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ORIGINAL ARTICLE

Relationship of Anti-Mullerian Hormone in Polycystic Ovary Syndrome Patients with Different Subgroups

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ABSTRACT

Objective: To determine the association between hyperandrogenism (HA) and polycystic ovarian morphology in a Chinese cohort of patients with polycystic ovary syndrome and the usefulness of anti-Mullerian hormone

Methods: Patients who visited the Department of Obstetrics and Gynecology at Indus Medical College Tando Muhammad Khan between May 2020 and October 2020 were the subjects of a prospective case-control study. According to Rotterdam criteria, 50 females with Polycystic ovary syndrome (PCOS) and 50 females without the condition participated in the study.

Results: An teenage patient clinic at our hospital enrolled 100 consecutive patients (50 by PCOS, 50 by healthy controls aged equal to the adolescent patients). Menstrual anomaly and hirsutism were most common in the study group, while vaginal discharge was most common in the control group. Analyses of anthropometric measures between the two groups showed a significant difference ($p<0.05$). In the PCOS group, both plasma fasting insulin (p-value = 0.001) and HOMA index (p value =0.003) had statistically greater values. PCOS patients also had significantly higher means of fT and 17-OH-P, as well as LH and LH/FSH ratios. Serum AMH levels were found to be negatively correlated with FSH levels in all patients ($r=-0.238$, $p=0.031$). The AUC value indicated by ROC analysis for distinguishing PCOS was 0.678. However, the sensitivity and specificity scores according to the highest Youden index were 47.8% and 76.1%, respectively.

Conclusion: The Anti-Mullerian hormone level is also linked to the existence of polycystic ovary morphology, which suggests that the AMH level might have a role in the diagnosis and treatment of PCOS.

Keywords: Anti-Mullerian Hormone, Polycystic Ovary Syndrome, Polycystic Ovary Morphology

INTRODUCTION

Approximately 8–13 % of females of reproductive age suffer from the polycystic ovarian syndrome, a prevalent endocrine condition. Ovarian polycystic morphology, anovulation, and hyperandrogenism all figure prominently in this diagnosis of polycystic ovary morphology.[1] Several phenotypes are possible, In addition to oligo-ovulation and hyperandrogenism, polycystic ovarian morphology, hyperandrogenism, and ovulatory dysfunction occur at the same time. Clinical therapy has no definite impact on polycystic ovary syndrome patients because of the wide range of individual variances. There are presently no precise serological markers that can be used to identify subgroups of people who should be treated differently. If you're looking for an indicator of ovarian reserve and function, the anti-Mullerian hormone is the best bet. Granulosa cells in pre-antral or small antral follicles produce the hormone.[2] If Anti-Mullerian hormone levels are high two to three-fold in polycystic ovary syndrome, we might use it as a diagnostic sign for the condition.[3,4] This is because the Anti-Mullerian hormone is positively associated with polycystic ovary morphology and serum androgen levels.[5] Despite a lot of research and unanimity on the link concerning the AMH and PCOS, the diagnostic criteria have not yet been established. It's unclear if this has anything to do with the polycystic ovary syndrome subgroup's tendency for variability. Among young polycystic ovary syndrome patients in a Chinese population, the objective of this study was to analyze Anti-Mullerian hormone distribution among subgroups of patients in order to better understand whether it is useful as a diagnostic or follow-up test.

MATERIAL AND METHOD

Patients who visited the Department of Obstetrics and Gynecology at Indus Medical College Tando Muhammad Khan between May 2021 and October 2021 were the subjects of a prospective case-control study. According to Rotterdam criteria, 50 females with Polycystic ovary syndrome and 50 females without the condition participated in the study. These women had been diagnosed with polycystic ovary syndrome. For this study, those who had undergone hormonal treatment during the previous three months were excluded from this study. The Rotterdam 2003 agreement recognized polycystic ovary syndrome as a diagnosis based on the discovery of two of the following three criteria:

Also known as hyperandrogenism, which is described as having a Ferriman-Gallwey score of over 8 or mild indications, such as acne or seborrhea; and/or oligo and/or anovulation.

