Original Research Paper

Volume - 5 | Issue - 3 | September- 2021 | ISSN No. Online : 2663 - 1199 | ISSN No. Print : 2663 - 1180

A STUDY OF CORRELATION OF SERUM ANTI -MULLERIAN HORMONE (AMH) AND INSULIN RESISTANCE (IR) IN PCOS WOMEN

Shruti Maheshwari* Department of Obstetrics and Gynecology, SMS Medical College, Jaipur, Rajasthan, India.*Corresponding Author

Dr. Lata Rajoria Department Of Obstetrics And Gynecology, Sms Medical College, Jaipur, Rajasthan, India

Dr. Aditi Bansal Department Of Obstetrics And Gynecology, Sms Medical College, Jaipur, Rajasthan, India

Dr Suman Bala Department Of Obstetrics And Gynecology, Sms Medical College, Jaipur, Rajasthan, India

Dr. Chelsea Kuntal Department Of Obstetrics And Gynecology, Sms Medical College, Jaipur, Rajasthan, India

ABSTRACT

INTRODUCTION : Polycystic ovary syndrome(PCOS) is a prevalent disease mostly affecting the women of reproductive age. It may be associated with metabolic disorders such as insulin resistance, diabetes mellitus, and cardiovascular disorders. Anti Mullerian hormone levels have been found higher in PCOS women as compared to women without PCOS. This can be due to hyperinsulinemia and hyperandrogenism commonly seen in these women. **AIM AND OBJECTIVE:** The present study was designed to evaluate the association between serum AMH and insulin resistance(IR) in PCOS women with and without IR. **METHOD:** It was a Cross-sectional study, including 90 women, selected and divided in 3 groups: Group-A : 36 women with PCOS and IR, Group-B : 36 women with PCOS and without AIR, Group-C : 18 control without PCOS. **RESULTS :** We found AMH levels to be significantly higher in women with PCOS as compared with women without PCOS. Serum AMH levels were higher in women with PCOS and IR, thus showing that PCOS and IR play an important role in elevating the levels of this hormone. **CONCLUSION :** AMH levels are significantly higher in patients with PCOS, particularly associated with IR suggesting a correlation between AMH, PCOS and IR .Serum AMH plays a role in prediction of insulin resistance in PCOS

KEYWORDS

Androgens , anovulation, anti-Mullerian hormone, body mass index, polycystic ovary syndrome

*Corresponding Author

Shruti Maheshwari*

Department Of Obstetrics And Gynecology, Sms Medical College, Jaipur, Rajasthan, India.*Corresponding Author
E-mail: shrutiimaheshwarii@gmail.com

INTRODUCTION

PCOS is one of the most common endocrine disorders in women of reproductive age group affecting 5-10% of women worldwide.(1) It is characterized by hyperandrogenism, olio-anovulation and polycystic ovaries at ultrasonography. It may be associated with metabolic disorders such as insulin resistance and obesity, with a consequent negative effective on long term health. (2)

The anti-mullerian hormone is a glycoprotein hormone structurally from TGFβ super family whose key role is growth differentiation and folliculogenesis. The AMH is produced by the granulose cells of the preantral and antral follicles, principally the smaller follicles (<4 mm), being undetectable in those over 10 mm and in atretic follicles. (3)AMH modulates folliculogenesis, protecting follicular reserve by avoiding the recruitment and selection of multiple follicles in each cycle. One of the characteristics of AMH is that its concentration does not vary significantly within a cycle, thus allowing it to be evaluated irrespective of the day of the cycle.(4) In clinical practice AMH has been used as a marker of ovarian aging and ovarian reserve.

In PCOS, the mediators involved in folliculogenesis particularly AMH are disrupted.(6) This appears to be related to obesity, insulin resistance and hyperendrogenism seen in PCOS women.

IR is a key feature of PCOS. Among women with PCOS, 50-70% are associated with insulin resistance, which plays a key role in the development of both reproduction and metabolic defect seen in PCOS. Hyperinsulinemia resulting from IR appears to increase the premature differentiation of the granulose cells suggesting that IR hypothetically plays some role in AMH secretion by these cells. Hyperinsulinemia is also linked to hyperandrogenism since insulin acts in the theca interna cells, potentiating the effects of luteinizing hormone on steriodogenesis in the granulose cells, increasing androgen levels and resulting in greater number of follicles in growth, suggesting a correlation with increased AMH levels. (6)

METHODS

This cross-sectional study was conducted at Department of Obstetrics and Gynecology at SMS Medical College, Jaipur between May 2019 to May 2020 following approval by the institutional internal review board. An informed consent was taken from the 90 women included in the study .These were of age group 18 to 40 and divided into three group, Group-A : PCOS with IR, Group-B : PCOS without IR, Group-C : Control women without PCOS.

