Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 13, (2024)
https://www.jneonatalsurg.com

OPEN ACCESS

The Role of Anti-Müllerian Hormone (AMH) Trends in Predicting Ovarian Reserve in Women Under 30

Nergis Taj[1], Manesha Juriasinghani[2], Dr. Kanwal Fatima[3], Monica Punshi[4], Shandana[5], Nargis Gulab[6*]

[1]Assistant Professor, Obs and Gynae Department, Nawab Sir Sadiq Muhammad Khan Abbassi Hospital, Bahawalpur, Pakistan

[2]MBBS, MSPH, Former Lecturer at SZABIST University, Karachi, Pakistan

[3]Consultant Gynaecologist, DHQ Teaching Hospital KDA, Kohat, Pakistan

[4]Consultant Gynaecologist / Obstetrician and Public Health Expert, C.W.MO (BPS 19), Dr Ruth K.M. Pfau Civil Hospital, Karachi, Pakistan

[5]Women Medical Officer, Obs and Gynae Department, DHQ Teaching Hospital, Kohat, Pakistan

[6*]Associate Professor, Obs and Gynae Department, Nortwest General Hospital and Research Centre / Northwest School OF Medicine, Peshawar, Pakistan

***Corresponding author:**

Nargis Gulab,

Email ID: nargisgulab123@gmail.com

Cite this paper as: Nergis Taj, Manesha Juriasinghani, Dr. Kanwal Fatima, Monica Punshi, Shandana, Nargis Gulab, (20xx) The Role of Anti-Müllerian Hormone (AMH) Trends in Predicting Ovarian Reserve in Women Under 30. *Journal of Neonatal Surgery*, 13, 911-915.

ABSTRACT

Background: To assess the pattern of serum AMH levels and their correlation with ovarian reserve markers in females below thirty years of age.

Methods: A prospective observational study was conducted from June 2023 to June 2024 involving 61 women aged 18–29 years. Data on demographics, menstrual history, and family history of early menopause were collected. Hormonal analysis included AMH, FSH, LH, and estradiol, while ovarian reserve was assessed via antral follicle count (AFC) using transvaginal ultrasound. Statistical analysis was performed to evaluate associations between AMH and other variables.

Results: AMH levels showed a significant decline with increasing age, even within the studied age range. 'A strong positive correlation was found between AMH and AFC, while inverse relationships were noted with FSH and estradiol'. Irregular menstrual cycles were also significantly associated with lower AMH levels.

Conclusion: AMH is a valuable, early marker of ovarian reserve in women under 30. Its decline with age—even in young women—emphasizes the need for early fertility awareness and personalized reproductive counseling.

Keywords: *Anti-Müllerian hormone (AMH), ovarian reserve, fertility, antral follicle count, young women, reproductive age, hormonal profile*

1. INTRODUCTION

'Ovarian reserve refers to the functional capacity of the ovary, particularly the quantity and quality of the remaining oocytes'. Traditionally, this concept was primarily discussed in the context of advanced maternal age. However, recent advances have revealed that the decline in ovarian function begins much earlier often well before clinical signs of reproductive aging appear [1-3].

The Anti-Müllerian hormone (AMH) produced by 'granulosa cells of pre-antral and small antral follicles is one of the most recognized indicators of assessing the ovarian reserve'. In comparison with follicle-stimulating hormone (FSH), AMH has a 'more stable concentration throughout the menstrual cycle' which aids in evaluating the available follicles within the ovarian reserve [4-6].

While numerous studies have evaluated AMH levels in older women and infertile populations, there remains a gap in literature regarding AMH trends in women under 30 years of age. Early identification of diminished ovarian reserve in this

group can have significant implications for reproductive planning, especially in regions where social and educational factors may delay childbearing [7-9].

This study aims to examine the patterns of AMH levels in women below 30 years of age and their correlation with antral follicle count and hormonal profiles. Understanding these trends can help clinicians guide young women about their reproductive potential and future fertility decisions.

