



Transvaginal ultrasound evaluation of ovarian volume among normal adults in Makurdi, North-Central Nigeria

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Abstract

Objective: This study was to evaluate the normal ovarian volume amongst normal adults using transvaginal ultrasound.

Methods: This was a hospital based prospective descriptive study carried out between May and December 2012 on consecutive patients presenting for ultrasonography at Federal Medical Centre Makurdi. Sonographic examination was done using Sonoscape SS1-1000 machine fitted with a 5.2 MHz transvaginal transducer and incorporated with an electronic calipers. With an empty bladder, the patient lay in a supine position and the transducer was advanced into the vagina. The ovarian volume of each patient was obtained. The sociodemographic data and body mass index of each patient was also recorded. The data was entered into an Excel sheet and analyzed using EPI INFO statistical software version 3.5.4.

Results: Two hundred and seven subjects were recorded for this study. The average volumes of the left and right ovaries were 6.5 ± 3.3 ml and 6.4 ± 3.8 ml respectively.

Conclusion: These values represent the normal average ovarian volume for healthy women in our environment.

Keywords: Transvaginal ultrasound, ovarian volume, correlates, transducer, body mass index

Introduction

Sonography is the imaging study of first choice in the investigation of cases of pelvic pathology. It is readily available, relatively inexpensive and uses a non-ionizing radiation. Though transabdominal approach is frequently done, the transvaginal technique is better. It gives a better resolution and hence improved visualization of the uterus and adnexa area. Moreover, the problem due to abdominal fat and the discomfort of full bladder are avoided. The technique is quick and gives accurate result in the assessment of ovarian size and volume.

The ovaries are paired ovoid structures. Each is located on either side of the uterus. They are found at the level of the fundus where the uterus becomes thinner. Though the exact positions are variable especially in the multi parous women, they usually lie adjacent to the psoas muscles with the iliac vessels lying laterally [1]. The ovarian size and volume are affected by diseases, drugs, ovulation and age [2,3].

Evaluation of the ovarian size is accomplished with the formula for the volume of prolate ellipsoid (Volume=length x height x width x 0.5233). In premenopausal women, the normal ovarian volume is documented to be between 5.3ml to 13.9ml, while in postmenopausal the volume is less than 8ml [4-6].

The clinical utility of measurement of ovarian volume include: screening for abnormalities of adolescences, diagnosis of Polycystic Ovarian Syndrome (PCOS), diagnosis and follow up of treatment of ovarian malignancies. Furthermore, ovarian

volume measurement is important in the assessment of ovarian reserve and in predicting response to super ovulation.

It has been demonstrated that all ovaries assessed to be of normal morphology by ultrasound were found to be normal at the time of laparotomy and there was good correlation between ovarian volume as determined by ultrasound and by direct measurement at the time of laparotomy [7]. Likewise, Rodriguez, demonstrated that trans vaginal ultrasound had a sensitivity of 90% and a specificity of 100% when compared with the direct ovarian measurement at the time of surgery [8].

However, in the diagnosis of ovarian enlargement or abnormality, it is necessary to determine the normal range of ovarian volume in specific age groups. Studies on ovarian volume are generally lacking in Nigeria. A previous study on ovarian volume done in Enugu south eastern Nigeria used a transabdominal approach even though the transvaginal approach is more accurate [4]. A similar study done in Port Harcourt south south Nigeria using transvaginal approach however employed a smaller sample size [5].

The purpose of this study therefore is to assess the normal ovarian volume in healthy women in a defined Nigerian population through the transvaginal ultrasonography.

Methodology

This was a prospective descriptive study. All consecutive clients who met the entry requirements were recruited between May

Table 1. Distribution of age and parity of the women.

Age group	Frequency (N207)	Percentage (100%)
<20	18	8.7
21-30	101	48.8
31-40	60	29.0
41-50	14	6.8
>50	14	6.8
Parity		
0	80	38.6
1-2	39	18.8
3-4	48	23.2
>5	40	19.2

Table 2. Distribution of correlation of independent variables with ovarian volume.

Variables	Ovarian volume	Pearson correlation (r)	P-value sig (2-tailed)
Age	RT	-0.316	0.00
	LT	-0.321	0.00
Weight	RT	0.107	0.13
	LT	0.142	0.04
Parity	RT	-0.070	0.32
	LT	-0.015	0.83

2011 and December 2012. Inclusion criteria included all non pregnant females whose age with clinically and sonographically healthy pelvic organs requesting an abdominopelvic scan. Clients on oral contraceptive pills, injectables or ovulation induction drugs were excluded from the study. So also were clients who had IUCD insitu or those who were unwilling to participate.

