Evaluation of Some Predictive Factors Influencing Ovarian Response in Cases of Intracytoplasmic Sperm Injection

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Abstract: Background: There are controversies about the role of different factors affecting ovarian stimulation, correlation between them in prediction of ovarian response and pregnancy achievement through the process of intracytoplasmic sperm injection and the prognosis of in vitro fertilization and embryo transfer The purpose of this study was to evaluate some of the ovarian reserve factors affecting ovarian stimulation including (age, body mass index (BMI), follicle stimulating hormone -to- luteinizing hormone ratio (FSH / LH), anti mullerian hormone (AMH)) in cases undergoing intra cytoplasmic sperm injection (ICSI) using the long agonist protocol. **Methods**: A prospective randomized study including 100 infertile women undergoing ICSI using long agonist protocol was conducted at International Islamic Center For Population Studies And Research - Assisted Reproduction Unit (Al-Azhar University) in the period between January 2015 to November 2017. **Results**: Our data demonstrated that the circulating AMH levels and FSH/LH ratio were preferable in prediction number of oocyte retrieved outcome during GnRH long agonist protocol than age, BMI and the other currently used hormone markers. The current results also confirm that AMH level ranges positively impact oocytes quality in the form of MII after COH. Serum AMH levels was the most accurate marker in predicting ovarian response to ovulation induction by gonadotropins in ICSI patients taking P value < 0.002. The present study demonstrated that there was statistically significant in FSH/LH ratio as regards number of oocytes retrieved. The day 3 FSH/LH ratio ≤ 2 was associated with higher number of oocytes retrieved (P value 0.040). Furthermore, we observed higher number of top-quality oocytes (in the form of M II) with the day 3 FSH/LH ratio ≤ 2. **Conclusion**: Serum AMH levels was the most accurate marker in predicting ovarian response to ovulation induction by gonadotropins in ICSI patients. Day 3 FSH/LH ratio could be used as an additional important predictor for compromised ovarian reserve and response, in refining the treatment protocol accordingly and avoiding potential reticulations especially in younger patients. Over all markers of ovarian response in our study, there was no factor that could predict pregnancy in high accuracy as it is multifactorial.

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1. Introduction

Infertility is estimated to affect as many as 186 million people worldwide. Although male infertility contributes to more than half of all cases of global childlessness, infertility remains a woman's social burden. Unfortunately, areas of the world with the highest rates of infertility are often those with poor access to assisted reproductive techniques (ARTs). However, emerging data suggest that making ART accessible and affordable is an important gender intervention **(Marcia and Pasquale, 2015).**

In vitro fertilization (IVF) has been shown to be an effective therapy for couples with unexplained infertility to achieve pregnancy in an expeditious and cost-effective manner **(Reindollar et al., 2010).**

Intracytoplasmic sperm injection (ICSI), which involves the direct injection of a single sperm into the oocyte, is considered as an alternative technique to IVF but effective with a mean fertilization rate of approximately 80% (**Zegres et al., 2009; Vanden et al., 2013 and Vanden et al., 2014**). ICSI, while typically effective for overcoming low or absent fertilization in couples with a clear abnormality of semen parameters, is frequently utilized in combination with assisted reproductive technologies for other etiologies of infertility in the presence of normal semen parameters **(ASRM, 2012).**

Ovarian reserve is a complex clinical phenomenon influenced by age, genetics, and environmental variables **(Tal et al., 2013)**. The term ovarian reserve aims to correlate reproductive potential with the number and quality of remaining oocytes in women of reproductive age **(ASRM, 2012)**. Ovarian reserve tests (ORTs) aim to measuring either oocyte quality, quantity or the ability for an individual to achieve pregnancy. These tests can be conducted

either through biochemical means or through ultrasonographic measures **(ASRM, 2012)**. These include biochemical markers (FSH, E2, inhibin B, AMH, FSH-LH ratio) **(Kelton et al., 2005)** and ovarian morphometric markers (ovarian volume, AFC, and mean ovarian diameter) **(László et al., 2002)** that are assessed in the early follicular phase (basal) of the menstrual cycle except for AMH. **(Mohamed et al., 2014).**

