

## Research Article



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## ASSOCIATION BETWEEN SERUM AMH LEVELS AND BODY MASS INDEX IN INFERTILE WOMEN WITH AND WITHOUT PCOD

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### ABSTRACT

**Background** AMH levels are often elevated in individuals with obesity and high BMI, which is a unique characteristic of PCOD.

**Aim:** Evaluation of the correlation between serum AMH levels and body mass index in infertile females with and without PCOD is the goal.

**Methods:** 400 female visitors to the Institute during the designated study period were evaluated for this study. Gynaecological evaluations and basic infertility tests, such as BMI, were performed on all individuals. The AMH levels of each female were measured, and the participants were split into two groups: those with PCOD and those without.

**Results:** According to the study's findings, the average AMH level was  $4.84 \pm 4.42$  ng/ml. AMH and BMI levels in females without PCOD did not significantly correlate ( $p > 0.05$ ). However, there was a strong inverse connection ( $p < 0.05$ ) between AMH and BMI levels in PCOD participants.

**Conclusion:** The current study comes to the conclusion that infertile females without PCOD do not exhibit a significant association between their BMI levels and AMH. Serum AMH levels and BMI, however, significantly correlate negatively in females with PCOD.

**Keywords:** antimullerian hormone, body mass index, Infertility, polycystic ovarian disease

### INTRODUCTION

Concerns among girls in the reproductive age range have been more common recently. While drastic measures are being taken to restrict the population in emerging countries like India, issues like infertility are also becoming more prevalent, especially among women from higher socioeconomic backgrounds. According to the WHO study, 4–17% of Indians are primary infertile, with urban dwellers accounting for the majority of cases. It can be linked to a number of variables that contribute to an increase in infertility, such as stress, obesity, improper eating habits, an unhealthy lifestyle, and older ages of conception and marriage.<sup>1</sup>

One of the main causes of infertility is obesity, with high body fat and BMI (body mass index) being the gold standard for determining obesity. BMI is calculated by calculating the subject's height and weight. Women are classified as overweight if their BMI is  $\geq 25$  kg/m<sup>2</sup>, and obese if their BMI is  $\geq 30$  kg/m<sup>2</sup>. Obesity must be classified and evaluated because it has a negative impact on the entire body and puts people at risk for a number of illnesses, the most common of which are diabetes mellitus and hypertension. When it comes to the female reproductive system, obesity is known to have an impact on ovarian folliculogenesis and oocyte development.<sup>2</sup>

Polycystic ovarian disease, or PCOD, is a diverse endocrine condition that affects women in the reproductive age range. It manifests itself in a variety of ways, including hyperandrogenism, irregular menstruation, and obesity. Approximately

5–10% of females in the reproductive age range suffer from this prevalent endocrine condition. A rise in luteinizing hormone (LH) and testosterone levels, which leads to anovulation, is a distinctive pattern.<sup>3</sup>

An effective test to evaluate ovarian function and reserve is the measurement of anti-mullerian hormone (AMH) levels. Because it shows the ovarian reserve, which is also an indirect indicator of a female's reproductive capability, estimating AMH levels is a common test in infertile individuals. After puberty, the granulosa cells of the ovary release the glycoprotein known as AMH. Ovarian follicle development and oocyte maturation are aided by AMH.

AMH's primary role is to suppress the early stages of folliculogenesis's FSH (follicle stimulating hormone)-dependent selection process. Additionally, it reduces the amount of LH receptors in granulosa cells, a process that is similarly triggered by FSH. Its evaluation is not time-dependent on the menstrual cycle, which makes it more convenient to use because AMH levels are relatively constant during the menstrual cycle.<sup>4</sup>

AMH levels typically range between 2 and 6.8 ng/ml, and they decline as people age. AMH levels are undetectable during menopause. AMH levels are typically used to evaluate a woman's fertility, and those with AMH levels < 1 ng/ml are regarded as having inadequate ovarian reserve. Obese women have higher AMH levels, and PCOD is typically characterized by a high BMI. In females with PCOD, where a greater number of antral tiny follicles might boost AMH release, high AMH levels are anticipated. The current study sought to determine if blood AMH levels and BMI in females presenting with infertility were related.

## **MATERIALS AND METHODS**

The present cross-sectional clinical study aimed to evaluate the relationship between BMI (bone mass index) and serum AMH (anti-mullerian hormone) levels in infertile females with and without PCOD (polycystic ovarian disease). The study subjects were from the Department of Obstetrics and Gynaecology of the Institute. Verbal and written informed consent were taken from all the subjects before study participation.

The study assessed all the females who presented with the complaint of infertility to the Institute within the defined study period. The inclusion criteria for the study were females presenting with infertility and aged 20–40 years who were willing to participate in the study. The exclusion criteria for the study were subjects with premature ovarian failure (FSH level > 15 IU/ml), ovarian surgery history, diabetes, congenital adrenal hyperplasia, Cushing's syndrome, hyperprolactinemia, thyroid dysfunction, and subjects that did not give consent for study participation. The study also excluded subjects with established male infertility.

Every participant received a thorough evaluation at baseline, which included a physical, general, and gynaecological examination, as well as a gynaecological history and a basic infertility assessment that included transvaginal ultrasound (TVS) on the second day of the menstrual cycle. Regardless of the day of the cycle, serum AMH (anti-mullerian hormone) was measured during the initial visit. The cubital vein was used to draw blood, which was then centrifuged for five minutes at 2000 rpm after waiting for lot retraction. The serum that was extracted was then stored between 2 and 80 degrees Celsius. Chemiluminescent immunoassay, or CLIA, was used to measure the amount of AMH in milligrams per milliliter. AMH samples were collected using a similar assay.