PCOS was diagnosed in accordance with the Rotterdam Consensus, consisting of the presence of two of the three parameters proposed oligo-anovulation , clinical and/or laboratory signs of hyperandrogenism and polycystic ovaries at USG (≥12 follicles of 2-9 mm or ovarian volume >10 cm^3), following the exclusion criteria of any other diseases such as congenital adrenal hyperplasia, hypothyroidism, hyperprolactinemia or ovarian tumors . IR was diagnosed according to the Homeostasis Model Assessment (HOMA), adopting cut off value 3. The HOMA index was calculated by multiplying the insulin value (IU/ml) by the glucose value (mg/dl) and dividing the product by 405.

BMI was calculated by dividing the women's weight (kg) by the square of her height (h^2). Hirsutism was defined by the score of 8 or higher on the modified Ferrymann Galleway Score.

All the patients were submitted to ultrasonography using a shimadzu SDU 350a ultrasound unit with 5-8 MHz multifrequency transducer.

Blood samples were collected in the early follicular phase following 12 hr overnight fasting. AMH levels were measured using ELISA.

Results are shown as mean ± standard deviation (SD). The correlation between variables was tested using Pearson Correlation test with r^2 - correlation coefficient, p-descriptive value. Data was statistically analysed.

RESULTS

Table— 1 ***Distribution of Cases and Control According to Age of Women***

Age (in yrs)	PCOS without IR (n = 36)	PCOS with IR (n = 36)	Control (Women without PCOS) (n = 18)
Mean ± SD	25.63 ± 2.63	26.08 ± 3.30	26.44 ± 2.97

p = 0.410

Table-2 ***Distribution of Cases and Control According to Body Mass Index***

Volume - 5 | Issue - 3 | September- 2021 | ISSN No. Online : 2663 - 1199 | ISSN No. Print : 2663 - 1180

BMI (in kg/m^2)	PCOS without IR (n = 36)	PCOS with IR (n = 36)	Control (Women without PCOS) (n = 18)
Mean ± SD	23.01 ± 1.17	25.22 ± 1.55	23.33 ± 1.89

p = 0.001

Table — 3 ***Distribution of Cases and Control According to Serum AMH Levels***

Serum AMH Levels (ng/ml)	PCOS without IR (n = 36)	PCOS with IR (n = 36)	Control (Women without PCOS) (n = 18)
Mean ± SD	6.97 ± 1.32	16.46 ± 1.80	2.19 ± 0.85

p = 0.001

Table — 4 ***Distribution of Serum AMH Levels in Women With PCOS and Without PCOS***

Serum AMH Levels (ng/ml)	Women with PCOS (n = 72)	Women without PCOS (n = 18)
Mean ± SD	11.71 ± 5.02	2.19 ± 0.85

p = 0.001

90 patients concluded the study. Age was not significantly different between groups; however BMI was significantly higher in Group-A compared to Group-B and to the controls.

Table 3'4 shows the comparison of serum AMH levels among the three groups. AMH levels were significantly higher in Group-A as compared to Group-B and control and . Serum AMH levels were also found to be higher in PCOS women as compared to non-PCOS women.

DISCUSSION

Most women in all the three groups were from the age group 22-26 years.. Various studies have reported the prevalence of PCOS in women of reproductive age to be 5-10% as most women with PCOS are clinically recognized between 20-30 years when they become concerned regarding irregular menstrual cycle, acne and hirsutism. Also lack of awareness among young females may lead to delay in diagnosis. Mangalath AA (2018)* conducted a study in which mean age of PCOS women was 25 and non-PCOS women was 26.(7) Also Dhagat et al reported that most of the infertile PCOS women were aged between 21-25 years with a mean age of 25.(8)

The mean BMI was found to be higher in PCOS women with IR as compared to PCOS women without IR. The reason behind this may be impaired glucose tolerance, deranged metabolism or hyperandrogenism which is seem commonly in PCOS women with IR. Study conducted by Cupisti S* showed that BMI >25 kg/m^2 was significantly associated with changes in all of the insulin sensitivity indices and may serve as predictive marker of IR in hyper androgenic women. (9)D Kiranmayee et al reported that BMI and Waist circumference are the most important anthropometric parameters correlated with dyslipidemia in south Indian PCOS women.(10)