Age is a major determinant of the success rate of infertility treatment and was the first recognized prognostic factor in IVF/ICSI. The chance of conceiving after ICSI decreases as age increases (**El-Mazny et al., 2011). Erdem et al. (2004) and Huiyu et al. (2017)** found that age was the only independent predictor of pregnancy as compared to hormonal and ultrasound indices of ovarian reserve. It is well understood that oocyte quality and quantity decline with increasing maternal age (**Eichenlaub- Ritter, 2012 and Christopikou et al., 2013)**. The lowering of human oocyte quality with maternal ageing is associated with chromosomal aneuploidy, mitochondrial dysfunction and altered metabolic output, as well as extrinsic follicular factors, such as changes in the functions and viability of the surrounding cumulus cells **(Fragouli et al., 2011; Pacella et al., 2012 and Pacella-Ince et al., 2014)** which translates to decreased pregnancy rates **(Baird et al., 2005; Alviggi et al., 2009 and Yan et al., 2012).** In addition, an age-related decline in response to exogenous gonadotropin stimulation and a reduction in the number of oocytes, oocyte quality, fertilization rate, number of embryos, implantation rate and, ultimately, live birth rate have been well documented **(Nelson et al., 2013).**

BMI is an important clinical characteristic for both planning the stimulation regimen and counseling on the chances of success after IVF. A number of studies have associated increased BMI with higher doses of gonadotropins, longer durations of ovarian stimulation, and poorer IVF success rates, leading to increasing concerns regarding obese or overweight women receiving IVF treatment **(Rittenberg et al., 2011; Xun et al., 2013; Ozekinci et al., 2015; Wang et al., 2016 and Provost et al., 2016)**. However, numerous studies have failed to show any significant differences between normal weight and obese women in terms of clinical pregnancy rates following IVF **(Sathya et al., 2010, Alexandra et al., 2014).**

Anti-Mullerian hormone (AMH) is a glycoprotein produced by the granulosa cells of principally small antral follicles of the ovary, where it plays a vital role in maintaining ovarian reserve and modifying the follicles response to FSH **(Dewailly et al., 2014)**. The serum AMH has recently emerged as a novel clinical marker of ovarian reserve. The advantages of AMH test are its little inter- and intra-cycle variability and gradually decreased value according to the increasing age. Serum AMH levels decrease steadily with ageing and are undetectable after menopause. Some studies presented that the serum AMH levels are age-specific and readily available clinical marker of the ovarian reserve. Therefore, AMH is regarded as a useful ovarian reserve test nowadays (**Yoo et al., 2011 and Jong et al., 2015).** It has been generally accepted as well that it is always appropriate to consider AMH levels when predicting ovarian response in all women and that these levels are associated with live birth independent of a woman's age after treatment (**Nelson et al., 2007 and Iliodromiti et al., 2014). Broer et al. (2013b)**, suggesting it would be an ideal marker for the individualization of COS strategies. Indeed, the use of an AMH-tailored approach has previously been suggested by several investigators **(Yates et al., 2011 and Van et al., 2012).**

Most of the studies support the correlation between the FSH/ LH ratio and the assessment of ovarian reserve. The favourability of the ratio is on the premise that a lower FSH and a higher LH correlates better with a larger number of antral follicles than either marker alone **(Brodin et al., 2009)**. Elevated FSH/LH ratio is associated with inferior outcome in IVF treatment cycles and it could be used as an additional predictor of decreased ovarian reserve. The day 3 FSH/LH ratio adds more predictive power over day 3 FSH alone, especially in younger patients with a normal FSH concentration ≤ 11 mIU/ml. **(Sudha et al., 2013)**.

The GnRH analogs suppress the pituitary FSH and LH secretion and enable the control of ovarian folliculogenesis to yield high pregnancy rates in IVF/ICSI cycles. The GnRH analogs have many advantages such as high potency, increased half life, and increased binding capacity to pituitary GnRH receptors, compared with the GnRH molecule. The two types of GnRH analogs in clinical practice are the GnRH agonist and GnRH antagonist. In normo-responders, the implantation rate, clinical pregnancy rate, and miscarriage rates were similar in the GnRH antagonist regimens as well in the GnRH agonist long protocol. However, a significantly higher number of oocytes and higher proportion of mature MII oocytes was retrieved per patient randomized in the GnRH agonist group compared to the GnRH antagonist group. (**Aygul et al., 2016)** In the long (luteal) protocol, GnRH agonist is started on day 21 of the cycle preceding treatment and continued in a constant dose until the day of hCG administration. It is continued in parallel with gonadotrophin treatment which is usually started on the first days of an ensuing menstruation, after two weeks of agonist treatment or

followingdemonstration of pituitary down regulation by measuring low (<200 pmol/l) E2 levels (**Roy, 2014).**

2. Materials and Methods

Patients

The study included 100 infertile women aging 20-35 years undergoing ICSI using the long agonist protocol for ovulation induction at **International Islamic Center For Population Studies And Research - Assisted Reproduction Unit (Al-Azhar University)**. Ethics committee approval and written consent from the patients were obtained.

