

Factors affecting male-to-female ratio at birth in IVF/ICSI cycles

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Study Question

Are there any factors during an IVF cycle that can influence the ratio of male or female preimplantation embryos?

Summary Answer

Semen preparation technique significantly influences the male-female ratio of newborns through IVF-ICSI with a greater proportion of boys with gradients and girls with swim up.

What is Known Already

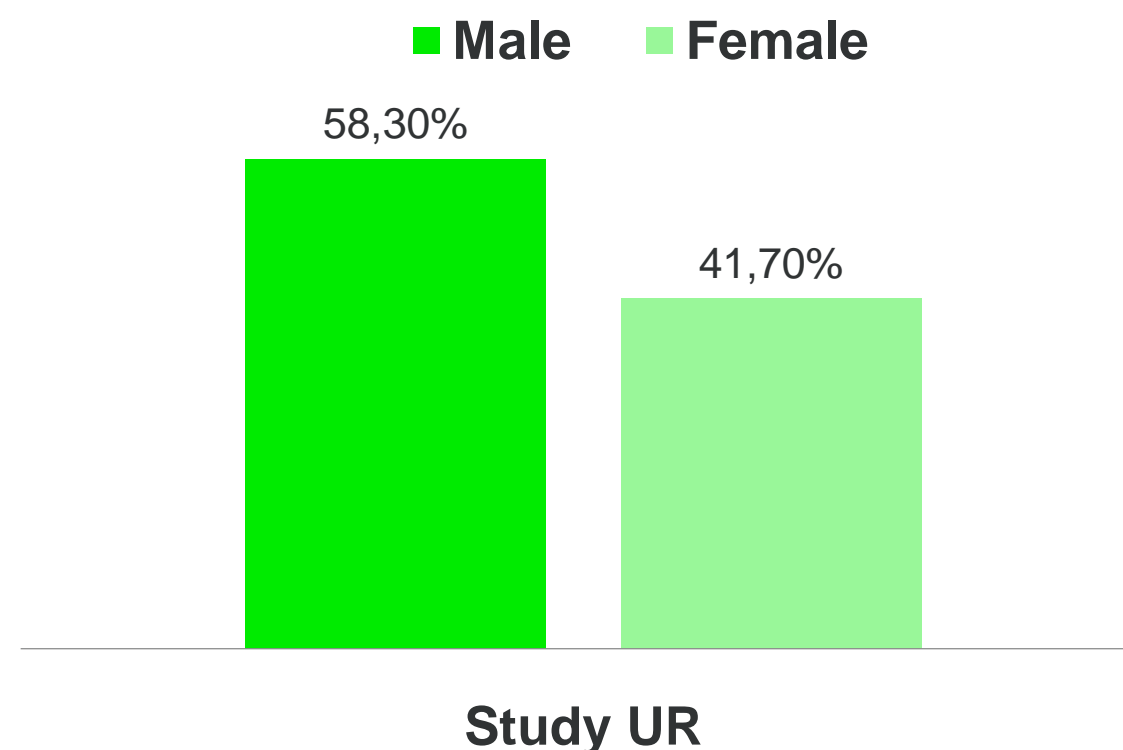
Although some works have related the fertilization technique or the transfer of blastocysts with the male-female ratio in those born through assisted reproduction, there are limited studies that investigate the relationships of the various factors involved during an IVF/ICSI cycle with the ratio male-female at birth. Furthermore, the number of studies that looked at the effect of embryo morphokinetics in sex ratio at birth, produced contradictory results.

Study design, size and duration

Retrospective, multicenter study at seven reproductive units belonging to the same center in Spain.

The study included 202 patients who underwent IVF/ICSI treatment between January 2022 and December 2022, ensuring that 100% implantation was obtained. All cycles were accomplished with time-lapse, and the transfers were performed at the blastocyst stage. The sex was confirmed at birth.

SEX RATIO



Results

223 live births were obtained: 181 single births after the transfer of one blastocyst and 42 double births of the same sex after the transfer of two blastocysts.

Among the 223 newborns included in the study, a statistically significant predominance ($p < 0.05$) of males was found: 58.3% (95%CI:51.8-64.8%) of boys (n:130) compared to 41.7% (95%CI:35.2-48.2%) of girls (n:93).

