Determination of Ovarian Reserve with Anti-Mullerian Hormone in Patients with Polycystic Ovary Syndrome and Premenopausal Women

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ABSTRACT

Objective: We aimed to evaluate the capacity of measuring serum anti-mullerian hormone (AMH) levels in determining ovarian reserve in patients with polycystic ovary syndrome (PCOS) with increased ovarian reserve and in premenopausal women with decreased ovarian reserve.

Methods: Seventy-five patients who presented to our clinic between May-September 2011 were included. The patients comprised 25 (20-35 years) with PCOS, 25 (20-35 years) with normo-ovulatory cycle, and 25 (40-45 years) in the premenopausal period. Blood specimen was taken from patients during the early follicular period (on the third day of spontaneous menstrual cycles) and FSH, LH, estradiol (E2), and AMH levels were analyzed. In addition, body mass indexes (BMI) of the patients were calculated by measuring their heights and weights.

Results: We determined statistically significant differences between groups regarding AMH values (p<0.001). We determined the mean AMH value of the PCOS group to be 58.45±33.68 pmol/L, 19.92±21.35 pmol/L for the control group, and 2.47±5.31 pmol/L for the premenopausal group. We found a statistically significant negative relationship between AMH and BMI levels in all cases without discrimination (r:-0,277; p=0.016), and we found a statistically significant positive relationship between AMH and AFC (antral follicle count) (r: 0.908; p=<0.001).

Conclusion: AMH is a highly specific biomarker in determining ovarian reserve. High levels of AMH values in patients with PCOS and low levels in premenopausal women demonstrate that AMH is a safe biomarker in determining ovarian reserve. *(JAREM 2014; 2: 62-8)*

Key Words: Polycystic ovary syndrome, follicle-stimulating hormone, anti-mullerian hormone

ÖZET

Amaç: Over rezervinin arttığını bildiğimiz polikistik over sendromlu (PCOS) hastalarla, azaldığını bildiğimiz premenopoz dönemdeki kadınlarda serum anti-mullerian hormon (AMH) düzeylerinin over rezervini belirlemedeki kapasitesini değerlendirmek çalışmamızın temel amacıdır.

Yöntemler: Çalışmamıza Mayıs-Eylül 2011 tarihleri arasında kliniğimize başvuran 75 hasta dahil edildi. Bunlardan 25 hasta (yaşları 20-35 arasında) PCOS hastası; 25 hasta (yaşları 20-35 arasında) normal ovulatuar siklusları olan hastalar; 25'i ise yaşları 40-45 yaş arasında olan premenopoz dönemdeki hastalardan oluşturuldu. Tüm hastalardan erken foliküler dönemde kan numunesi alındı (normal menstruel siklusun 3. günü) ve follicle-stimulating hormone (FSH), luteinizing hormone (LH), anti-mullerian hormone (AMH) değerleri analiz edildi. Ayrıca hastaların vücut kitle indeksleri (VKİ) boy ve kilo değerleriyle hesaplandı.

Bulgular: Gruplar arasında AMH değerleri açısından istatistiksel anlamlı farklılıklar saptadık (p<0,001). PCOS grubunun AMH değeri ortalamasını 58,45±33,68 pmol/L; kontrol grubun AMH değeri ortalamasını 19,92±21,35 pmol/L; premenopoz grubun AMH değeri ortalamasını 2,47±5,31 pmol/L olarak saptadık. Herhangi bir ayrım yapmadan tüm vakaları dahil ettiğimiz analizde AMH ve VKİ düzeyleri arasında negatif yönde istatistiksel olarak anlamlı ilişki bulduk (r:-0,277; p=0,016). Ayrıca AMH değerleri ile antral folikül sayısı arasında istatistiksel olarak anlamlı pozitif bir ilişki bulduk (r: 0,908; p=<0,001).