Laboratory investigations

Blood sample were collected during the early follicular phase (day 3) of menses of a spontaneous cycle preceding the cycle of ICSI. All patients had been tested for: serum AMH, serum FSH, serum LH, serum E2, TSH and prolactin, all were measured with an enzyme-linked immunosorbent assay (ELISA).

Ultrasound:

Transvaginal ultrasound was performed on days 3–5 of the menstrual cycle to assess the basal AFC and the ovarian volume and during induction to follow up follicular growth using 2D ultrasonography.

Controlled ovarian stimulation protocol:

Standard long GnRH agonist down regulation protocol was used. The decision of doses used of gonadotropins was variable based on the age, BMI, basal FSH level, and AFC and AMH of each patient. For the long protocol 0.1 mg, SC, Decapeptyl (Ferring pharmaceuticals, Germany) was started in the midluteal phase. At suppression, ovarian stimulation was initiated with HMG and continued until the day of ovulation induction. The dosage was adjusted accordingly by the sonographic findings and serum E2 levels. When at least two follicles had reached a mean diameter of 18 mm, HCG (10, 000 IU IM, Chorimon 5000 IU, IBSA, Italy) has been administrated for final oocyte maturation, followed by transvaginal ultrasound guided OPU 36 hours later. A good quality embryos were transferred 3 to 5 days after oocyte retrieval Similar luteal support was provided for all patients with intramuscular administration of 100 mg progesterone (Prontogest 100 mg/2ml, EIPICO, Egypt) starting on the same day of oocyte retrieval until pregnancy test or until 12 weeks in case pregnancy was achieved.

Outcomes:

ICSI cycle characteristics; duration of stimulation, total dose of gonadotropins used, numberand quality of retrieved oocytes, number and quality of transferred embryos and cancellation rates, clinical pregnancy rates were determined.

Statistical analysis:

Data were collected, coded, revised and entered to the Statistical Package for Social Science (IBM SPSS) version 20. The data were presented as number and percentages for the qualitative data, mean, standard deviations and ranges for the quantitative data with parametric distribution and median with inter quartile range (IQR) for the quantitative data with non parametric distribution. Chi-square test was used in the comparison between two groups with qualitative data and Fisher exact test was used instead of the Chi-square test when the expected count in any cell found less than 5. Independent t-test was used in the comparison between two groups with quantitative data and parametric distribution and Mann-Whitney test was used in the comparison between two groups with quantitative data and non parametric distribution. The comparison between more than two groups with quantitative data and parametric distribution were done by using One Way Analysis of Variance (ANOVA) test and Kruskall-Wallis test was used in the comparison between more than two groups with quantitative data and non parametric distribution. Spearman correlation coefficients were used to assess the significant relation between two quantitative parameters in the same group.

3. Results

There was positive correlation in AMH values and negative correlation in FSH/LH ratio as regards No. of oocytes retrieved.

Table (1): Relation between oocytes retrieved and Age, BMI, AMH and FSH/LH ratio.

	No. of oocyte retrieved	
	r	P-value
Age	-0.093	0.363
BMI	-0.198	0.052
AMH	0.306	0.002
FSH / LH	-0.296	0.003

