



दिल्ली विश्वविद्यालय
University of Delhi

Diversity in Science Grant 2024

Beyond Stereotypes: A Comparative Analysis of Fellowships, women's representation in Indian Science Academies

Parneeta Chaudhary¹; Renu Deswal^{2*}

Parneeta Chaudhary¹

School of Engineering & Technology, Vivekananda Institute of Professional Studies – Technical Campus, AU- Block (Outer Ring Road), Pitampura, Delhi - 110034, India.

¹Orcid Id: [0000-0003-4314-3573](https://orcid.org/0000-0003-4314-3573)

Renu Deswal^{2*}

*Corresponding Author: Professor Renu Deswal

^{1*}Molecular Physiology and Proteomics Laboratory, Department of Botany, University of Delhi, Delhi-110007, India.

^{1*}Orcid Id: [0000-0002-7298-1050](https://orcid.org/0000-0002-7298-1050)

Background

Women's participation in STEM education is vital for achieving the United Nations' SDG 5 on Gender Equality and SDG 4 on Quality Education. These goals aim to tackle challenges like the under-representation of women in STEM and the biased recognition of their contributions in scientific advancements. Promoting gender equality in STEM fields is essential for empowering women and driving societal development through diverse perspectives (**Fig. 1**). Despite women comprising half of the global population, their intellectual potential remains under-utilized in scientific fields. This proposal aims to assess gender representation in Indian science academies like INSA, IASc, and NASI. By understanding the existing disparities, the study will offer recommendations to foster greater gender equity, ensuring that women have equal access to STEM education and research opportunities and contributing to a more inclusive and innovative scientific community. Achieving these goals is crucial for the 2030 Agenda for Sustainable Development.



Fig. 1 Illustration showing how gender equality or diversity leads to better decision-making and knowledge outcomes, with diverse individuals collaborating and sharing ideas for innovative solutions.

Objective:

1. To analyze gender biases in fellowship awards, women in leadership roles, and their ratio to male scientists, with recommendations for improvement.
2. To investigate participation patterns of women researchers in STEM, differentiating between independent researchers and those collaborating with spouses or close associates.
3. To examine the representation of women researchers from rural versus urban communities.

Project Implementation

- The proportion of women fellows across three main Indian science academies (INSA, IASc, NASI) was compiled from their official websites (www.insaindia.res.in, www.ias.ac.in, www.nasi.org.in).
- Data focused on three categories of women researchers:
 - decipher the uneven and biased participation patterns in awarding of fellowships, women at leadership positions, and their ratio against the male scientists: The data included fellows' institutes, awards, specialization, academic details, and women.
 - Women from urban and rural backgrounds
 - Partnering women researchers (working with spouses/close relatives): To gather additional data, 126 women researcher fellows were contacted via email. A questionnaire was used

to collect information on their educational background, rural/urban origins, challenges faced, and other relevant issues.

Outcomes

The comparative analysis conducted as part of this study highlighted significant gender disparities in fellowship distribution within India's leading science academies (**Fig. 2**). For example, INSA has awarded fellowships to over 1,000 scientists since its founding, with only 11% of those fellowships granted to women (**Fig. 3**). Although this proportion has increased slightly in recent years, the gender imbalance remains stark. Similar trends were observed in other academies, such as NASI and IASc, where women remain underrepresented in leadership roles (**Fig. 5**).

