Although results were sometimes conflicting but most studies agree that the endometrium has to reach a certain thickness for successful pregnancy to occur [9]. There was a significant difference between the endometrial thickness of the normal group and those with secondary infertility ($p < 0.05$), implying that when the endometrial thickness is outside the normal for this study, there could be fertility abnormality.

The endometrial thickness among women with secondary infertility ranged from 2.0-18mm, the largest frequency of 25 (35.7%) was found among the group who had thin endometrium of 2.0-3.4mm; this was followed by 19 (27.1%) of the subjects who had endometrial thickness of 3.5-7.4mm. Therefore, the study showed that 44(62.8%) of the subjects had thin endometrium which measured less than the minimum thickness of 7.5mm found among the normal groups. This is in agreement with the study of Dickey et al.,[8] who opined that specified minimum thickness of the endometrium must be reached before a successful pregnancy would occur. The result also showed that more than 50% of the causes of secondary infertility in this study were found to be related to thin endometrium or to causes that reduce endometrial thickness. About 21 (30%) of the subjects had endometrial thickness of 7.5-13.5mm, which is within the range of normal thickness. These data indicated that secondary infertility can still exist in the presence of normal endometrial thickness; therefore a normal endometrium alone does not rule out secondary infertility but makes it probable that the cause of the secondary infertility may not be related to endometrium, helping the clinician or health provider to look for other causes. Only about (7.2%) of the subjects had endometrial thickness that range from 13.5-18.0mm. This appeared to be higher than the range among the normal subjects. Endometrial hyperplasia may be suspected as suggested by Creighton[1], that endometrial thickness more than 15mm at any stage of the menstrual cycle requires histological studies.

Follicular Sizes

The follicular size among the normal group ranged between 17.5-23.4mm. The largest frequency of 34 (48.6%) of the normal subjects had follicular size of 19.6-21.5mm, and the least follicular size of 17.6-19.5mm had 12 (17.1%) of these subjects. Saaraneen et al.,[6] had normal follicular sizes of 16-23mm in their study; however there was no significant difference between the mean of this study (20mm) and that of Saaranen et al.,[6] (20.1mm). The mean follicular size of 20mm is in agreement with the study of Ojegbende et al.,[7]. The follicular size among the normal group in this study showed significant difference from the follicular size of women with secondary infertility ($P<0.05$), implying that follicular size outside the range of found in this study could also result in fertility abnormality.

Follicular Size among Women with Secondary Infertility

About 32(45.7%) of the subjects had follicular size of 2.0-5.5mm, 12(17.2%) had follicular size of 5.6-9.5mm, and 50 (70.5%) had follicular sizes less than the minimum size (17.6mm) of the normal group. This reveals that about 70% of subjects who had secondary infertility had follicles which were less than the minimum normal follicular size and probably failed to grow as a result of hormonal disorder [10 &11]. Only 2 (2.8%) of subjects of secondary infertility had follicular size of 13.6-17.5mm which was less than normal but on the borderline of normal follicular size. About 16 (22.8%) of the subjects had normal follicular size of 17.6-23.5mm pointing to the fact that infertility can occur in the presence of normal follicular size, which also suggests that in the event of infertility, normality should not be assumed because the follicle is normal. About 4(5.7%) of the subjects had follicular size (23.6-27.5mm) which were greater than normal for the study.

Comparison of the Pair Endometrial Thickness and Follicular Sizes

Since the pair of endometrium and follicle commence growth at the same time during menstrual cycle[12 &1]. The pair, for normal women was compared with the pair of endometrial thickness and follicular size of women with secondary infertility.

Six main categories of the pair of follicle and endometrial abnormalities were observed among the group of secondary infertility and these groups were:

1. Thin endometrium with small follicular size
2. Thin endometrium with normal follicular size
3. Normal endometrial thickness with normal follicular size
4. Subnormal endometrial thickness with subnormal follicular sizes
5. Thick endometrium with small or normal follicular size
6. Ovarian/Follicular Cysts with Normal or Thin Endometrium

Conclusion

Ultrasound is a veritable diagnostic tool in the investigation of the pelvic organs (endometrium and the follicles) among normal women and women with secondary infertility, showing a varying pattern of sizes for pairs of endometrial thickness and follicular size simultaneously at mid-menstrual cycle of women. Ultrasound should be the first line of investigation in the management of secondary infertility as the study was able to show disorders that had anatomical and inflammatory background. Further studies should be carried out to know whether various degrees of follicular sizes are related to endometrial thickness.

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