

THE RELATIONSHIP OF ANTI-MULLERIAN HORMONE (AMH) WITH INFERTILE WOMEN

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Abstract

The study focused on the Anti-Mullerian Hormone (AMH) and its relationship with the regularity of the menstrual cycle and the increase in infertility in women. The study sample consisted of 93 infertile women, with 60 samples as a control group. The results showed a significant decrease in the AMH concentration in infertile women, compared to the healthy women for all age groups of infertile women compared to healthy women at the probability level ($P = 0.05$), and age is a major factor affecting hormone levels, and usually, older women are more susceptible to deficiency AMH due to decreased ovarian production of eggs with age and decreased fertility, especially after the age of 35 due to a decrease in the number and quality of eggs, as an egg is sent from the ovary to the female's uterus every month from the time of puberty to menopause. The study also showed that the AMH level in infertile women with a regular menstrual cycle is higher compared to infertile women who suffer from irregular menstruation, which indicates the possibility of AMH deficiency is one of the factors that affect the regularity of the menstrual cycle. Finally, the study proved that AMH is a new indicator of increased risks of infertility and miscarriage in women, especially with menstrual disorders for all age groups.

Keywords: Infertility, AMH, Miscarriage, menstruation, age.

علاقة الهورمون المضاد لمولر (AMH) مع عقم النساء

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نبذة مختصرة:

ركزت الدراسة على الهورمون المضاد لمولر (AMH) وعلاقته مع انتظام الدورة الشهرية وزيادة الاصابة بالعقم لدى النساء، حيث تم جمع 93 عينة لنساء مصابات بالعقم و60 عينة كمجموعة سيطرة. أظهرت النتائج انخفاض معنوي في تركيز AMH عند النساء المصابات بالعقم، مقارنة بالنساء السليمات لجميع الفئات العمرية للنساء المصابات بالعقم مقارنة بالنساء السليمات عند مستوى احتمالية ($P = 0.05$)، والعمر عامل رئيسي يؤثر على مستويات الهورمون، وعادة ما يكونن النساء كبار السن أكثر عرضة لنقص AMH بسبب انخفاض إنتاج المبيض للبيوضات مع تقدم العمر وانخفاض الخصوبة، خاصة بعد سن ٣٥ بسبب انخفاض عدد ونوعية البيوضات، حيث يتم إرسال البويضة من المبيض إلى رحم الأنثى كل شهر من وقت البلوغ إلى سن اليأس. كما اظهرت الدراسة ان مستوى AMH عند النساء المصابات بالعقم مع الدورة الشهرية المنتظمة أعلى مقارنة بالنساء المصابات بالعقم واللواتي يعانين من عدم انتظام الدورة الشهرية، حيث يشير ذلك إلى احتمال نقص AMH هو أحد العوامل التي تؤثر على انتظام الدورة الشهرية. أخيراً، واثبتت الدراسة ان AMH علامة دالة جديدة لزيادة مخاطر العقم والإجهاض لدى النساء خاصة مع اضطرابات الدورة الشهرية لكافة الفئات العمرية.

الكلمات الدالة: العقم، AMH، الإجهاض، الدورة الشهرية، العمر.

Introduction:

Infertility is a condition of the human reproductive system that is one of the most frequent health concerns all over the world. The inability of a man or woman to produce children, whether due to psychological or biological factors. According to the data, between 10% and 15% of couples between the ages of 18 and 45 are infertile, and as a result of certain changes in lifestyle and environmental changes, the prevalence of infertility has risen rapidly, becoming the third most hazardous disease after cancer and heart disease (Starrs, 2018).

Anti-Müllerian hormone (AMH), is a protein hormone generated by granulosa cells in the ovarian follicle that influences female fertility (Kucera *et al.*, 2018).

Higher levels indicate a high number of eggs in the body (Alsafi *et al.*, 2021), and its highest levels are usually recorded when a woman reaches about 25 years old, and then its levels begin to decline after reaching the age of thirty, and studies have indicated that the AMH hormone can be analyzed on any day of the menstrual cycle, implying that its levels can be analyzed on any day of the menstrual cycle, implying that its levels can be analyzed on any day of the menstrual cycle. It does not change (Josson, 2019) AMH is often conducted to examine ovarian function and reproductive concerns in women, particularly during pregnancy-assisted procedures like as in vitro fertilization or what is known as in vitro fertilization. Many more reasons include forecasting the beginning of menopause or what is known as menopause, determining the cause of early menopause, and determining the cause of the lack of menstruation or the absence of a period (Ameno) (Xu *et al.*, 2018; Rzeszowska *et al.*, 2016), by studying 'truncated' models of the AMH gene, the functional role of AMH in early follicular development was highlighted. follicles until the primary follicle pool is depleted at an early age, so AMH has an inhibitory effect on early follicular recruitment, preventing entry of primordial follicles into the growing pool and thus premature follicle exhaustion. In vivo through decreasing follicular sensitivity to FSH (Qin *et al.*, 2019; Broer *et al.*, 2014; Fleming *et al.*, 2015).