2. METHODOLOGY

This prospective observational study was conducted over a period of one year, from June 2023 to June 2024, at Nawab sir sadiq Muhammad khan Abbassi hospital Bahawalpur. A total of 61 women under the age of 30 were enrolled through non-probability purposive sampling. 'The primary objective was to evaluate the trend of serum anti-Müllerian hormone (AMH) levels and its association with ovarian reserve indicators in young reproductive-age women'. The study was approved by the Institutional Review Board of the concerned institute. All participants were ensured confidentiality, and participation was strictly voluntary.

Women aged between 18 and 29 years presenting for fertility assessment or routine gynecological evaluation were considered eligible. Only those with regular or irregular menstrual cycles but without any known ovarian pathology were included. Exclusion criteria comprised women with a history of ovarian surgery, diagnosed polycystic ovarian syndrome (PCOS), premature ovarian insufficiency, known endocrine disorders (such as thyroid dysfunction), or current use of hormonal medications including oral contraceptives, which might influence AMH levels.

After obtaining written informed consent, each participant was interviewed using a structured proforma. Demographic data including age, BMI, menstrual history, marital status, parity, age at menarche, and family history of early menopause were recorded. A detailed medical and reproductive history was also obtained.

On days 2 to 5 of the menstrual cycle, participants underwent transvaginal ultrasonography to measure antral follicle count (AFC) and ovarian volume. Blood samples were collected in the early follicular phase for hormonal evaluation. 'Serum AMH levels were measured using an ELISA-based assay, and values were categorized as low (<1.0 ng/mL), normal (1.0–3.5 ng/mL), or high (>3.5 ng/mL)'. 'Follicle-stimulating hormone (FSH), luteinizing hormone (LH), and estradiol (E2) levels were also measured using standard laboratory protocols'.

The primary outcome was the trend of AMH levels in relation to age, BMI, menstrual regularity, and AFC. Secondary outcomes included correlations between AMH and other biochemical markers such as FSH, LH, and estradiol. All measurements and ultrasound evaluations were carried out by trained personnel to ensure consistency.

The analysis was performed in SPSS version 25. Continuous variables were reported as mean ± standard deviation, and categorical data were presented as frequencies and percentages. Group comparisons were performed 'with chi-square test or one-way ANOVA, depending on the variables'. A p-value of <0.05 was considered significant.

3. RESULT

Most 'participants were in the age group of 25–29 years' with a mean age of 26.4 ± 2.3 years. A majority had a normal BMI, and 75.4% reported regular menstrual cycles. The family history of early menopause was present in 21.3% of the cases. There were no significant differences in AMH levels across marital or contraceptive history categories.

Table 1: Demographic Characteristics of Participants (n = 61)

Variable	Frequency (n)	Percentage (%)	p-value
Age Group (years)			
18–22	14	23.0%	
23–26	20	32.8%	
27–29	27	44.2%	0.321
BMI Category			
Underweight (<18.5)	6	9.8%	
Normal (18.5–24.9)	39	63.9%	
Overweight/Obese (≥25)	16	26.3%	0.204
Menstrual Regularity			

Regular	46	75.4%	
Irregular	15	24.6%	0.015*
Family History of Early Menopause			
Yes	13	21.3%	
No	48	78.7%	0.142

*Statistically significant at $p < 0.05$

A comparison of mean AMH levels across different age brackets showed a decreasing trend with advancing age. The difference in mean AMH was statistically significant, indicating a natural decline in ovarian reserve even in women under 30.

Table 2: AMH Trends by Age Group

Age Group (years)	Mean AMH (ng/mL) ± SD	p-value
18–22	5.3 ± 1.8	
23–26	3.7 ± 1.2	
27–29	2.4 ± 0.9	<0.001

There was a positive correlation between serum AMH and AFC values. Higher AMH levels were associated with higher AFC, 'supporting its reliability as a biomarker of ovarian reserve'.

Table 3: Relationship Between AMH and Antral Follicle Count (AFC)

AMH Range (ng/mL)	Mean AFC ± SD	p-value
<1.0	6.1 ± 1.3	
1.0–3.5	9.8 ± 2.1	
>3.5	13.7 ± 3.5	<0.001*

*Statistically significant at $p < 0.05$

Women with lower AMH (<1.0 ng/mL) exhibited significantly higher FSH and lower estradiol levels compared to those with moderate or high AMH levels. LH levels did not vary significantly across groups.