Sonuç: Anti-müllerian hormon, over rezervini belirlemede oldukça spesifik bir biyomarkerdır. PCOS hastalarında AMH değerinin yüksek çıkması ve rezervin azaldığı bilinen premenopoz dönemdeki hastalarda AMH değerinin düşük çıkması, over rezerv tayininde AMH'ın güvenilir bir marker olduğunu göstermiştir. *(JAREM 2014; 2: 62-8)*

Anahtar Sözcükler: Polikistik over sendromu, folikül stimulan hormon, anti-müllerian hormon

INTRODUCTION

Ovarian reserve is an important marker that is related to the number and quality of oocyte, reflecting the reproductive capacity of a woman. Follicle-stimulating hormone (FSH) and estradiol (E2) values measured on the 3rd day of spontaneous period are indirect markers showing ovarian reserve (1); therefore, provocative tests, such as clomiphene citrate challenge test and GNRH agonist stimulation test were developed (2). Recently, ultrasound assessment of ovarian volume and total antral follicle count (AFC) were also found to be useful in predicting ovarian responses. Studies are ongoing to find better biomarkers in determining ovarian

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reserve. Anti-müllerian hormone (AMH), activin, follistatin, and inhibin b can be regarded among candidate biomarkers (1, 3).

Anti-müllerian hormone is a dimeric glycoprotein. It is composed of two 72-kDa monomers linked by disulfide bridges (4, 5). AMH belongs to the transforming growth factor beta family, which includes the inhibin and activin glycoproteins (6). AMH is secreted by primary, pre-antral, and antral follicles. It is expressed in granulosa cells of the follicle and secreted independently from FSH (7). As the follicle enlarges, secretion decreases. (8). Since AMH is both independent from the menstrual cycle and highly correlated with the pre-antral follicle number, its importance in determining ovarian reserve has begun to be understood increasingly in recent years (4, 5).

Polycystic ovary syndrome (PCOS), seen approximately in 4%-12% of women in the reproductive age group, is the most frequently encountered reproductive endocrinopathy in women (9,10). There is a parallel correlation between antral follicle number and serum AMH in women with polycystic ovary syndrome (11). Elevated AMH values in either serum or follicular fluids of patients with PCOS are associated with an increase in immature oocyte number. It is considered that this elevation is related to the increase in number of granulosa cells rather than the number of follicles. Studies have shown that there are 75 times as many granulosa cells in follicles of women with polycystic ovary syndrome than granulosa cells in follicles of women without PCOS (12).

We aimed to evaluate the capacity of measuring serum AMH levels in determining ovarian reserve in patients with PCOS with increased ovarian reserve and in premenopausal women with decreased ovarian reserve.

METHODS

Study Design and Subjects

This study was performed on total 75 patients comprised of 25 patients aged 20-35 years with PCOS; 25 women in the same age group with normo-ovulatory cycle and 25 patients aged 40-45 years in premenopausal period who presented to the Obstetrics and Gynecology Clinic of İstanbul Medeniyet University Göztepe Training and Research Hospital between May-September 2011. To rule out the primary infertility, study groups were constituted from women who gave their first births earlier.

PCOS diagnosis was made based on the "2003 Rotterdam Consensus Conference on PCO" (ESHRE ASRM) criteria: 1- menstrual irregularities (oligo/amenorrhea, oligo/anovulation), 2- clinical and/or biochemical hyperandrogenism and 3- ultrasonographic PCO morphology (13). Presence of at least two of these three criteria and being able to rule out diseases such as congenital adrenal hyperplasia, Cushing syndrome, and androgen-secreting tumor was considered to be sufficient for a diagnosis. Presence of at least two of these three criteria and being able to rule out diseases such as congenital adrenal hyperplasia, Cushing syndrome and androgen-secreting tumor was considered to be sufficient for PCOS diagnosis.

The study was approved previously by Ethics Committee and Research Evaluation Committee of İstanbul Göztepe Training and Research Hospital (05.04.2011 No:11/F) . Patients were informed about the purpose of the study, tests and procedures that would be performed, Ethics Committee Approval was expressed and patients giving consent to participate in the study were included into the study. Informed consent was obtained from patients.

Age, medical history, history of delivery, height, weight, menstrual cycle and gynecologic examinations of patients were recorded before the study. During the first visit, body mass index (BMI) values of patients were calculated in kg/m^2 by measuring their heights (cm) and weights (kg). All of the ultrasonographic examinations were performed in the lithotomy position and by using a 6-8 mHz B mode pelvic and endovaginal probe (Logiq A5; General Electric, Connecticut, USA). Antral follicles were defined as follicles between 2 and 10 millimeters in diameter. Antral follicle count represents the total number of antral follicles from two ovaries. The number of antral follicles, was counted on the third day of the menstrual period Presence of 12 or more follicles with asize of 2-9 mm and/or increased ovary volume (>10 mL) was described to be polycystic ovary. Presence of this finding in one ovary was considered to be sufficient. Distribution of follicles was not taken into consideration in the evaluation of polycystic ovary.