Sonographic examinations was done using a sonoscape machine fitted a 5.2MHz transvaginal sector transducer. With an empty bladder, the client lay in a supine position and the buttocks elevated with pillows. The transducer was advanced about 6 to 8cm into the vagina angling laterally until the ovary was seen. The length and Antero-Posterior (AP) measurements were obtained in the longitudinal plane, while the transverse plane was used to measure the width. The age, height and weight of the clients were recorded. The menstrual phase and the parity were also recorded. The ovaries were classified into left and right. The data was entered into an Excel sheet and analyzed using EPI INFO statistical software version 3.5.4. The normal ovarian volume and the correlates were estimated for the population.

Sample size

For convenience the sample size for the study was 207 clients.

Ethical considerations

Ethical approval was obtained from the ethical committee of the Federal Medical Centre Makurdi. Informed written consent was obtained from the clients after the nature, aim

and objectives of the study were explained to the clients in the language they best understood. Consenting participant signed a consent form or appended their thumb prints appropriately. The participants were given the option to opt out of the study if they so wished without affecting any benefit accruing to them.

Results

A total of 207 women were studied. The means of their social demographic features namely; age, parity, weight and height were, 31.2 ± 10.5 years, 2.5 ± 4.1 , 63.0 ± 11.3 kg and 1.87 ± 0.4 m respectively. The average volumes of the left and right ovaries were 6.5 ± 3.3 ml and 6.4 ± 3.8 ml respectively.

Pearson's correlation analysis showed that ovarian volume was negatively correlated with age (RT ovary $r = -0.36$, $p < 0.001$; LT ovary $r = -0.15$, $p = 0.83$). Similarly, the ovarian volume was negatively correlated with parity (RT ovary $r = -0.070$, $p = 0.32$; LT ovary $r = -0.015$, $p = 0.83$). However, the ovarian volume was positively correlated with weight (RT ovary $r = 0.107$; LT ovary $r = 0.142$, $p = 0.04$). Analysis with one way ANOVA indicated a statistically significant difference amongst the menstrual phases and ovarian volume (RT ovary: $f = 3.575$, $df = 5$, $p = 0.04$; LT ovary: $f = 3.177$, $df = 5$, $p = 0.009$) (Tables 1 and 2).

Discussion

Transvaginal sonography which was described about two decades ago is more promising because it provides better resolution and hence more morphological details of the ovaries [9]. Our result showed the mean ovarian volumes for the left and the right ovaries were 6.5 ± 3.3 ml and 6.4 ± 3.8 ml respectively. These values are similar to that reported by other workers [4,5,10]. This also supports the assertion that there is no racial or geographical difference in values of ovarian volume. However, in a study of postmenopausal women Pongsatha S et al., showed that there is a racial difference between ovarian volume of Thai women and western women [11].

Ovarian volume gradually increases with age but becomes smaller at perimenopausal age of 40 years. This reduction in volume is said to be due to decrease in the number of follicles with advancing age [12]. This finding is demonstrated by our study where there is a significant negative correlation between ovarian volume and age ($P < 0.001$).

Similarly, our data has demonstrated a negative correlation between ovarian volume and parity. This could be due to the fact that with increasing parity, there is advancement in age which consequently led to a waning ovarian function. This finding supports the work by Goswamy et al., [13]. In contrast, Merz et al., reported that parity had no effect on ovarian volume [14].

Our study however, showed a positive correlation between ovarian volume and weight. This may be due to the fact that there is a general increase in the size of body organs with increasing weight and the ovaries are expected to increase in size and consequently volume. This relationship between

ovarian volume and weight has been reported by other researchers [4,15].

Ovarian volume is expected to change with the different phases of menstrual cycle in keeping with the change in sizes of the follicles within them. This study showed a positive correlation between the ovarian volume and the phases of menstruation (RT ovary: $f=3.575$, $df=5$, $p=0.04$; LT ovary: $f=3.177$, $df=5$, $p=0.009$). Joseph et al., in a work done in Enugu, South Eastern Nigeria also reported a similar finding [4]. However, this finding is in sharp contrast to that by Oppermann et al., who in a study done at Hospital de Clinicas de Porto algra, Brazil did not establish any statistical difference in ovarian volume in relation to the phases of menstruation [16].

Conclusion

Measurement of ovarian volume is important for accurate evaluation and management of ovarian disorders. The ultrasound which is readily available, simple and cost effective is better suited for our environment than other imaging modality. The values of ovarian volume from our study may provide a baseline of normal ovarian volume in our community.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

Authors' contributions	MH	NS	BU	ST
Research concept and design	√	√	√	√
Collection and/or assembly of data	--	√	√	--
Data analysis and interpretation	--	√	--	√
Writing the article	√	--	--	√
Critical revision of the article	--	√	--	√
Final approval of article	√	√	√	√
Statistical analysis	--	--	√	--

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