

Anti-Müllerian Hormone predicts high-quality blastocyst formation in patients undergoing IVF treatment, Libya

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Introduction

Socioeconomic status often dictates access to quality medical care, including assisted reproductive therapy (ART). Lower socioeconomic status has been associated with decreased access to ART and relevant treatment (1, 2). In developing countries like Libya, where access to resources and quality medical care is limited, ART poses a greater financial and emotional burden on women (3). Anti-Müllerian Hormone (AMH) is secreted at levels non-fluctuant with menstrual cycle, is an indicator of ovarian reserve, and has recently been indicated as a potential reliable predictor of in-vitro fertilisation (IVF) success (4, 5, 6) . Reliable predictions would help identify promising IVF candidates, improve resource allocation and decrease unnecessary financial and emotional burden in women.

Objectives

To analyse maternal serum concentrations of Anti-Mullerian Hormone (AMH) as a predictor for high-quality blastocyst formation compared to basal Follicle Stimulating Hormone (FSH). AMH levels may may reliably predict in-vitro fertilisation (IVF) treatment success, prevent ineffective treatment in poor prognostic cases, and allow effective treatment allocation in underdeveloped healthcare systems, like Libya’s.

References

1. Bitler, M. & Schmidt, L. Health disparities and infertility: impacts of state-level insurance mandates. *Fertility and Sterility*. 85(4): 858-865 (2006) <https://doi.org/10.1016/j.fertnstert.2005.11.038>
2. Chambers, G.M., Hoang, V.P. & Illingworth, P.J. Socioeconomic disparities in access to ART treatment and the differential impact of a policy that increased consumer costs. *Human Reproduction*. 28(11): 3111-3117 (2013) <https://doi.org/10.1093/humrep/det302>
3. Connolly, M.P. & Hoorens, S. The costs and consequences of assisted reproductive technology: an economic perspective. *Human Reproduction Update*. 16(6): 603-613 (2010) <https://doi.org/10.1093/humupd/dmq013>
4. Sadruddin, S., Barnett, B.D., Ku, L.T., Havemann, D.L., Mucowski, S.J. *et al*. Maternal serum concentration of anti-Müllerian hormone is a better predictor than basal follicle stimulating hormone of successful blastocysts development during IVF treatment. *PLOS ONE*. 15(10): e0239779 (2020) <https://doi.org/10.1371/journal.pone.0239779>
5. Sadruddin, S., Barnett, B.D., Ku, L.T., Havemann, D.L., Mucowski, S.J. *et al*. Maternal serum concentrations of follicle stimulating hormone and anti-müllerian hormone as predictors of successful blastocyst development during IVF treatment. *Fertility and Sterility* 110(4): E358 (2018) DOI:<https://doi.org/10.1016/j.fertnstert.2018.07.1001>
6. Riggs, R.M., Duran, E.H., Baker, M.W., Kimble, T.D., Hobeika, E. *et al*. Assessment of ovarian reserve with anti-Müllerian hormone: a comparison of the predictive value of anti-Müllerian hormone, follicle-stimulating hormone, inhibin B, and age. *American Journal of Obstetrics and Gynecology*. 199(2): 202.e1-202.e8. (2008) <https://doi.org/10.1016/j.ajog.2008.05.004>

Table: Comparison of treatments reflected by number of mature follicles at trigger.

<i>Parameters</i>	<i>Mature Follicles</i>		<i>P value</i>
	< 12 N= 74	12≤ N = 16	
Female age/years	34.5± 5.2	33.7± 4.9	<i>0.561</i>
Male age/years	40.9± 4.9	42.1± 6	<i>0.385</i>
Total dose	2549± 956.5	2029.6± 973.8	<i>0.053</i>
E2 level at trigger	2051.9± 801.3	2841± 451.9	<i>0.000</i>
Basal FSH	6.8± 2.2	5.8± 2.3	<i>0.095</i>
AMH level	1.8± 1.4	3.6± 1.4	<i>0.000</i>
Oocytes retrieved	5.5± 2.3	11.1± 3.6	<i>0.000</i>
Oocytes normally fertilized	2.7± 1.2	4.8± 1.9	<i>0.000</i>
High quality blasts	1.96± 0.88	2.94± 0.68	<i>0.000</i>
% of high quality blasts	75.5± 25.5	71.5± 21.6	<i>0.560</i>

Conclusion

This is a novel study done in Libya. [AMH] is a more reliable indicator of high-quality blastocyst formation compared to basal [FSH] in women undergoing IVF treatment. [AMH] integration is yet to be a routine prediction of blastocyst development. Further studies are required to determine an appropriate protocol that prioritises underdeveloped healthcare systems, and the emotional and financial burden these regions face from cultural stigma around infertility.

Methods

Design: Retrospective observational study design.

