

Performance of ovarian response prediction index (ORPI) in predicting ovarian response in the IVF/ICSI cycles



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INTRODUCTION

- The prediction of ovarian response is important prior to IVF as women can be counselled regarding approximate number of oocytes that can be obtained and the starting dose of gonadotrophin.
- Anti-Mullerian hormone (AMH) and antral follicle count (AFC) have been used to predict a woman's ovarian response
- Recently, the ovarian response prediction index (ORPI), calculated as serum AMH level (ng/ml) multiplied by AFC and then divided by female age (years), has been proposed as a composite score for predicting ovarian response.
- ORPI was first reported by Oliveira et al. (2012), who showed that ORPI was significantly correlated with number of oocytes retrieved and chance of pregnancy.

AIMS & OBJECTIVES

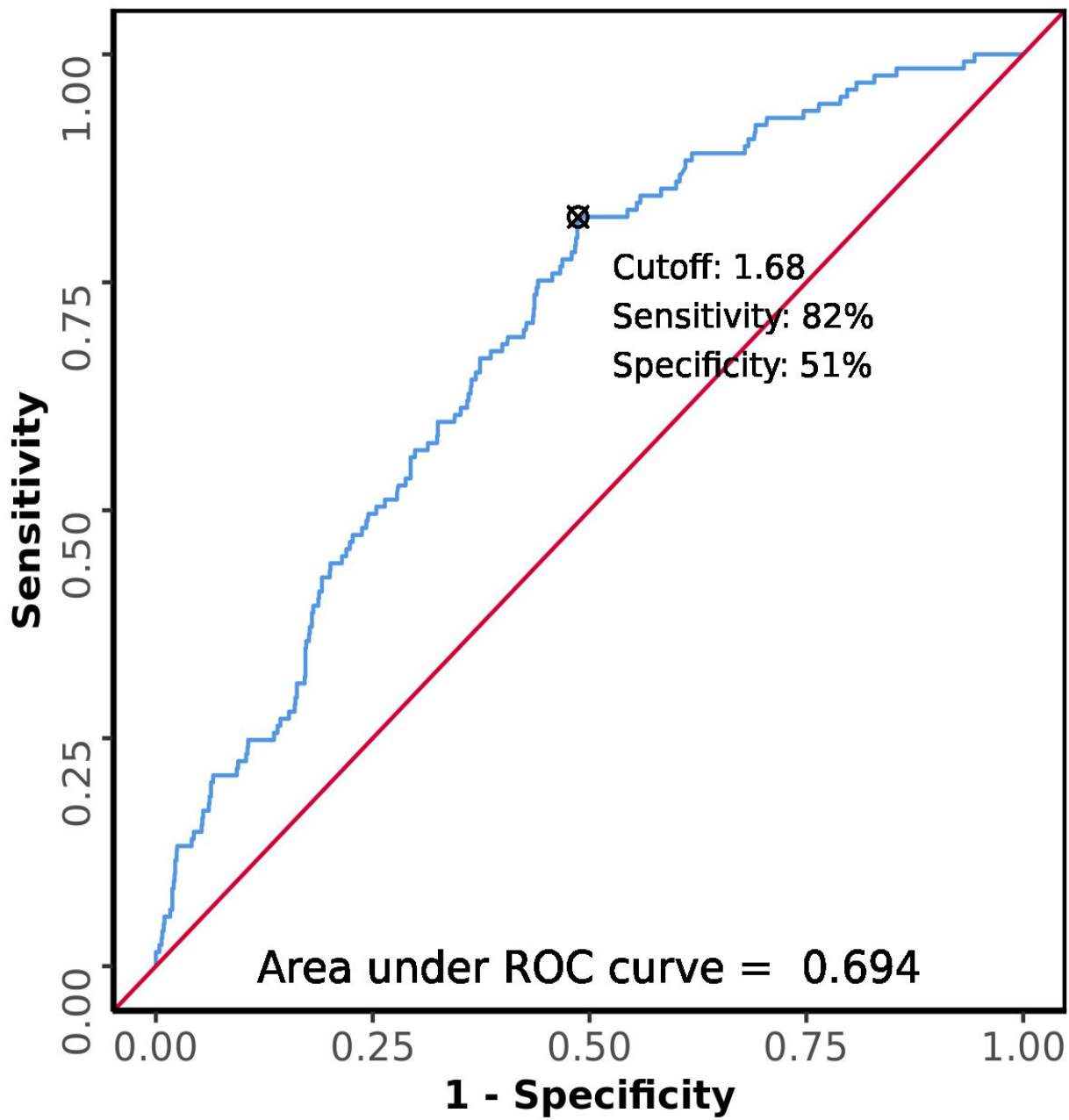
- The objective of this study was to assess the correlation of ovarian response prediction index (ORPI) with ovarian response and clinical outcome in the IVF/ICSI cycles in Indian population