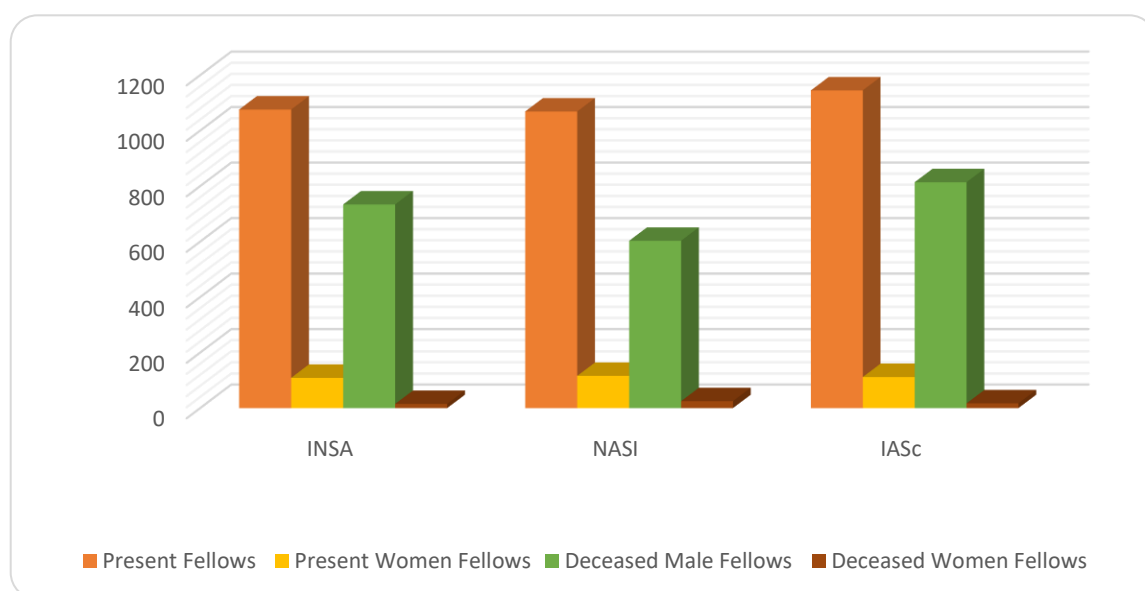


Fig. 2. Bar graph illustrating the total number of fellows in each academy, categorized by gender (male vs. female). The x-axis represents the major three academies, while the y-axis indicates the total number of fellows.