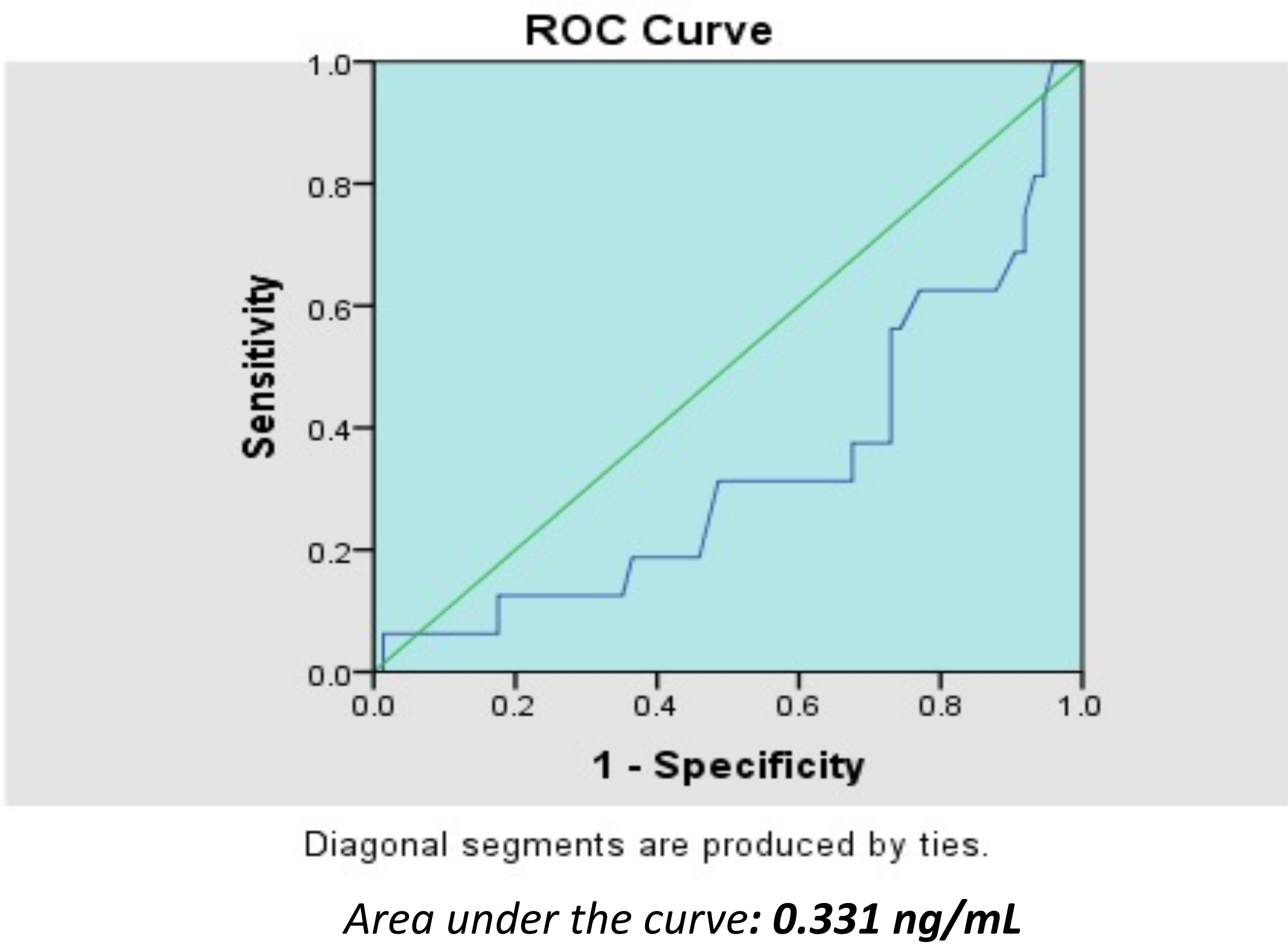
Data collection: A proforma was generated and patient sampling was based on the predetermined outcome: high-quality blastocyst formation (>/=40% fertilised oocytes developed into blastocysts per treatment). The population was patients presenting to Benghazi Teaching Hospital for Fertility and Assisted Reproduction (BTH-FAR) from 2018-2020. Inclusion criteria was limited to patients with successful blastocyst formation following *BTH-FAR’s* standardised protocol.

Data analysis: Analysis to elucidate a correlation between hormonal variables (AMH and basal FSH levels) and high-quality blastocyst formation. Deidentified data from 91 patients was retrieved. Descriptive and inferential analysis was performed using SPSS v23.

Results

Correlations between the diagnostic findings of basal [FSH], [AMH], and their predictive values in blastocyst development was examined. Data for patients who produced >= 12 mature follicles (m.f.) at trigger was compared to patients with <12 m.f. at trigger. Analysis showed significantly higher [AMH] in patients with >=12 m.f. compared to patients with <12 m.f. Additionally, higher [AMH] were associated with a lower mean of gonadotropin used per treatment. Basal [FSH] levels did not differ significantly between both categories. Results showed that [AMH] had significance over basal [FSH], according to Receiver Operating Characteristics curve (ROC) analysis (=0.819 ng/mL for [AMH] and =0.331 mIU/mL for basal [FSH]).

Basal FSH Sensitivity and Specificity



AMH Sensitivity and Specificity

