

Table 1. Summary of studies on the correlation between SDF and treatment outcomes

Title	Year/ journal	Authors	Main outcome	Short conclusion
Sperm DNA damage and its impact on male reproductive health: A critical review for clinicians, reproductive professionals and researchers	2019- Expert Review of Molecular Diagnostics	Agarwal, A. et al	No clear indication when to use SDF tests	Lack of well-defined reference range. Standardization of various SDF assays will aid in establishing reference range and expanding the clinical utility of SDF testing
A search for molecular mechanisms underlying male idiopathic infertility	2018- Reproductive BioMedicine Online	Bracke, A. et al.	No clear indication when to use SDF tests	Sperm DNA integrity tests are already frequently used; however, clinical practice guidelines do not recommend the routine use of these tests in the evaluation and treatment of the infertile couple
Impact of human papillomavirus infection in semen on sperm progressive motility in infertile men: A systematic review and meta-analysis	2020- Reproductive Biology and Endocrinology	Cao, X. et Al.	SDF testing by low motility and HPV	HPV semen infection could significantly reduce sperm progressive motility in infertile individuals. Further evidences are needed to better elucidate the relationship between HPV seminal infection and sperm quality
Relationship between leukocytospermia, reproductive potential after assisted reproductive technology, and sperm parameters: a systematic review and meta-analysis of case, and control studies	2020- Andrology	Castellini, C. et al.	No clear indication to use SDF tests in cases of leuco's in semen	Leukocytospermia in men seeking consultation for couple subfertility is not associated with a reduced fertility after ART and with altered semen quality in populations asymptomatic for genital tract infection
Measuring sperm DNA fragmentation and clinical outcomes of medically assisted reproduction: A systematic review and meta analysis	2016- PLoS ONE	Cissen, M. et al.	No clear indication when to use SDF tests	Current sperm DNA fragmentation tests have limited capacity to predict the chance of pregnancy in the context of MAR. SDF tests have little or no difference in predictive value between IVF and ICSI. Further research on the

				predictive value of SDF for the chance of pregnancy after MAR.
Sperm DNA fragmentation index influences assisted reproductive technology outcome: A systematic review and meta-analysis combined with a retrospective cohort study	2019- Andrologia	Deng, C. et al.	Controversial outcome	Retrospective cohort studies: high DFI decreased the good-quality embryo rate but it did not influence the live birth rate, miscarriage rate or clinical pregnancy rate. Systemic review: high DFI is significantly associated with increased pregnancy loss, a decrease in the good-quality embryo rate and a poor clinical pregnancy rate
Sperm DNA integrity and male infertility: a narrative review and guide for the reproductive physicians	2022- Translational Andrology and Urology	Farkouh, A. et al.	No clear indication when to use SDF tests	Addressing lifestyle risks and underlying conditions, advanced sperm selection techniques have all been proposed as potential therapeutic options to lower SDF. The quality of evidence and the heterogeneity of the studies prevent to make strong recommendations regarding indications of SDF testing,
Advanced paternal age and sperm DNA fragmentation: A systematic review	2021- World Journal of Men's Health	Gonzalez, D. C. et al.	SDF in older men. No clear evidence	Older age is associated with increased DFI. In elderly men with normal semen parameters, further studies should be performed to assess the clinical implications of DFI
The impact of ejaculatory abstinence on semen analysis parameters: a systematic review	2018- Journal of Assisted Reproduction and Genetics	Hanson, B. M. et al.	Lower SDF by short abstinence	Overall, abstinence of less than 3 days was associated with significantly higher pregnancy rates and fertilization rates in IUI, ICSI, and IVF. Lower SDF after short abstinence
PICSI vs. MACS for abnormal sperm DNA fragmentation ICSI cases: a prospective randomized trial	2020- Journal of Assisted Reproduction and Genetics	Hasanen, E. et al.	Sperm selection lower rate of SDF	PICSI and MACS are efficient techniques for sperm selection in cases with abnormal sperm DNA fragmentation. MACS is preferred when the females are younger than 30 years, while PICSI is preferred in older females
Effect of varicocelectomy on sperm deoxyribonucleic acid fragmentation rates in infertile	2021- Fertility and Sterility	Lira Neto, F. T. et al.	Benefit of SDF testing in varicocele?	Pooled results from studies including infertile men with clinical varicocele indicated that varicocelectomy reduced the SDF rates. The treatment effect was greater in men with