Materials and methods:

Infertile Patients as a Group: ٩٣ infertile women were included in this study; they were diagnosed by experts in hospitals, and a laboratory test was performed in hospital laboratories as well as external laboratories from 13/9/2019 to 17/5/2020. Their ages range from 18 to 45 years old, and clinical data for each patient was collected using a specially designed questionnaire. Diabetes, high blood pressure, and thyroid illness are among the disorders that are not covered.

The control group: Consisted of ٦٠ Young fertile women ranging in age from 17 to 45 years old.

The two groups of blood after 12 h fasting, early follicular periods (day 2 or 3 period) were tested for Estrogen, Progesterone, Ovulation hormone (LH), Follicle stimulating hormone (FSH), Anti-Mullerian hormone (AMH), and lipids profile in a test tube and centrifuged to separate serum within 1 h of blood collection, and the serum was stored in a deep freezer at -20°C for later analysis. Samples were analyzed in batches of 100 to omit between analytical differences. Samples were allowed to reach room temperature prior to the study. Then using commercial kits (Bio Merieux kits) were measured by mini VIDS type (69280-Marcy-Letiole) from Biomerieux –Italy Co., the principle of this technic is Enzyme-Linked Fluorescent Assay. The lipid profile also included Total Cholesterol, Triglyceride (TG), High-Density Lipoprotein (HDL) analysis and was measured using commercial kits (Biolabo Kits) were measured by UltraViolet & Visible Spectro method. Low-Density Lipoprotein (LDL) and Very-Low-Density lipoprotein (VLDL) were determined indirectly, utilizing the Friedewald formula. WHR was calculated, using the following formula: $\text{WHR} = \text{W (Waist)} / \text{H (Hip)}$.

Ethical approval:

The research was carried out and approved by the author's Institutional Review Board in accordance with all applicable national legislation, institutional policy, and Helsinki Declaration ideals.

Statistical analysis:

SPSS software has been used to analyze the data. The T-test and Duncan tests were already used to compare parameters between the total control number and patients based on occupancy at $p \leq 0.05$, $p \leq 0.01$, and $p \leq 0.001$, respectively, and the Pearson correlation coefficient test was also performed (Kirkpatrick & Feeney, 2012).

Results:

The results listed in Table-1 prove that there is a correlation factor for infertility with the level of AMH, which confirms that the decrease in AMH concentration is a sign that increases the risk factors for infertility. Where the results showed that there is a significant positive correlation between infertility and the level of Anti-Müllerian hormone (AMH) in each of the estrogen, ovulation

hormone (LH) to follicle stimulating hormone (FSH) Ratio LH/FSH, cholesterol, High Density Lipoproteins (HDL) and Very Low Density Lipoproteins (VLDL), as their concentration decreases with the decrease in the level of Anti-Müllerian hormone (AMH) and vice versa, on the other hand, the results indicate a significant negative correlation between infertility and the level of infertility Anti-Müllerian hormone (AMH) in both progesterone hormone, ovulation hormone (LH) and follicle stimulating hormone (FSH), Body Mass Index (BMI) and Waist and Hip Circumference (WHR), as their concentration increases with decreased Anti-Müllerian hormone (AMH) and vice versa.

Table-1: Correlation of the effect of AMH for infertile women, depending on hormonal and biochemical variables.

Hormonal and Biochemical Variables	r correlation value	P value
Estrogen E2(pg/ml)	0.089	0.399
Progesterone P4(ng/ml)	-0.041	0.695
LH (mIU/ml)	-0.075	0.480
FSH(mIU/ml)	-0.203	0.052
LH/FSH	0.240	0.021
Cholesterol (mg/dl)	0.150	0.154
(TG) (mg/dl)	-0.114	0.281
HDL (mg/dl)	0.006	0.958
LDL (mg/dl)	-0.125	0.234
VLDL (mg/dl)	0.112	0.286
Atherogenic Risk Factor	-0.072	0.494
WHR	-0.041	0.697

The results showed clear results in Table-2 a significant decrease in the level of AMH in infertile women compared with the group of healthy women (control group) at a probability level ($P = 0.05$) for all age groups The results listed in Table (3-6) prove that there is a correlation factor for infertility with the level of AMH

hormone with increasing age, which confirms that the decrease in AMH concentration is a sign that increases the risk factors for infertility. Where the results showed when comparing the level of AMH hormone among infertile women with different age groups, a positive significant correlation in the level of AMH hormone for the age groups (18-24), (25-29) and (30-34), as the younger the age, the higher the AMH level. Natural, and the results also indicate a significant negative correlation between infertility and the level of AMH hormone in the age groups (35-39) and (40-44), where the level of AMH hormone decreases in infertile women as they age, and this is consistent with a recent study that found that Women under the age of 35 years have more chances of pregnancy related to levels of the follicle-stimulating hormone (FSH), while women over the age of 35 years have more chances of pregnancy related to levels of AMH (Sacha *et al.*, 2020; Dai *et al.*, 2020). Low levels of AMH before 39 years may be associated with a risk of menopause between 40 and 45 years (Desongnis *et al.*, 2021).

