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REVIEW ARTICLE

The anticipated contribution of AMH for positive pregnancy in females experiencing ICSI

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Abstract:

Background: "Anti-Müllerian hormone (AMH)" is a type of the transforming-growth-factor-beta family, and its chemical structure is a dimeric glycoprotein. The cells of the granulosa type of the antral follicles are the source of secretion of this hormone. It was suggested that serum amounts of such hormones may be an indicator marker of the count of ovarian follicles and hence can be used as an indicator of the reserve of ovaries.

Research objective: By examining the clinical pregnancy rate (CPR) in relation to AMH concentration in women who had ICSI cycles, this retrospective research sought to ascertain the anticipated usefulness of AMH amounts for ICSI yield.

Patients and methods: In the present retrospective cohort study, the clinical reports of 100 women were analyzed. Those women underwent ICSI cycles at The Higher Institute for Infertility Diagnosis and Assisted Reproduction Technologies, Baghdad, Iraq. Inclusion criteria: unexplained infertility, cases with actual embryo transfer (fresh embryos), and the use of "a gonadotrophin-releasing-hormone (GnRH) antagonist-protocol." Exclusion criteria: women with no retrieved oocytes, women with no embryo transfer, male infertility, and female factor infertility.

Results: Univariate analysis showing the possible predictors of positive pregnancy outcome revealed that positive pregnancy outcome is associated with lower BMI, 24.16 ±2.76 kg/m² versus 27.35 ±3.56 kg/m² ($p < 0.001$), higher level of AMH, 3.81 ±4.49 versus 2.57 ±1.15 ($p = 0.028$), and greater number of transferred embryos, 3.19 ±0.81 versus 2.46 ±1.09 ($p = 0.005$). Logistic regression analysis showed that lower BMI and higher level of AMH were associated significantly with positive pregnancy outcome, $p = 0.002$ and $p = 0.040$, respectively.

Conclusion: Lower body mass index within the normal range and higher serum levels of AMH are good predictors of positive pregnancy outcomes in women undergoing ICIS cycles.

Keywords: ICSI, AMH, positive pregnancy, infertility

Introduction

The reserve of ovaries is reflected by the quantity and quality of ovarian follicles, which give clues about ovarian function (1). In practicing the medical branch of reproduction, there is a continuous search for the most accurate method to measure ovarian reserve potential (2). "Anti-Müllerian hormone (AMH)" is a type of the transforming-growth-factor-beta family, and its chemical structure is a dimeric glycoprotein. The cells of the granulosa type of the antral follicles are the source of secretion of this hormone (3). It was suggested that serum amounts of such hormones may be an indicator marker of the count of ovarian follicles and hence can be used as an indicator of the reserve of ovaries (4).

The predictive potential of this hormone with respect to the response of ovaries to "controlled-ovarian-stimulation" has been shown to be better than other predictors such as estradiol level, inhibin level, level of follicle-stimulating hormone, and maternal age (5-8). A direct correlation between the level of this hormone and maternal reproductive capacity has been reported across women aged 9-11. A high level of this hormone has been shown to correlate with positive pregnancy outcomes in women subjected to controlled ovarian stimulation having an age over 40 during intracytoplasmic sperm injection (ICSI) cycles (12). Indeed, age decline in serum AMH level has been shown to correlate to age decline in women's reproductive ability (13). Thus, AMH concentration in females with age > 40 may be considered to be an anticipating indicator of pregnancy after cycles of IVF/ICSI (12). Nevertheless, based on the results

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of a meta-analysis, amounts of this hormone showed a positive correlat¬ion to live birth after ICSI but exhibited low prognostic potential (14).

The possibility of "ovarian-hyperstimulation-syndrome (OHSS)" can be decreased by changing the treatment plan for women with increased AMH, who may react excessively to exogenous gonadotrophins. Conversely, women with low AMH are less likely to become pregnant because they are more prone to react negatively to stimulation. By talking about alternatives like oocyte donation, these women's expectations can be suitably modified (15). A direct correlation between live birth rate and high levels of AMH has been reported, but the level of such a hormone is a measure of the quantity of ovarian follicles rather than their quality. The possible suggestion for such a correlation between AMH and live birth can be the result of that greater count of ovarian follicles being associated with a greater opportunity of having good quality embryos (15).

By examining the rate of clinical pregnancy (CPR) in relation to AMH concentration in women who had ICSI cycles, this research of a retrospective kind sought to ascertain the anticipated usefulness of AMH amounts for ICSI yield.

Patients and methods

In the present retrospective cohort study, the clinical reports of 100 women were analyzed. Those women underwent ICSI cycles at "The Higher Institute for Infertility Diagnosis and Assisted Reproduction Technologies, Baghdad, Iraq." The period of data collection extended to 6 months, during which records of patients during the period between January 2024 and January 2025 were retrieved. Inclusion criteria: unexplained infertility, cases with actual embryo transfer (fresh embryos), and the use of" a gonadotrophin-releasing hormone (GnR"H) antagonist protocol. Exclusion criteria: women with no retrieved oocytes, women with no embryo transfer, male infertility, and female factor infertility.

Approval of study

Ethical approval was signed by the committee of research ethics at "The Higher Institute for Infertility Diagnosis and Assisted Reproduction Technologies."

Variables included in the analysis

Serum FSH on cycle day 2, serum AMH on cycle day 2, mother's age, mother's body mass index (BMI), the duration of infertility, serum level of estradiol at day of trigger, total number of oocytes retrieved, count of mature (metaphase II) oocytes, clinical pregnancy rate, and number of good-quality embryos.

