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ORIGINAL ARTICLE

OVARIAN VOLUME BETWEEN FERTILE AND INFERTILE MARRIED WOMEN WITH TRANSVAGINAL SONOGRAPHY

Sarah Yunus[1], Sadaf Rasheed[1], Amir Amanullah[1], Shehla Aman[1], Usman Ullah[2], Fidaullah Wazir[3]

Departments of Anatomy, [1]Gomal Medical College, D.I.Khan, [2]Gajju Khan Medical College, Sawabi and [3]Pak International Medical College, Peshawar

ABSTRACT

Background: Infertility is a social problem and a big stigma. The objectives of the study were to determine the age wise distribution of ovarian volume and the difference in ovarian volume between married fertile and infertile women with transvaginal sonography.

Materials & Methods: This comparative, cross-sectional study was conducted in the Department of Anatomy, Gomal Medical College, D.I.Khan, Pakistan from March 2013 to December 2013. Sample Size was 100 women selected by consecutive non probability sampling technique. Sample size was calculated using online calculator Raosoft. Inclusion criteria were women aged 18-50 years, married, fertile and infertile. Color Doppler sonoscape with multi frequency transvaginal probes were used in measurements on any day in the start of menstrual cycle by the same observer. The volume was calculated by applying formula for ellipsoid called Prolate ellipsoid formula. The total volume was represented by sum of volume of two ovaries**.** Data collection site was out patient department of Radiology DHQ Teaching Hospital, D.I.Khan. Demographic variable were age groups and presence of fertility. Research variable was ovarian volume. Mean and standard deviation were calculated for ovarian volume whereas frequency and percentages were calculated for age groups and presence of fertility. Descriptive statistics along with estimation of parameter was done at 95% confidence interval for proportion and mean. Student- t test was used for significance of difference in ovarian volume between fertile and infertile women with p value <0.05 considered significant. SPSS was used for data analysis.

Results: The ovarian volume in infertile women of reproductive age (6.09 cm^3) is significantly smaller than fertile (9.75cm^3) women.

Conclusion: Ovarian volume is maximum in age group 18-26. There is effect of fertility on ovarian volume.

KEY WORDS: Infertility; Ovarian volume; Sonography.

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INTRODUCTION

In Pakistan about 22% of gynecological consultations are concerned with infertility. Despite all the basic tests used for infertile couples the most important test regarding success of ovulation induction is to determine ovarian volume at first followed by other invasive tests.[1] As a result of rapid increase in the use of transvaginal ultrasound, ovarian volume measurement has become very fast, accurate and economical.[2] The size of the ovary is better described as volume because of changes in its shape and configuration. The volume is calculated by using the formula for an ellipsoid: the prolate ellipsoid formula which is calculated as length x breadth x width x 0.523. Ovarian volume measurement is a better predictor of ovarian response and is also reproducible with very low inter and intra observer variability.[3] Infertility has greatly affected persons in developing countries and the conception of children is a symbol of social value. There are a number of tests used to evaluate the infertile couple but now a days ovarian volume measurement is in progress. The ovaries are oval structures which measure some 4x2x1cm. Depending on age and physiological status, their size and morphology can vary. It remains relatively constant from birth to five years of age but after this time period, there is an increase in volume.

Corresponding Author:

Dr. Sarah Yunus
Assistant Professor
Department of Anatomy
Gomal Medical College
D.I.Khan, Pakistan
E-mail: drsarah_anwar@yahoo.com

With the onset of puberty, they enlarge rapidly as a result of hormonal stimulation. After reaching puberty, the size of the ovary is 2cm long, 2cm wide and 3-4cm thick. The normal shape of the ovary is ellipsoid which may vary in configuration. The shape of the ovary varies widely i.e. from spherical to linear in addition to the ovulation associated functional alterations.[4]

At or soon after puberty, the volume is 12 cm^3 which then progressively decreases to 2.5 cm^3 at menopause and 0.5 cm^3 10 years after menopause. In literature no other lower limit has been described, but if the ovary cannot be identified does not exactly mean agenesis or dysgenesis of ovary.[4]

Age is very important in order to determine quality and quantity of ovarian volume. The rate of infertility in females who got married at the age of 20-24, 25-29, 30-34, 35-39, 40-44 years are 6%, 9%, 15%, 30%, and 64% respectively in Pakistan.[1,5,6] Estimation of ovarian volume will help in predicting the remaining reproductive life span and expected success of assisted reproductive technique like in vitro fertilization.[7-9] There are number of test used for the assessment of ovarian volume but ultrasonography is considered to be a useful tool for the evaluation of ovarian function.[8,10] The objectives of the study were to determine the age wise distribution of ovarian volume and the difference in ovarian volume between married fertile and infertile women with transvaginal sonography.