Table-2: Comparison of AMH level in infertile women with different age groups.

Age groups	r correlation value	P value
(18-24) year	0.256	0.05
(25-29) year	0.067	0.05
(32-34) year	0.191	0.05
(35-٣9) year	-0.967	0.05
(40-44) years	-0.587	0.05

The results shown in figure -1 showed the rate of infertility with regular menstruation. The rate of irregular menstruation is 72% of infertile women. The menstrual cycle is an important indicator of a woman's possibility of pregnancy, as well as a woman's reproductive health (Mao *et al.*, 2021). Many hormones affect the menstrual cycle and irregularity is one of the main symptoms of anovulation, which is a phenomenon accompanied by a decrease in the secretion and production of ovarian steroid hormones (Zhou *et al.*, 2022). The most important cause of

irregular menstruation is interruption of the menstrual cycle due to dysfunction of the hypothalamus gland associated with decreased secretion of GnRH releasing hormone and imbalance in the hypothalamic-pituitary-adrenal-HPA axis, the occurrence of such hormonal disorders may It leads to the development of many chronic diseases such as infertility, type 2 diabetes and heart disease (Bae *et al.*, 2018). In addition, great stress may affect the effectiveness of the HPA axis, so studies have indicated that lifestyle is related to the menstrual cycle (Young *et al.*, 2021; Bala *et al.*, 2021).

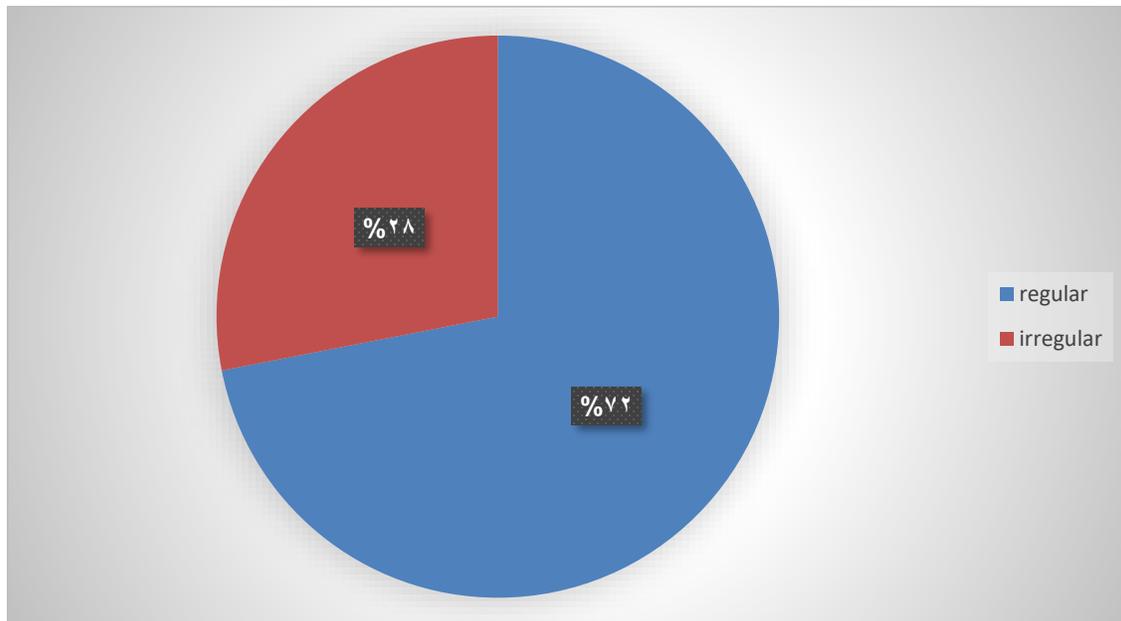


Figure -1: The relationship of AMH with the regularity of the menstrual cycle in infertile women.

Conclusion:

This study found that AMH is a new marker for increasing infertility in women associated with irregular menstruation and for different age groups, so the primary goal should be to manage these women before starting any treatment to correct their hormonal imbalance by measuring their level and AMH and regulating the menstrual cycle under medical supervision before planning a pregnancy.

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