METHODOLOGY

- **Design:** Retrospective cohort study
- **Method:** The data was collected from the IVF database from Jan 2013 to December 2020. We included patients undergoing first IVF/ICSI cycles with normal uterine cavity ,excluded patients with any endocrinological abnormalities.
- Total 1341 patients were analysed, 549 underwent GnRH antagonist protocol and 792 underwent GnRH agonist protocol.
- The baseline characteristics of all the patients including age, BMI, AFC, AMH, FSH and ORPI (AMH X AFC/Age) was correlated with the ovarian response in terms of number of oocytes retrieved, grade 1 oocytes, grade 1 embryos and clinical pregnancy rate, to assess the best predictor of oocyte yield in Indian population.
- GnRH agonist or GnRH antagonist protocol were used, depending on the patient's baseline characteristics. Gonadotropin stimulation was started after ensuring down-regulation in GnRH agonist protocol. Standard formulations of either rFSH or HMG were used for stimulation with initial starting dose ranged between 150 to 300 IU per day. Gonadotropin dose was decided on the basis of ovarian reserve, patient age, BMI and individual physician's discretion.

RESULTS

- The mean age (yrs),AFC, AMH and ORPI was 30.44 ± 3.58 , 14.86 ± 6.71 , 4.75 ± 3.11 and 2.73 ± 3.32 , respectively.
- Mean oocytes retrieved, number of grade 1 oocytes was 9.19 ± 5.07 and 4.51 ± 3.40 .
- According to Spearman correlation, ORPI was significantly associated ($p < 0.05$) with number of oocytes retrieved, grade 1 oocytes and grade I embryos.
- There was significant inverse correlation between total dose of gonadotrophin and ORPI ($\rho = -0.56$, $p = < 0.001$).
- The median (IQR) of ORPI in Poor response(< 5 oocytes), normal response($5-15$ oocytes) and hyper-response (> 15 oocytes) group was 1.11 (0.67-2.03), 1.9 (1.07-3.32) and 2.93 (1.88-4.33), significant difference between the groups ($\chi^2 = 133.544$, $p = < 0.001$).
- The area under the ROC curve for ORPI predicting hyper-response vs poor or normal was 0.694 (95% CI: 0.65-0.738), $p = < 0.001$. (as shown in Figure)
- At a cutoff of ORPI ≥ 1.675 , it predicts hyper-response with a sensitivity of 82%, specificity of 51% and diagnostic accuracy of 54.3%, as compared to AMH alone with cut off of 2.99, which has sensitivity of 88 %, specificity of 32.8% and diagnostic accuracy of 38%. (as shown in table 1)
- The odds ratio (95% CI) and the relative risk (95% CI) for hyper-response when ORPI is ≥ 1.675 was 4.86 (3.05-7.73) and 4.27 (2.77-6.61), respectively.



Variable	Sensitivity	Specificity	PPV	NPV	Diagnostic Accuracy
Age (Years) (Cutoff: 29 by ROC)	58.1% (49-67)	61.6% (59-64)	13.9% (11-17)	93.2% (91-95)	61.2% (59-64)
BMI (Kg/m ²) (Cutoff: 24.1 by ROC)	64.3% (55-73)	42.3% (40-45)	10.6% (9-13)	91.8% (89-94)	44.4% (42-47)
Total AFC (Cutoff: 14 by ROC)	74.4% (66-82)	53.0% (50-56)	14.4% (12-17)	95.1% (93-97)	55.0% (52-58)
AMH (Cutoff: 2.99 by ROC)	88.4% (82-93)	32.8% (30-36)	12.3% (10-15)	96.4% (94-98)	38.2% (36-41)
ORPI (Cutoff: 1.675 by ROC)	82.2% (74-88)	51.3% (48-54)	15.2% (13-18)	96.4% (95-98)	54.3% (52-57)

STATISTICAL ANALYSIS

- Statistical tests were performed by IBM SPSS Statistics version 23 (IBM Corporation, New York, USA).The values for the ORPI, age of the woman, AMH, AFC, total number of oocytes retrieved, grade 1 oocytes, grade 1 embryos were treated as continuous variables for analysis, and analysed as mean, standard deviations and medians/IQRs.
- Linear Correlations were performed using the Spearman's rank correlation test. A p value of < 0.05 was considered statistically significant.

LITERATURE REVIEW

- This study showed that ORPI was significantly correlated with the number of oocytes. It is a good predictor of both excessive and poor ovarian responses, similar to serum AMH level. This was consistent with findings from previous studies (Oliveira et al., 2012).
- Although both AMH and AFC are good markers in predicting ovarian responses during IVF, discordant results may result in some women.
- Therefore, prediction of ovarian response based on a single biomarker may not be the best to determine the formulation of a treatment plan.
- In order to increase the prognostic values and to adjust for the discordance between individual markers, combining the ovarian reserve markers has been proposed.

CONCLUSION

- Our observations suggest that ORPI is good predictor of oocyte yield, as compared to AMH and AFC alone, ORPI is a more specific prognostic marker, especially useful in predicting hyper-response.
- Accordingly, patient can be prognosticated and managed clinically, planned for freeze all cycles, aiding all the clinics to be OHSS free clinics.

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