



The landscape of postdoctoral research in India: opportunities, challenges, and recommendations

Sriparna Chatterjee^{1,2} · Nishant Chakravorty^{1,3} · Pooja Devi^{1,4} · Rajendra Singh Dhaka^{1,5} · Arnab Dutta^{1,6} · Sugandha Maheswary^{1,7} · Praveen Kumar^{1,8} · Chirasree RoyChaudhuri^{1,9}

Received: 23 December 2024 / Accepted: 18 March 2025 / Published online: 3 April 2025
© Indian National Science Academy 2025

Abstract

The landscape of postdoctoral research in India is characterized by both opportunities and challenges. Over time, significant evolution has been witnessed, supported by diverse funding agencies and academic institutions. However, postdoctoral fellows face various hurdles, including limited fellowship durations, administrative obstacles, and uncertainties in the job market. To gain comprehensive insights into these experiences, a nationwide survey was conducted by the Indian National Young Academy of Sciences (INYAS), gathering responses from 189 postdoctoral researchers. The survey illuminated the motivations, aspirations, and concerns of postdoctoral fellows in India. While many respondents pursue postdoctoral positions to gain research experience and enhance their skill sets, they encounter challenges in accessing state-of-the-art facilities and securing job opportunities post-training. Moreover, preferences for postdoctoral destinations and funding agencies underscore the need for increased awareness and streamlined application processes. Emphasizing job security, research skills development, and career advancement, the survey highlights the priorities and expectations of postdoctoral researchers. In response to these findings, a set of recommendations is proposed to address existing challenges and enhance the postdoctoral experience in India. These include increasing fellowship numbers and durations, fostering inter-institutional collaborations, minimizing biases in recruitment, and supporting career development, particularly for women researchers. Implementation of these recommendations can contribute to building a more robust and supportive research ecosystem, promoting talent growth and retention within the country. This endeavor aims to contribute to ongoing discussions regarding the enhancement of the postdoctoral experience and the advancement of research endeavors in India.

Keywords Postdoctoral fellows · Career · Challenges · Opportunities · STEM

✉ Sriparna Chatterjee
inyasindia@gmail.com

¹ Indian National Young Academy of Science (INYAS),
INSA, New Delhi 110 002, India

² CSIR-Institute of Minerals and Materials Technology,
Bhubaneswar 751013, India

³ Indian Institute of Technology Kharagpur,
Kharagpur 721302, India

⁴ CSIR-Central Scientific Instruments Organisation,
Chandigarh 160030, India

⁵ Indian Institute of Technology Delhi, Hauz Khas,
New Delhi 110016, India

⁶ Indian Institute of Technology Bombay, Powai,
Maharashtra 400076, India

⁷ Indian Institute of Technology (IIT) Roorkee,
Roorkee-Haridwar Highway, Roorkee, Uttarakhand 247667,
India

⁸ Indian Association for the Cultivation of Science,
Kolkata 700032, India

⁹ Indian Institute of Engineering Science and Technology,
Shibpur, West Bengal 711103, India

Background

Postdoctoral fellowships play a pivotal role in nurturing an individual's research and innovation drives while serving as a transitional phase in their journey toward an independent research career (Laudel and Gläser 2008). Postdoctoral researchers make substantial contributions to the research output of academic institutions and research organizations, often resulting in publications, patents, and the advancement of new technologies. The experience gained during this phase enhances their research skills and encourages collaborations, ultimately benefiting the scientific community (Weijden, et al. 2016). In the Indian context, the landscape for postdoctoral fellows has evolved over the years, reflecting the country's commitment to fostering a robust scientific and research ecosystem (Lakhotia 2015; Muniyappa 2007). India has made significant strides in providing opportunities for research careers including supporting postdoctoral research through several funding schemes across various disciplines by several government-funded agencies, academic institutions, and research organizations. The Department of Science and Technology (DST), Council of Scientific and Industrial Research (CSIR), Indian Council of Medical Research (ICMR), and the University Grants Commission (UGC) are among the key organizations providing financial support for postdoctoral research (Muniyappa 2007). These fellowships often come with a stipend, travel allowances, and other benefits, enabling postdoctoral fellows to focus on their research without being burdened by financial constraints. Additionally, collaborations with international institutions are actively encouraged, providing exposure to a global research environment.

