ORIGINAL RESEARCH PAPER

Obstetrics & Gynaecology

AGE-RELATED DECLINE IN FERTILITY AND THE ROLE OF ANTI-MÜLLERIAN HORMONE

KEY WORDS: Anti-Müllerian hormone, FSH, LH, Menopause

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ABSTRACT

Anti-Müllerian hormone (AMH) is produced by the granulosa cells in the ovaries and Sertoli cells in the testes. AMH plays a crucial role in the determination of fertility potential. The decline in AMH levels with age has been shown to be a strong predictor of age-related changes in fertility, including the onset of menopause. This was a retrospective study carried out in two Hospital, (BIMR hospital, and Peetambara Hospital, Gwalior) that involve 300 women between the ages of 18 and 50 years (from 2019-2020). Blood samples were collected, serum isolated, AMH levels measured using ELISA. Age, body mass index (BMI), and menstrual cycle characteristics were also collected. The results showed a significant decline in AMH levels with age. The mean AMH levels were highest in women aged 18-30 years (3.5 ng /mL) and minimum in women aged 46-50 years (1.2 ng /mL). There was a significant negative correlation between AMH levels and age. The results suggest that AMH levels can be used as a reliable biomarker for the assessment of reproductive aging and the prediction of the onset of menopause.

INTRODUCTION:

Anti-Müllerian hormone (AMH) is a hormone produced by the granulose cells of small antral follicles in the ovary prior to FSH dependent growth. (1,). AMH levels are thought to reflect the size of the pool of primordial follicles, throughout life; i.e., in infancy, peripubertal girls, adolescents and adult women. (2) In adult women, the number of small growing follicles are in equilibrium with the number of resting primordial follicles constituting the total number of germ cells established in fetal life. (3) Thus, risk of early menopause is increased in women with low age-specific AMH. (4)

AMH in females is crucial for recruitment and selection of follicle development (5), and it is a promising biochemical marker for ovarian function. Interest has increased in the role of AMH in assessing acyclic ovarian activity (6), evaluating follicular response (5), and predicting the age of menopause (7). The age-dependent model of serum AMH was first generated by Kelsey et al. (8), and the correlation with the nongrowing follicle pool has been well-described using data extracted from published studies.

Given the importance of ovarian reserve in determining reproductive potential, it is important to understand the relationship between AMH levels and age in women. This information can be used to inform counselling and management of women seeking fertility treatments or contraception. The aim of this study was to investigate the relationship between age and AMH levels in women and using AMH as a predictor of age-related decline in fertility.

MATERIAL AND METHODS:

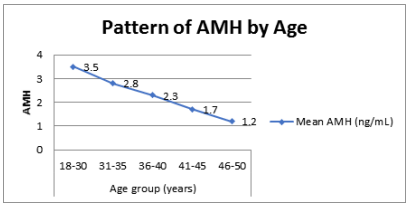
This was a retrospective study carried out in two Hospital, (BIMR hospital, and Peetambara Hospital, Gwalior) that involved recruiting a sample of 300 women between the ages of 18 and 50 years over a period of two years from 2019-2020. The women were classified into five age groups (18-30, 31-35, 36-40, 41-45, 46-50). Blood samples were collected from each participant and the serum was isolated for measurement of AMH levels using an enzyme-linked immunosorbent assay (ELISA). The women also completed a self-administered questionnaire that collected information on their demographic characteristics, medical history, and reproductive history. The AMH levels were compared between the different age groups using a one-way analysis of variance (ANOVA) . The correlation between AMH levels and age was analysed using Pearson's correlation coefficient. The proportion of women who reached menopause at different age groups was also determined. An informed consent was obtained from all participants.

Results: The results showed a significant decline in AMH levels with age. The mean AMH levels were highest in women aged 18-30 years (3.5 ng/mL) and a minimum in women aged 46-50 years (1.2 ng/mL). There was a significant negative correlation between AMH levels and age. No significant associations were found between AMH levels and BMI or menstrual cycle characteristics.

Table showing correlation between AMH levels and Age in women

Age groups (years)	Mean AMH (ng/mL)
18-30	3.5
31-35	2.8
36-40	2.3
41-45	1.7
46-50	1.2

Graph showing correlation of AMH with age



DISCUSSION:

AMH levels decline with age, reflecting the decline in levels that is associated with age-related changes in fertility, including the onset of menopause. This study was prompted by the need for reliable marker of diminishing ovarian function, apart from FSH and oestradiol (9), and independent of the phases of the menstrual cycle (10). In view of its utility in evaluating fertility, assessment of age-specific variation in AMH levels is central for infertility workup (11), as serum AMH reflects AMH production only from functioning follicles (12).

AMH serum levels are reliable indicators of ovarian reserve in reproductive age women (13), as they remain constant throughout the menstrual cycle (14), with low variability in subsequent cycles (15), and are not affected by endocrine perturbations (16, 14) . Clinical studies demonstrated that decreased AMH levels indicate reduced ovarian responsiveness to exogenous gonadotropin administration, and poor pregnancy outcome in women undergoing infertility treatment (13, 12).

In women undergoing infertility treatments, such as in vitro

fertilization (IVF), a low AMH level is often used as an indicator of a reduced chance of success and may prompt the use of donor eggs or other fertility treatments. AMH levels can also be used to monitor the response to treatment for conditions such as poly cystic ovarian syndrome (PCOS), which can cause change in AMH levels.

However, the timing of menopause appears to vary according to the ethnic/racial background, exemplified by the early onset of menopause in Africans and delayed onset of menopause in Asians (17). The inverse relationship between serum AMH and age was previously reported for several ethnic groups, and our findings on Indian women confirm this negative association. In so far as the timing of natural menopause and age-dependent reduction in AMH vary according to race and ethnicity (17), this study identifies population-based reference range for AMH concentration and yearly decline levels in Indian women.

We found no clinically significant correlation with between AMH and metabolic parameters. This is consistent with previous observations about lipid profiles in women of reproductive age (18). Nor did we confirm an association between AMH and BMI.

CONCLUSION:

The results of this study provide evidence for the use of AMH as a predictor of age-related decline in fertility in women. These findings have important implications for the counselling and management of women seeking fertility treatments or contraception.

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