COMPARATIVE ANALYSIS OF ANTI-MULLERIAN HORMONE (AMH) AND FERTILITY IN WOMEN WITH AND WITHOUT POLYCYSTIC OVARY SYNDROME (PCOS)

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Abstract

Anti-Müllerian hormone (AMH) is one of the most important markers for assessing ovarian reserve and reproductive potential in women. The AMH level reflects the number of antral follicles and is widely used in clinical practice for the assessment of fertility and the diagnosis of disorders such as polycystic ovary syndrome (PCOS). The aim of this study is to analyze the distribution of AMH values and their relationship with age in a group of women. This study includes a retrospective analysis of 64 female women, for whom data on date of birth and serum levels of AMH, expressed in ng/mL, were collected. The results of this study demonstrate a significant relationship between AMH levels and ovarian function. Elevated AMH levels are strongly associated with the possible presence of PCOS, whereas low AMH levels reflect diminished ovarian reserve, often related to advancing age. The findings of this study reinforce the importance of incorporating AMH into the clinical evaluation of women of reproductive age and highlight the need to combine this parameter with clinical and imaging data for a more accurate diagnosis.

Keywords: AMH, PCOS, ovarian reserve, fertility, women, diagnosis.

Introduction

Currently, anti-Müllerian hormone (AMH) is gaining an increasingly important role in the diagnosis of PCOS. AMH is a glycoprotein belonging to the transforming growth factor-beta family, produced and released by granulosa cells in preantral and antral ovarian follicles [1]. It is considered a marker of ovarian reserve, as it plays a role in the maturation and selection of follicles. As serum AMH levels correlate with the number of growing follicles in the ovaries, this hormone is considered an indicator of both the quantity and quality of a woman's ovarian reserve [2]. In women, AMH levels decline with age and become undetectable after menopause. It is assumed that peak levels of this hormone are reached by women between the ages of 21 and 30, on average, at 24.5 years of age [3]. During reproductive age, women with PCOS have approximately two to three times higher serum AMH levels compared to individuals without the condition [3,4]. This is particularly significant for women with polycystic ovary syndrome who are unsuccessfully trying to conceive. Anti-Müllerian hormone (AMH) is a dimeric glycoprotein that belongs to the transforming growth factor-β (TGF-β) family [5, 6], and a female baby in the fetal period begins to produce AMH from the 9th month [7]. AMH is secreted by the antral follicles and small antral follicles in the ovary. The greater the number of these follicles, the higher the serum AMH concentration. Because of this feature, AMH is considered to be a marker for the process of ovarian aging [8]. The objectivity and potential standardization of AMH levels, as well as their readily detectable convenience throughout the menstrual cycle, make AMH levels the gold standard biomarker for assessing ovarian reserve and predicting ovarian response to stimulation [9]. It is currently one of the best indicators for assessing ovarian function, guiding assisted reproduction, and indicating iatrogenic damage (such as chemotherapy, radiotherapy or surgery) to the ovarian follicle reserve. It has a broader application in assisted reproduction field [10,11]. Therefore, the accurate measurement of AMH will guide the dosage of ovarian stimulation-related programs, and it has important reference significance to improve the outcome of assisted reproduction technology [12].

Materials and Methods

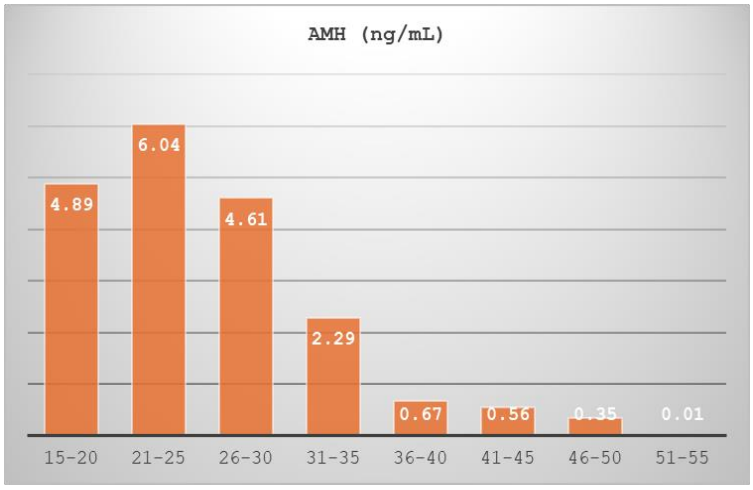
This study includes a retrospective analysis of 64 female women, for whom data on date of birth and serum levels of anti-Müllerian hormone (AMH), expressed in ng/mL, were collected. The aim of the study was to assess the distribution of AMH values and to analyze their relationship with ovarian function and the possible presence of Polycystic Ovary Syndrome (PCOS). Serum samples were collected from all participants and analyzed using the Enzyme-Linked Fluorescent Assay (ELFA) method.
Women were classified into three groups based on AMH values, according to literature references:
AMH <1 ng/mL: low ovarian reserve
AMH 1–4 ng/mL: normal ovarian reserve
AMH >4 ng/mL: high values, suggestive of PCOS
The data were analyzed descriptively, taking into account the distribution according to age and hormonal levels. The age of the women was estimated indirectly through the year of birth, to identify the influence of age on AMH levels.