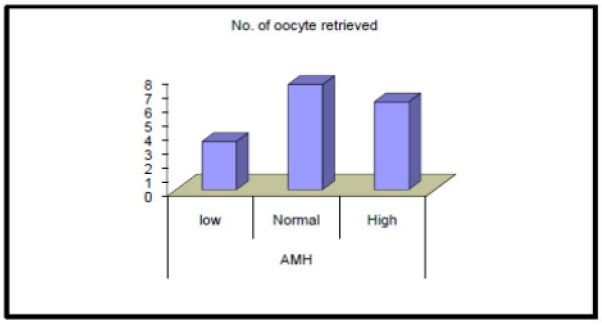

Figure (1): AMH regarding number of oocytes

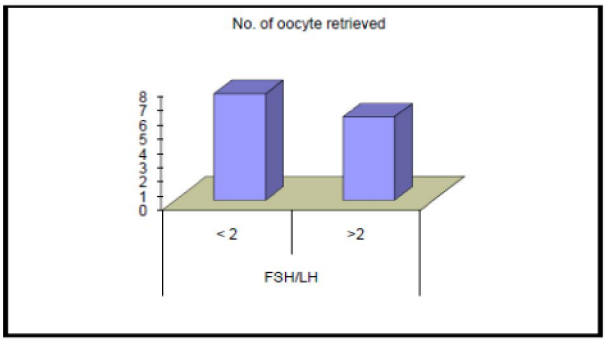

Figure (2): FSH/LH regarding number of oocytes

There was positive correlation in AMH values and negative correlation in FSH/LH ratio as regards M II of quality of occytes but positive correlation in BMI as regards degenerated of quality of occytes.

Table (2): Relation between Quality of oocyte and Age, BMI, AMH and FSH/LH ratio.

	M II		M I		G.V		Degenerated	
	r	p	r	p	r	p	r	p
Age	-0.059	0.568	-0.175	0.114	0.067	0.668	-0.226	0.289
BMI	-0.077	0.458	-0.084	0.451	-0.073	0.639	0.487	0.016
AMH	0.309	0.002	0.132	0.235	0.084	0.587	0.111	0.605
FSH / LH	-0.269	0.008	-0.125	0.262	0.179	0.246	-0.106	0.623

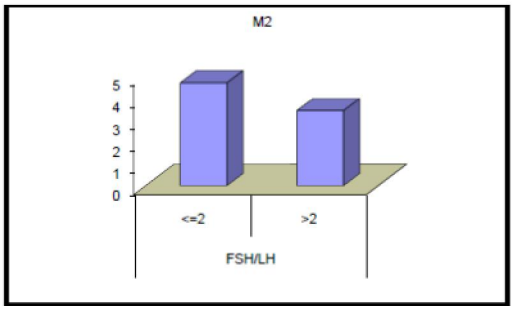

Figure (2): FSH/LH regarding M II

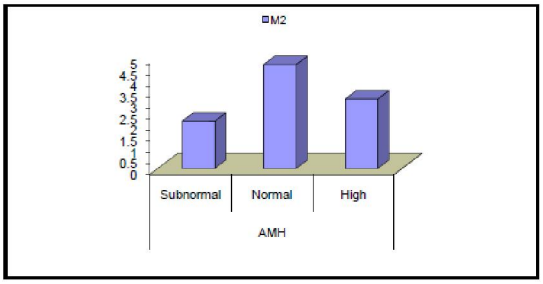

Figure (3): AMH regarding M II

There was negative correlation in BMI regards number of ET.

Table (3): Relation between number of ET and Age, BMI, AMH and FSH/LH ratio

	Number Of ET	
	r	p
Age	0.188	0.070
BMI	-0.217	0.036
AMH	0.010	0.922
FSH / LH	-0.106	0.309

There was no statistically significant difference in age, BMI, AMH and FSH /LH and pregnancy.

Table (4) Relation between pregnancy and Age, BMI, AMH and FSH/LH ratio

	Yes		No pregnancy		Independent t-test	
	Mean	SD	Mean	SD	t	P-value
Age	28.41	4.15	29.35	4.02	-1.124	0.264
BMI	32.81	6.39	31.97	6.75	0.630	0.530
AMH	3.53	4.04	3.55	3.63	-0.017	0.986
FSH / LH	1.91	1.05	1.60	0.87	1.558	0.122

4. Discussion

Various ovarian reserve markers have been used to predict ovarian response and pregnancy **(Huiyu et al., 2017).** As a consequence, ovarian reserve assessment is no longer just relevant for women undergoing treatment for infertility. Indeed, there has been an increased demand for ovarian reserve testing from women with un explained fertility problem to obtain estimates on their remaining reproductive lifespan **(Tremellen and Savulescu, 2014; Hvidman et al., 2015 and Seifer et al., 2015).**