Ovarian volume must increase by at least 10 millimeters (3 millimeters) to be polycystic, as determined by ultrasonography. A/B/C/D phenotypes were assigned to patients who met the diagnostic criteria for polycystic ovary syndrome. The human ethics committee approved the study after all women gave their informed permission. There was no endometriosis, cysts, or other ovarian gynecological disorders in the control group; they had regular menstrual cycles of 26-35 days; they were in the normal range of prolactin, Follicle-stimulating hormone, and basal estradiol; According to ultrasound, their ovaries did not appear to be hyperandrogenic, so they were not hyperandrogenic. Participants were asked to fill out a questionnaire that included demographic information, such as their age and the nature of their complaints (hirsutism, menstrual history, and symptoms of androgen excess).

The examination included an FG score and body mass index as part of the patient's history of oligomenorrhea and hirsutism. Oligo menorrhea was defined as fewer than eight menstrual cycles or a menstrual gap of over 35 days in the previous 12 months. A Ferriman-Gallwey score of >8 was used to characterize clinical hyperandrogenism. Both ovaries had over 12 follicles with diameters of 2-9 mm or over 10 cm when they were examined by ultrasonography. Acne, hirsutism, and acanthosis nigricans were found after a comprehensive skin examination. On days 2-3 of menstruation or after withdrawal bleeding, a blood sample was taken and placed in sample vials. After that, samples were spun down to 3000 rpm in a centrifuge in the biochemistry lab to prepare for serum testing. ELISA kits from immunological concept bio-detect were used to measure Anti-Mullerian hormone levels in 96-well plates with six reference standards included. Using an Anti-Mullerian hormone -HRP conjugate on an Anti-Mullerian hormone coated plate, the researchers performed the analysis using a competitive enzyme immunoassay approach. The kit has a 0.025 ng/ml detection limit. One of the samples was tested for hormone levels using chemiluminescence immunoassay for Thyroid-stimulating hormone, Follicle-stimulating hormone, Luteinizing

hormone, and estradiol. All the ladies had trans abdominal ultrasounds to identify PCOM.

RESULTS

An adolescent outpatient clinic at our hospital enrolled 100 consecutive patients (50 by PCOS, 50 by healthy controls aged equal to the adolescent patients) for this case-control study. The average age of the patients was between 16 and 25. The majority of study woman had menstruated for at least three years. The study group was most likely to experience menstrual anomaly and hirsutism, while the control group was more likely to suffer from vaginal discharge. Analyses of anthropometric measures among the two groups showed a significant change (p<0.05). We found a statistically significant difference (p<0.002) between the FGS of the study group and the control group (12±5.7 vs 6.1±3.6). In the PCOS group, both plasma fasting insulin (p=0.001) and homeostasis model assessment of insulin resistance index (p=0.003) had statistically higher values. polycystic ovary syndrome patients also had significantly higher means of fT and 17-OH-P, as well as LH and LH/FSH ratios. The other hormone levels did not differ significantly among the groups. Furthermore, the lipid profiles were statistically indistinguishable (p > 0.05). All the patients had measurable levels of AMH. There was a statistically significant variance among the PCOS group and the controls in AMH levels. The study and control groups both experienced a decline in AMH levels with increasing age (r=-0.321, p=0.001).

Additionally, serum AMH levels were originate to be negatively linked with FSH levels in all patients (r=-0.238, p=0.031). The AUC value indicated by ROC analysis for distinguishing PCOS was 0.678. However, the sensitivity and specificity scores giving to the highest Youden index calculated in **Figure 1** were 47.8% and 76.1%, respectively.