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men with clinical varicocele: a systematic review and meta-analysis				elevated (vs. normal) preoperative SDF levels. Further research is required to determine the full clinical implications of SDF reduction for these men.
Impact of sperm DNA fragmentation on the clinical outcome of assisted reproduction techniques: a systematic review of the last five years	2023- Jornal Brasileiro de Reproducao Assistida	Lourenco, M. L. et al.	SDF indicative of negative outcome in ART	SDF increase have to be a limiting potential for ARTs. In IVF, clinical outcomes such increased abortion rates were observed. In ICSI, outcomes such as reduced live birth rate were verified. In IUI, results of reduced pregnancy rates were observed
Good practice recommendations on add-ons in reproductive medicine	2023- Human Reproduction	Lundin, K. et al.	No clear indication when to use SDF tests	ESHRE guideline: There is insufficient evidence for the relevance of SDF tests to predict pregnancy or guide treatment decisions. Further research in this field is strongly recommended
Human papillomavirus in semen and the risk for male infertility: A systematic review and meta-analysis	2017- BMC Infectious Diseases	Lyu, Z. et al.	SDF testing by HPV infection	A significantly increased risk of infertility was found for males with HPV positivity in semen (OR = 2.93, 95% CI = 2.03-4.24).
Quantifying the association of sperm DNA fragmentation with assisted reproductive technology outcomes: An umbrella review	2024- BJOG	Maghraby, H. et. al	No clear indication when to use SDF tests	No convincing or suggestive evidence linking SDF with ART outcomes. Caution should be exercised in making any claims, policies or recommendations concerning SDF.
European Association of Urology Guidelines on Male Sexual and Reproductive Health: 2021 Update on Male Infertility	2021- European Urology	Minhas, et. al	No clear indication when to use SDF tests	There is no standardised method of measuring seminal ROS, with a lack of prospective randomised controlled trials (RCTs) with appropriate cost-benefit analysis. The EAU guidelines panel for male sexual and reproductive health concluded that seminal ROS testing cannot be recommended in routine clinical practice until there is a validation of its diagnostic utility from further studies

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The effect of sperm DNA fragmentation on live birth rate after IVF or ICSI: A systematic review and meta-analysis	2015- Reproductive BioMedicine Online	Osman, A. et al.	No difference in ICSI for high SDF	IVF: men with low sperm DNA fragmentation had significantly higher LBR . A sensitivity analysis showed no statistically significant difference in LBR between low and high sperm DNA fragmentation when ICSI treatment was used. Well-designed randomized studies are required to assess the role of ICSI over IVF in the treatment of men with high sperm DNA fragmentation
DNA fragmentation in spermatozoa: a historical review	2017- Andrology	Rex, A. S. et. al	No clear indication when to use SDF tests	Although the area of DNA fragmentation in spermatozoa is highly relevant in the fertility clinics, the need for further studies focusing on standardization of the methods and clinical implementation persists.
Lifestyle-, environmental-, and additional health factors associated with an increased sperm DNA fragmentation: a systematic review and meta-analysis	2023- Reproductive Biology and Endocrinology	Szaba, A. et. al	Men at risk higher SDF	Risk factors such as varicocele, impaired glucose tolerance, testicular tumors, smoking, pollution, and paternal age of over 50 were associated with the highest SDF
Sperm selection with hyaluronic acid improved live birth outcomes among older couples and was connected to sperm DNA quality, potentially affecting all treatment outcomes	2022- Human Reproduction	West, R. et al.	Use of selected sperm to avoid SDF	The interventional avoidance of defective sperm is the best explanation for the equalization in live birth rates among older couples randomized to the trial's PICSI arm. HA-based selection of sperm for ICSI could be considered as part of their treatment plan
Second ejaculation produces good quality sperm and blastocyst and decreases the rate of unexpected ICSI cycle: a propensity score-matched analysis	2024- Middle East Fertility Society Journal	Zhang, X. et. al	Short abstinence lower SDF	Second ejaculation significantly improved sperm concentration, progressive motility before and after sperm swim-up, total progressive motility sperm count after swim-up, and decreased sperm DNA fragmentation (SDF). A significant increase in good-quality blastocyst rate was observed for second-ejaculation IVF couples.

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<p>Outcomes comparison of testicular versus ejaculated sperm for intracytoplasmic sperm injection in infertile men with high DNA fragmentation: updated systematic review and meta-analysis</p>	<p>2023- Translational Andrology and Urology</p>	<p>Zhao, G.et al. .</p>	<p>Beter outcomes using Testicular sperm</p>	<p>Compared with Ejac-ICSI, a non-significant tendency was observed for fertilization rates (FRs) in the Testi-ICSI group. However, there was significant difference pointing to better outcomes for Testi-ICSI in clinical pregnancy rates (CPRs)</p>
<p>Is sperm DNA damage associated with IVF embryo quality? A systematic review</p>	<p>2011- Journal of Assisted Reproduction and Genetics</p>	<p>Zini, A. et al.</p>	<p>No clear evidence of improved outcome</p>	<p>Evaluable studies are heterogeneous and that overall, there is no consistent relationship between sperm DNA damage and embryo quality and/or development. The influence of sperm DNA damage on embryo quality/development may be more significant in ICSI compared to IVF cycles.</p>

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