Reach significance was found in the high SDF group (20.0% vs 34.4%, significant differences between groups, a lower implantation rate near to elevate DNA fragmentation and normal DNA fragmentation with respect to pregnancy outcomes in infertile men. Ooplasmic sperm DNA fragmentation repair complexes compared with conventional sperm preparation have shown that sperm DNA fragmentation correlates with adverse pregnancy outcomes in infertile men. Ooplasmic sperm DNA fragmentation repair mechanisms may occur in female gametes, mainly in young women. However, research on the impact of DNA fragmentation on LBR are limited. Also, chromosomally normal embryos analysed by PGT-A offers opportunity to isolate female factor and study male factor. The aim of this study is to assess whether high level of semen DNA damage has an impact on reproductive outcomes in terms of live birth rate.

Study question: Does sperm DNA fragmentation (SDF) by TUNEL affect reproductive success measured as live birth rate (LBR) in egg recipients after euploid embryo transfer?

Summary answer: SDF increases miscarriage rates in egg recipients with PGT-A. Therefore, live birth rates depends on sperm DNA damage in egg recipients after euploid embryo transfer.

What is known already: Sperm DNA integrity is important for optimal fertilisation, implantation and pregnancy. Although controversial, several studies have shown that sperm DNA fragmentation correlates with adverse pregnancy outcomes in infertile men. Ooplasmic sperm DNA fragmentation repair mechanisms may occur in female gametes, mainly in young women. However, research on the impact of DNA fragmentation on LBR are limited. Also, chromosomally normal embryos analysed by PGT-A offers opportunity to isolate female factor and study male factor. The aim of this study is to assess whether high level of semen DNA damage has an impact on reproductive outcomes in terms of live birth rate.

Study design, size, duration: This is a retrospective study of 467 PGT-A cycles in egg recipients. The study population consists of infertile couples for euploid embryo transfer (February 2017-November 2022). Semen samples were obtained to measure DNA damage from 447 men. PGT-A was performed in 1831 blastocysts. Trophectoderm biopsies (d5/d6 blastocysts) were analysed by NGS (Veriseq Illumina). Embryos were frozen and 568 blastocysts transferred in the subsequent cycle. Conventional hormone replacement was used for endometrial preparation in recipient patients.

Participants/materials, setting, methods: Cohort study with 447 infertile couples attending to private fertility clinic undergoing ART with their autologous semen, donated oocytes and PGT-A. SDF was measured by Terminal deoxynucleotidyl transferase-mediated dUTP Nick End Labelling (TUNEL) assay using the FITC-labelled-dUTP in situ cell death detection kit (Roche). The cohort was divided into two groups according the DNA fragmentation index (DFI): high SDF group (DFI>20%) and normal SDF group (DFI<20%). To evaluate reproductive outcomes Chi-square and Linear regression tests were used.

Main results and the role of chance: Of the 447 couples included (average paternal age 41.29 ± 7.32 years), 66.5% of male partners had normal semen parameters. We reported high sperm DNA fragmentation in 8% of patients. Overall, the embryo aneuploidy rate was 31.7%. For the further statistical analysis confounding factors such as, female and male age, embryo quality, day of embryo biopsy were included. PGT-A analysis showed an aneuploidy rate of 32.1% in the high DNA fragmentation group and 30.3% in the normal DNA fragmentation group (p = 0.453). Regarding clinical data, the overall implantation rate was 34.9%. There was no significant difference between elevate DNA fragmentation and normal DNA fragmentation with respect to biochemical miscarriage rate (4.3% vs 7.6%, p = 0.799). Although not significant differences between groups, a lower implantation rate near to reach significance was found in the high SDF group (20.0% vs 34.4%, p = 0.050). Pregnancy and clinical pregnancy rates were significantly lower in the high SDF group (26.1% vs 44.9%, p = 0.042; 21.7% vs 31.3%, p = 0.044), respectively. Also, miscarriage rate was significantly higher in the high SDF group (40% vs 12.5%, p = 0.014). Therefore, the live birth rate was significantly lower in the high SDF group (13.0% vs 32.6%, p = 0.024).

Limitations, reasons for caution: Larger studies including a higher number of samples are needed to confirm the correlation observed between LBR in egg recipients with semen DNA fragmentation. Those patients with a DFI higher than control values should be treated with antioxidants. The pregnancy outcomes should be analyzed after treatment of DNA fragmentation.

Wider implications of the findings: Our findings suggest that autologous semen DNA fragmentation influence in live birth rate in egg recipients. Our data show that live birth rates decreased in patients with a high DFI after PGT-A. This study confirms published studies in the literature showing that ART outcomes are affected by sperm DNA fragmentation.

Trial registration number: Not Applicable