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Evaluation of antral follicular count (AFC) and total ovarian volume as markers of ovarian reverse in infertile and healthy women (fertility proven)

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Abstract
Background: Ovulatory disorders are the leading cause of female infertility. Infertility is age- related decline in fertility. Antral follicular count (AFC) is a reliable marker to assess female fecundity. This study was designed to evaluate the relationship of AFC with age in sub-fertile cases and with healthy (fertility proven) control women.
Materials and Methods: A total of 50 infertile females attending investigation of subfertility and age, sex-matched 50 healthy control subjects were recruited. On 2nd or 3rd day of the ovarian cycle, the basal ovarian volume and AFC were measured by endovaginal ultrasound. Transvaginal USG was carried out on the second and third day of the menstrual cycle.
Results: The mean total ovarian volume in cases was 11.25 and in controls 11.67. The mean antral follicular count in cases was 6.95±1.85, while in controls 10.44±2.01. There was an inverse correlation between age and antral follicular count (r = -0.424 with p value 0.002). While there was no significant correlation between ovarian volume and antral follicular count (r = -0.318 with p value 0.352).
Conclusion: The ovarian volume has no role as a biomarker of ovarian reserve. AFC has been proved significantly as an excellent predictor of ovarian reserve and response when compared to other parameters

Keywords: primary infertility, antral follicular count (AFC), ovarian volume

Introduction
Infertility is an age related decline in fertility, which occurs by multiple factors that give overall reproductive failure, including poor endometrium and substandard oocyte quality [1]. Globally, infertility affects approximately 8-10% of couples [2]. Ovulatory disorders are the leading cause of female infertility in 30% of cases [3]. Autopsy studies on human ovaries demonstrated that the follicular count has been decreased with age. Various methods like anti follicular count (AFC) by USG, day-3 follicle-stimulating hormone (FSG) and anti-mullarian harmone (AMH) have been detected that fertility has been decreased with reproductive age [4]. Few cases with the small ovarian volume on USG shows a poor response to controlled ovarian hyperstimulation in assisted reproductive programs. USG based measurement of ovarian stromal blood flow after pituitary suppression can prognosticate ovarian responsiveness. Transvaginal ultrasonography based antral follicular count (AFC) correlates well with increasing age [5, 6]. Thus, USG help to measure reproductive potential to help the women's prospects for pregnancy [7]. Therefore, this study evaluates the relationship of AFC with age in sub-fertile cases and with healthy (fertility proven) control women.

Materials and Methods
The present case-control study was conducted in the department of obstetrics and gynaecology at MNR Medical College and Hospital, Sangareddy, Telangana during June 2018 to October 2019. A total of 50 infertile females attending investigation of subfertility and age, sex-matched 50 healthy control subjects attending for routine health check-up were recruited. Cases with primary infertility, no ovarian abnormalities were included; cases with ovarian abnormalities, with uterine malformations, history of ovarian surgery, with PCOD and ovarian endometriomas were excluded. Cases confirmed with natural fertility with a minimum one pregnancy, regular menstrual cycles, without ovarian surgeries were recruited as control subjects. Informed consent was obtained from all the cases and study protocol was approved by the institutional ethics

committee.

On 2nd or 3rd day of the ovarian cycle, the basal ovarian volume and AFC were measured by endovaginal ultrasound. Transvaginal USG was carried out on the second and third day of the menstrual cycle. Three different planes were used to measure ovaries and followed the prolate ellipsoid formula to assess ovarian volume.

Prolate ellipsoid formula V=D1xD2xD3x0.523.

Statistical analysis was done by SPSS statistical software version 16. According to age group, cases and control subjects were divided into two groups. Subgroup variables were compared by students 't" test.

Results

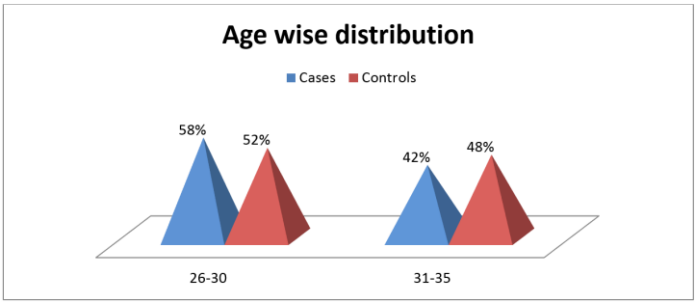

Fig 1: Age-wise distribution of study participants.

Table 1: Details of study variables among cases and control subjects.

	Cases (Mean±SD)	Controls (Mean±SD)	P value
Age (In years)	32.04±2.34	30.98±2.42	0.002
BMI (Kg/m^2)	22.18±2.25	22.67±2.30	0.287
Ovarian volume	11.25±2.01	11.67±1.85	0.350
Antral follicular count	6.95±1.85	10.44±2.01	0.001

Table 2: Correlations between study variables and antral follicular count.