Table 4: Hormonal Profile Across AMH Categories

AMH Group (ng/mL)	Mean FSH (mIU/mL)	Mean LH (mIU/mL)	Mean Estradiol (pg/mL)	p-value (FSH)	p-value (E2)
<1.0	9.1 ± 2.3	6.3 ± 1.7	38.4 ± 7.2	<0.001*	<0.01*
1.0–3.5	6.4 ± 1.9	6.1 ± 1.3	53.2 ± 10.6		
>3.5	5.8 ± 1.4	6.5 ± 1.5	58.9 ± 11.2		

*Statistically significant at $p < 0.05$

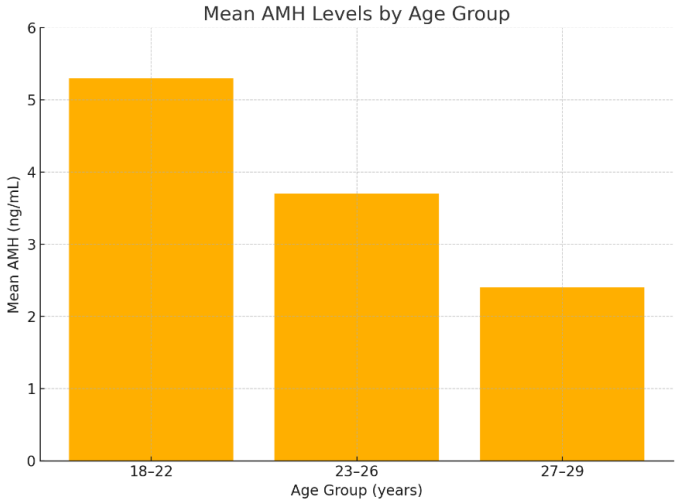

Figure 1

Bar graph illustrating the mean AMH levels across different age groups. It clearly shows a decreasing trend in AMH as age increases, even in women under 30.

4. DISCUSSION

This study explored the patterns of anti-Müllerian hormone (AMH) among women under 30 and its predictive value in assessing ovarian reserve. A clear age-related decline in AMH levels was observed even within this young cohort, supporting earlier evidence that ovarian aging begins earlier than traditionally believed.

Our findings align with those of studies reported a consistent downward trend in AMH levels beginning in the mid-20s, emphasizing the importance of early ovarian reserve assessment, especially in women considering delayed childbearing [10, 11]. Similarly, studies highlighted AMH as a more stable marker compared to day-3 FSH, as it remains relatively constant throughout the menstrual cycle and reflects the remaining follicular pool more reliably [12, 13].

The positive correlation between AMH and antral follicle count (AFC) observed in our study reinforces AMH's clinical relevance, consistent with 'research by studies demonstrated a strong predictive value of AMH for AFC and response to ovarian stimulation'. In our sample, 'women with AMH >3.5 ng/mL had significantly higher AFCs, supporting its role in fertility counseling and treatment planning' [14, 15].

Menstrual regularity was significantly associated with AMH levels, where irregular cycles were more often linked to lower AMH. This reflects the findings of studies found menstrual disturbances to be early signs of diminished ovarian reserve even in women under 30 [16, 17]. Moreover, women with a family history of early menopause showed a non-significant trend toward lower AMH, aligning with a study, who suggested a genetic component in ovarian aging trajectories [18].

Biochemically, women with low AMH levels had elevated FSH and reduced estradiol levels. This inverse relationship echoes earlier studies, including study, who reported that rising FSH in young women with low AMH may reflect early follicular depletion, even in the absence of clinical symptoms. Though LH did not differ significantly across AMH groups [19], this was in agreement with study who noted that LH fluctuations were less tightly linked to ovarian reserve [20].

Despite the small sample size, the results emphasize the utility of AMH as a non-invasive, cycle-independent biomarker. In regions where fertility planning is often delayed due to social or academic commitments, these findings may help guide early reproductive decision-making and counseling.

5. CONCLUSION

This study underscores the value of AMH as a reliable marker for assessing ovarian reserve in women below 30. The data demonstrated that AMH levels decrease with increasing age, even within a relatively young population, and correlate significantly with antral follicle count and hormonal profiles. These results reinforce the clinical importance of early ovarian reserve screening, especially in women with menstrual irregularities or familial risk factors for early menopause. Incorporating AMH testing into routine reproductive health assessments may offer valuable insights for women contemplating future fertility.