Grouping of infertile women

Enrolled women were categorized into pregnant and non-pregnant groups.

Statistical analysis

SPSS version 16 was used to analyze the data (SPSS Inc., Chicago, IL, USA). Using the Student's t-test, continuous variables were assessed for statistical significance and displayed as standard deviation. The chi-square test was used to compare categorical data, which were expressed as numbers (percent). To ascertain how each variable affected the CPR, a logistic regression analysis was conducted. P-values less than 0.05 were regarded as statistically significant.

Results

Univariate analysis showing the possible predictors of positive pregnancy outcome revealed that positive pregnancy outcome is associated with lower BMI, 24.16 ±2.76 kg/m² versus 27.35 ±3.56 kg/m² ($p < 0.001$), higher level of AMH, 3.81 ±4.49 versus 2.57 ±1.15 ($p = 0.028$), and greater number of transferred embryos, 3.19 ±0.81 versus 2.46 ±1.09 ($p = 0.005$), as shown in table 3.1. In order to get rid of the effect of possible confounders, we performed logistic regression analysis, as demonstrated in table 2. Accordingly, lower BMI and higher level of AMH were associated significantly with positive pregnancy outcome, $p = 0.002$ and $p = 0.040$, respectively. With respect to odds ratio, it was less than 1 (0.669) in the case of BMI, indicating that lower BMI is a significant predictor of positive pregnancy outcome, while in the case of AMH, the odds ratio was > 1 (2.653), indicating that a higher level of AMH is a significant predictor of positive pregnancy outcome.

Table 1: Univariate analysis showing the possible predictors of positive pregnancy outcome

Characteristics	Pregnant group	Non-pregnant group	p
	Number = 21	Number = 80	
Age	30.19 ±5.16	31.23 ±5.51	0.440
BMI	24.16 ±2.76	27.35 ±3.56	<0.001***
Duration	7.24 ±3.79	8.01 ±4.41	0.464
Type of infertility (primary/ secondary)	15/6	66/4	0.355
AMH	3.81 ±4.49	2.57 ±1.15	0.028*
FSH	5.60 ±2.36	6.10 ±1.78	0.288
Estradiol	41.01 ±9.10	42.10 ±11.57	0.692
AFC	14.62 ±3.01	14.16 ±6.76	0.764
Oocytes	11.81 ±4.25	10.15 ±5.86	0.227
Transferred embryos	3.19 ±0.81	2.46 ±1.09	0.005**

Data were presented as mean ±SD or number of cases; BMI: body mass index AMH: anti-mullerian hormone; FSH: follicle stimulating hormone; AFC: antral follicle count; *: significant at $p \leq 0.05$; **: significant at $p \leq 0.01$; ***: significant at $p \leq 0.001$

Table 2: Logistic regression analysis showing the possible predictors of positive pregnancy outcome

Variable	p	OR	95 % CI
Age	0.513	1.054	0.90 - 1.23
BMI	0.002**	0.669	0.52 -0.86
Duration	0.960	0.995	0.83 -1.19
Type(1)	0.328	0.473	0.11 -2.12
AMH	0.040 *	2.653	1.77 -5.53
FSH	0.373	0.87	0.64 -1.18
Estradiol	0.327	0.971	0.92 -1.03
AFC	0.675	0.959	0.79 -1.17
Oocytes	0.846	1.019	0.84 -1.23
Transferred embryos	0.162	1.67	0.81 -3.42

BMI: body mass index; AMH: anti-mullerian hormone; FSH: follicle stimulating hormone; AFC: antral follicle count; *: significant at $p \leq 0.05$; **: significant at $p \leq 0.01$; ***: significant at $p \leq 0.001$

Discussion

In the research, we evaluated a number of female characteristics in relation to pregnancy outcome following ICSI cycles, and we have found that BMI and serum AMH are crucial indicators of positive pregnancy yield in such a group of women. With respect to the relation between the amount of AMH and pregnancy outcome following assisted-reproduction techniques, several previous reports indicated, in line with current study findings, that a higher serum level of AMH is associated significantly with better fertility outcomes (10-12, 14).

With a high anticipated potential for response of ovaries and egg production following stimulation of ovaries, AMH is regarded as a superior anticipator of quantity elements of ART (16–18). Data on the relationship between qualitative ART results and amounts of AMH have been inconsistent and are still up for debate, despite the established link between higher oocyte yield and a higher live birth rate (19). AMH is a poor anticipator of ICSI yield after ART, according to a number of earlier findings (14, 21, 22).

This implies that variables other than reserve of ovaries (as measured by AMH) probably influence the likelihood of becoming pregnant. Contributing factors are probably embryo quality, sperm/egg, genetic makeup, transfer technique, stimulatory procedure, and receptivity of endometrium (23). Therefore, while advising infertile patients on ART outcomes, it is important to consider the poor anticipatory power of AMH for the success of ICSI. Additionally, a reduced or even near-zero level of AMH should not be the only reason for denying a patient ART (24).

Nonetheless, it appears that, even in the absence of a clear cutoff value, AMH is able to predict positive pregnancy outcomes in women undergoing ICSI and that cancelling the progress in a cycle for women with low serum AMH may be strongly justified to reduce the cost and associated adverse organic and psychological outcomes of non-successful trials.

Conclusion: Lower body mass index within the normal range and higher serum levels of AMH are good predictors of positive pregnancy outcomes in women undergoing ICIS cycles.

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