EFFECT OF PARENTAL AGE ON EMBRYO SEX RATIO USING PGT DATA FROM IVF CYCLES

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Background: The human sex ratio is expressed as the proportion of males relative to females in a given population. It is a dynamic and nuanced measure that can be influenced by a wide variety of factors. Numerous studies have investigated different variables and their impact on sex ratio, including environmental exposures (e.g. tobacco use), season of pregnancy, and maternal stress.[1] As delayed childbearing becomes more prevalent, there is an increasing trend toward older first-time parents worldwide.[2] Although some studies have explored the effects of maternal and paternal age on sex ratio, almost all have exclusively looked at secondary sex ratio (SSR), or the sex ratio at birth.[3–5] While valuable, this information is inherently biased due to the inability to control for confounding factors. This may also explain the conflicting findings and lack of consistent evidence in the literature.

   In the context of assisted reproductive technology (ART), there is tremendous incentive to better understand and characterize the factors that influence sex ratio, particularly as the average age of the patient population continues to increase. Before the advent of preimplantation genetic testing (PGT), estimating the primary sex ratio (PSR), or the sex ratio at conception or fertilization, was not possible. At best, crude estimations were obtained from backward extrapolation of data obtained from spontaneous and induced abortions.[3] Today, PGT results are almost universally derived from embryo biopsies at the blastocyst stage, typically day 5 or 6 after fertilization. Utilizing this data offers a unique opportunity to better understand PSR.

Objective: Historically, studies have attempted to evaluate the effects of parental age on sex ratio using birth data which have shown mixed results. Our study aims to evaluate sex ratio using data from PGT. This information can be invaluable for counseling patients, particularly as parental age increases and more couples express interest in sex selection for family balancing.

Materials and Methods: A retrospective chart review was performed at a university-affiliated fertility center. All IVF cycles with PGT between 1/2023 and 2/2024 were included. Cycles yielding no euploid embryos or utilizing donor gametes were excluded. Chi squared and logistic regression analyses were conducted to assess whether parental age was associated with embryo sex ratio.

Result(s): 1,100 euploid embryos from 334 IVF cycles (292 patients) were included in the analysis. Paternal age ranged from 26.0 to 59.23 years with mean age of 37.0. Maternal age ranged from 26.0 to 44.7 years with mean age of 34.7 years. There were overall 625 XY embryos and 573 XX embryos (sex ratio of 109:100). Sex ratios across parental age groups are presented in Table 1. The differences in sex ratios did not reach statistical significance. Multivariate logistic regression including both paternal and maternal ages did not show significant correlation between parental age and embryo sex ratio.

Table 1: Sex ratios across parental age groups.

Paternal age (years)	25-30	30-35	35-40	40-100	*P*-value

No. of XY/XX embryos (Sex ratio)	25/14 (179:100)	209/201 (104:100)	277/230 (120:100)	114/128 (89:100)	0.103
Maternal age (years)	**25-30**	**30-35**	**35-40**	**40-100**	***P*-value**
No. of XY/XX embryos (Sex ratio)	58/45 (129:100)	289/257 (112:100)	232/226 (103:100)	46/45 (102:100)	0.717

*Sex ratios are expressed in number of XY embryos per 100 XX embryos.

Conclusions(s): A larger study is needed to validate whether there is a trend towards lower sex ratios (number of male embryos to female embryos) with increasing parental age.

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