Original Research Article

Ultrasound measurement of ovarian volume and antral follicular count in normal (fertility –proven) and infertile south Indian women (Chennai)

Nalini Jeyaprakash[1*], Sudha M[2]

[1]Associate Professor, Department of Physiology, Madha Medical College and Research Institute, Kovur, Thandalam Chennai, Tamil Nadu, India
[2]Professor, Department of Physiology, Rajah Muthiah Medical College and Hospital Annamalai University, Chidambaram, Tamil Nadu, India
[*]Corresponding author email: **nalinidgo@gmail.com**

International Archives of Integrated Medicine, Vol. 7, Issue 12, December, 2020.
Available online at http://iaimjournal.com/
ISSN: 2394-0026 (P) **ISSN: 2394-0034 (O)**
Received on: 14-11-2020 **Accepted on:** 24-11-2020
Source of support: Nil **Conflict of interest:** None declared.
How to cite this article: Nalini Jeyaprakash, Sudha M. Ultrasound measurement of ovarian volume and antral follicular count in normal (fertility –proven) and infertile south Indian women (Chennai). IAIM, 2020; 7(12): 34-38.

Abstract

Background: Antral follicle count (AFC) has been labeled as the most accurate biomarker to assess female fecundity. Unfortunately, no baseline Indian data exists, and we continue using surrogate values from the Western literature (from studies on women, grossly different than Indian women in morphology and genetic makeup).
Aim: To establish the role of AFC as a function of ovarian reserve in fertility- proven and in subfertile Indian women.
Materials and methods: Thirty patients undergoing workup for infertility were included and compared to an equal number of controls (women with proven fertility). The basal ovarian volume and AFC were measured by endovaginal USG the relevant clinical data and AFC, ovarian volume was charted for every patient.
Results: Regression analysis revealed the highest correlation of AFC and age in fertile and infertile patients with the difference in mean AFC of both the groups. A comparison of the data recorded for cases and controls showed no significant difference in the mean ovarian volume.
Conclusion: AFC has the closest association with chronological age in normal and infertile Indian women. The same is lower in infertile women than in matched controls. Baseline and cut-off values in south Indian women are lower than those mentioned in Western literature.

Key words

Antral follicle, Endovaginal USG, Fertility.

Introduction

Infertility is the failure of a couple to conceive after 1 year of regular, unprotected intercourse. The ovulatory disorder is one of the most common reasons for female factor infertility 30% of all cases) [1]. The term denotes the capacity of the ovary to provide egg cells which is capable of fertilization results in a good outcome which in turn means a successful pregnancy [2]. With advanced maternal age, the capability of the ovary to produce egg cells will decline, constituting a major factor in the inverse correlation between age and female fertility. However, between women of the same chronological age, the quantitative ovarian reserve may vary substantially. To assess the individual quantitative variant reserve, ovarian reserve tests (ORTs) have been developed, viz. (1) day–3 follicle-stimulating hormone (FSH), (2) anti–Mullerian hormone (AMH), and (3) antral follicle count (AFC) [3]. The antral follicular count is referred to as several oocytes and follicles in ovaries which is morphologically healthy and associated with serum concentrations of the anti-Mullerian hormone. An anti-Mullerian hormone is a marker of the number of healthy follicles and oocytes in ovaries. Antral follicular count measured by serial transvaginal ultrasonography during the follicular phase is reproducible within an individual [4]. An ovarian volume is an important tool in the screening, diagnosis, and monitoring of the treatment of conditions such as polycystic ovarian syndrome, ovarian cancer, and adolescent abnormalities in reproductive medicine. Recent advances in technology, including the transvaginal scan, have made possible the measurement of ovarian volume both easy and cost-effective [5]. Measurement of ovarian volume has a role in the assessment of ovarian reserve and prediction of response to superovulation [4]. Reproductive aging is considered to be the consequence of a decrease in the quantity and quality of the ovarian follicle pool [5]. Studies of human ovaries show that the number of follicles decreases rapidly with female age, starting in fetal life and continuing until after menopause [6]. The number of antral follicles and the total ovarian volume as measured by transvaginal USG have been mentioned in the literature to predict declining fertility-related to reproductive aging [7]. Studies concerning physiological ovarian aging in women with and without fertility problems are very limited and most of them are done in Western countries. It, therefore, seems warranted to evaluate the aforementioned sonographic test parameters in women of different ages in India [8].

Materials and methods

Thirty patients undergoing workup for infertility were included and compared to an equal number of controls (women with proven fertility) in Madha Medical College and Hospital were included in the study in the year 2018-2019. The basal ovarian volume and AFC were measured by endovaginal USG. The relevant clinical data and AFC, ovarian volume was charted for every patient.