Various markers are available to assess the OR, which include age, the serum FSH, serum E2 and the serum AMH levels, the ovarian volume, the antral follicular count, etc **(Perloe et al., 2000).** The commonly used tests for ovarian reserve are basal FSH, LH, E2, inhibin B levels and AFC by ultrasonography **(Van et al., 2006).** So far no study has shown their clear ability to predict chance of pregnancy, neither in the general population, nor in patients with unexplained infertility or women undergoing medically assisted reproductio**n (Hagen et al., 2012; Broer et al., 2013; Casadei et al., 2013 and Ripley et al., 2015).** This study included 100 patients. All were candidates for ICSI program in International Islamic Center For Population Studies And Research (Assisted Reproduction Unit) (Al-Azhar University) from January 2015 to November 2017. Prospective randomized study to evaluate factors affecting ovarian stimulation response including age, FSH / LH ratio, BMI, AMH in cases undergoing ICSI using the long agonist protocol. As women age, their ability to produce oocytes of good quality and quantity is going to decrease. This decreased ability has been related to chronological or biological age, which represents the ovarian reserve and its response to ovarian stimulation **(Alviggi et al., 2009, Afaf Ismail et al., 2016 thesis under publication).** The examined women in this study represented different age groups ranging from 20 to 35 years. The mean average age of patients was 28.75 and the standard deviation was 4.10 years. Maternal age has a well-established value in predicting the outcome of assisted reproductive technologies, and pregnancy rates decline with age **(Horcajadas, 2007).** At approximately 30 years, female fertility is reduced and that it decreases more slowly between the ages of 30 and 35 years, finally followed by rapid decrease **(ESHRE, 2005).** Our study showed that there was no statistically significant difference in age as regards number of oocytes retrieved, quality of oocytes, number of embryo transferred, quality of embryo transferred nor pregnancy rate. The mean number of oocytes retrieved in age group from 20 to 25 years is 7.41, mean number of oocytes in age group from 26 to 30 years is 7.0 and mean number of occytes in age group from 31 to 35 years is 6.63 with P value of 0.733 which has no statistic significant difference. As regards quality of oocytes retrieved, the mean number of M II in age group from 20 to 25 years is 4.48, mean number of M II in age group from 26 to 30 years is 4.35 and mean number of M II in age group from 31 to 35 years is 4.12 with P value of 0.855 which has no statistic significant difference. The mean number of ET in age group from 20 to 25 years is 2, mean number of ET in age group from 26 to 30 years is 2.33 and mean number of ET in age group from 31 to 35 years is 2.41 with P value of 0.159 which has no statistic significant difference. As regard the quality of ET, 72% of age group from 20 to 25 years is A and 12 % is B, 68% of age group from 26 to 30 years is A and 21.3% is B but 63.4% of age group from 31 to 35 years is A and 12.2% is B. In patients who got pregnant, the mean age was 28.41while in the non-pregnant group the mean age was 29.35, 28.8% of pregnancy from 20 to 25 years old while 39% of pregnancy is from 26 to 30 years old. About 42.5% of non pregnant patients from 31 to 35 years old but 15.0% of non pregnant patients is from 20 to 25 years old. **Yu-Ting (2017),** found that maternal age predominantly modulates oocyte quality. In his study a higher clinical pregnancy rate per cycle and per transfer were both significantly associated with the younger group, with females aged < 35 years showing a significantly higher pregnancy rate per transfer than the other two groups (28.5%, 27.1%, and 7.6% for < 35 years, 35–40 years and ≥ 40 years, respectively, $p < 0.001$). A higher score of embryo transferred and higher number of mature oocytes were also significantly associated with the younger group. **M.H. Razi (2014)** found that the women's age strongly influence outcomes of assisted reproductive technology treatment. His study results added additional data indicating a negative impact of woman age on the number of retrieved oocytes, the quality of oocytes, and number of fertilized oocyte, as well as, zygote and embryo scores. In addition, Age strikingly influence the pregnancy rate. Chronological age is the age determined by passage of time since birth; however, biological age is determined by physiology rather than chronology. Although the chronological age is a very important predictive factor for fertility and ovarian response, it was found that reproductive aging varied among individuals **(Alviggi et al., 2009).** Chronological and biological aging may differ significantly, since both genetics and the environment contribute to biological age **(Alviggi et al., 2009).** Reproductive functions are more influenced by biological than chronological age; the ovarian reserve seems to be a good marker for the biological age of the ovary. In this study we divided patients according to BMI into 4 groups: underweight group (< 18.5), normal BMI group (18.5-24), overweight group (25-