Biochemical Analysis

Blood specimens were taken from all of the patients for FSH, luteinizing hormone (LH), estradiol (E2), and AMH analyses during the early follicular period (on the third day of spontaneous period). Samples were centrifuged for 10 minutes at 4000 rpm after leaving them at room temperature for at most 1 hour. The sera obtained were stored at -20°C until they were analyzed.

FSH, LH, and E2 levels were measured on a DXI 800 access analyzer (Beckman Coulter, Indianapolis, USA) by using a chemiluminescent method. AMH level measurement was performed by using ELISA method with the AMH Gen II Elisa Kit (Beckman Coulter, Indianapolis, USA). Intra- and inter-assay CVS of the kit were less than 5%.

Statistical Analysis

The Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA) v. 11.5 program was used for statistical analysis. Kolmogorov-Smirnov normality test was used for the distribution of continuous data. During the evaluation of the study data, regarding the intergroup comparisons of the data with parametric distribution as well as descriptive statistical methods (Mean, Standard deviation). Differences at baseline between groups were, when normally distributed, evaluated by ANOVA test, and by the Kruskal-Wallis test, when non-normally distributed. Tukey HSD Test was used for the in-group comparisons of the data. Regarding the data without a parametric distribution, Spearman's rho correlation coefficient was used for analysis of the relationship between parameters when normally distributed and Pearson correlation was used when they were non-normalllly distributed. P-value <0.05 was considered significant.

RESULTS

As a result of this study, we found that there was a significant difference between age, FSH (IU/L), LH (IU/L), AMH (pmol/L), and AFC parameters. There was no statistically significant difference in E2 values between groups (p=0.086) (Table 1).

There was a highly statistically significant difference between the FSH levels of the cases according to the groups (p<0.001).

Table 1. Mean values and standard deviations for age, FSH, LH, E2, AMH, and AFC in all three groups

	Groups			p
	PCOS	Premenopausal	Control	
Age	25.76±4.26	42.20±2.40	27.64±3.91	<0.001
BMI (kg/m^2)	25.68±6.33	29.12±6.26	23.00±3.86	=0.001
FSH (IU/L)	5.34±1.91	20.39±22.90	7.36±4.46	<0.001
LH (IU/L)	7.35±4.29	14.13±12.59	5.79±10.18	=0.001
AMH (pmol/L)	58.45±33.68	2.47±5.31	19.92±21.35	<0.001
E2 (pmol/L)	245.07±189.24	487.5±389.67	421.98±370.95	=0.086
AFC	18.04±3.94	4.28±1.17	8.96±2.15	<0.001

BMI: body mass index; FSH: follicle stimulating hormone; LH: luteinizing hormone; AMH: anti-mullerian hormone; E2: estradiol; AFC: antral follicules count; PCOS: Polycystic ovary syndrome

Table 2. Multiple Comparisons between the groups

Dependent Variable	(I) Group	(J) Group	(I-J) Mean	p
FSH (IU/L)	PCOS	Premenopausal	-15.05	=0.001
		Control	-2.03	=0.861
	Premenopausal	PCOS	15.05	=0.001
		Control	13.02	=0.003
	Control	PCOS	2.03	=0.861
		Premenopausal	-13.02	=0.003
AMH (pmol/L)	PCOS	Premenopausal	55.99	<0.001
		Control	38.53	<0.001
	Premenopausal	PCOS	-55.99	<0.001
		Control	-17.46	=0.026
	Control	PCOS	-38.53	<0.001
		Premenopausal	17.46	=0.026
LH (IU/L)	PCOS	Premenopausal	-6.78	=0.045
		Control	1.56	=0.856
	Premenopausal	PCOS	6.78	=0.045
		Control	8.33	=0.013
	Control	PCOS	-1.56	=0.856
		Premenopausal	-8.33	=0.013
AFC	PCOS	Premenopausal	13.76	<0.001
		Control	9.08	<0.001
	Premenopausal	PCOS	-13.76	<0.001
		Control	-4.68	<0.001
	Control	PCOS	-9.08	<0.001
		Premenopausal	4.68	<0.001

