Supplementary File 1. Complete methodology with CHERRIES checklist

This was a cross-sectional global online survey regarding the practices related to sperm DNA fragmentation (SDF) (SDF) testing worldwide. The questionnaire was comprehensive and covered all aspects including indications for SDF testing, technical aspects of performing SDF testing, management of elevated SDF, and barriers to incorporating SDF into clinical practice. The survey was constructed, disseminated, and analyzed in accordance with the Checklist for Reporting Results of Internet E-Surveys (CHERRIES). The checklist is provided at the end of this file.

1. Target population

This survey was targeted toward clinicians all over the world who may utilize SDF testing in their routine patient care and practice. Urologists, andrologists, gynecologists, reproductive endocrinologists, ART specialists, and embryologists, who actively and specifically work in the field of infertility, were included. Clinicians or researchers with no experience or knowledge of SDF were excluded.

2. Questionnaire creation & structure

A preliminary draft of survey questions was compiled by senior authors (AA, RSS, AF). This was then reviewed by 30 clinicians and expert members of the Global Andrology Forum (GAF) (https://www.globalandrologyforum.com/) who routinely utilize SDF testing in their clinical practice and actively publish on SDF (AC, AH, AR, AZ, DPE, EB, ECS, EK, Fahmi B, Florence B, GC, GIR, GP, HK, IS, MG, MM, NHVP, PKK, PB, QN, RC, RFA, RH, RS, SK, SL, SS, TH, TM, TT). These experts suggested additional clinically relevant questions, refined the questions with more precision, and ensured that the answer options were comprehensive and unambiguous. All questions and options were extensively reviewed and edited to better capture the global practices related to each aspect of SDF including the various indications for testing and available treatment options. All items included a "not applicable" option to allow completeness of the responses if the participant does not encounter such a case in their practice. The final questionnaire consisted of 64 questions divided among five sections: demographic data, indications for SDF testing, technical aspects of SDF testing, management of elevated SDF, and barriers and limitations in incorporating SDF testing into clinical practice. The first two questions were identifying information (name and email address), which were asked as a quality control measure to exclude duplicates. The online survey was seven pages long with the invitation letter on the first page, each section on an individual page of varying length and the number of questions according to the respective section, and finally a page that allowed respondents to recommend other participants. The survey was constructed in a way to allow participants to move back and forth between all pages as they filled it out and they were able to change or edit responses before submitting.

3. Questionnaire dissemination

This questionnaire was made available online from April 4th 2022 to May 10th 2022 via a secure platform (SelectSurvey). This ensured the protection of participants' personal information. An invitation along with a secure link to complete the survey was sent by the GAF management team via email. The aims of the survey were explained in the invitation letter and invitees were notified that by submitting their responses, they consent to participation. The survey was initially sent out to 260 members of GAF. On the final page of the survey, responders had the option to recommend other experts who were also eligible to take this survey. The survey was also disseminated by the GAF management team via email to those recommended experts, in addition to direct communication between respondents and recommended experts. Furthermore, 21 andrology and urology professional societies helped in the dissemination of the survey to their members. These societies are listed in the acknowledgments.

4. Data collection and analysis

The raw data were extracted from the SelectSurvey platform as a CSV file. In total, 551 responses were submitted. Out of 551 responses, 115 were excluded because they were completely blank, duplicate responses, or had only answered a few questions in the demographic section. After excluding the 115 invalid responses, 436 responses were

eligible for final analysis. Incomplete responses were included, provided the respondent answered some questions beyond the demographic section. The frequencies of responses in each question were calculated using MedCalc® (MedCalc Software Ltd, Ostend, Belgium). Based on the results from MedCalc®, tables and graphs for each question were created.

Question responses were described as numbers and percentages of participants for each response. For questions where multiple responses were selected, the analysis was done based on the total number of responses for that question. Subgroup analysis was performed for certain variables where the statistical significance was obtained using the Chi-square or Fischer's exact test whenever appropriate. Statistical analysis and chart plotting were performed using R programming language version 4.1.2 with a p-value <0.05 considered statistically significant.

5. Society guidelines

Major professional society guidelines related to the diagnosis and management of infertile men and couples were screened for recommendations related to all aspects of SDF in the evaluation of an infertile couple. The following professional society guidelines were examined:

1. Diagnosis and Treatment of Infertility in Men: American Urological Association/American Society for Reproductive Medicine (AUA/ASRM) Guideline.
2. European Association of Urology (EAU) Guidelines on sexual and reproductive health and the EAU Guidelines Panel on Male Sexual and Reproductive Health: A Clinical Consultation Guide on the Indications for Performing Sperm DNA Fragmentation Testing in Men with Infertility and Testicular Sperm Extraction in Nonazoospermic Men.
3. European Society of Human Reproduction and Embryology (ESHRE) guideline: recurrent pregnancy loss.
4. European Academy of Andrology (EAA) guideline: Management of oligo-astheno-teratozoospermia.
5. Management of male factor infertility: position statement from the Italian Society of Andrology and Sexual Medicine (SIAMS).
6. Diagnosis and Treatment before Assisted Reproductive Treatments. Guideline of the German Society of Gynecology and Obstetrics (DGGG), the Austrian Society of Gynecology and Obstetrics (OEGGG), and the Swiss Society of Gynecology and Obstetrics (SGGG).