29.9) and obese group (> 30). The mean average BMI of them was 32.40 and the standard deviation was 6.52. BMI of our patients revealed that there was no statistically significant difference in it as regards number of oocytes retrieved, quality of oocytes, quality of ET nor pregnancy. **Alexandra et al., (2014)**, reported that female obesity did not appear to affect the clinical outcomes of IVF adversely. Mean number of oocytes retrieved in underweight subjects is 9, mean number of oocytes retrieved in subjects with normal BMI is 6.88, mean number of oocytes retrieved in over weight subjects is 7.71 and mean number of oocytes retrieved in obese subject is 6.53 with P value of 0.49. This was In agreement with **Mette (2016),** who found that there was no significant difference in the total number of oocytes retrieved per cycle when comparing underweight, overweight and obese with women with normal BMI. In our study we found that there was no statistically significant difference in BMI as regards quality of oocytes except for a positive correlation in degenerated oocytes with a P value of 0.01. This was in agree with **John et al. (2015)**, who reported that female adiposity might impair maturity in conventional IVF. Mean M II in underweight is 4, mean M II in subjects with normal BMI is 4.43, mean M II in overweight subjects is 4.45 while mean MII in obese subjects is 4.20 with a P value of 0.969. This finding was supported with **Rittenberg et al. (2011)** meta-analysis that showed no evidence of high BMI affecting the oocyte outcome. There was also negative correlation in BMI regards number of ET with a P value of 0.036. **Zhang et al. (2010),** reported that women who are overweight and obese undergoing ART have lower rates of fertilization. **Sathya et al. (2010)**, failed to show any significant differences between normal weight and obese women in terms of clinical pregnancy rates following IVF. In contrary, **John et al. (2015),** reported that female adiposity might impair oocyte number and maturity in conventional IVF. Also **Meredith et al. (2016)**, reported that success rates in recipient cycles are highest in those with low and normal BMI. Furthermore, there is a progressive and statistically significant worsening of outcomes in groups with higher BMI with respect to clinical pregnancy and live birth rate. Overall, the existing studies that have evaluated the relationship between a woman's BMI and IVF outcomes have yielded conflicting results, and thus the true impact of obesity on the outcomes of IVF still remains unclear **(Alexandra et al., 2014). Cardozo et al. (2011)**, tried to explain that conflict by reporting while there are substantial data indicating that excess weight has a negative impact on the reproductive outcomes of ART cycles, it remains unclear if this effect is exerted at the level of the oocyte or the endometrium.

Day 3 serum FSH/LH ratio could be used as an additional predictor of ovarian response outcome in ICSI treatment cycles. The mean value of day 3 serum FSH/LHin our study was 1.79 ± 0.99 in all patients. The FSH/LH ratio showed statistically significant difference as regards number of oocytes retrieved. In patients with FSH / LH ratio ≤ 2, mean number of oocytes retrieved was 7.46 while in patients with FSH / LH ratio > 2, mean number of oocytes retrieved was 5.83 and P value was 0.040. In agreement to our results **Shrim et al. (2006) and Brodin et al. (2009),** reported that, most of the evidence points towards a FSH/ LH ratio >2 being correlated with decreased ovarian reserve. Sudha (2013), found that Women with an elevated FSH/LH ratio ≥ 2 had fewer retrieved oocytes. **Orvieto et al. (2008),** reported that an exaggerated day 3 FSH/LH ratio even with normal basal FSH has been reported to be a sign of diminished ovarian reserve and poor IVF outcome. This study shows that there was no statistically significant difference in GV, M1 and degenerated of quality of oocyte but there was significant difference in M II as regards FSH/LH as there was negative correlation in FSH/LH as regards M II of quality of occytes with P value of 0.018. Gerardo et al. found that a negative impact of a basal cycle high FSH/LH ratio on follicular development and oocyte quality.