Inclusion criteria

Primary infertility, No ovarian abnormality (polycystic ovary, ovarian endometriomas) as assessed by transvaginal USG, no evidence of uterine malformations or uterine pathology, no evidence of endocrinological disease, no evidence of previous ovarian surgery, no history of ovulation induction for last 3 months.

Exclusion criteria

Any history of ovarian abnormality like polycystic ovary, ovarian endometriomas. history and any evidence of uterine malformations or uterine pathology, history of endocrinological disease, and history of previous ovarian surgery, Hormonal contraception stopped > 3 months before entering the study protocol, history of ovulation induction for last 3 months.

The sample size for frequency in a population – 30 cases and 30 controls.

Results

Among infertile group N=30, control group N=30, the mean standard deviation, it was found that there exists a statistical significance among the two groups in the response to antral follicle count (**Table – 1**).

Ovarian volume was not a significant variable to determine infertility - Significant level P – 0.4113 (>0.05) as per **Table – 2**.

AFC was a significant variable to determine infertility with a significant value of <0.05. We also got the mean standard deviation of both infertile and control groups and found that there exists a statistical significance among the two groups with the response to antral follicular count. Significant level p - <0.0001. There exists a significant correlation between infertility duration and antral follicular count in the infertile group with a significant level of 0.0018. Here in the control group also there exists a significant correlation between age and antral follicular count with a significant level of <0.0001.

Table – 1: Comparative analysis of biophysical and sonographic variables in infertile and fertile patients.

VARIABLES	CASES (n=30) (Mean± SD)	CONTROLS (N=30) (Mean± SD)	P-Value
AGE (years)	31.30±2.466	29.80±2.355	**0.0134**
BMI(kg/m^2)	22.70±2.672	22.22±2.194	0.4568
Antral follicle Count (AFC)	6.67±1.688	11.23±2.112	**0.0001**
Total ovarian volume (cc)	10.86±1.639	11.36±2.112	0.4113

BMI-Body mass index, SD-standard deviation

Table – 2: Ovarian volume.

GROUP	n	Mean	Standard deviation	Standard error mean	Significance p
Ovarian Volume 1 (infertile)	30	10.86	1.639	0.299	0.184
0 (control)	30	11.36	1.211	0.221	0.185

Discussion

Limited data is available on ovarian aging in the sub-fertile and healthy population and the role of sonographic biomarkers (AFC, ovarian volume) of ovarian reserve. Most of the available data is based on studies outside India. The present study evaluates the relationship of AFC with age and BMI in subfertile cases and with healthy controls. The role of the ovarian volume is also evaluated and compared with AFC [9]. My observation indicates that the number of antral follicles is lower in sub-fertile patients than infertile group (25 -35 years), because of the significantly lower median AFC in women of the former group (P<0.001). The range of AFC in females presenting with complaints of infertility was 4-12 (median value of 8). The cut-off value in Indian women is at a lower baseline than that noted in the western literature [10]. This variability in the value of AFC is most probably due to the differences in the ratio, socio-economic, and geographic background of Indian and Western populations. Though the reproductive ability of a woman is directly related to the remaining pool of primordial follicles at a particular point in time [11]. This stock depletes as age progresses and is completely exhausted at menopause. Hence it may be reasonable to assume that the number of antral follicles reflects the ovarian pool and indirectly the reproductive age. My data shows that there is an inverse relation between AFC and the age of females (A negative correlation value

r= -0.4887 with p=0.0061) [12]. The sensitivity of AFC to identify poor responders before induction of ovulation with exogenous gonadotrophins is around 89% in previous studies [13]. We however did not establish any such correlation in our population as the same was out of the scope of the study. I submit that the good correlation shown by my data between the aforementioned parameters may be used in the future by other Indian groups, evaluating metrics for patient selection during the planning of ovulation induction [14]. On evaluating antral follicles up to 10mm in diameter, a significant difference in numbers was noted in my study population (6.67±1.688 in cases; 11.23 ± 2.112 in controls; p-value of <0.0001) [15]. A cut-off value of 8 follicles (aggregate of both ovaries) may be taken as a standard for successful pregnancy outcome [16]. Inter-group comparison of median values of ovarian volume showed no significant difference in my study [17]. This parameter however can be routinely measured without any added effort along with AFC. Though my data reflects that ovarian volume has no role as a biomarker of ovarian reserve, I would like to suggest routine recording and further evaluation of the role of this parameter in population-based data sets [18, 19, 20].

