

## Role of Anti-Müllerian Hormone in Prediction of ICSI Outcome in Sudanese Women with Polycystic Ovaries Syndrome

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### Abstract

**Background:** Polycystic ovary syndrome (PCOS) is the most common cause of infertility in women at reproductive age. The treatment of PCOS is expensive and time consuming and occasionally isn't simply possible, so, the prediction of treatment success is a new need for infertile couples.

**Aim:** The aim of this study was to identify the role of Anti-Müllerian hormone (AMH) in prediction of outcome of intracytoplasmic sperm injection (ICSI) in patients with PCOS.

**Methods:** Retrospective study conducted in the period from January to March 2018. Eighty Sudanese women aged between 21 to 47 years old with PCOS underwent ICSI were recruited in this study. The selection of patients was done at Dr. Elsir Abu-Elhassan fertility center, Khartoum-Sudan.

**Results:** There was no statistically significant difference in the levels of AMH between the group of women who had got successful pregnancy compared to who hadn't, whereas there was a significant difference LH and LH/FSH ratio. On the other hand age significantly affect success rate, there was probability to get success ICSI with younger women of < 35 years old compared to women of > 35 years.

**Conclusion:** The present study showed AMH may not predict successes rate of ICSI in patients with PCOS.

**Keywords:** AMH; PCOS; IVF/ICSI; Prediction

### Introduction

Anti-Müllerian hormone (AMH), a member of the transforming growth factor-beta superfamily, it is mainly secreted in human ovary by the granulosa cells of ovarian early developing follicles, AMH is secreted inside preantral and early antral follicles < 4 mm in diameter in granulosa cells. Its secretion decreases when the antral follicles begin to grow and stops when the follicles are larger 8 mm in diameter, or when atresia occurs. AMH levels are shown to be age-dependent [1,2], it is rarely detectable in newborn baby girls and it reaches peaks after puberty and steadily declines with age until menopause when serum concentration becomes undetectable [3].

AMH seems to be the novel endocrine marker for assessing the age-related decline of the ovarian pool in healthy women; thus, it has a potential ability to predict future reproductive lifespan. The most important role for AMH measurements is before *in vitro* fertilization initiated because AMH can be predictive of the ovarian response, namely poor and hyper-responses [4].

AMH play a role in the regulation of ovarian function, mainly in follicle development and selection. It inhibits the initiation of human primordial follicle growth and avoids multiple selections of a dominant follicle by decrease the sensitivity of follicles to follicle stimulating hormone (FSH) [5].

In ovarian pathophysiology such as (PCOS), serum AMH level can be used as a marker, in this case, antral follicle pool is enlarged and produces more AMH [6].

PCOS is the most common endocrine disorder cause infertility in reproductive-aged women; characterized by elevated free testosterone levels and hirsutism due to hyperandrogenism, oligomenorrhea or anovulation due to ovulatory dysfunction, and polycystic ovarian morphology [7].

PCOS represent approximately 7% in adult women when defined by the “National Institutes of Health (NIH) criteria” (hyperandrogenism plus ovulatory dysfunction) [7], whereas apparent prevalence may be double that when using recent diagnostic criteria that incorporate ovarian morphology [8].

Intracytoplasmic Sperm Injection (ICSI), is considered as one of the greatest advanced methods in treating patients with infertility problems since, *in vitro* fertilization (IVF), intracytoplasmic sperm injection (ICSI) is the process where a single sperm is injected directly into an egg [9].

### Aim of the Study

The aim of this study was to identify the role of AMH in prediction of outcome of ICSI in patients with PCOS.

### Materials and Methods

#### Study design

Retrospective study conducted in Dr. Elsir Abu-Elhassan fertility center in Khartoum-Sudan, the study approved by the scientific committee of Faculty of Medical Laboratory Science, Al-Neelain University, from January to March 2018. Eighty Sudanese women with age between 21 to 47 years, diagnosed with PCOS were recruited in this study. All participants underwent ICSI and the outcome was reported as positive pregnancy test or negative.

#### Measurement of hormones

Blood samples for AMH, LH, FSH, were obtained by venipuncture on follicular phase. The serum was separated and frozen at -80°C for future analysis with the measurement being performed by enzyme-linked immunosorbent assay (ELISA) according to the manufacturer’s instructions (Immunotech version; Beckman Coulter, Marseille, France).

#### Statistical analysis

Data were statistically analyzed by using SPSS (Statistical Package for Social Science) version 21.0. The quantitative data were expressed as frequency and percentage, mean and standard deviation (SD). The statistic tests used in this study were paired test, person’s correlation, one sample T-test, and chi-square test. P. values of < 0.05 were considered significant.

### Results

Table 1 shows the frequency of age group of the women included, women with age of < 35 years were 63 (78.8%), and of age > 35 were 17 (21.2%).

Age group	Frequency	Percentage (%)
< 35 Years	63	78.8
> 35 Years	17	21.2
Total	80	100.0

**Table 1:** Describe the study population according to age group.

Parameter	Mean ± SD
FSH	7.12 ± 2.02
LH	7.41 ± 4.37
LH/FSH Ratio	1.13 ± 0.81

**Table 2:** The mean concentration of study parameters.

Table 3 shows the frequency and percentage of the success rate of the ICSI. There were 19 women (23.8%) had successful ICSI, whereas 61 women (76.2%) had not.