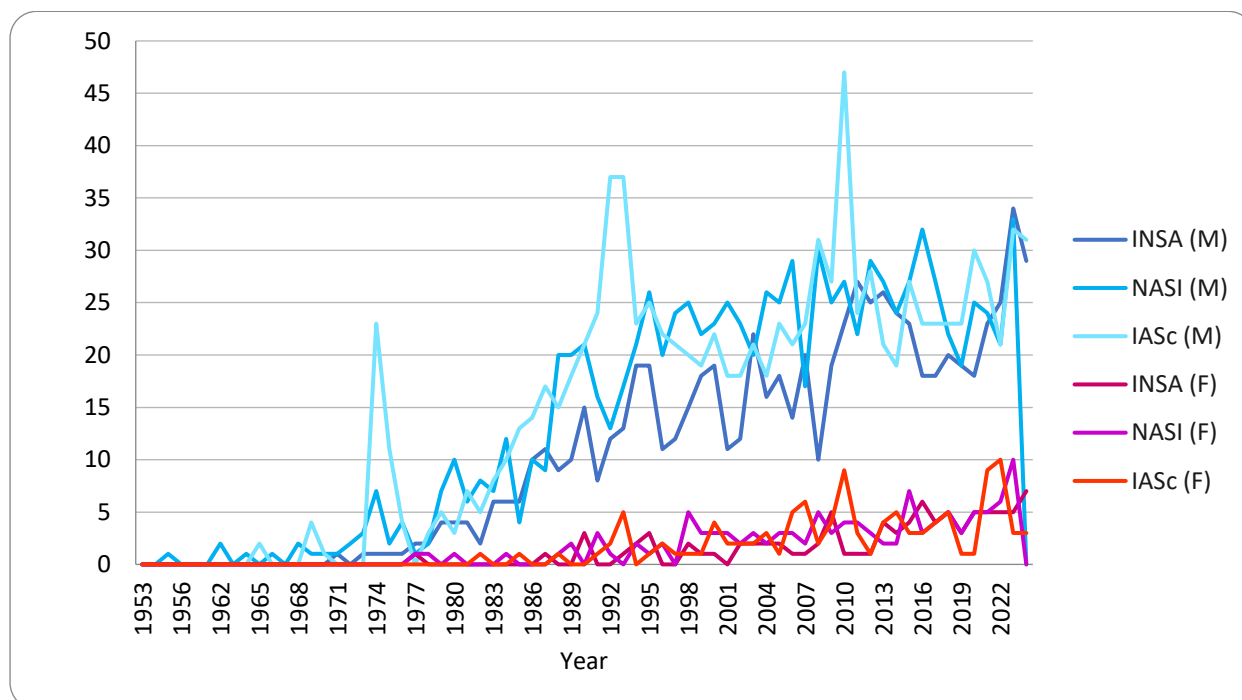


Fig. 3. Graph showing the number of male vs. female fellows awarded each year by science academies. The x-axis represents the number of fellows, while the y-axis shows the year of award/election. INSA (M/F) refers to male/female fellows awarded by the Indian National Science Academy, NASI (M/F) to those awarded by The National Academy of Sciences India, and IASc (M/F) to those awarded by the Indian Academy of Sciences.

The study also included a statistical analysis to understand the degree of gender disparity in fellowship awards. Further investigation revealed that women receive only 11.41% of fellowships annually across these three academies, far below the global target of 35% female representation in academia (**Fig. 4**). These findings are particularly alarming given the growing participation of women in STEM education. The study also identified specific fields where gender disparities are more pronounced. For example, women are better represented in fields like physics, plant science, and medicine, while disciplines like mathematics, earth sciences, and chemistry show significant gender gaps. Additionally, the study revealed that women who collaborate with spouses or close family members represent a notable portion of the female fellows, suggesting that collaboration dynamics might influence fellowship outcomes. However, the underrepresentation of rural women in science remains a significant challenge. Data limitations, including a lack of comprehensive data on rural scientists, made it difficult to assess the representation of women from rural backgrounds.

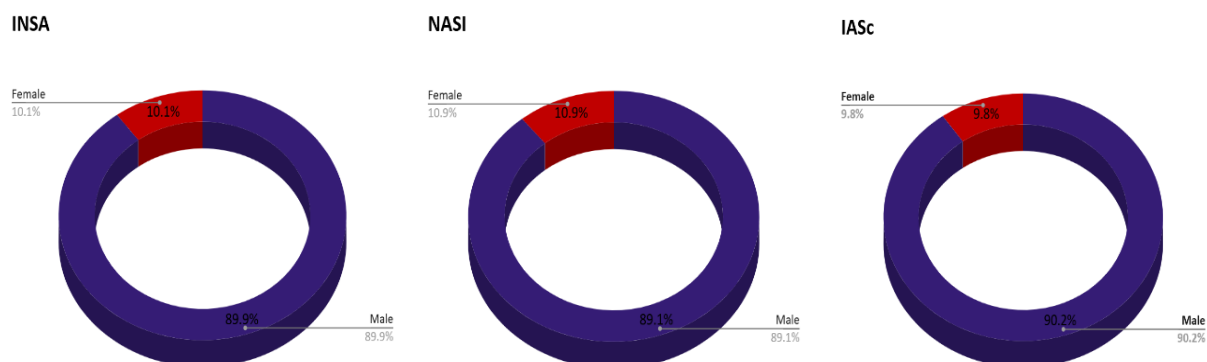


Fig. 4. Pie-chart illustrating the percentage of elected fellows in three academies, categorized by gender (male vs. female).