Challenges and the need for systemic reform

Despite the available opportunities, postdoctoral fellows in India face numerous challenges affecting their career progression and overall journey (Muniyappa 2007). These challenges include the typically limited duration of fellowships, spanning from one to three years, which can create pressure to deliver substantial research outcomes within a short timeframe (<https://indiabioscience.org/columns/indian-scenario/is-india-ready-to-boost-its-post-doctoral-training>). Furthermore, the availability and access to state-of-the-art infrastructure and resources including essential facilities and equipment varies across institutions, further complicating the postdoctoral experience (<https://indiabioscience.org/columns/indian-scenario/is-india-ready-to-boost-its-post-doctoral-training>; Sharma

2024). Additionally, the transition from a postdoctoral position to a faculty or permanent research position is not very easy and rather competitive. The lack of clear career pathways and job security may discourage talented researchers from exploring postdoctoral opportunities in India (Muniyappa 2007; <https://indiabioscience.org/columns/indian-scenario/is-india-ready-to-boost-its-post-doctoral-training>). Apprehensions related to bureaucratic procedures, administrative obstacles, availability of funding opportunities, and challenges with transition to permanent positions all impact research productivity and quality (Singhvi 2022) and lead to missed opportunities. Recently, Nxele highlighted postdoctoral researchers' challenges and proposed a wish list outlining the key measures to improve their professional lives (Nxele 2024). It is realized that the postdoctoral experience, while rewarding, is fraught with instability and financial strain. Globally, postdoctoral and early-career researchers receive structured support through well-defined fellowship programs, mentorship opportunities, and institutional career development initiatives. Countries such as the United States, the United Kingdom, and Germany have established funding bodies like the National Science Foundation (NSF), the UK Research and Innovation (UKRI), and the German Research Foundation (DFG) that provide competitive grants, dedicated career transition support, and interdisciplinary collaboration opportunities (Woolston 2020). However, in India well-structured support system for postdoctoral fellows is missing although India has made notable progress through initiatives like the National Postdoctoral Fellowship (NPDF) by the Science and Engineering Research Board (SERB), and the Ramanujan and Ramalingaswami Fellowships, aimed at attracting and retaining scientific talent (Gupta and Sharma 2021). Long-term funding security, institutional research autonomy, and postdoctoral career pathways within academia and industry remain major concern to ponder upon (Dasgupta 2022). Addressing these concerns through employment stability, fair pay, mentorship, and transparent hiring would create a more supportive environment for postdocs, benefiting both researchers and the academic community as a whole. An interaction with early career researchers also underscores the need for institutional support, mentorship, and inclusive policies to support them in academia (Ie et al. 2024) and it calls for ongoing discussions and systemic changes to create a more diverse and equitable research environment.

Survey findings and data analysis

In light of the above facts and reports, as the only recognized young science academy in the country, the Indian National Young Academy of Science (INYAS), a think tank



of researchers voicing for science promotion in the country, developed a questionnaire for a nationwide survey in the year 2022 (Please see, Supplementary document) that aimed to obtain feedback from the post-doctoral fellows, and early

career scientists/faculties working in India to comprehend their perspectives, expectations, and suggestions for establishing an efficient "Brain Pool" ecosystem in the country. The survey was aimed to provide a reality check of facts