6. Expert recommendations

The Delphi method was used to develop the recommendations. This method is used to collect opinions on a particular issue in order to reach a consensus through a panel of experts using a series of questionnaires. Passing criteria are set for each recommendation. After the initial questionnaire, recommendations not meeting the criteria are revised and submitted for a second vote. Those that still do not meet the passing criteria after the second questionnaire, are then discussed and finalized in a meeting between experts.

To reach a consensus on SDF, the initial recommendations were written by the different authors responsible for writing each section. These recommendations were made based on: (1) the survey results, (2) the professional society guideline recommendations, and (3) the evidence available in the literature. A Google survey was constructed with each initial recommendation listed and participants were invited to rate it on a scale of 1–10; with 1 indicating "strongly disagree" and 10 indicating "strongly agree". A score of 7 or more indicated acceptance of the recommendation, while a score of 1–6 indicated disagreement. A space was provided below each score to allow participants to propose an alternative recommendation if they gave a score of 1–6. A passing criterion of scoring 7 or more by >80% of participants was set. A total of 18 recommendations were included in the survey. These included seven recommendations on indications for SDF testing, ten recommendations on the management of elevated SDF, and one recommendation on technical aspects related to SDF testing. An invitation email with clear instructions was sent to a selected group of GAF experts, considering a variety in age, academic position, geographical distribution, and subspecialty. The invitation included a description of the Delphi method, complete instructions, and the link to the survey. If a recommendation failed to meet the criteria on the first round, a small panel of experts (AA, RSS, RS, MA, AZ, CW, KT, AF) reviewed the respondents' comments on the failed items and alternative recommendations

were proposed. A second survey with revised alternative recommendations was then created.

Footnote: Author Initials:

AA = Ashok Agarwal; AC = Aldo Calogero; AF = Ala'a Farkouh; AH = Ahmed Harraz; AR = Amarnath Rambhatla; AZ = Armand Zini; CW = Christine Wyns; DPE = Donald P. Evenson; EB = Emre Bakircioglu; ECS = Ege Can Serefoglu; EK = Edmund Ko; Fahmi B = Fahmi Bahar; Florence B = Florence Boitrelle; GC = Giovanni Colpi; GIR = Giorgio Ivan Russo; GP = Germar Pinggera; HK = Hussein Kandil; IS = Ioannis Sokolakis; KT = Kelton Tremellen; MA = Mohamed Arafa; MG = Murat Gül; MM = Marlon Martinez; NHVP = Nguyen Ho Vinh Phuoc; PB = Ponco Birowo; PKK = Parviz K Kavoussi; QN = Quang Nguyen; RFA = Rafael F. Ambar; RC = Rossella Cannarella; RH = Ralf Henkel; RS = Ramadan Saleh; RSS = Rupin Shah; SK = Shinnosuke Kuroda; SL = Sheena Lewis; SS = Selçuk Sarıkaya; TH = Taha Abo-Almagd Abdel-Meguid Hamoda; TM = Taymour Mostafa; TT = Tuncay Toprak.

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CHERRIES Checklist

Item category & checklist item	Explanation	Section
Design		
Describe survey design	Describe target population, sample frame. Is the sample a convenience sample? (In "open" surveys this is most likely)	Target Population
IRB (Institutional Review Board) approval and informed consent process		
IRB approval	Mention whether the study has been approved by an IRB.	Not applicable
Informed consent	Describe the informed consent process. Where were the participants told the length of time of the survey, which data were stored and where and for how long, who the investigator was, and the purpose of the study?	Questionnaire dissemination
Data protection	If any personal information was collected or stored, describe what mechanisms were used to protect unauthorized access.	Questionnaire dissemination
Development and pre-testing		
Development and testing	State how the survey was developed, including whether the usability and technical functionality of the electronic questionnaire had been tested before fielding the questionnaire.	Questionnaire creation & structure
Recruitment process and description of the sample having access to the questionnaire		
Open survey versus closed survey	An "open survey" is a survey open for each visitor of a site, while a closed survey is only open to a sample which the investigator knows (password-protected survey).	Questionnaire dissemination
Contact mode	Indicate whether or not the initial contact with the potential participants was made on the Internet. (Investigators may also send out questionnaires by mail and allow for Web-based data entry)	Questionnaire dissemination
Advertising the survey	How/where was the survey announced or advertised? Some examples are offline media (newspapers), or online (mailing lists – If yes, which ones?) or banner ads (Where were these banner ads posted and what did they look like?). It is important to know the wording of the announcement as it will heavily influence who chooses to participate. Ideally the survey announcement should be published as an appendix.	Questionnaire dissemination
Survey administration		
Web/E-mail	State the type of e-survey (e.g., one posted on a Web site, or one sent out through e-mail). If it is an e-mail survey, were the responses entered manually into a database, or was there an automatic method for capturing responses?	Data collection and analysis
Context	Describe the Web site (for mailing list/newsgroup) in which the survey was posted. What is the Web site about, who is visiting it, what are visitors normally looking for? Discuss to what degree the content of the Web site could pre-select the sample or influence the results. For example, a survey about vaccination on a anti-immunization Web site will have different results from a Web survey conducted on a government Web site	Questionnaire dissemination
Mandatory/voluntary	Was it a mandatory survey to be filled in by every visitor who wanted to enter the Web site, or was it a voluntary survey?	Questionnaire dissemination
Incentives	Were any incentives offered (e.g., monetary, prizes, or non-monetary incentives such as an offer to provide the survey results)?	Not applicable
Time/date	In what timeframe were the data collected?	Questionnaire dissemination
Randomization of items or questionnaires	To prevent biases items can be randomized or alternated.	Not applicable
Adaptive questioning	Use adaptive questioning (certain items, or only conditionally displayed based on responses to other items) to reduce number and complexity of the questions.	Not applicable