Tukey HSD
FSH: follicle stimulating hormone; AMH: anti-mullerian hormone; LH: luteinizing hormone; AFC: antral follicules count;

We determined the mean FSH values of the PCOS, premenopausal, and control groups to be 5.34±1.91 IU/L, 20.39±22.90 IU/L, and 7.36±4.46 IU/L, respectively (Table 1). As a consequence of the paired comparisons performed to determine where the difference arose from each group, mean FSH levels of the premenopausal group were determined to be significantly higher than in the PCOS group and control group (p=0.001; p=0.003), and no statistically significant difference was determined between mean FSH levels of the PCOS group and control group (p=0.861) (Table 2).

Table 3. Spearman Correlation Analysis of AMH with FSH, BMI and AFC

		FSH (IU/L)	AMH (pmol/L)	BMI (kg/m²)
AMH (pmol/L)	r	-0.579		
	p	<0.001		
BMI (kg/m²)	r	0.262	-0.277	
	p	0.024	0.016	
AFC	r	-0.568	0.908	-0.408
	p	<0.001	0.000	<0.001

r: Spearman's rho correlation coefficient
AMH: anti-mullerian hormone; BMI: body mass index; AFC: antral follicules count

There was a statistically significant difference between the LH levels of the cases according to the groups (p=0.001). We determined the mean LH values of the PCOS, premenopausal, and control groups to be 7.35±4.29 IU/L, 14.13±12.59 IU/L, and 5.79±10.18 IU/L, respectively (Table 1). As a consequence of the paired comparisons performed to determine where the difference arose from each group, mean LH levels of the premenopausal group were determined to be significantly higher than in the PCOS group and control group (p=0.045; p=0.013), and no statistically significant difference was determined between mean LH levels of the PCOS group and control group (p=0.856). There was no statistically significant difference between the E2 levels of the cases according to the groups (p=0.086) (Table 2).

There was a highly statistically significant difference between the AMH levels of the cases according to the groups (p<0.001). We determined the mean AMH values of the PCOS group to be 58.45±33.68pmol/L, 2.47±5.31 pmol/L for the premenopausal group, and 19.92±21.35 pmol/L for the control group (Table 1). As a consequence of the paired comparisons performed to determine where the difference arose from each group, mean AMH levels of the PCOS group were determined to be significantly higher than in the premenopausal group and the control group (p<0.001; p<0.001). The control group was also determined to be higher than the premenopausal group (p=0.026) (Table 2).

There was a highly statistically significant difference between the AFC of the cases according to the groups (p<0.001). We determined the mean AFC of the PCOS group to be 18.04±3.94, 4.28±1.17 for the premenopausal group, and 8.96±2.15 for the control group (Table 1). As a consequence of the paired comparisons performed to determine where the difference arose from each group, mean AFC of the PCOS group was determined to be significantly higher than in the premenopausal group and the control group (p<0.001; p<0.001). The control group was also determined to be higher than the premenopausal group (p<0.001) (Table 2).

In all groups, a statistically significant negative correlation was found between AMH and FSH levels (r=-0.579; p<0.001) (Table 3, Figure 1). Therefore, in the analysis performed including all patients without group discrimination, a statistically significant negative relationship was found between AMH and BMI levels (r=-0.277; p=0.016) (Table 3, Figure 2). Also, a statistically significant negative correlation was found between AFC and BMI lev-