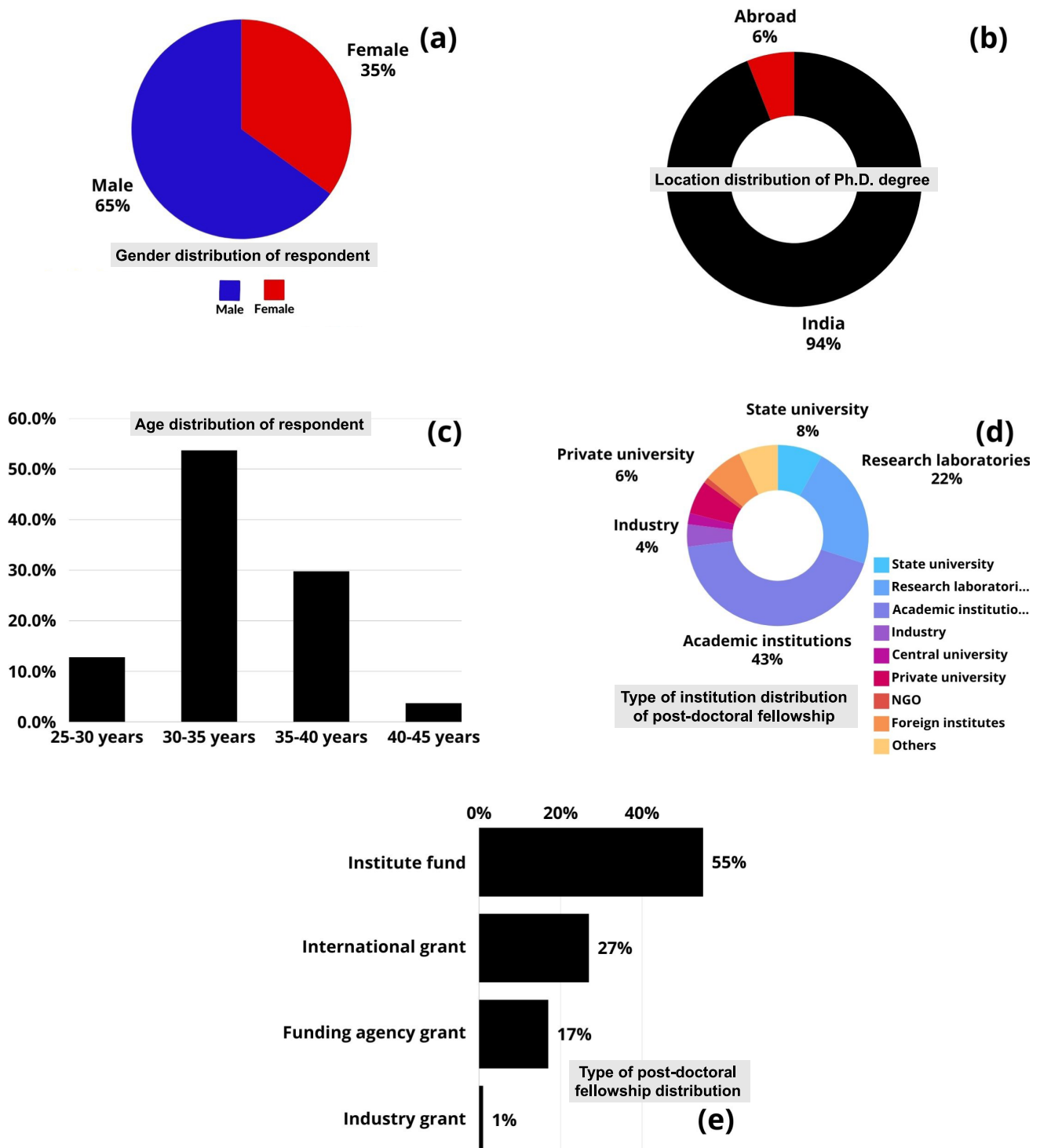


Fig. 1 Distribution of the respondents based on **a** gender, **b** the country of doctoral degree awarded, **c** age of the respondents (Y-axis represents percentage response), **d** type of institution of post-doctoral fellowship availing/availed, **e** type of post-doctoral fellowship availing/availed