Item category & checklist item	Explanation	Section
Number of Items	What was the number of questionnaire items per page? The number of items is an important factor for the completion rate.	Questionnaire creation & structure
Number of screens (pages)	Over how many pages was the questionnaire distributed? The number of items is an important factor for the completion rate.	Questionnaire creation & structure
Completeness check	It is technically possible to do consistency or completeness checks before the questionnaire is submitted. Was this done, and if "yes", how (usually JAVAScript)? An alternative is to check for completeness after the questionnaire has been submitted (and highlight mandatory items). If this has been done, it should be reported. All items should provide a non-response option such as "not applicable" or "rather not say", and selection of one response option should be enforced.	Questionnaire creation & structure
Review step	State whether respondents were able to review and change their answers (e.g., through a Back button or a Review step which displays a summary of the responses and asks the respondents if they are correct).	Questionnaire creation & structure
Response rates		
Unique site visitor	If you provide view rates or participation rates, you need to define how you determined a unique visitor. There are different techniques available, based on IP addresses or cookies or both.	Not applicable
View rate (Ratio of unique survey visitors/unique site visitors)	Requires counting unique visitors to the first page of the survey, divided by the number of unique site visitors (not page views!). It is not unusual to have view rates of less than 0.1 % if the survey is voluntary.	Not applicable
Participation rate (Ratio of unique visitors who agreed to participate/unique first survey page visitors)	Count the unique number of people who filled in the first survey page (or agreed to participate, for example by checking a checkbox), divided by visitors who visit the first page of the survey (or the informed consents page, if present). This can also be called "recruitment" rate.	Not applicable
Completion rate (Ratio of users who finished the survey/users who agreed to participate)	The number of people submitting the last questionnaire page, divided by the number of people who agreed to participate (or submitted the first survey page). This is only relevant if there is a separate "informed consent" page or if the survey goes over several pages. This is a measure for attrition. Note that "completion" can involve leaving questionnaire items blank. This is not a measure for how completely questionnaires were filled in. (If you need a measure for this, use the word "completeness rate")	Not applicable
Preventing multiple entries from the same individual		
Cookies used	Indicate whether cookies were used to assign a unique user identifier to each client computer. If so, mention the page on which the cookie was set and read, and how long the cookie was valid. Were duplicate entries avoided by preventing users access to the survey twice; or were duplicate database entries having the same user ID eliminated before analysis? In the latter case, which entries were kept for analysis (e.g., the first entry or the most recent)?	Not applicable
IP check	Indicate whether the IP address of the client computer was used to identify potential duplicate entries from the same user. If so, mention the period of time for which no two entries from the same IP address were allowed (e.g., 24 hours). Were duplicate entries avoided by preventing users with the same IP address access to the survey twice; or were duplicate database entries having the same IP address within a given period of time eliminated before analysis? If the latter, which entries were kept for analysis (e.g., the first entry or the most recent)?	Not applicable
Log file analysis	Indicate whether other techniques to analyze the log file for identification of multiple entries were used. If so, please describe.	Not applicable
Registration	In "closed" (non-open) surveys, users need to login first and it is easier to prevent duplicate entries from the same user. Describe how this was done. For example, was the survey never displayed a second time once the user had filled it in, or was the username stored together with the survey results and later eliminated? If the latter, which entries were kept for analysis (e.g., the first entry or the most recent)?	Questionnaire creation & structure

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Item category & checklist item	Explanation	Section
Analysis		
Handling of incomplete questionnaires	Were only completed questionnaires analyzed? Were questionnaires which terminated early (where, for example, users did not go through all questionnaire pages) also analyzed?	Data collection and analysis
Questionnaires submitted with an atypical timestamp	Some investigators may measure the time people needed to fill in a questionnaire and exclude questionnaires that were submitted too soon. Specify the timeframe that was used as a cut-off point, and describe how this point was determined.	Not applicable
Statistical correction	Indicate whether any methods such as weighting of items or propensity scores have been used to adjust for the non-representative sample; if so, please describe the methods	Not applicable

This checklist was obtained from the article of Eysenbach et al (J Med Internet Res 2004;6:e34) [12]. https://doi.org/10.2196/jmir.6.3.e34