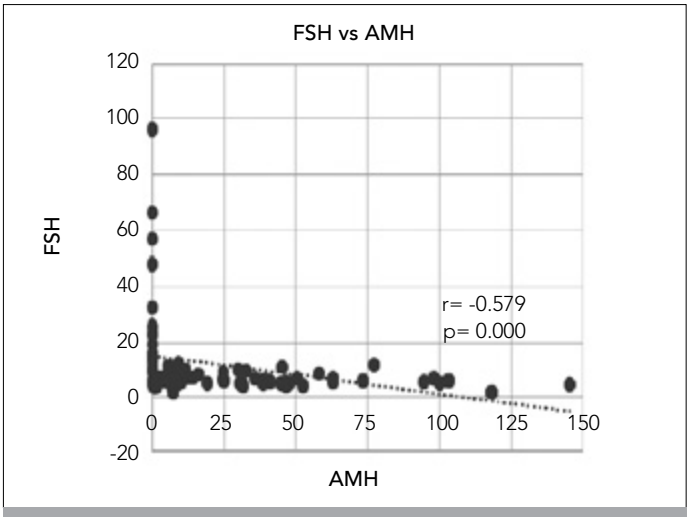

Figure 1. A graphic of correlation between FSH and AMH
FSH: follicle stimulating hormone; AMH: anti-mullerian hormone

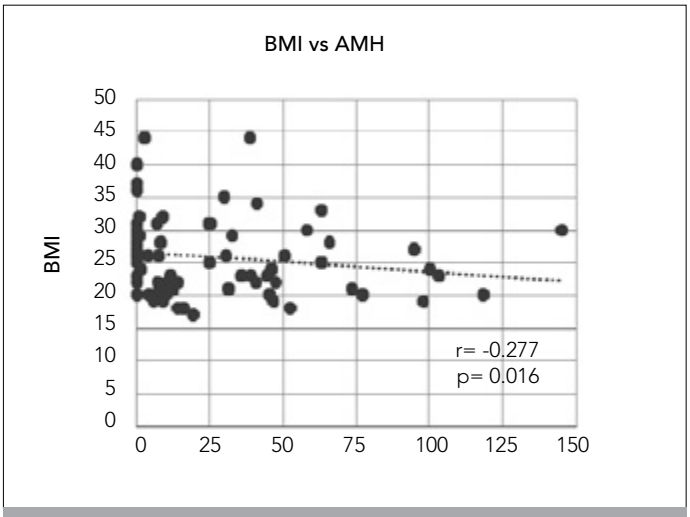

Figure 2. A graphic of correlation between AMH and BMI
BMI: body mass index; AMH: anti-mullerian hormone

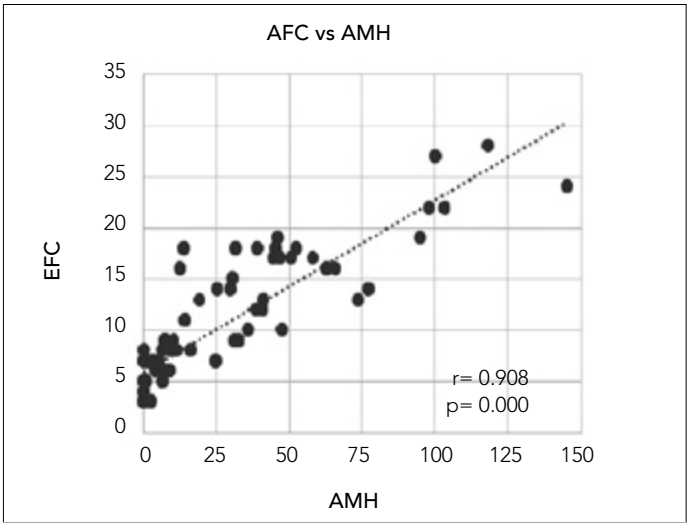

Figure 3. A graphic of correlation between AFC and AMH
AFC: antral follicules count; AMH: anti-mullerian hormone

Table 4a. Group Crosstabulation for AMH values (pmol/L) (Binned)

			Groups			Total
			PCOS	Premenopausal	Control	
AMH (pmol/L) (Binned)	<= 10.56	Count	0	24	13	37
		% within AMH	0%	64.9%	35.1%	100.0%
		% within Group	0%	96.0%	52.0%	49.3%
	>10.56	Count	25	1	12	38
		% within AMH	65.8%	2.6%	31.6%	100.0%
		% within Group	100.0%	4.0%	48.0%	50.7%
Total	Count	25	25	25	75	
	% within AMH	33.3%	33.3%	33.3%	100.0%	
	% within Group	100.0%	100.0%	100.0%	100.0%	

AMH: Anti-Mullerian Hormone; PCOS: Polycystic ovary syndrome

els (r=-0.408; p<0.001) (Table 3). There was a highly statistically significant positive correlation between AMH and AFC levels (r=0.908; p<0.001) (Table 3), (Figure 3).

