Original Research Article

Anti Mullerian hormone levels in women of central Madhya Pradesh- A retrospective analysis

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A B S T R A C T

Introduction: Anti Mullerian Hormone(AMH) is homodimeric protein that is classified under the superfamily of transforming growth factor beta(TGF-β). The granulose cells of the primary, preantral and small antral follicles of the ovary express this hormone. AMH levels remain fairly constant throughout the cycle which makes it a favourable and suitable marker for determining the ovarian reserve in women of reproductive age. The present retrospective study was carried out with the aim of studying the AMH levels in women upto 50 years of age coming to our diagnostic centre for AMH screening for different reasons

Materials and Methods: This was a retrospective study conducted between January to August 2019 in women upto 50 years of age coming to our diagnostic centre for AMH screening test. They were divided into <20 years, 21-30, 31-40 and 41-50 years of age groups. The AMH values in different age groups were further classified as <1.0 ng /ml,1.0-4.0,4.1-8.0,8.1-10.0 and >10.0 ng /ml .The mean and median values were calculated for each group.

Results: AMH levels below 1 ng/ml were observed in 102/400(25.5%) patients. AMH levels between 1-4 ng/ml was observed in 171/400 (42.75%) women. High AMH values between 4-8 ng/ml were observed in 90/400(22.5%) women out of which66/90(73.33%)were in 21-30 years age range, followed by 18.89% in 31-40 years, 6.67% below 20 years and 1.11%above 40 years of age

Conclusion: Since AMH levels do not vary with the days of the menstrual cycle in women, it is one of the best markers available in the current scenario for assessing the ovarian reserve in women of reproductive age group. Our study emphasizes the observation that PCOS is a growing health problem in women of reproductive age due to several factors like sedentary life style, lack of exercise and unhealthy eating habits which can be easily managed by lifestyle changes.

1. Introduction

Anti Mullerian Hormone(AMH) is homodimeric protein that is classified under the superfamily of transforming growth factor beta (TGF-β). The granulose cells of the primary, preantral and small antral follicles of the ovary express this hormone which is involved in the control of follicle formation by a negative feedback mechanism thereby inhibiting the recruitment of primordial follicles for folliculogenesis.[1,2] It also modifies the growth of preantral and antral follicles by decreasing the sensitivity of follicles to follicle stimulating hormone(FSH).[3] AMH levels decrease as age advances and become almost undetectable in the post menopausal period due to the diminishing reserve of the ovarian follicles with age.[4,5] However, in contrast to the levels of Luetenising hormone (LH) and FSH, which change with the duration of the menstrual cycle, AMH levels remain fairly constant throughout the cycle which makes it a favourable and suitable marker for determining the ovarian reserve in women of reproductive age.[6–8]

It can also be used to predict the ovarian response to ovarian stimulation in assisted reproduction techniques

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(ART)as well as to identify premature ovarian failure, hypogonadotrophic hypogonadism, polycystic ovarian syndrome (PCOS) etc. It is observed in various studies that chronological age of women is of limited value in predicting the ovarian reserve as women of same age can have different stages of folliculogenesis. Similarly, the age of menopause also varies widely among women.[9] AMH levels have gained importance in monitoring treatment response to certain ovarian tumours in recent years.

AMH levels gradually increase from first day of life of a female and exhibit an increasing trend till 25 years of age. It gradually decreases till menopause is attained when it becomes undetectable. It also becomes undetectable in patients who have undergone oophorectomy.[10,11] It has been observed that AMH levels vary among different ethnic groups also.

The present retrospective study was carried out with the aim of studying the AMH levels in women upto 50 years of age coming to our diagnostic centre for AMH screening for different reasons.

2. Materials and Methods

This was a retrospective study conducted between January to August 2019 in women upto 50 years of age coming to our diagnostic centre for AMH screening test. They were divided into <20 years, 21-30, 31 -40 and 41-50 years of age groups. The AMH values in different age groups were further classified as <1.0 ng /ml,1.0-4.0,4.1-8.0,8.1-10.0 and >10.0 ng/ml. The mean and median values were calculated for each group.

Samples were collected by following standard protocols in gel separator tubes and the test was run on fully automated immunoassay analyser COBAS E411(Roche Diagnostics GMBH) within 2 hours of sample collection to avoid possible evaporation effects. The principle of the test is electrochemiluminescence immunoassay (ECLIA). The measuring range of the equipment is 0.01-23 ng /ml.

3. Results

This was a retrospective study carried out in 400 women coming to our diagnostic centre for AMH screening between January to August 2019. Out of 400 patients, 203(50.75%)were in 21-30 years age group, followed by 162(40.50%)in 31-40 and 18(4.50%)below 20 years of age. 4.25% patients were in 41-50 years of age group. (Table 1).

AMH levels below 1 ng/ml were observed in 102/400(25.5%) patients out of which 55.88%were in 31-40 years, 26.47% in 21-30 years and 15.69% in 41-50 years age group. AMH levels between 1-4 ng/ml was observed in 171/400(42.75%) women with maximum 86/171(50.29%) in 31-40 years age, 78(45.61%) in 21-30 years and 7(4.09%)below 20 years of age. High AMH values between 4-8 ng /ml were observed in 90/400(22.5%)

women out of which 66/90(73.33%)were in 21-30 years age range, followed by 18.89% in 31-40 years, 6.67% below 20 years and 1.11% above 40 years of age.

AMH values between 8-10 ng/ml were observed in 18/400(4.5%) women with maximum incidence (83.33%) in 21-30 years of age ,followed by 11.11%below 20 years and 5.56%between 31-40 years of age.