ICSI	Frequency	Percentage (%)
Successful	19	23.8
Failed	61	76.2
Total	80	100.0

**Table 3:** Frequency and percentage of the success of ICSI.

Table 4 shows the mean concentration of AMH, FSH, LH and LH/FSH ratio in the two groups, successful ICSI and failed. There was no significant difference ( $P > 0.05$ ) in AMH level and FSH, whereas there was a significant difference in LH and LH/FSH ratio between the two groups.

Parameters	Successful ICSI (Mean ± SD)	Failed ICSI (Mean ± SD)	P-value
AMH	10.23 ± 4.55	9.06 ± 3.84	0.529
FSH	7.10 ± 1.93	7.12 ± 2.06	0.962
LH	9.35 ± 4.19	6.80 ± 3.47	0.025
LH/FSH Ratio	1.45 ± 1.25	1.03 ± 0.59	0.044

**Table 4:** Comparison between the outcome of success ICSI and not success ICSI as regard to concentrations of AMH, FSH, LH, and LH/FSH ratio.

Table 5 shows the distribution of successful ICSI and failed ICSI according to age group. There were 17 (21.3%) women give positive ICSI with age < 35 years old, whereas 2 women (2.5%) gave positive ICSI with age > 35 years old. The odds ratio (odds ratio > 1) indicate there was a high chance to get success ICSI with women of age < 35 years compared to women of age > 35 years.

Age	ICSI	
	+Ve	-Ve
Pregnancy		
< 35 Years	17 (21.3%)	46 (57.4%)
> 35 Years	2 (2.5%)	15 (18.8%)
Total	19 (23.8%)	61 (76.2%)
P-value	0.162	
Odds Ratio	2.772	
CI Lower	0.573	
CI Upper	13.414	

**Table 5:** Distribution of successful ICSI and failed ICSI according to age group.

### Discussion

Polycystic ovaries have an abnormally rich pool of growing follicles and a disturbance in the selection and subsequent maturation of a dominant follicle. Increased serum AMH is due to increased production per granulosa cell, suggesting an intrinsic granulosa cell dysregulation in PCOS [10]. Our study aimed to evaluate the relationship between serum level of AMH and the outcome of ICSI in patients with PCOS.

In this study, eighty Sudanese women with PCOS who underwent ICSI were recruited from the fertility center of Dr. Elsir Abu-Elhassan.

Our study showed no significant difference in the levels of AMH and FSH between the group that had successful ICSI compared to failed ICSI group, whereas there was a significant difference in LH and LH/FSH ratio. The finding of AMH is in agreement with Smeenk [11] study, who found that the success rate of ICSI is not related to AMH level. While a study done by Gomez R to study the influence of AHM on IVF success, the study indicated that AMH levels do not predict the outcome of IVF/ICSI and reported that, women with too low levels of AMH, still have a possibility to become pregnant [12].

The results of our study are in agreement with previous reports, which showed that AMH levels were not a reliable predictor of IVF/ICSI outcome in women with PCOS [5,13]. A study done by Sahmay concluded that serum AMH and FSH, cannot predict pregnancy in IVF/ICSI patients. This finding is in contrast to other study [14].

Other studies showed that AMH levels are a good predictor of IVF outcome in women without PCOS undergoing IVF/ICSI treatment [13,14]. It seems that the role of AMH in the prediction is suitable in women without PCOS, this may be to the pathological imbalance in the expression and secretion of AMH in patients with PCOS.

Regarding FSH, we found no significant difference between the women who had successful ICSI compared to who hadn't, suggesting that women with levels of may have no predictive value regarding ICSI, this is agreement with a meta-analysis performed by Bancsi L [15] to assess the predictive ability of FSH to predict the outcome of IVF/ICSI, it concluded that estimation of basal FSH is not useful for prediction of IVF/ICSI outcome.

The current study indicated that, out of 63 women with age of < 35 years-old, 17 (30%) had successful ICSI, while 46 (70%) hadn't. While 2 (11%) out of 17 women with age of >35 years old had successful ICSI. This indicating the success rate is more in younger women with PCOS, this can be explained by the fact long term of hyperandrogenism and other endocrine abnormalities occurs in PCOS patients negatively affects pregnancy chance [16].

While this result disagree with Wang study, who demonstrated that women between 34 and 41 years old with higher serum AMH concentrations are associated with significantly greater chances of pregnancy [17]. In contrast to our results, Fanchin reported a significant correlation between AMH and pregnancy rate [18].

This study is limited by two factors, firstly, the study was a retrospective study, so it was not possible to control for confounding factors that could have impacted the outcomes, and secondly, the number of patients included, to some extent, is small and other variables should be included like body mass index, type of hormonal stimulation protocol and previous history of pregnancy.

### Conclusion

This study shows, there was probability to get success ICSI with younger women < 35 years old compared to women >35 years. AMH level is not of predictive value in Sudanese women with POCS undergoing ICSI.

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