and figures of postdoctoral fellowships in India. It gathered feedback from 189 respondents, comprising 65% male and 35% female participants (Fig. 1a). In this article, we present a summary of the survey findings, aiming to consolidate efforts toward enhancing the postdoctoral experience, providing greater support for career development, and streamlining administrative processes. These endeavors aim to foster a more dynamic and sustainable research ecosystem in India. Recognizing the pivotal role of postdoctoral fellows and addressing their needs will not only benefit individual researchers but also contribute significantly to the overall advancement of science and technology in our country. The vast majority of respondents for the survey (approx. 94%), with only a few exceptions, obtained their doctoral degrees from India (Fig. 1b), covering national laboratories, universities, institutes of national repute, and others. Over half of the survey respondents were individuals aged 30–35 (Fig. 1c).

The survey results also indicate that most respondents are conducting their postdoctoral research at academic institutions (Fig. 1d), including IITs, NITs, and IISERs, and are primarily funded by the respective institutes (Fig. 1e).

The post-PhD career opportunities are aimed at gaining further research experience, developing new skills, and establishing an independent research profile in an academic or industry setting (Singhvi 2022). During this time, post-doctoral researchers often work under the guidance of a senior researcher or join research groups and institutions that align with their research interests. On average, the duration between completing a Ph.D. and starting a post-doctoral position ranges from a few months to a couple of years (Sharma 2024). The exact duration of the time gap is observed to be dependent on various factors such as the availability of postdoctoral positions in the desired research

area, the competitiveness of the job market, networking opportunities, and the success of securing funding or fellowships. In response to the survey, all respondents confirmed to have secured post-doctoral opportunities at some point in time post-PhD; amongst which an overwhelming majority (80.3%); secured within a year of their PhD. More than half of the respondents secured post-doctoral positions within six months (63.3%) and 38.3% secured them immediately after PhD (38.3%) (Fig. 2a). A concerning trend emerges from our analysis: when the time span between earning a Ph.D. degree and starting a Post-doctoral position is less than 6 months (Fig. 2b), the proportion of female respondents is notably lower compared to males. Conversely, as this time gap widens, the ratio of females to males increases. This suggests that female researchers encounter challenges in securing immediate opportunities following their Ph.D. completion. Such findings underscore the existence of a "leaky pipeline" within STEM fields, highlighting the need to address the limited opportunities available for female Ph.D. holders. The time gap between PhD and post-PhD opportunities depends on several factors that include the search for an appropriate field of study, availability of research and funding opportunities, personal circumstances, etc. It is worth noting that some researchers are unable to secure a post-doctoral position immediately after their Ph.D. and instead engage in short-term research projects or internships while actively seeking postdoctoral opportunities. This may result in a time gap between their Ph.D. and post-Ph.D. endeavors. It is noticed that factors like regional disparities, limited research opportunities, personal circumstances like maternity gap, unavailability of fellowships, change in the research area, etc., are considered as the reasons for increasing time gap between PhD and post-PhD opportunities. However, it may be suggested that consulting with academic advisors,