There was no statistically significant difference in number of ET, quality of ET nor pregnancy as regards FSH/LH. In disagreement to our results, **Orvieto et al. (2008)**, and **Giuseppe (2014),** demonstrated that patients undergoing ovarian stimulation using agonist protocols with FSH/LH ratios > 3, achieved significantly lower pregnancy rates. Also **Sudha (2013)**, found that Women with an elevated FSH/LH ratio ≥2 had fewer pregnancy rates. This may be attributed to the young age of patient involoved in our study as confirmed by **Berna et al. (2012),** found that elevated day 3 FSH/LH ratio is useful in predicting IVF outcome in older women, but does not seem to be an accurate predictor in younger women. In our study three cycles were cancelled and FSH/ LH was >2 in the three cycles. **Liu et al. (2008), and Kimberly et al. (2008),** demonstrated that day 3 FSH/LH ≥ 2 is associated with higher rates of cancellation of IVF cycles. Elevated day 3 FSH/LH ratio is associated with inferior outcome in IVF treatment cycles and it could be used as an additional predictor of decreased ovarian reserve. Surprisingly, two of clinically relevant studies went **unnoticed (Prasad et al., 2013 and Giuseppe, 2014).** While **Rehana et al. (2015),** reported that patients with an elevated FSH/LH ratio (>1.26) had decreased number of oocytes, mature oocytes, cleaved embryos, endometrial thickness, implantation rate and blastocysts formed; all implying poor response to

ICSI. FSH/LH ratio can be used to assess response of treatment in ART. Adequate OR is a prerequisite for successful IVF or ICSI treatment; thus a measurement of FSH/LH ratio is important to determine which patients have a high outcome possibility. Serum AMH is useful in predicting the ovarian response; however it is not significant in predicting pregnancy. The mean value of serum AMH in our studywas 3.51 ± 3.85 in all patients showing that there was statistically significant difference in number of oocytes retrieved as regards AMH value (P value 0.002) while there was no statistically significant difference in pregnancy rate. **Huiyu et al. (2017),** reported that AMH is the best ovarian reserve markers in predicting ovarian response but has unfavorable value in predicting clinical pregnancy.

Nelson et al. (2013), similarly showed that AMH is a good predictor of ovarian reaction. They observed that less AMH indicates lower oocyte yields with lower fertilization rates. **(Jayaprakasan et al., 2012 and Wunder et al., 2008)**, reported that AMH does seem to predict the number of retrievable oocytes in a significant way. In our study we divided patients according to serum AMH level into 3 groups: low AMH group (0.05-1 ng/ml), normal AMH group (1-7 ng/ml) and high AMH group (>7 ng/ml). Mean number of oocytes in low AMH group value is 3.40 and mean number of occytes in normal AMH group is 7.48 and mean number of oocytes in high AMH group is 6.25.

In agreement with our results As we cover young age group varying from 20 to 35 years old **Gomez (2016)**, discovered that AMH is a predictive marker of pregnancy in patients older than 36 years, but do not influence pregnancy rates in younger patients (< 36 years) some studies focused on younger women, **Baird and Steiner (2012)**, have suggested that low AMH among these patients does not predict reduced fecundability **(Hagen et al., 2012)**, also supported our results **Tremellen et al. (2010)**, showed us that AMH is not a predictive marker of live birth rate. Our supposition is that, due to better oocyte quality with lower rates of aneuploidy, the number of oocytes needed to achieve a pregnancy in younger patients is as low as that of the oocytes obtained in the low serum AMH. Previous literature described this effect as an ‘‘age protection’’ against the effects of poor ovarian response **(Check et al., 2002 and Lin et al., 2014)**. The second hypothesis therefore did not hold true for young patients with low AMH levels. AMH levels do not influence the pregnancy rate in this group. In disagreement with our results **Steiner et al. (2011)**, demonstrated that low AMH levels are associated with reduced fecundability. **Fréour et al. (2006)**, showed a significant association between serum AMH and pregnancy outcome. Also **La Marca et al. (2011)**, in disagreement with our results, showed that AMH predicts the chance of success in both younger and older women. The heterogeneity of the samples in the studies that analysed both younger and older women may explain the contradictive results. In the present study there was statistically significant difference in M II (P value 0.003). in agreement with our results **(Ebner et al., 2006; Irez et al., 2011 and Fréour et al., 2006)**, reported is that it also influences oocyte quality (in agreement with our study) and reproductive outcome (in contrary to our results). Many are familiar with the large controversy about whether AMH predicts oocyte quality. There are two hypotheses: the first is that AMH only influences the ovarian response, and the second is that it also influences oocyte quality and reproductive outcome **(Gomez et al., 2016)**. This study also shows that there was statistically significant difference in degenerated oocytes (P value 0.000) as regards AMH value which can be explained by coasting in cases of polycystic ovaries to avoid ovarian hyperstimulation. There was no statistically significant difference in No. of ET and quality of ET as regards AMH in our study. **Penarrubia et al. (2005)** and **Van et al. (2003)**, reported that AMH only influences the ovarian response.

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