The mean age of the patients was 38.3 years (SD: 4.87), with no significant differences found regarding the sex ratio, as well as with the fertilization technique ($p = 0.937$), culture medium ($p = 0.096$), twinning ($p = 0.222$), the origin of the oocytes ($p = 0.608$), the origin of the semen ($p = 0.721$) and embryo quality ($P = 0.186$).

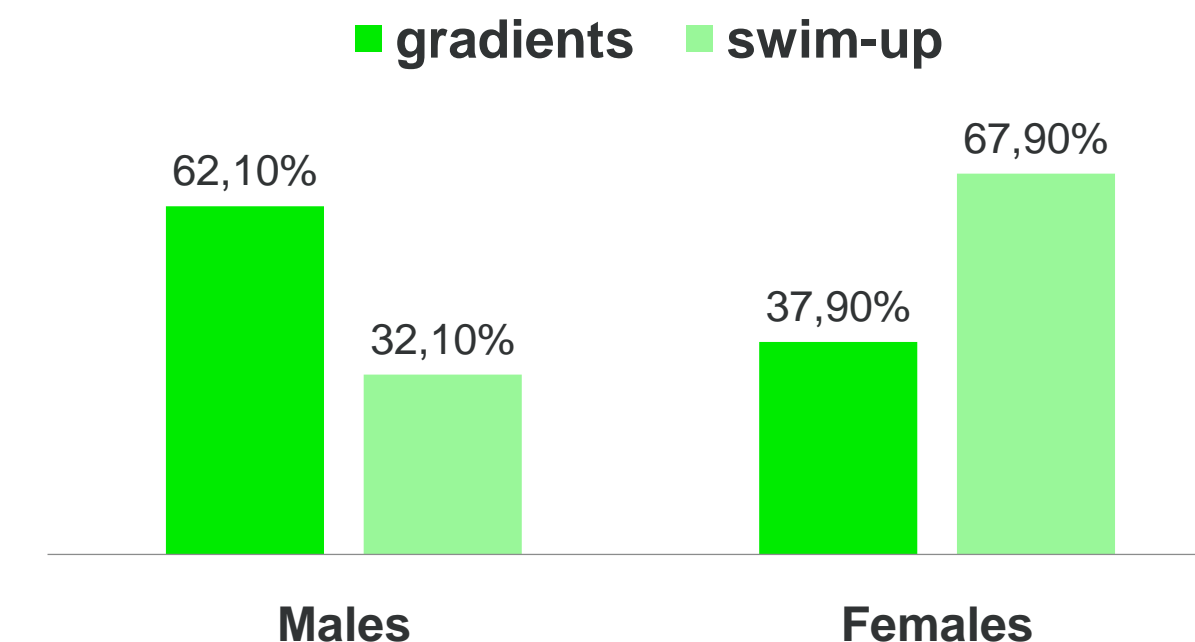
A statistically significant relationship was found between the sex of the newborn and the semen preparation technique (62.1% of male with gradients versus 32.1% with swim up, $p = 0.003$), which was confirmed using a multivariate binary logistic regression model ($p = 0.0200$).

Analyzing each of the parameters obtained from the time lapse with respect to the sex of the newborns in a univariate manner with Student's T for independent samples no significant differences were found in the division times studied or in the times of the cell cycle and synchrony.

Participant, Materials, Setting and methods

Sex ratios of 223 live births were compared regarding to fertilization method (IVF or ICSI), age, culture medium, embryo morphokinetics (t2, t3, t4, t5, tM, tSB, tBc, cc2, s2), twinship, origin of oocytes and sperm, embryo quality and sperm preparation technique (swim-up vs gradients). The Student's T test was used for metric variables and the χ^2 test for dichotomous variables ($p < 0.05$). To assess if the rest of the metric variables influenced sex, the Kolmogorov-Smirnov test and the Pearson test were used.

Sperm preparation technique



Limitations, reasons for caution

The main limitation is the necessity of a larger sample size and to further investigate the reasons for these results. Further studies with standardized culture conditions and well-justified inclusion criteria are needed to reach robust and reliable conclusion.

Wider implications of the findings

While the study needs for more extensive sample size for future research, is the first time to suggest that method of sperm preparation may have an impact on the sex ratio at birth. Understanding which factors within ART process can affect sex ratio remain important considerations.