Very high AMH value, above 10 ng/ml was observed in 19(4.75%) women with 17/19(89.47%) being in 21-30 years of age, followed by 5.25% below 20 years and in 31-40 years of age group. (Table 2)

The mean AMH value was 4.42 ng /ml with a median value of 4.02 ng/ml. The minimum value was 0.01 ng/ml and maximum value was 1.91 ng /ml. In the 21-30 years age group, the mean AMH value was 4.76 ng /ml with a median value of 3.81 ng /ml, minimum value 0.024 ng /ml and maximum value 22.81 ng /ml. In 31-40 years age group, the mean and median values were 2.08 ng /ml and 1.45 ng/ml respectively and minimum and maximum values were 0.01 ng /ml and 10.49 ng /ml respectively. In 41-50 years age group the mean and median values as well as minimum and maximum values were 0.61 ng/ml,0.37 ng /ml,0.01 ng /ml and 6.05 ng/ml respectively. (Table 3)

4. Discussion

Anti Mullerian hormone or AMH, as it is popularly known, was described as Mullerian Inhibiting substance by Jost in 1947, who described it as being produced by Sertoli cells of the male embryo.[12] Now it is well known that AMH, which is also secreted by the granulose cells of the ovarian antral follicles, is a fairly stable hormone and is unaffected by the days of the menstrual cycle, unlike LH, FSH. AMH levels play a significant role in embryonic life for determination of sex of the developing foetus. In females ,the secretion of AMH starts at 6th day of life from the granulose cells of the ovary ,while it is secreted by the Sertoli cells of the male foetus which gradually becomes undetectable postnatally in males allowing the Woolfian ducts to develop into male reproductive tract under the influence of testosterone.[13] AMH measurements have been gaining popularity in identifying candidates for assisted reproduction techniques(ART)as well as to detect PCOS, premature ovarian failure and in follow up cases of ovarian granulosa cell tumours.

A study conducted by Fong SL et al in 2012 in 804 women observed a plateau of AMH values until 25 years of age in women after which a declining trend was observed.[14] Our study had similar findings where we observed a declining trend in the mean AMH values after 30 years of age with the peak values between 21-30 years of age. In the study by Sandhya et al, they observed a declining value of AMH after 27 years of age in their study population.[15]

Thomas MP et al observed that ovaries of Indian women aged six years earlier as compared to the Caucasians and

Table 1: Age Wise Distribution of women

Age (Years)	No. Of Patients	%
< 20	18	4.50%
21 - 30	203	50.75%
31 - 40	162	40.50%
41 - 50	17	4.25%

Table 2: Age & Range Wise Distribution of AMH Values (ng/ml)

Range	<20 (Yrs)	<20 Yrs (%)	21 - 30 (Yrs)	21 - 30 Yrs (%)	31 - 40 (Yrs)	31 - 40 Yrs (%)	41 - 50 (Yrs)	41 - 50 Yrs (%)	Total
<1.0	2	1.96%	27	26.47%	57	55.88%	16	15.69%	102
1.0 - 4.0	7	4.09%	78	45.61%	86	50.29%	0	0.00%	171
4.0 - 8.0	6	6.67%	66	73.33%	17	18.89%	1	1.11%	90
8.0 -10.0	2	11.11%	15	83.33%	1	5.56%	0	0.00%	18
>10.0	1	5.26%	17	89.47%	1	5.26%	0	0.00%	19

Table 3: Mean & Median of AMH Values (ng/ml)in different age groups

Age (Years)	No. of Patients	Mean	Median	Minimum	Maximum
< 20	18	4.42	4.02	0.01	11.91
21 – 30	203	4.76	3.81	0.024	22.81
31 – 40	162	2.08	1.45	0.01	10.49
41 – 50	17	0.61	0.37	0.01	6.05

that 1-2% of Indian women attained menopause at 29-34 years of age.[16]

However, In our study we observed menopausal levels of AMH at 41-50 years of age. Johnson Jebin et al in their study of 75 patients recorded a higher AMH value in their study population between 21-40 years of age.[17] In our study also we had similar observations. We observed that about 48.2% of the women in 21-30 yeas age group and 11.7% in 31-40 years age group had AMH values above 4.0 ng/ml. AMH values above 10 ng /ml was observed in 17 women in 21-30 years age group. PCOS is a complex endocrine disorder affecting females of reproductive age group characterised by signs and symptoms of hyperandrogenemia, obesity and insulin resistance. Mahajan N et al in their study population observed a cut off AMH value of > 5.03 ng/ml to discriminate between normal and PCOS women at a sensitivity and specificity of 70.68% and 79.9% respectively.[18] We also observed similar findings in our study with high AMH values in 21-30 years age group. Similarly, studies conducted by Awadhesh Kumar et al had same findings.[19] Studies done on AMH levels have shown values to be affected by smoking, body weight, ethnicity,Vitamin D levels, AMH receptor polymorphoism and gene variability.[20–24] However, AMH still remains the best option available for predicting ovarian reserve in women of reproductive age.[25]

5. Conclusion

Since AMH levels do not vary with the days of the menstrual cycle in women, it is one of the best markers available in the current scenario for assessing the ovarian reserve in women of reproductive age group. Our study emphasizes the observation that PCOS is a growing health problem in women of reproductive age due to several factors like sedentary life style, lack of exercise and unhealthy eating habits which can be easily managed by lifestyle changes. However, studies assessing the AMH levels among healthy women are few and far between but such studies are necessary to understand the trends and factors which affect the fertility of the women so that awareness can be generated and women counselled for assisted reproductive techniques and also in predicting the age of onset of menopause.

6. Source of Funding

None.

7. Conflict of Interest

None

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