Results and discussion

Of the 64 women included in the study, a considerable variability in AMH levels was observed, ranging from <0.01 ng/mL to >9.00 ng/mL.

Table 1. AMH levels of women.

Age group	15-20 (no=2)	21-25 (no=8)	26-30 (no=16)	31-35 (no=12)	36-40 (no=10)	41-45 (no=7)	46-50 (no=3)	51-55 (no=1)
AMH **(ng/mL)**	**4.89**	**6.04**	**4.61**	**2.29**	**0.67**	**0.56**	**0.35**	**0.01**



Graphic. 1. Average AMH levels by age group

Table 2. Distribution of women according to AMH levels

Group	AMH Range	No	Percentage (%)	Interpretation
Low AMH	<1 ng/mL	22	~34%	Reduced ovarian reserve
Normal AMH	1–4 ng/mL	24	~37%	Normal ovarian function (control group)
High AMH	>4–5 ng/mL	18	~28%	Associated with Polycystic Ovary Syndrome

Table 3. Low AMH (<1 ng/mL) according to age

Parameter	Description
Total number	22 women
Minimum value	<0.01 ng/mL
Predominant age group	Born before 1990
Interpretation	Decreased ovarian reserve
Biological trend	Increasing age → decreasing AMH

Table 4. Normal AMH (1–4 ng/mL)

Parameter	Description
Total number	24 women
Range	1 – 4 ng/mL
Age group	Mainly 20–35 years
Ovarian function	Normal
Risk of PCOS	Low

Table 5. High AMH (>4–5 ng/mL), Suspected PCOS group

Parameter	Description
Total number	18 women
Range	>4 – >9 ng/mL
Maximum value	>9 ng/mL
Predominant age group	Born after 1995
Characteristics	Increased number of small follicles
Interpretation	Strongly associated with Polycystic Ovary Syndrome

Table 6. Biological trend (AMH vs Age)

Age Group	AMH Level	Interpretation
<25 years	High	High ovarian activity / possible PCOS
25–34 years	Normal	Optimal ovarian function
35–44 years	Decreasing	Declining ovarian reserve
>45 years	Very low	Markedly reduced ovarian reserve

A significant proportion of women (about one third) presented low AMH values (<1 ng/mL), which were more frequent in women born before 1990. These results suggest a reduction in ovarian reserve, consistent with increasing reproductive age.
The second group included women with normal AMH values (1–4 ng/mL), representing preserved ovarian function. These women are considered a control group, with a low probability of hormonal disorders.
A significant number of women (about 25–30%) presented high AMH levels (>4 ng/mL), with some cases exceeding 8–9 ng/mL. These values were more pronounced in younger women (born after 1995). This group presents features that are often associated with Polycystic Ovary Syndrome (PCOS), including an increase in the number of small follicles and disorders of follicular maturation. A clear biological trend was also evident, with AMH levels progressively decreasing with increasing age, reflecting the physiological decline in ovarian reserve.

Conclusion

The results of this study demonstrate a significant relationship between anti-Müllerian hormone (AMH) levels and ovarian function. Elevated AMH levels are strongly associated with the possible presence of Polycystic Ovary Syndrome (PCOS), whereas low AMH levels reflect diminished ovarian reserve, often related to advancing age.
AMH represents a reliable and non-invasive biomarker for the assessment of ovarian reserve and can be used as a supportive tool in identifying women at risk for PCOS.
The findings of this study reinforce the importance of incorporating AMH into the clinical evaluation of women of reproductive age and highlight the need to combine this parameter with clinical and imaging data for a more accurate diagnosis.

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