After then, the subjects were split up into two groups. Group I comprises individuals with PCOD, while Group II consists of individuals without PCOD. According to the Rotterdam criteria, patients with two of the following three characteristics—hyperandrogenism, oligo/anovulation, and/or polycystic ovaries on ultrasound—were diagnosed with PCOD. A polycystic ovary was defined as having at least 12 little antral follicles. The BMI of each female was calculated by dividing her height in square meters by her weight in kilograms.

Establishing a correlation between BMI and AMH levels in PCOD subjects and evaluating the relationship in the Institute's non-PCOD infertility population were the main outcomes evaluated. Version 24.0 of the statistical package for the social sciences (SPSS) program (IBM Corp., Armonk, NY, USA) was used for the assessment of descriptive measures, Student t-test, ANOVA (analysis of variance), and Spearman correlation test. The results were expressed as mean and standard deviation and frequency and percentages. The p-value of <0.05 was considered.

## **RESULTS**

The current cross-sectional clinical study sought to assess the association between serum levels of anti-mullerian hormone (AMH) and bone mass index (BMI) in female infertiles with and without polycystic ovarian disease (PCOD). During the research period, 400 females who came to the Institute with infertility were evaluated. There were 300 individuals with infertility for reasons other than polycystic ovarian disease, including as tubal factors, poor ovarian response, and unexplained infertility, and 100 individuals with a diagnosis of polycystic ovarian disease.

Based on the age distribution of the 400 research participants, 43% of the participants were between the ages of 25 and 30, followed by 32% of those between the ages of 31 and 35, 20% of those over 35, and 5% of those under the age of 25. According to the research's findings, there was a significant difference ( $p < 0.05$ ) in AMH levels between the two groups of study participants with polycystic ovarian disease (Group I) and those without PCOD (Group II) in terms of mean age, BMI, and AMH levels. Additionally, the study's findings revealed a statistically significant inverse association between AMH and BMI levels in Group I ( $p = 0.04$ ). However, in group II, there was no correlation ( $p > 0.05$ ) between AMH levels and BMI (Table 1).

It was observed that the percentage of lean PCOD individuals (those with a BMI  $< 25$ ) in the study was substantially greater than the percentage of non-lean PCOD patients (those with a BMI  $> 25$  kg/m<sup>2</sup>). The mean AMH levels in individuals with lean PCOD were  $11.16 \pm 2.62$  ng/ml, while those with non-lean PCOD had mean values of  $10.09 \pm 4.24$  ng/ml. Nevertheless,  $p > 0.05$  indicated that the difference was statistically non-significant.

400 women who came to the Institute with infertility throughout the research period were evaluated for the current study. There were 300 individuals with infertility for reasons other than polycystic ovarian disease, including as tubal factors, poor ovarian response, and unexplained infertility, and 100 individuals with a diagnosis of polycystic ovarian disease. These variables were similar to those reported by Amer SA et al. (2013) and Siefer DB et al. (2007), who found that the causes of PCOD in their research participants were identical to those in the current study.

The study results indicated that among 400 study volunteers, on examining the age distribution, most of the study participants were between the ages of 25 and 30 (43%), followed by those between the ages of 31 and 35 (32%), those over 35 (20%), and those under 25 (5%). These statistics were equivalent to those of the investigations conducted by Piouka A. et al. in 2009 and Halawaty S. et al. in 2010, where the authors also provided demographic data similar to the current study.

AMH levels were substantially greater in persons with polycystic ovarian disease (Group I) than in subjects without PCOD (Group II), with a p-value of less than 0.05, according to the mean age, BMI, and AMH levels of the two research groups.

In Group I, the study's findings likewise revealed a statistically significant inverse association between AMH and BMI levels ( $p = 0.04$ ). However, in group II, there was no correlation ( $p > 0.05$ ) between AMH levels and BMI. These findings aligned with those of Freeman EW et al. (2007) and Jungheim ES et al. (2013), whose findings of similar age, BMI, and AMH levels to those of the current study were reported by the authors. The results of the study also demonstrated that there were significantly more subjects with lean PCOD (defined as those with a BMI  $< 25$ ) than non-lean PCOD (defined as those with a BMI  $> 25$  kg/m<sup>2</sup>).

The mean AMH levels in individuals with lean PCOD were  $11.16 \pm 2.62$  ng/ml, while those with non-lean PCOD had mean values of  $10.09 \pm 4.24$  ng/ml. Nevertheless,  $p > 0.05$  indicated that the difference was statistically non-significant. These results were consistent with those of Su Hi12 et al. and Teixeira J et al.13 in 2001, where the authors of those studies also reported a similar percentage of lean PCOD subjects (those with a BMI  $< 25$ ) and non-lean PCOD subjects (those with a BMI  $> 25$  kg/m<sup>2</sup>).

## CONCLUSION

The current study comes to the conclusion that, within its constraints, infertile females without PCOD do not exhibit a significant association between their BMI levels and AMH. Serum AMH levels and BMI, however, significantly correlate negatively in females with PCOD.

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S. No	Variables	Group I (n=100)		Group II (n=300)		Overall (mean)
		Mean	p-value	Mean	p-value	
1.	Age	28.16±2.89	0.04	33.2±5.40	0.77	32.11±5.39
2.	BMI	24.30±4.60		23.15±3.15		23.44±3.58
3.	AMH (ng/ml)	10.76±3.38		2.86±2.60		4.84±4.42

**Table 1: Age, BMI, and AMH levels in the two groups of study subjects**