Table 1: Distribution of the patients according to clinical and demographic details (n = 100)

	polycystic ovarian syndrome group (n=50)	Control group (n=50)	p-value
Age in years	17.9±1.2	18.4±2.3	0.262
Anthropometric measurements			
Body mass index (kg/m2)	23.8±4.7	22.7±2.8	0.071
Waist circumference (cm)	82±14.5	73.4±8.2	0.002
Hip circumference (cm)	101.0±10.6	98.1±7.7	0.032
Waist to hip ratio	0.84±0.07	0.76±0.06	<0.002
Ferriman Gallwey score	12.0±5.7	6.1±3.6	<0.002
Menarch age (years)	6.8±2.3	4.9±2.4	0.146
Demographic profile			
Educational level n (%)			0.540
≤High school >High school	26 (52%) 24 (48%)	29 (58%) 21 (42%)	
Economic level n (%)			0.911
<1000 TL ≥1000 TL	12 (24%) 38 (76%)	11 (22%) 39 (78%)	
Markers of glucose metabolism			
Glucose (mg/dL)	87.7±4.5	86.6±6.7	0.413
Insulin (IU/mL)	12.1±6.6	7.6±3.1	0.003
HbA1c (%)	5.2±0.3	6.0±0.4	0.474
Homeostasis model assessment Insulin resistance n (%)	3.5±1.5 18 (39.5)	1.5±0.6 5(8.5)	0.001 0.002
Gonadotropins and sex steroids			
Luteinizing hormone (IU/L)	8.3±4.7	5.2±2.2	0.002
Follicle-stimulating hormone (IU/L)	6.1±1.4	6.3±1.8	0.765
LH/FSH	1.3±0.8	0.8±0.3	0.002
Estradiol (pg/mL)	48.1±26.2	43.2±20.5	0.213
(DHEA-S) Dehydroepiandrostenedione sulphate (µg/mL)	387.0±180.6	306.7±118.8	0.005
(17-OHP) 17-hydroxyprogesterone (ng/dL)	1.7±1.0	1.5±0.8	0.012
Free testosterone (ng/mL)	3.1±1.7	1.6±0.6	<0.002
Lipid profile in mg/dL			
Total cholesterol	161.1±23.5	167.0±24.9	0.812
Triglyceride	87.6±51.7	73.7±30.3	0.129
High-density lipoprotein	55.8±10.8	56.4±14.2	0.846
Low-density lipoprotein	88.2±22.6	82.2±24.0	0.632
Anti-mullerian hormone	11.1±6.9	9.5±5.5	0.187

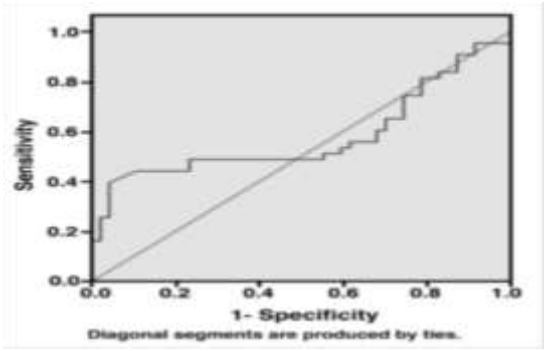

Figure 1: PCOS cases can be discriminated against using a curve analysis of the antimullerian hormone.

DISCUSSION

According to this research Adolescents and young adults. Indus patients' levels are somewhat higher than those of the controls. polycystic ovary syndrome patients can be identified by a higher cut-off value of 14ng/mL, however, this has a low sensitivity for distinguishing patients from controls. In addition, the AMH was ineffective as a analytical marker for PCOS in individuals aged 15 to 19 years old.[6] The granulosa cells of the antral and parenteral follicles generate the Anti-Mullerian hormone, a member of the TGF- family.[7] Anti-Mullerian hormone's main function in the ovary appears to be to prevent non-dominant follicles from joining dominant follicles by suppressing the initial stages of follicular development.[8] It was shown that the antral follicle count (AFC) and serum Anti-Mullerian hormone levels on cycle day 3 were tightly LinkedIn infertile women, according to Fanchin et al.[9] Antral follicle