Variables	Cases (n=50)	Controls (n=50)
Age VS antral follicular count		
Significance (p value)	0.0024	0.0003
Correlation coefficient r	-0.424	-0.687
Ovarian volume VS antral follicular count		
Significance (p value)	0.352	0.587
Correlation coefficient r	-0.318	-0.498
Duration of infertility VS antral follicular count		
Significance (p value)	0.001	-
Correlation coefficient r	-	-

Discussion

Infertility is termed as failure to conceive after one year unprotected, regular intercourse. In 30% female, ovulatory disorder is a reason for infertility [8]. The antral follicular count has become an appropriate biomarker to assess female fecundity [9]. This study was designed to assess the role of antral follicular count as a function of ovarian reserve in sub-fertile and infertile women. The mean age in cases and controls was 32.04 and 30.98 years respectively. The mean statistical difference among the two study groups was statistically significant (p=0.002). The mean BMI in cases (22.18 Kg/m^2) and controls (22.67 Kg/m^2) was statistically not significant (p=0.287). A study by Arjit Agarwal *et al*., found mean age in the study cases (n=30) was 26.77 years and in controls (n=30) was 26.73 years. The mean difference in BMI was statistically not significant (p=0.237) [9]. A study by Arjit Agarwal *et al*., found mean age in the study cases was 26.5 years. There was a significant difference in BMI among two study groups (p=0.020) [10]. A study by Nayak PK *et al*. noted mean in cases was 27.86 years and in controls 28.8 years. The mean difference in age was statistically not significant (p=0.3). The mean BMI in cases was 23.41 and in controls 24.25. The mean difference of BMI was statistically not significant (p=0.105) [11]. A study by Sanjay Kumar Chowdhury on 30 infertile cases found mean age 26.77 years, while in controls 26.73 years. The mean difference in age (p=0.959) and BMI (p=237) was statistically not significant [13].

In the present study, the mean total ovarian volume in cases was 11.25 and in controls 11.67. A study by Arjit Agarwal *et al*., found mean total ovarian volume in cases was 12.95±7.279 and in controls was 11.38±4.939. The mean difference in total ovarian volume was statistically not significant (p=0.334) [9]. Study by Arjit Agarwal *et al*., found no significant difference in the mean ovarian volume in both study groups (12.5±6.279 in cases and 11.0±5.280 in controls) [10]. A study by GJ Scheffer *et al*., found mean ovarian volume in young 25-34 years was 11.8 ml, in middle 35-40 years was 11.4 ml and in old 41-46 years was 8.3 ml [12]. A study by Sanjay Kumar Chowdhury found mean total ovarian volume in cases was 12.95±7.279, while in controls 11.38±4.93. The mean difference was statistically not significant (p=0.334) [13].

In the present study, the mean antral follicular count in cases was 6.95±1.85, while in controls 10.44±2.01. The mean difference among the two study groups was statistically significant (p=0.001). A study by Arjit Agarwal *et al*., found mean antral follicular count in cases was 9.60±4.082 and in controls was 12.53±2.623. The mean difference of antral follicular count was statistically significant (p=0.002) [9]. A study by Arjit Agarwal *et al*., found mean antral follicular count in cases 7.71±4.26, while in controls 11.25±3.19. The mean difference of antral follicular count was statistically significant (p=0.004) [10]. A study by Nayak PK *et al*., stated that the mean antral follicular count in cases was 11.2±4.36, while in controls 16.36±3.95. The mean difference of antral follicular count was statistically significant (p<0.001) [11]. Sanjay Kumar Chowdhury in his study on 30 infertile cases noticed that the mean antral follicular count was 9.60±4.082 in cases and 12.53±2.623 in controls. The mean difference of antral follicular count was statistically significant (p<0.002) [13].

In this study, there was an inverse correlation between age and antral follicular count (r = -0.424 with p value 0.002). While there was no significant correlation between ovarian volume and antral follicular count (r = -0.318 with p value 0.352) (Table 2). A study by Sanjay Kumar Chowdhury found that there is an inverse relationship between AFC and the age of female (a negative correlation value; r = −0.528 with P value of 0.03) [13]. A cut-off value of 10 may be used to prognosticate cases undergoing assessment for female factor infertility [9]. The mean AFC count of 12 can be considered as a cut off of successful treatment for infertile Indian women [11].

Conclusion

The results of this study conclude that the ovarian volume has no role as a biomarker of ovarian reserve. AFC has been proved significantly as an excellent predictor of ovarian reserve and response when compared to other parameters.

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