The AMH reference value was determined in the control group. The median of the control group was 10.56 pmol/L, and this value was used as the reference for all other groups. AMH values were divided into two groups: ≤10.56 pmol/L and >10.56 pmol/L, respectively (Table 4a). There was no value under 10.56 pmol/L in the PCOS group. All measurements in the PCOS group were above the reference value. There were 13 cases (52%) under 10.56 pmol/L and 12 cases (48%) above 10.56 pmol/L in the control group, and there were 24 cases (96%) under 10.56 pmol/L and 1 case (4%) above 10.56 pmol/L in the premenopausal group. Also, 64.9% of all patients with AMH levels under the reference value were found in the premenopausal group, and the remaining 35.1% was found in the control group (Table 4a).

To refine the value of the AMH reference range, the first and third quartiles in the median value in the control group measurements were also determined as reference values. The first quartile value was 6245 pmol/L, and the third quartile value was 32.150 pmol/L. According to this, cases that had AMH levels ≤6245 pmol/L; 6245 to 10,560 pmol/L; 10.560 to 32,150 pmol/L, and >32.150 were divided into four groups, respectively. In the PCOS group, 76% of cases (n=19) were found to have higher than 32.150 pmol/L. In the premenopausal group, 84% of cases were found to have under 6245 pmol/L. In the control group, 24% of cases (n=6) were under 6245 pmol/L, 28% of them (n=7) were found between 6245 and 10,560 pmol/L, 24% of them (n=6) were found between 10,560 and 32,150 pmol/L, and 24% of them (n=6) were found above 32.150 pmol/L (Table 4b).

DISCUSSION

Ovarian reserve depends on two factors: 1- primordial follicle reserve and 2- oocyte quality. Primary follicles develop from the primordial follicle pool, and afterwards, secondary (pre-antral) follicles occur. Those structures compose the antral follicle pool. One follicle has been selected each month for ovulation. AMH is secreted by ovarian granulosa cells of growing pre-antral and small antral follicles (4).

Many authors suggested that antral follicle count, an important marker of ovarian reserve, decreases with advancing age, and correspondingly, serum AMH levels also decrease with advancing age (8,14). In our study, we found a statistically significant positive correlation between AMH levels and antral follicle count. We also found a statistically significant negative correlation between age and AMH levels. There is a statistically significant positive correlation between age and FSH levels. We have demonstrated that when the serum levels of FSH are increased, the serum AMH levels decrease concordantly. There are statistically significant differences between AMH and FSH levels of the control and premenopausal groups, who had only an age difference between each other. Comparing AMH and FSH levels in the premenopausal to the control group, we found lower AMH and higher FSH levels for the premenopausal group.

In their study performed by Annemarie De Vet et al. (15) in 41 normo-ovulatory premenopausal and 13 healthy cases in the menopausal period, the authors have suggested that AMH was a good marker showing ovarian aging, considering that AMH production decreased with advancing age (15). In the study performed by Fanchin et al. (7), the direct and indirect relationships between AMH, antral follicle count, FSH, and inhibin-b hormones were investigated. It was shown that ovarian volume, antral follicle count, and AMH decreased with advancing age, and also, there was the presence of a positive correlation between antral follicle count and AMH. A negative correlation between AMH and FSH production with advancing age was also noted in other studies (14).

It has been suggested that there is a positive correlation between antral follicle count and serum AMH levels in women with polycystic ovary syndrome. However, it has also been suggested that high levels of AMH in these patients might be related to the increase in the number of granulosa cells rather than the increase in number of follicles (16). Indeed, in studies performed by Desforges-Bullet and Pellatt, it has been shown that follicular granulosa cell numbers of women with PCOS are 75 fold higher than in women without PCOS (11, 16). It has been suggested that serum AMH levels of women with PCOS are 2-3-fold higher than serum AMH levels of healthy women in the same age group, and also, the reduction occurring in AMH concentrations with advancing age is more slowly progressing in patients with PCOS (16).