count was shown to have a better correlation with Anti-Mullerian hormone than any other hormone measure, according to scientists. Because the number of tiny follicles is reflected in blood Anti-Mullerian hormone levels, the levels decline during reproductive life. In today's fertility testing, Anti-Mullerian hormone levels are frequently detected in the bloodstream. A decline in AMH and AFC levels with increasing age has been previously shown.[10] Reference values for AMH levels were being developed for a wide range of ages, but specific values for teenagers were not yet available. AMH and teenage polycystic ovarian syndrome have been studied in just a few studies. We have put several theories up why AMH and PCOS are linked. In individuals with PCOS, the AFC was elevated, and AMH levels were discovered to be linked to the AFC.[11] It is important to note that the rise in Anti-Mullerian hormone concentration is not only related to an increase in the number of follicles. The high AMH levels in people with PCOS may also be initiated by anovulation,[12,13] hyperandrogenism,[14], and hyperinsulinemia.[15] However, further research is needed to determine the exact process by which PCOS occurs. In their large teenage population, Hart et al.[16] studied the link between Anti-Mullerian hormone, PCO morphology, and PCOS. It was found that the AMH was not a good indicator of PCO morphology or polycystic ovary syndrome, according to scientists. When a polycystic ovary syndrome threshold of 30 pmol/L was used, only 48 % of cases were missed. Li et al.[17] Serum AMH levels were significantly higher in individuals with PCOS (9.94.9 ng/mL vs. 7.13.0 ng/mL, p=0.002) compared to controls. There was a 70% specificity and 61.77% sensitivity for the AMH cut-off value of 8ng/mL in that research. Using a small sample of non-obese teenagers with polycystic ovary syndrome, Sopher et al.[18] investigated the diagnostic potential of Anti-Mullerian hormone. Serum Anti-Mullerian hormone levels were significantly greater in patients with PCOS (4.4–3.4 ng/mL, p0.05) compared to those without the condition (2.4–1.3 ng/mL). Patients with polycystic ovary syndrome have greater levels of ovarian and adrenal androgens than those without the condition. Earlier investigations found that Anti-Mullerian hormone had poor sensitivity and high specificity for polycystic ovary syndrome diagnosis, which was consistent with previous findings. In our investigation, AMH's sensitivity and specificity were comparable to those of earlier research. A greater concentration of AMH in the blood was discovered in PCOS patients compared to controls, although the difference was not statistically significant. A greater threshold was also discovered than previously reported in the literature. Serum AMH levels were PCOS severity, based on Koninger et al's study.[19] Diagnostic criteria and sample population may influence the variance observed.

If vaginal scans are not possible in teenagers or individuals without hyperandrogenemia, the authors proposed that the Anti-Mullerian hormone might be utilized as an alternative criterion in the diagnosis of polycystic ovary syndrome. Our study's strength is in the fact that it is a prospective one. After meeting all the Rotterdam criteria, the diagnosis of polycystic ovary syndrome was confirmed by one physician, and inter-observer variability was low.

In terms of age and BMI, the study and control groups were identical. When it comes to determining if an individual has polycystic ovary syndrome or not, the Anti-Mullerian hormone was proven to be inefficient. When it comes to assessing Anti-Mullerian hormone levels, this might have been a result of the test technique utilized.[20] Ethnicity may have played a role. We conclude that the AMH is not a reliable indicator of PCOS in teenage and young adult women. Further randomized controlled research with higher sample size is needed to assess the Anti-Mullerian hormone's diagnostic usefulness in Adolescent woman with PCOS.

CONCLUSION

The Anti-Mullerian hormone level is also linked to the existence of polycystic ovary morphology, which suggests that the AMH level might have a role in the analysis and treatment of PCOS. Different diagnostic thresholds should be established for different age groups, BMIs, ethnicities, and detection methods to improve the analytical value of Anti-Mullerian hormone. Combined with glucose and lipid metabolism, these factors must also be evaluated for their potential impact on cardiovascular risk markers in our future research.

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