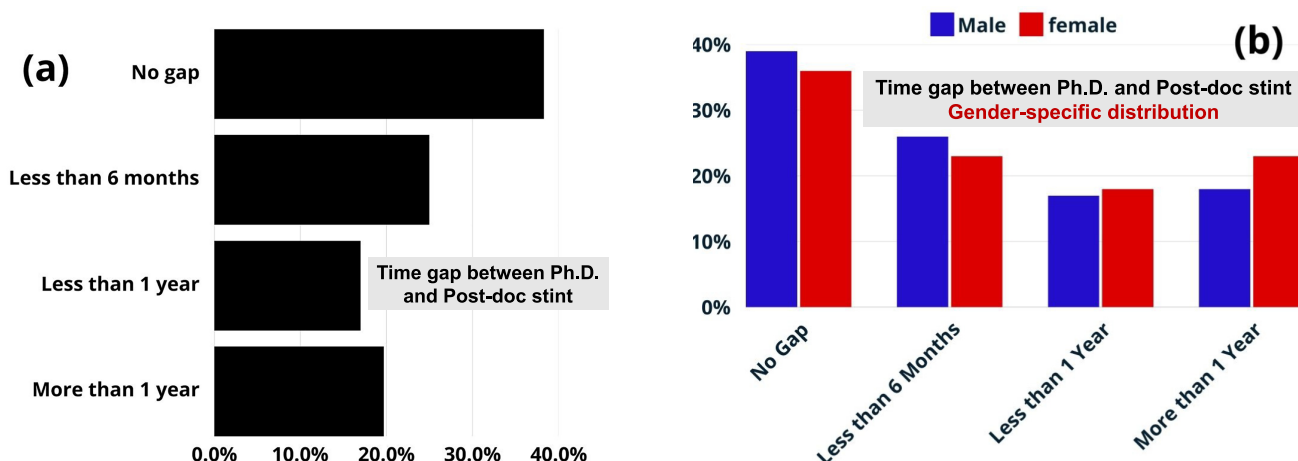


Fig. 2 **a** Distribution of the respondents based on the time gap between the Ph.D. and the start of the Post-doctoral stint, **b** gender-specific distribution of the respondents based on the time gap between the Ph.D. and the start of the Post-doctoral stint



and mentors, or conducting targeted research in the desired research field may provide more insights into the regional dynamics of postdoctoral opportunities (<https://indiabioscience.org/columns/indian-scenario/is-india-ready-to-boost-is-post-doctoral-training>; Singhvi 2022).

Our survey analysis indicates that the majority of the respondents have availed at least one post-doctoral position during their careers. To explore the motivations driving this decision, the respondents had to answer the question seeking their reasons for pursuing post-doctoral research following their doctoral degree. Many participants offered multiple explanations, with some providing their own reasons beyond the options provided in the question. Analysis of the data revealed four primary motivations for recent Ph.D. graduates to pursue post-doctoral research experiences. The most popular option opted by ~76% of respondents emerged from this study was “Interested to gain experience as an independent researcher/ team leader in academic institutions/ research laboratories/industry”. Additionally, 41% of respondents indicated dissatisfaction with job opportunities immediately after obtaining their Ph.D., while 17% opted to explore opportunities outside of academia. Furthermore, 7.4% of participants mentioned “following the trend” set by their peers as their reason for pursuing a post-doctoral stint. Therefore, the dataset suggests that (a) recent Ph.D. graduates often feel ill-prepared for employment, leading them to seek further opportunities to refine their skills before entering the job market. Additionally, (b) it's evident from the survey that many Ph.D. degree holders struggle to find suitable job openings immediately after completing their studies. This highlights a lack of tailored job prospects for Ph.D. graduates, as the current market tends to favor bachelor's or master's degree holders, leaving Ph.D. graduates potentially overqualified. However, there exists a demand for independent academics or group leaders in certain industry sectors, where post-Ph.D. experience is valued positively. Consequently, pursuing post-doctoral research positions has become a common practice for Ph.D. graduates in India. Graduates from esteemed Indian research institutions such as IITs, IISERs, NITs, CSIR labs, and top-tier universities frequently pursue post-doctoral positions both domestically and internationally, which significantly contributes to their career advancement. This trend influences the next generation of researchers, who often seek to emulate this trajectory. Such inclinations may be influenced by the abundance of academic post-doctoral fellowship opportunities at both national (SERB-NPDF, Kothari Fellowship, IPDF at various IITs, IISERs, etc.) and international levels (Rhodes Scholarship, Humboldt Fellowship, Marie-Curie Fellowship, Raman-Charpak Fellowship, Fulbright Fellowship, etc.). The limited job opportunities immediately after 1–2 years of post-doctoral tenure also is an alarming factor for the candidates to go for more than one post-doctoral training

(<https://indiabioscience.org/columns/opinion/the-curious-case-of-the-missing-indian-postdoc>).

