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PPAR α rs4253778 POLYMORPHISM AND THE EFFICACY OF ASSISTED REPRODUCTIVE TECHNOLOGIES: A COMPARATIVE ANALYSIS OF ALLELES AND GENOTYPES

Muzaffarova M. Kh.

Doctor of Medical Sciences, Institute of Reproductive
Medicine and Genetics, Tashkent

Abstract

The effectiveness of achieving pregnancy through assisted reproductive technologies (ART) may depend not only on the clinical characteristics of the reproductive system but also on genetic factors. Therefore, studying the distribution of alleles and genotypes of the rs4253778 polymorphism of the PPAR α gene, which is involved in the regulation of metabolic processes, according to ART outcomes is important from the perspective of reproductive prognostication.

Aim of the study. To assess the allele and genotype frequencies of the PPAR α rs4253778 polymorphism in infertile women undergoing assisted reproductive technologies according to IVF/ICSI outcomes and to compare successful and unsuccessful outcomes with those of the control group.

Study population. The study included 110 infertile women in the main group. Pregnancy was achieved following IVF/ICSI in 59 women (IVF/ICSI (+)), whereas ART treatment was unsuccessful in 51 women (IVF/ICSI (-)). The control group consisted of 107 women. The frequencies of alleles and genotypes of the PPAR α rs4253778 polymorphism were determined in all study participants.

Results. In the IVF/ICSI (+) group, the frequency of the G allele was 83.9%, while the frequency of the C allele was 16.1%. In the IVF/ICSI (-) group, the G



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and C alleles were detected at frequencies of 72.55% and 27.45%, respectively. In the control group, the corresponding frequencies were 78.04% for the G allele and 21.96% for the C allele.

Regarding genotype distribution, the IVF/ICSI (+) group had frequencies of 71.19% for the G/G genotype, 25.42% for G/C, and 3.39% for C/C. In the IVF/ICSI (–) group, the corresponding frequencies were 50.98%, 43.14%, and 5.88%, respectively. In the control group, G/G, G/C, and C/C genotypes were detected at frequencies of 61.68%, 32.71%, and 5.61%, respectively.

No statistically significant difference was found in the distribution of the G allele between the IVF/ICSI (+) and control groups ($\chi^2=1.6$; $p=0.49$; $RR=1.1$; 95% CI: 0.48–2.40; $OR=1.5$; 95% CI: 0.82–2.63). Similarly, no statistically significant difference was observed for the C allele ($\chi^2=1.6$; $p=0.49$; $RR=0.9$; 95% CI: 0.65–1.32; $OR=0.7$; 95% CI: 0.38–1.23).

Although the frequency of the G/G genotype was higher in the IVF/ICSI (+) group than in the control group, the difference was not statistically significant ($\chi^2=1.5$; $p=0.47$; $RR=1.2$; 95% CI: 0.46–2.87; $OR=1.5$; 95% CI: 0.78–3.04). No statistically significant difference was identified for the G/C genotype either ($\chi^2=1.0$; $p=0.56$; $RR=0.8$; 95% CI: 0.30–2.00; $OR=0.7$; 95% CI: 0.34–1.43). For the C/C genotype, the following values were obtained: $\chi^2=0.4$; $p=0.73$; $RR=0.6$; 95% CI: 0.06–6.58; $OR=0.6$; 95% CI: 0.12–2.97, with no statistically significant difference observed.

At the same time, the IVF/ICSI (+) group demonstrated higher frequencies of the G allele and G/G genotype compared with the IVF/ICSI (–) group. The G/G genotype accounted for 71.19% in the IVF/ICSI (+) group and 50.98% in the IVF/ICSI (–) group. Conversely, the G/C genotype was more frequent in the IVF/ICSI (–) group (43.14%) than in the IVF/ICSI (+) group (25.42%). These



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differences were considered observational findings, and further studies involving larger samples are required to confirm their prognostic significance.

Conclusion

Analysis according to IVF/ICSI outcomes demonstrated relatively higher frequencies of the G allele and G/G genotype among women with successful treatment outcomes. However, no statistically significant differences in allele or genotype frequencies were identified between the IVF/ICSI (+) group and the control group. Therefore, based on the available data, there is insufficient statistical evidence to consider the PPAR α rs4253778 polymorphism an independent genetic predictor of IVF/ICSI outcomes. Nevertheless, the higher proportion of the G/G genotype observed among women with successful IVF/ICSI outcomes provides a scientific basis for further investigation in this area.