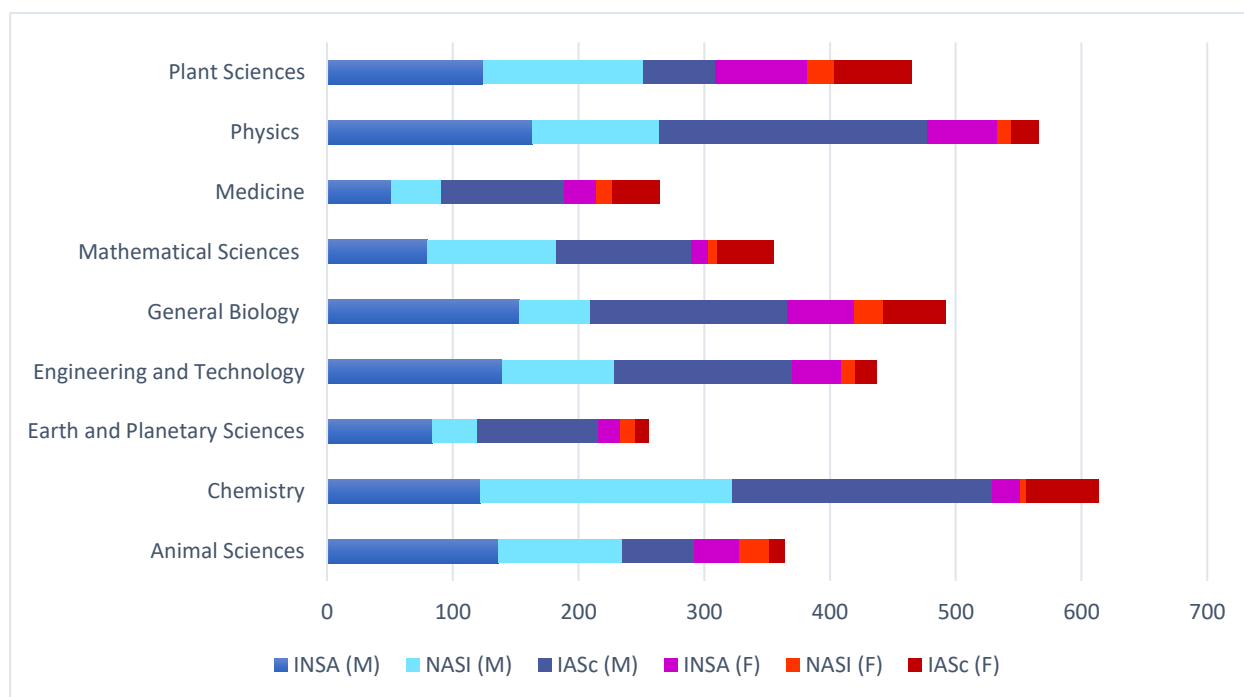


Fig. 5. Graph illustrating the various sets of specializations within each academy, highlighting the comparison between male and female representation across these specializations. The x-axis represents the number of fellows, while the y-axis represents area of specializations.