The survey also tried to understand the choice of post-doctoral tenure location as well as the funding agency by the candidates (<https://indiabioscience.org/columns/opinion/the-curious-case-of-the-missing-indian-postdoc>). Majority of the respondents (61.2%) did not consider India as the primary choice for postdoctoral fellowship experience as seen from Fig. 3a. To understand the preferred destination for postdoctoral positions outside India, the Borda count method was employed, Europe emerged as the preferred location for postdoctoral stints over the USA, with Australia ranking third and Asia fourth in terms of preference (Fig. 3b). Interestingly, both male and female respondents exhibited a similar trend of preference (Fig. 3c).

This could also be due to the limited post-doctoral positions within the country. To mitigate this, there needs to be an increase in the number of available fellowships, along with efforts to diversify funding sources and streamline application procedures. Further, the survey revealed that within India, the majority of the respondents are relying on funding agencies like SERB and DST for funding (Fig. 3d). The next major choice of funding for postdoctoral fellowships is either through the institute or by CSIR. Surprisingly, funding agencies such as UGC, DoS, DRDO, and ICMR are less preferred options. This could be due to various reasons, including limited awareness of available funding opportunities, complex application procedures, or perceived inadequacies in terms of support offered by these agencies (Singhvi 2022). To address this issue, enhancing awareness about the funding opportunities provided by these agencies and simplifying the application process could encourage more researchers to consider them as viable options. Additionally, ensuring transparency and efficiency in the disbursement of funds could improve the appeal of these agencies among researchers (Singhvi 2022). INYAS has also steered efforts in this direction through its flagship program PRAYOJAN (Post-PhD: Research, Academia, and Industry Opportunities, science Journalism, grAnt writing and Networking) (<https://inyas.in/category/inyas-flagship-programs/prayojan/>). The program aims to provide awareness about career opportunities post-Ph.D. in academic, industrial, academic publishing, and science communication domains. It also aims to give information about national and international post-doctoral opportunities, workshops on grant writing, and proposal building (<https://inyas.in/category/inyas-flagship-programs/prayojan/>). Thus, funding agencies can connect the potential candidates through this popular platform for wide awareness and visibility.

Regarding the availability of postdoctoral fellowships within India, 83% of respondents expressed dissatisfaction with the current number of opportunities. When asked about the factors influencing their choice of destination for