REFERENCES

[1] Moolhuijsen, L.M., J.A.J.T.J.o.C.E. Visser, and Metabolism, *Anti-Müllerian hormone and ovarian reserve: update on assessing ovarian function.* 2020. 105(11): p. 3361-3373.

[2] Xu, H., et al., *An ovarian reserve assessment model based on anti-müllerian hormone levels, follicle-stimulating hormone levels, and age: Retrospective cohort study.* 2020. 22(9): p. e19096.

[3] Tehrani, F.R., et al., *Investigating the clinical utility of the anti-mullerian hormone testing for the prediction of age at menopause and assessment of functional ovarian reserve: a practical approach and recent updates.* 2022. 13(2): p. 458.

[4] Han, Y., et al., *An online tool for predicting ovarian reserve based on AMH level and age: A retrospective cohort study.* 2022. 13: p. 946123.

[5] Cedars, M.I.J.T.J.o.C.E. and Metabolism, *Evaluation of female fertility—AMH and ovarian reserve testing.* 2022. 107(6): p. 1510-1519.

[6] Ramezani Tehrani, F., et al., *Does the anti-Mullerian hormone decline rate improve the prediction of age at menopause?* 2021. 12: p. 727229.

[7] Das, S., et al., *Correlation of Follicle-stimulating Hormone, Anti-Mullerian Hormone, and Antral Follicle Count with Age in Ovarian Reserve Testing.* 2024. 14(3): p. 162-168.

[8] Bedenk, J., et al., *The role of anti-Müllerian hormone (AMH) in ovarian disease and infertility.* 2020. 37(1): p. 89-100.

[9] Anderson, R.A., et al., *Anti-Müllerian hormone as a marker of ovarian reserve and premature ovarian insufficiency in children and women with cancer: a systematic review.* 2022. 28(3): p. 417-434.

[10] Burak, Ü., B.Ç.J.O. ÜN, and G. I, *THE RELATIONSHIP BETWEEN ANTI-MÜLLERIAN HORMONE (AMH) AND FEMALE FERTILITY.* 2024: p. 41.

[11] Huang, Y., et al., *Using anti-Müllerian hormone to predict premature ovarian insufficiency: a retrospective cross-sectional study.* 2024. 15: p. 1454802.

[12] Iwase, A., et al., *Anti-Müllerian hormone beyond an ovarian reserve marker: the relationship with the physiology and pathology in the life-long follicle development.* 2023. 14: p. 1273966.

[13] Oldfield, A.L., M. Kazemi, and M.E.J.J.o.C.M. Lujan, *Impact of obesity on anti-mullerian hormone (AMH) levels in women of reproductive age.* 2021. 10(14): p. 3192.

[14] Butt, M.S., et al., *Serum anti-Müllerian hormone as a predictor of polycystic ovarian syndrome among women of reproductive age.* 2022. 22(1): p. 199.

[15] Gunasheela, D., et al., *Age-specific distribution of serum anti-mullerian hormone and antral follicle count in Indian infertile women.* 2021. 14(4): p. 372-379.

[16] Lin, C., et al., *The value of anti-Müllerian hormone in the prediction of spontaneous pregnancy: a systematic review and meta-analysis.* 2021. 12: p. 695157.

[17] Rios, J.S., et al., *Associations between anti-mullerian hormone and cardiometabolic health in reproductive age women are explained by body mass index.* 2020. 105(3): p. e555-e563.

[18] Koller, T., et al., *Ovarian reserve assessed by the anti-Mullerian hormone and reproductive health parameters in women with Crohn's disease, a case-control study.* 2021. 70(Suppl 1): p. S69.

[19] Wang, X., et al., *Evaluation of ovarian reserve tests and age in the prediction of poor ovarian response to controlled ovarian stimulation—A real-world data analysis of 89,002 patients.* 2021. 12: p. 702061.

[20] Hariton, E., et al., *Anti-Müllerian hormone levels among contraceptive users: evidence from a cross-sectional cohort of 27,125 individuals.* 2021. 225(5): p. 515. e1-515. e10.