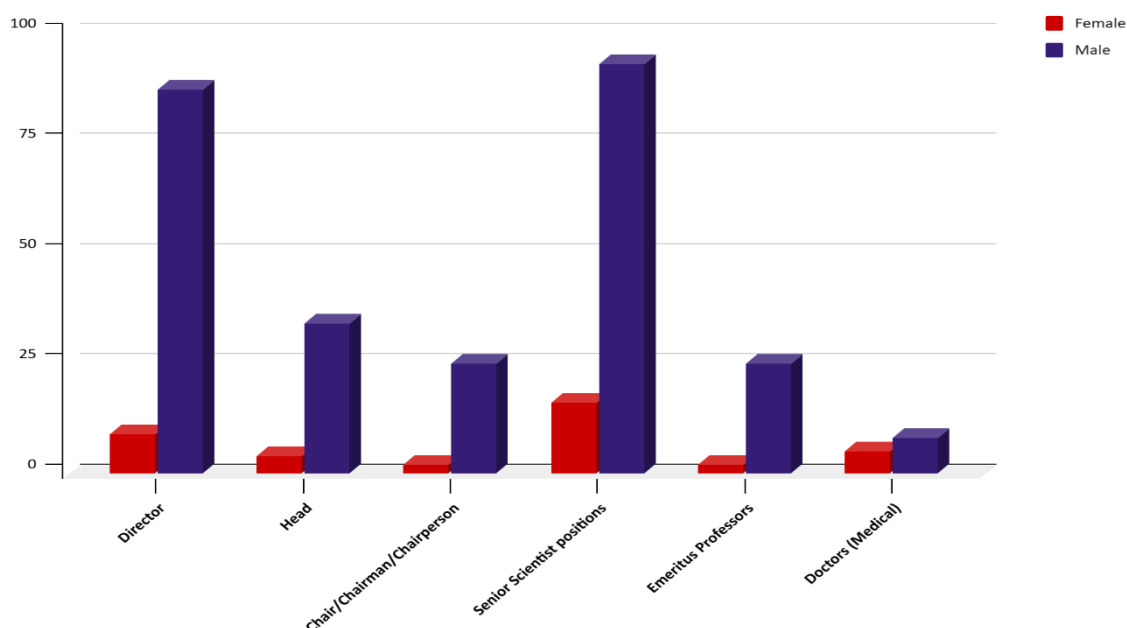


Fig. 6. Graph illustrating the leadership position, highlighting the comparison between male and female representation. The y-axis represents the number of males v/s females, while the x-axis represents different leadership positions.

Future Plans:

1. **Advocacy for Gender-Responsive Policies:** Promote policies that ensure equal access for women to grants, fellowships, and leadership roles in science academies.
2. **Expanded Data Collection:** Broaden data collection and make it public to include more rural women, helping to identify and address their unique challenges in STEM.
3. **Support for Rural Women:** Develop pathways for rural women to access STEM education and research, including scholarships and improved infrastructure.
4. **Mentorship and Networking:** Expand mentorship programs and networking opportunities for women scientists at all career stages, especially in under-represented fields.
5. **Outreach Initiatives:** Increase awareness of scientific opportunities in rural areas to encourage greater female participation in STEM.
6. **Regular Gender Equity Audits:** Conduct ongoing audits to evaluate and improve gender equality initiatives in scientific institutions.

Recommendations

- Encourage women to apply for projects, funding, publications, and awards, fostering a supportive environment.

- Evaluate individual publications separately from team efforts, giving more weight to solo contributions.
- Initiate programs to increase female applications for grants, fellowships, and recognition.
- Ensure an equal number of male and female applications are forwarded for fellowship awards.
- Provide mentorship and networking opportunities to support career advancement.
- Highlight the achievements of female scientists in publications, conferences, and awards.
- Adopt policies for work-life balance, such as flexible hours and family support systems.
- Conduct regular gender equity audits to assess progress.
- Foster an inclusive culture where all voices are valued in research and decision-making.
- Offer language support and digital literacy programs for non-English and rural scientists.
- Conduct outreach initiatives in rural areas to raise awareness of opportunities.
- Promote urban-rural collaborations through joint projects and exchange programs.

Conclusion

This project has highlighted significant gender disparities in fellowship distribution across Indian science academies, particularly focusing on the under-representation of women in leadership roles and key scientific recognitions (**Fig. 6**). The study has provided valuable insights into the challenges faced by women researchers, including unconscious bias, limited mentorship opportunities, and work-life balance pressures. By implementing policies that promote gender equity, targeted mentorship programs, and systemic changes to reduce bias, India can foster a more inclusive and supportive scientific environment. Ensuring equal opportunities for women in STEM will empower women and drive progress and innovation in science, benefiting society.



Acknowledgements

Prof. Renu Deswal thanks the London Biochemical Society's Diversity in Science Grant for financial support of the study.

Declaration of Interest statement

Authors declare no financial and personal relationships with other people or organizations that could inappropriately influence or bias their work.

Author contribution statement

PC was responsible for the collection, sorting, and analysis of the data, as well as the drafting of the manuscript. RD contributed to the study's conceptualization, provided critical revisions to the manuscript, and supervised interpreting the results. Both authors reviewed and approved the final version of the manuscript.

Fundings

This research work was funded by the London Biochemical Society's Diversity in Science Grant, 1 Naorji Street, London WC1X 0GB. Registered address: First Floor, 10 Queen Street Place, London EC4R 1BE. The funds were granted to Prof. Renu Deswal.

Conflicts of interest

The authors declare that they have no conflict of interest.