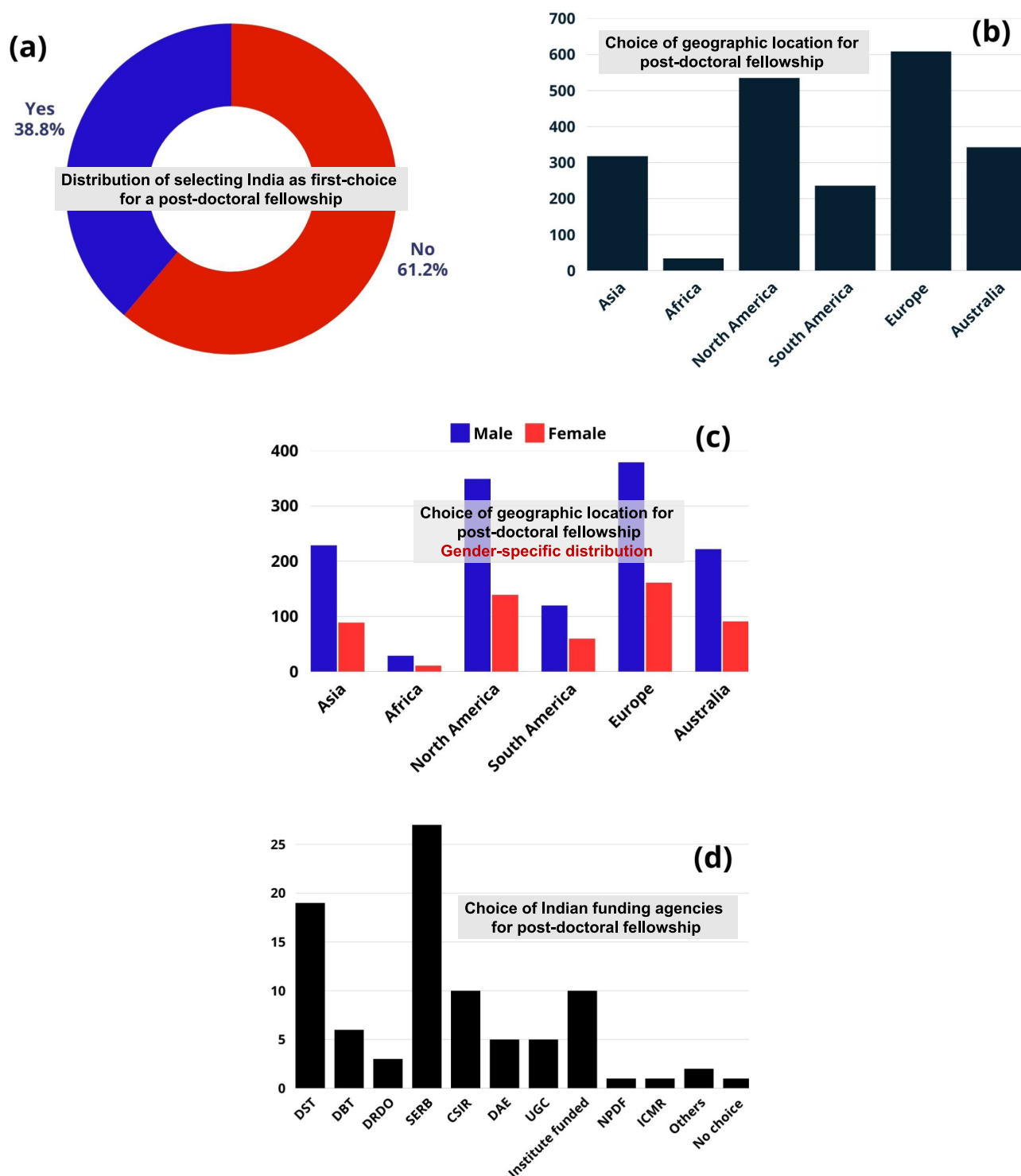


Fig. 3 **a** Distribution of responses of selecting India as first-choice for a post-doctoral fellowship, **b** distribution of responses based on the preferred choice of geographic location for post-doctoral tenure, **c** gender-dependent distribution of responses based on the preferred

choice of geographic location for post-doctoral tenure, **d** distribution of responses based on the preferred choice of funding agencies for a post-doctoral fellowship in India. The y-axis of **c**, **d** represents the Borda counts for each region

a postdoctoral position, several key considerations emerged. The availability of modern research facilities in the laboratory was the top priority for the majority of respondents (64.4%). Additionally, the reputation and expertise of the prospective supervisor played a crucial role, with 57.4% of participants citing this as a significant factor. Other important considerations included the merit of the potential research project (46.8%), the reputation of the university/institute (45.7%), and the quantity of the fellowship (45.7%). Furthermore, the job potential of the research field was also taken into serious consideration by 35.6% of Ph.D. graduates when selecting their next venture.