MATERIALS AND METHODS

This comparative cross-sectional study was conducted in the Department of Anatomy, Gomal Medical College, D.I.Khan, Pakistan from March 2013 to December 2013. Sample Size was 100 women selected by consecutive non probability sampling technique. Sample size was calculated using online calculator Raosoft.[15] Inclusion criteria were married women aged 18-50 years. Exclusion criteria were women having history of hypertension, diabetes mellitus, drug abuse, smoking, malignancy, ovarian surgery, abnormal ovarian morphology and the presence of polycystic ovaries. Consent was taken from all the subjects and confidentiality of data was ensured. Color Doppler sonoscape with multi frequency transvaginal probes with the mid frequency of 2-6 MHz for 5-9 MHz for transvaginal probe were used in measurements on any day in the start of menstrual cycle by the same observer. Each ovary was scanned in three dimensions; D1 (Longitudinal), D2 (Antero posterior) and D3 (Transverse). The volume was calculated by applying formula for ellipsoid called Prolate ellipsoid formula (viz D1 x D2 x D3 x 0.523 cm^3). The total volume was represented by sum of volume of two ovaries4,7,9. Data collection site was OPD of Department of Radiology District Head Quarter Teaching Hospital, D.I.Khan.

Demographic variable were age groups (18-26, 27-34, 35-42, 43-50 years) and presence of fertility (Yes, No). Research variable was ovarian volume in cm^3. Mean and standard deviation were calculated for numeric variable such as ovarian volume whereas frequency and percentages were calculated for categorical variables such as age groups and presence of fertility. Descriptive statistics along with estimation of parameter were calculated at 95% confidence interval for proportion as well as mean. Student- t test was used for significance of difference in ovarian volume between fertile and infertile women with p value <0.05 considered significant. SPSS was used for data analysis.

RESULTS

Out of 100 women, 45 (45%) were fertile and 55 (55%) infertile (Table 1).

The ovarian volume in fertile women was 14.42 cm^3 in 18-24 years, 11.24 cm^3 in 27-34 years, 6.23 cm^3

Table 1: Distribution of the subjects by fertility status in DHQ Hospital, D.I.Khan, Pakistan (n=100)

S. No.	Presence of fertility	Frequency	Percentage	95% confidence interval of proportion
1	Yes	45	45%	±9.75 (35.25 - 54.75)
2	No	55	55%	±9.75 (45.25 - 65.75)

Table 2: Ovarian volume in fertile and infertile women by various age groups in DHQ Hospital, D.I.Khan, Pakistan (n=100)

S. No.	Age groups in years	Ovarian volume (cm^3) fertile women	95% CI of mean	Ovarian volume (cm^3) Infertile women	95% CI of mean
1	18-26	14.42	7.53-21.31	8.16	2.79-13.53
2	27-34	11.24	5.05-17.43	5.40	0.97-09.83
3	35-42	6.23	1.49-10.97	3.28	0.21-06.77
4	43-50	3.47	0.12-07.06	1.44	0.89-03.77

Table 3: Comparison of ovarian volume between fertile and infertile women in DHQ Hospital, DIKhan, Pakistan (n=100)

Variable	n	Mean (cm^3)	SD	Mean difference	95% CI of mean difference		t-value	d.f.	p-value
Fertile	45	9.75	4.50	3.65	Lower	Upper	5.16	98	<0.00001
Infertile	55	6.09	2.20		2.25	5.06			

in 35-42 years and 3.47 cm^3 in 43-50 years. Similar values for infertile women were 8.16, 5.40, 3.28 and 1.44 among age groups 18-26, 27-34, 35-42 and 43-50 respectively. (Table 2)

Ovarian volume of 9.75±4.50 cm^3 was found in fertile group whereas ovarian volume of 6.09±2.20 was recorded in infertile patients. It was found that highly significant ($P \leq 0.01$) differences were observed in ovarian volume between infertile and infertile patients. (Table 3)

DISCUSSION

Our study clearly showed that ovarian volume was more in fertile population as compared to infertile population (9.75 cm^3 and 6.09 cm^3 respectively) and the difference was highly significant. We have chosen ultrasound instead of other biochemical tests because it is non-invasive, easily performed and reproducible, readily available and inexpensive as concluded by Shahida et al., in their study on fertile and sub fertile population of Karachi.[10,11]

A decrease in ovarian volume is a sign of ovarian ageing which is observed earlier than a rise in FSH concentrations and is a good predictor of poor response to ovulation induction.[3] Our study in table 1 showed that as the age of the women increases the volume of the ovaries decreases (14.42-3.47 cm^3 from youngest to oldest age group). In the same way Lass concluded from his study in which volume was 10.4 cm^3 in females < 35 years and 6.1cm^3 in females > 35 years of age.[12,13] Ultrasound assessment of ovarian volume is cost effective and non-invasive if not a better technique than hormonal levels.[13] Age doesn't have a major effect on ovarian volume during the reproductive life span of women till the peri menopausal period as shown by Ernest in his study on fertile Chinese population.[14] Similarly our study also showed significant difference in volume between the two extremes i.e. youngest and the oldest age group. Another study conducted in Egypt, the mean ovarian volume was found to be 9.9 cm^3 which is close to our value.[4] In a Chinese population the mean ovarian volume was found to be 3.90 cm^3 in a study conducted in fertile a woman who shows that there are obvious demographic differences in ovarian volume varying from region to region.[14]

CONCLUSION

Ovarian volume is maximum in age group 18-26. There is effect of fertility on ovarian volume.

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
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AUTHORS' CONTRIBUTION

The following authors have made substantial contributions to the manuscript as under:

Conception or Design:	SY
Acquisition, Analysis or Interpretation of Data:	SY, SR, AA, SA, UU, FW
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All the authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.