Conclusion

The results of this study indicate that AFC is a predictor of fecundity in South Indian women of childbearing age in terms of capability to conceive on a two-point scale (i.e. positive or negative). The mean AFC in South Indian women is significantly different from that noted in Western literature, mainly due to racial, geographic, and socio-economic reasons. A cut off value of 8 may be used to prognosticate patients undergoing assessment for female factor infertility. On the other hand, the same data can be utilized for optimal patient selection for ART. This would in turn lead to a higher success rate of this technique.

References

1. Abdelazim IA, Makhlouf HH. Sequential clomiphene citrate/hMG versus hMG for ovulation induction in clomiphene citrate resistant women. Arch Gynecol Obstet., 2013; 287: 591-7.
2. Abma JC, Chandra A, Mosher WD, et al. Fertility, family planning, and women's health: new data from the 1995 National Survey of Family Growth. Vital Health Stat., 1997; 23: 1–114.
3. Akande VA, Keay SD, Hunt LP, Mathur RS, Jenkins JM, Cahill DJ. The practical implications of a raised serum FSH and age on the risk of IVF treatment cancellation because of a poor ovarian response. J Assist Reprod Genet., 2004; 21: 257-62.
4. Alviqqi C, Humaidan P, Howles CM, Tredway D, Hillier SG. Biological versus chronological ovarian age: implications for assisted reproduction technology. Reprod Biol Endocrinol., 2009; 7: 101.
5. Aubuchon M, Burney RO, Schust DJ, Yao MW. Infertility and assisted reproductive technology. In: Berek JS, Berek DL editors. Berek and Novak's Gynecology, 15th edition, New Delhi: Wolters Kluwer India Pvt Ltd; 2012.
6. Broekmans FJ, Kwee J, Hendricks DJ, Mol BW, Lambalk CB. A systematic review of tests predicting ovarian reserve and IVF outcome. Hum Reprod Update, 2006; 12: 685-718.
7. Chandra A, Mosher WD. The demography of infertility and the use of medical care for infertility. Infert Reprod Med Clin North Am., 1994; 5: 283–296.
8. Chuang CC, Chen CD, Chao KH, Chen SU, Ho HN, Yang YS. Age is a better predictor of pregnancy potential than basal follicle-stimulating hormone levels in women undergoing in-vitro fertilization. Fertil Steril., 2003; 79: 63-8.
9. Gleicher N, Kim A, Weghofer A, Barad DA. Differences in ovarian aging pattern between races we associate ovarian genotypes and subgenotypes of the FMR1 gene. Reprod Biol Endocrinol., 2012; 10: 77.

10. Gleicher N, Kim A, Weghofer A, Barad DH. Towards a better understanding of functional ovarian reserve: AMH (AMHO) and FSH (FSHO) hormone ratio per retrieved oocyte. J Clin Endocrinol Metab., 2012; 97: 995-1004.
11. Jahromi BN, Husseini Z. Pregnancy outcome at maternal age 40 and older. Taiwan J Obstet Gynecol., 2008; 47: 318-21.
12. Kailasam C, Keay SD, Wilson P, Ford WC, Jenkins JM. Defining poor ovarian response during IVF cycles, in women aged <40 years, and its relationship with treatment outcome. Hum Reprod., 2004; 19: 1544-7.
13. Liu K, Case A. Advanced reproductive age and fertility. J Obstet Gynaecol Can., 2011; 33: 1165-75.
14. Malhotra N, Bahadur A, Singh N, Kalaivani M, Mittal S. Does obesity compromise ovarian reserve markers? A clinician's perspective. Arch Gynecol Obstet., 2013; 287: 161-6.
15. Mosher WD, Pratt WF. The demography of infertility in the United States. In: Asch RH, Stubb JW, eds. Annual progress in reproductive medicine. Park Ridge, NJ: The Parthenon Publishing Group, 1993, p. 37– 43.
16. Nelson SM, Telfer EE, Anderson RA. The aging ovary and uterus: new biological insights. Hum Reprod Update, 2013; 19: 67-83.
17. Sills ES, Alper MM, Walsh APH. Ovarian reserve screening in infertility: practical applications and theoretical directions for research. Eur J Obstet Gynecol Reprod Biol., 2009; 146: 30-6.
18. Su HI, Sammel MD, Freeman EW, Lin H, DeBlasis T, Gracia CR. Body size affects measures of ovarian reserve in late reproductive-age women. Menopause, 2008; 15: 857-61.
19. Tonneau P, Marchand S, Tallec A, et al. Incidence and main causes of infertility in a resident population (1,850,000) of three French regions (1988–1989). Hum Reprod., 1991; 6: 811–816.
20. Wilcox LS, Mosher WD. Use of infertility services in the United States. Obstet Gynecol., 1993; 82: 122–127.