The association between anti-Müllerian
hormone and IVF pregnancy outcomes is
influenced by age

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Introduction

- Securing accurate prognostic tests for predicting pregnancy success is essential for counselling pts' chances from ART.
- Determinants of success in ART : quantity and quality of the gametes , receptivity of uterus, maternal medical condition .

- Quantitative ov reserve markers :
  – AMH
  – FSH
  – Oestradiol
  – Inhibin B
  – Antral follicle count and ov volume
- Clinical predictors for oocyte quality → lack!
- Limited predictive value for pregnancy and live birth rates with quantitative ov reserve markers alone !! (Broekmans, 2006)

- AMH vs pregnancy rates
  – predictive capability ?→ inconsistent across all studies. Kwee et al., 2008, Eldar-Geva et al., 2005, Barad et al., 2009, Wunder et al., 2008, Ebner et al., 2006 Ficicioglu et al., 2006, Hazout et al., 2004, Smeenk et al., 2007, McIlveen et al., 2007, Penarrubia et al., 2005, Gnoth et al., 2008, Fanchin et al., 2007, Broer et al., 2009

  – Small sample size with inadequate power
  – Disparities in age distribution
  – Different study designs

Aim of this study

- Analyse IVF clinical pregnancy and live birth rates utilizing only AMH as the predictor for quantitative ov reserve and patient age as the best available proxy for oocyte quality in a large sample size .

- Postulation : a significant relationship between AMH and pregnancy outcomes, but may differ by patient age group.

Material and methods

- Retrospective study , Jan 2005~Mar 2009
- 1558 couples , female age : 38± 4 yrs (22~45)
  – 1558 IVF first cycles, 691 needed second cycles
  – Total 2249 IVF cycles
- AMH was drawn 3 months before ov stimulation
- ov stimulation : standard IVF protocols
- Cycle cancellation: < 3 dominant follicles ≥ 8 mm
- Clinical pregnancy : at least 1 intrauterine FHB 4-5wks after oocyte retrieval.

Slide 1

- AMH (3 tertiles): low , middle and high (≤0.29, 0.30–1.20 and ≥1.21 ng/ml)
- Age (4 groups): <34, 34–37, 38–41 and >42 years
- Clinical pregnancy rates
  - Initial analysis (quantity) → per initiated cycle
  - Second analysis (quality) → per oocyte retrieval
- Live birth rates/ET vs AMH in different age groups

Slide 2

**Table 1.** Patient demographics and IVF cycle parameters.

	Age groups (years)			
	<34	34–37	38–41	42+
Number of patients	314	458	528	258
Number of cycles	404	633	792	420
AMH (ng/ml)	2.43 ± .14	1.56 ± 0.08	1.09 ± 0.05	0.72 ± 0.06
No. of oocytes retrieved	13.3 ± 0.4	12.0 ± 0.3	10.4 ± 0.3	8.6 ± 0.3
No. of embryos transferred	2.12 ± 0.03	2.44 ± 0.03	3.11 ± 0.05	3.40 ± 0.11

AMH = anti-Müllerian hormone.

Slide 3

- Statistical analyses
  - Logistic regression analysis (Each age groups , clinical pregnancy vs cycle cancellation vs live birth rate compared across AMH tertiles)