Serum AMH levels were found to be significantly higher in women with PCOS as compared to women without PCOS. Serum AMH levels were significantly higher in PCOS women with IR. It is well known that ovaries in PCOS comprise a higher number of pre-antral and small antral follicles indicating arrest of follicular development at the stage when AMH production is greatest. Hyperinsulinemia resulting from IR appears to increase the premature differentiation of granulosa cells suggesting that IR plays some role in AMH secretion by these cells leading to its increased levels. This finding is in agreement with the reports by Fleming et al,(11) and Chen et al(12) suggesting a direct association between serum AMH levels and the severity of PCOS ,both of them usually depend on the presence of IR. La Marca et al showed a positive correlation between HOMA score and serum AMH concentration(13). Park et al showed a positive association between AMH and IR in women without PCOS, emphasizing the role of insulin in a possible stimulatory effect of AMH.(14) Also, Nardo et al found an increased AMH levels in women with IR, with and without PCOS(15). Fonseca et al found increased AMH concentration in PCOS women with IR as compared to PCOS women without IR suggesting a correlation between insulin resistance and AMH levels in PCOS women.(6)

It can be assumed that women with PCOS, particularly with IR , may have higher serum AMH levels due to the greater release of inflammatory factors into the systemic circulation, thus affecting AMH production in ovaries

CONCLUSION

The study showed that serum AMH levels were significantly higher in PCOS women particularly with IR suggesting positive correlation between serum AMH levels and IR in PCOS women. Based on our study it may be suggested that serum AMH levels may be used as a predictor of IR in PCOS women.

REFERENCES

1. Weenen C, Laven JS, Von Bergh AR, et al. Anti-Mullerian hormone expression pattern in the human ovary: potential implications forinitial and cyclic follicle recruitment. Mol Hum Reprod 2003;10:77–83.
2. Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group. Revised 2003 consensus on diagnostic criteria and long-term health risks related to polycystic ovary syndrome,Fertil Steril 2004;81:19–25.
3. Carlsson IB, Scott JE, Visser JA, et al. Anti-Mullerian hormone inhibits initiation of growth of human primordial ovarian follicles in vitro. Hum Reprod 2006;21:2223–7.
4. Durlinger AL, Gruijters MJ, Kramer P, et al. Anti-Mullerian hormone inhibits initiation of primordial follicle growth in the mouse ovary. Endocrinology 2002;143:1076–84.
5. La Marca A, Stabile G, Artenisio AC, Volpe A. Serum anti-Mullerian hormone throughout the human menstrual cycle. Hum Reprod 2006;21:3103–7.
6. Fonseca HP, Brondi RS, Piovesan FX, Miklos TG, Aldrighi JM. Anti-Mullerian hormone and insulin resistance in polycystic ovary syndrome. Gynecol Endocrinol. 2014 Sep;30(9):667-70. doi: 10.3109/09513590.2014.920004. Epub 2014 Jun 5
7. Mangalath AAM, Alias A, Sajith M, Nimbargi V, Kumdale S. Sociodemographic Characteristics and Clinical Presentation of Infertile Women with Polycystic Ovary Syndrome in a Tertiary Care Hospital. Int J Infertil Fetal Med. 2018;9(1&2):14-18
8. Dhagat V, Shah P, Thakar R, Deliwala K. Study of 100 cases of infertility in polycystic ovarian syndrome and its management outcome. International Journal of Medical Science and Public Health. 2013 Oct 1;2(4):1041-1046.
9. Cupisti S, Kajaia N, Dittrich R, Duezenli H, Beckmann MW, Mueller A. Body mass index and ovarian function are associated with endocrine and metabolic abnormalities in women with hyperandrogenic syndrome. Eur J Endocrinol. 2008 May;158(5):711-9. doi: 10.1530/EJE-07-0515.
10. Kiranmayee D, Kavya K, Himabindu Y, Sriharibabu M, Madhuri GLJ and Venu S. Correlations Between Anthropometry and Lipid Profile in Women With PCOS. J Hu Reprod Sci. 2017 Jul-Sep; 10(3): 167–172. doi: 10.4103/jhrs.JHRS_108_16
11. Fleming R, Deshpande N, Traynor I, Yates RW. Dynamics of FSHinduced follicular growth in subfertile women: relationship with age,insulin resistance, oocyte yield and anti-Mullerian hormone. HumReprod 2006;21:1436–41.
12. Chen MJ, Yang WS, Chen CL, et al. The relationship between anti-Mullerian hormone, androgen and insulin resistance on the number of antral follicles in women with polycystic ovary syndrome. Hum Reprod 2008;23:952–7.
13. La Marca A, Orvieto R, Giulini S, et al. Mullerian inhibitingsubstance in women with polycystic ovary syndrome: relationship with hormonal and metabolic characteristics. Fertil Steril 2004;82:970–2.
14. Park HT, Cho GJ, Ahn KH, et al. Association of insulin resistance with anti-Mullerian hormone levels in women without polycystic ovary syndrome. Clin Endocrinol 2010;72:26–31
15. Nardo LG, Yates AP, Roberts SA, et al. The relationships between AMH, androgens, insulin resistance and basal ovarian follicular status in non-obese subfertile women with and without polycystic ovary syndrome. Hum Reprod 2009;24:2917–23.