Exploring statistical analysis in medical research: A journey of self, with a statistician or both

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Medical research is the core of clinical practice and its advancements, eventually leading to evidence-based practices. In any academic writing, a statistician is involved in various stages of research, from the initial planning phase to the final analysis, to ensure accuracy and transparency in scholarly manuscripts.[1] Biostatistics is a pivotal tool in any biomedical research, and inadequate knowledge of biostatistical fundamentals can have far-reaching consequences, even incorrect method selection or misrepresentation of data.[2,3] We assessed the current state of statistical analysis in research papers published in the Indian Journal of Anaesthesia (IJA) by a Google survey-based questionnaire. The primary objective was to gain insight into how authors engaged with statistical analysis, collaborated with a statistician, their training in statistics and their confidence in interpreting the statistical observations.

Data for this was collected over one month by sending a survey questionnaire of 10 questions to 44 random corresponding authors of original research articles recently published in IJA, using Google Forms to collect responses. The survey questions were pre-validated by experts with vast experience in research and biostatistics. Each question was strategically prepared to explore various aspects of statistical analysis in research papers. The participants were informed about the anonymity and confidentiality of all responses to the survey. Out of 44 authors contacted via email, 20 participants responded. After completing the study, we downloaded the data into a Microsoft Excel sheet and summarised the data by radar charting [Figure 1].

The study revealed that collaboration with statisticians is widespread among authors. Among the respondents, 36% involved the statistical department of their institutes, while 40% engaged private statisticians. This diversity in collaboration strategies highlights the acknowledgement of the complexity inherent in statistical analysis.[4-8] Moreover, 24% of participants conducted statistical analysis themselves, demonstrating their willingness to be deeply involved in research methodology using basic and advanced statistical techniques. Authors with varying levels of statistical knowledge bring different perspectives to research, which is a good thing. It means they can offer unique and valuable insights.[6-9] A significant observation from the study was that a substantial number of authors (72%) lacked formal training or coursework in statistics, with only 22% having completed relevant coursework or formal statistical training. This observation prompts early collaboration with experts in biostatistics.[6-10] Nevertheless, it underscores a distinct requirement for enhanced statistical education, especially within medical research. Enhancing statistical literacy among authors can lead to better informed decisions during
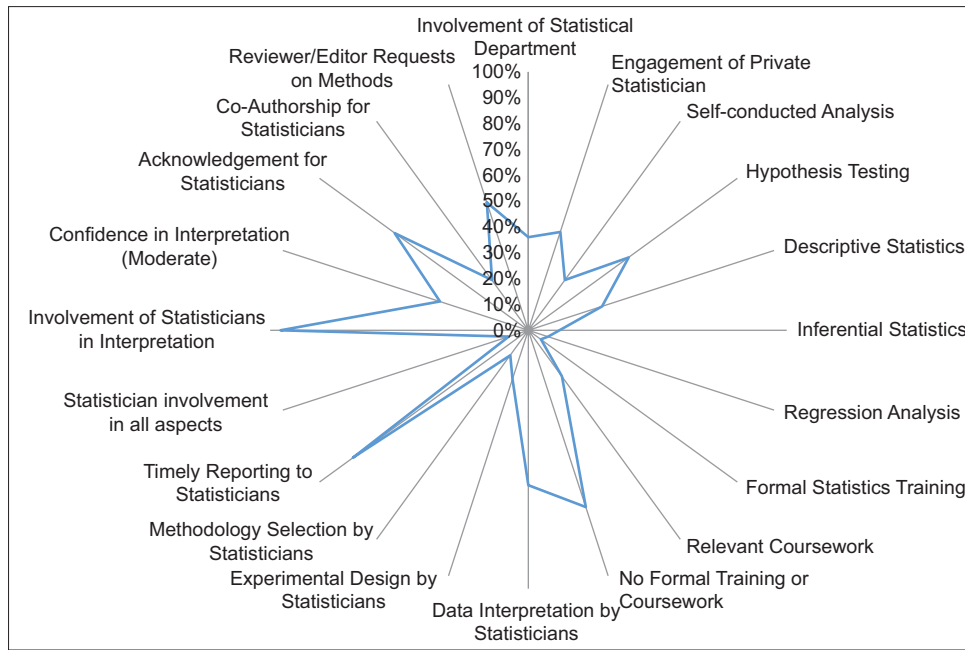
Figure 1: Summary of survey findings

study design, data collection and analysis, ultimately improving the research quality.[8-12]

The authors' varied confidence levels in interpreting and communicating statistical results were another notable aspect of the study. Although most respondents indicated a moderate confidence level, there was some variability in their responses.[13-16] Addressing this inconsistency through targeted training and support from journals can empower authors to engage more effectively with statistical methodologies. The study further revealed that many authors have been asked to provide additional resources and justification for the statistical analysis used in their research. This common occurrence underscores the rigorous scrutiny of research papers.[14-17] Furthermore, insufficient comprehension of the mathematical principles underpinning statistical techniques and statistical fundamentals may result in inappropriate utilisation of software packages and data errors, necessitating reanalysis of statistical data during the review process.[16-20]

We also explored authors' perspectives on recognising statisticians in research publications. Most respondents (64%) favoured acknowledging statisticians in the acknowledgement section of research papers. However, 20% considered statisticians eligible for co-authorship. Acknowledgement follows established ethical norms and recognises statisticians' assistance without

assigning authorship.[8-11] Conversely, co-authorship signifies statisticians' substantial contribution and collaborative role in the research.[12-17] The nuanced viewpoints emphasise the importance of transparent communication between authors and statisticians to ensure that recognition aligns with the nature and extent of their involvement.[5,6,18-21] It is worth noting that there may be constraints or guidelines for naming statisticians as co-authors, which could potentially hinder collaboration. Nevertheless, collaborative efforts between researchers and statisticians are critical for ensuring robust study designs, accurate analyses and meaningful interpretations.[22]

Authors should view the feedback provided by reviewers or editors as an opportunity to improve the clarity and comprehensiveness of their statistical methods sections.[5-7,9,11-17] By providing comprehensive descriptions of statistical analyses, authors can ensure that readers and reviewers can assess the robustness of the study design and validity of the conclusions drawn.[4-11,19,23,24] Transparent reporting enhances research credibility and contributes to scientific knowledge advancement.[22-24]

The study's limitations include a restricted survey of only corresponding authors from IJA, potentially not representing all authors' perspectives, and a small sample size. Expanding the study to authors from a broader range of journals could yield more comprehensive insights.

In conclusion, the survey highlights several essential aspects of the collaboration of statisticians, authors and research publications. Collaboration with statisticians is ubiquitous, and authors employ diverse strategies to ensure robust statistical analysis. Transparent reporting of statistical methodologies is essential for research reproducibility and integrity. Effective collaboration between authors and statisticians can lead to more robust research outcomes and higher-quality publications, ultimately advancing the field of anaesthesiology and scientific research.

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