Table 4b. Group Crosstabulation for AMH values (pmol/L) (Binned)

			Groups			Total
			PCOS	Premenopausal	Control	
AMH (pmol/L) (Binned)	≤6,245	Count	0	21	6	27
		% within AMH	0%	77.8%	22.2%	100.0%
		% within Group	0%	84.0%	24.0%	36.1%
	6.245-10,560	Count	0	3	7	10
		% within AMH	0%	30.0%	70.0%	100.0%
		% within Group	0%	12.0%	28.0%	13.3%
	10,560-32,150	Count	6	1	6	13
		% within AMH	46.2%	7.7%	46.2%	100.0%
		% within Group	24.0%	4.0%	24.0%	17.3%
	≥32,150	Count	19	0	6	25
		% within AMH	76.0%	0%	24.0%	100.0%
		% within Group	76.0%	0%	24.0%	33,3%
Total	Count	25	25	25	75	
	% within AMH	33.3%	33.3%	33.3%	100.0%	
	% within Group	100.0%	100.0%	100.0%	100.0%	

AMH: Anti-Mullerian Hormone; PCOS: Polycystic ovary syndrome

In our study, we found a significant difference between PCOS, premenopausal, and control groups regarding AMH levels and AFC. AMH levels and AFC of the PCOS group were significantly higher than in the premenopausal group and the control group. Therefore, patients having PCOS with larger ovarian reserves may be represented in serum with high AMH levels and higher AFC in USG.

In the study performed by Tehrani et al. (17) a total of 174 patients, including 89 normo-ovulatory and 85 PCOS cases, were included. They have shown that serum AMH levels of PCOS cases were statistically significantly higher than in normo-ovulatory healthy individuals. Also, in the study performed by Hudecova et al. (18) in 2009, the authors found that AMH levels and AFC in patients with polycystic ovary syndrome were higher than in the control group, and FSH in patients with polycystic ovary syndrome was less than in the control group. Again, as a consequence of the study performed by Hosseini et al. (19) in 2009, the authors concluded that AMH values in patients with PCOS were higher than in the group without PCOS.

Obesity is an important factor, preventing fertility, impairing normal ovulatory cycles, and increasing abortion rates (20). Possible causes of this condition are considered to be as follows: obesity affects the pulsatile release of gonadotropin-releasing hormone negatively, and the synthesis of ovarian and adrenal androgens and sex hormone-binding globulin are negatively affected by obesity and insulin resistance in obese individuals (21). Low levels of AMH and inhibin b values of obese patients in studies performed suggest decreased ovarian reserves in these individuals (20). During the comparison of AMH and BMI without group discrimination, we found a significant negative correlation between AMH and BMI levels. A similar negative correlation was also found between AFC and BMI levels.

In summary, obesity can be considered an important factor that decreases ovarian reserves and might be associated with the decreased number of successful pregnancies. In a study performed on 290 individuals by Buyuk et al. in 2008, the authors found that AMH levels of individuals with BMI above 30 kg/m^2 were 65% less than AMH levels of individuals with BMI below 30 kg/m^2 (21). When all other parameters were neglected, in the statistical analysis performed for BMI alone, it was shown in this study that ovarian reserves and, concordantly, serum AMH levels decreased in obese women (21). In a study performed by Steiner et al. (22), the authors divided 330 women aged 18-35 years into two groups according to their BMI: below 25 kg/m^2 and above 30 kg/m^2. According to these results, they found AMH values to be lower in the obese group at a rate of approximately 34% (2.9±2.1 ng/mL). Thus, the authors demonstrated a negative relationship only between BMI and AMH by ruling out all other characteristics.

CONCLUSION

The result of our study has shown that AMH is a highly reliable marker in determining ovarian reserve. Any pathology affecting ovarian reserve will directly affect serum AMH levels. The most certain proof of this statement is that "a condition like PCOS," which increases the ovarian reserve, has made an elevation in serum AMH levels and that "a factor like obesity," which has affected ovarian reserve negatively, has made a decrease in serum AMH levels. Also, there has been a positive relationship between AMH levels and AFC. The correlation between serum AMH levels and AFC, which is a valuable marker for ovarian reserve, has shown us that AMH can be considered to have an important role in determining ovarian reserve. Whether it is helpful or not to use AMH as a screening tool for PCOS requires future investigations.

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