  - SPSS , P < 0.05

Slide 4

Result

Slide 5

Slide 6
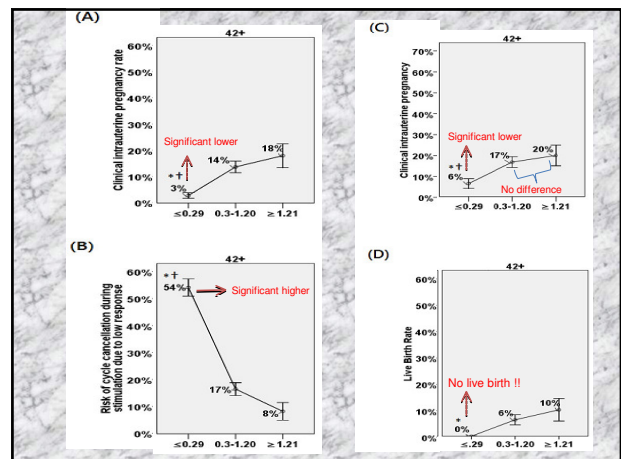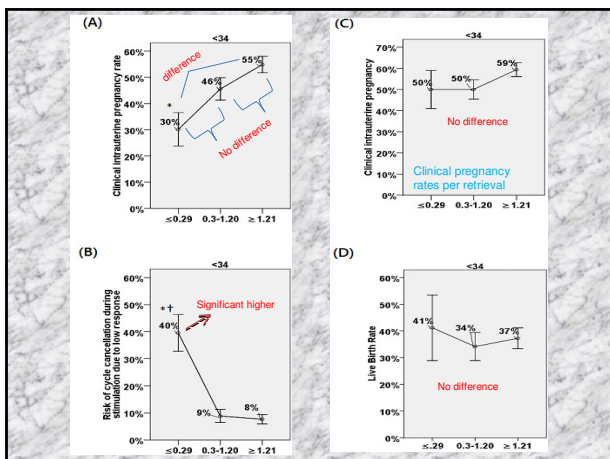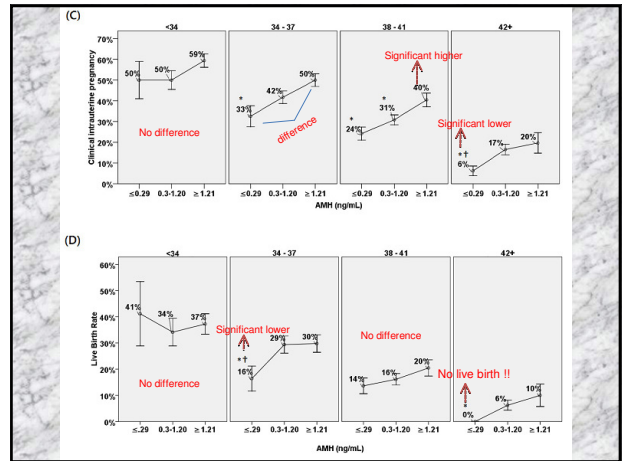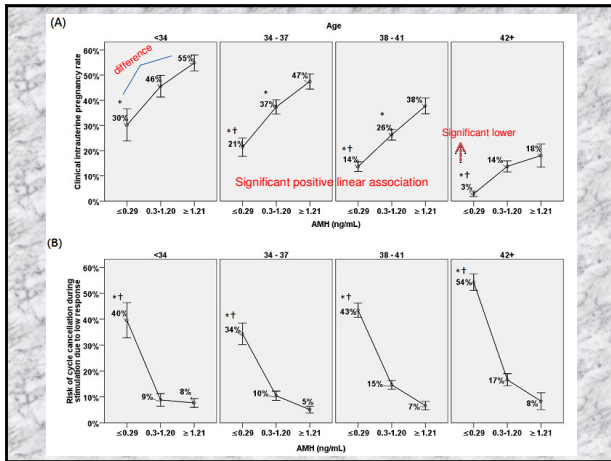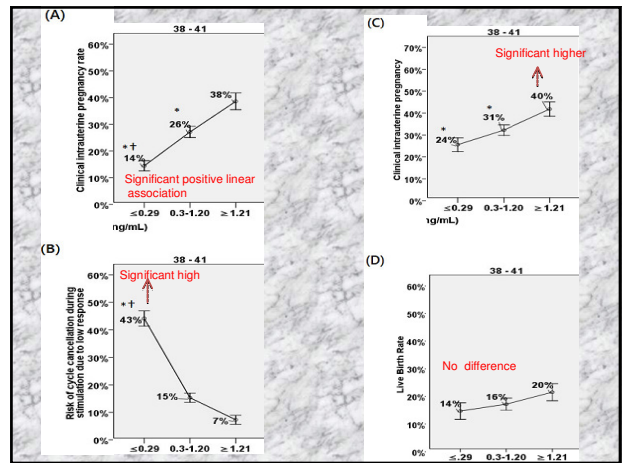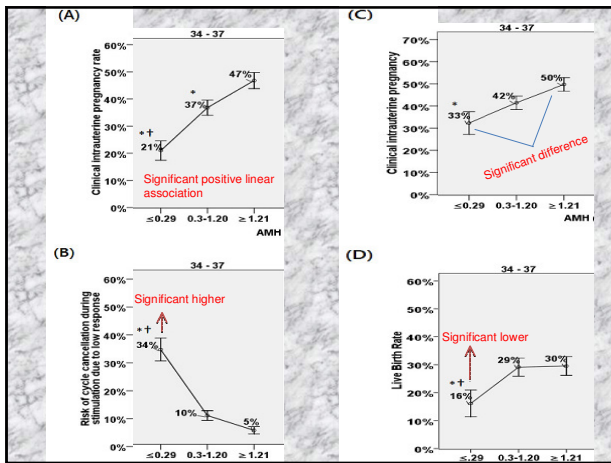
Discussion

- Prior studies about AMH and clinical pregnancy rate
  - discrepant results
    - May explain by significant positive relationship between clinical pregnancy rate and AMH , but strength is modulated by age.
  - small sample size →inadequate statistical power

- In this study : greatest clinical pregnancy rate difference between the highest and the lowest tertiles → 26%

- Factors of success of ART
  – Oocyte quantity : proportion of competent oocytes, no. of oocytes for selection and recruitment
  – Oocyte quality
    → Mainpoint : Ovarian ageing !!!

- Greater proportion of competent oocytes
  →oocytes needed to achieve pregnancy ↓

- Early and middle stage of ov ageing
  →proportion of normal oocyte ↓
  →used COH
  → oocytes retrieved per IVF cycle ↑
  → higher chance to obtain competent oocyte

- Advanced ov ageing
  → insufficiently compensate for the paucity of normal gametes even using ov stimulation
  .

- Generalized AMH threshold value for predicting pregnancy outcomes → not exist!!!
  – Oocyte quality is not accounted for by ov reserve markers alone!
  – e.g . < 34y/o, clinical pregnancy rate per retrieval not differ between higher and low AMH group .
  – e.g. Live birth rates remain the same across all AMH level in <34 y/o group .

- Low quantitative ov reserve is not associated with lower oocyte quality in young pts .
- Pregnancy prognosis remains excellent !

- **> 42y/o**
  – AMH ≤ 0.29ng/ml → 97% chance of failure per IVF cycle
    →54% chance of cycle cancellation
    →6% chance of clinical pregnancy per cycle
    →No live births were observed
  – Clinical pregnancy and live birth rates in middle and highest AMH tertiles → no difference !!

  – Higher quantitative ov reserve dose not imply better-quality oocytes.
  – Should not be falsely reassured these pt have the same prognosis as that of younger women , even with high AMH level!!!

Conclusion

- 34y/o – 41 y/o women
  – Positive linear relationship between AMH and pregnancy outcomes . (higher AMH → higher chance of pregnancy)
  – Extent of oocyte quality decline can be partially and effectively compensated by utilizing the excess oocyte reserve.
  – Clinical application of AMH as a predictor of IVF outcomes may be most appropriate in this age group.

Conclusion

- <34y/o and > 42 y/o women
  – The chance of pregnancy is predominantly determined by oocyte quality .
  – The predictive value of quantitative ov reserve diminishes.

Thank you !