Insights from the analysis

Overall, the survey result indicates that the graduating Ph.D. students consider themselves under-prepared for the job market as they continue to search for positions, where they can learn new cutting-edge technologies to improve their profile. A similar trend in thought can be seen as students tend to align themselves with "famous" or "high-profile" researchers to enhance their curriculum vitae. The results showcase that the students perceive the association with high-profile lab/faculty members as a vital aspect of their career as they may help them to get an appropriate job. Post-doctoral fellowship applicants are also wary of the potential of upcoming projects and their relevance in the ever-evolving job market. Additionally, the fellowship amount during post-doctoral work has emerged as one of the critical factors in selecting their next destination. The findings also suggest that graduating students are willing to learn new skills, and are adaptable to venture into new fields as per the demand of the job market. In recent years, the migration of a significant number of basic science graduates (from Chemistry, Physics, and Mathematics) into diverse interdisciplinary fields like materials and chemical biology, biomedical imaging, informatics, etc. possibly corroborates this trend.

Further, to delve deeper into the primary objective of a postdoctoral fellowship, a multiple-choice-based question was posed, with four options representing the most common goals. An overwhelming majority of respondents (87.2%) mentioned "honing new research skills" as the primary reason. Publishing in top-tier peer-reviewed journals was also mentioned by a large proportion of respondents as their goal (68.6%) for a post-doctoral stint. Nearly half of the respondents (46.8%), of the participants, considered networking among their peers in the research field to be an important factor. Interestingly, nearly 3 out of every 10 respondents (29.3%) aimed for a better teaching and administrative experience during their tenure. These findings are in alignment with our findings related to the reason(s) for selecting a post-doctoral group. Enhancing their research profiles

with new skills is one of the top priorities for PhD graduates during their post-doctoral tenures. This suggests that graduates from India often feel inadequately equipped in terms of research skill set development (<https://indiabioscience.org/columns/indian-scenario/is-india-ready-to-boost-its-post-doctoral-training>). The lack of state-of-the-art infrastructure and narrowed research projects in the majority of the Indian research labs are possibly reflected in such responses (Singhvi 2022; Agashe et al. 2022). Limited opportunities for participating in teaching and administrative duties in Indian academia have been highlighted in the responses to this particular question. In India, teaching assistantships for Ph.D. students are majorly restricted to the grading of examination answer scripts/assignments and are usually devoid of the opportunity for in-class teaching experience. Additionally, the current pedagogic engagements do not allow the Ph.D. or post-doctoral fellows to have a direct insight into the administration duties of an Indian academician, which is regarded as one of the key verticals. The responses to the survey also highlight the lack of scope for career mentoring/counseling or the development of soft skills during their post-doctoral training (Fig. 4a).

The majority of post-doctoral researchers express a desire to remain in academia (84%), yet a significant portion is open to exploring alternative opportunities. Specifically, 60.1% expressed interest in joining the R&D divisions of industries, while 31% expressed their interest in industrial research division positions. With the burgeoning Indian startup job market, 15.4% of post-doctoral students indicate readiness for such roles. Moreover, leading research publishing houses like the American Chemical Society, Royal Society of Chemistry, Wiley, Elsevier, and Cell Press have actively recruited students for science editing and communication roles, a relatively new job profile. Approximately 61% of participants showed a willingness to engage in science writing-related jobs. However, there is a recognized need for essential support regarding science communication among Indian postdoctoral fellows, which is currently lacking (Fig. 4b). This data highlights that while the Indian post-doctoral community primarily seeks academia-related positions, they are also open to transitioning into industrial and editorial job markets given the right opportunities and support provisions.

To assess disparities in job opportunities following the completion of Indian postdoctoral training, the questionnaire asked about job opportunities post-training, and the findings are both surprising and concerning. Only 11.2% of candidates reported success in securing a job after a national postdoctoral position, while 48.9% stated otherwise, and 39.9% remained uncertain (Fig. 4c). This raises questions about potential biases or inadequacies in training for Ph.D. candidates pursuing national postdoctoral fellowships. It is imperative to conduct follow-up investigations to

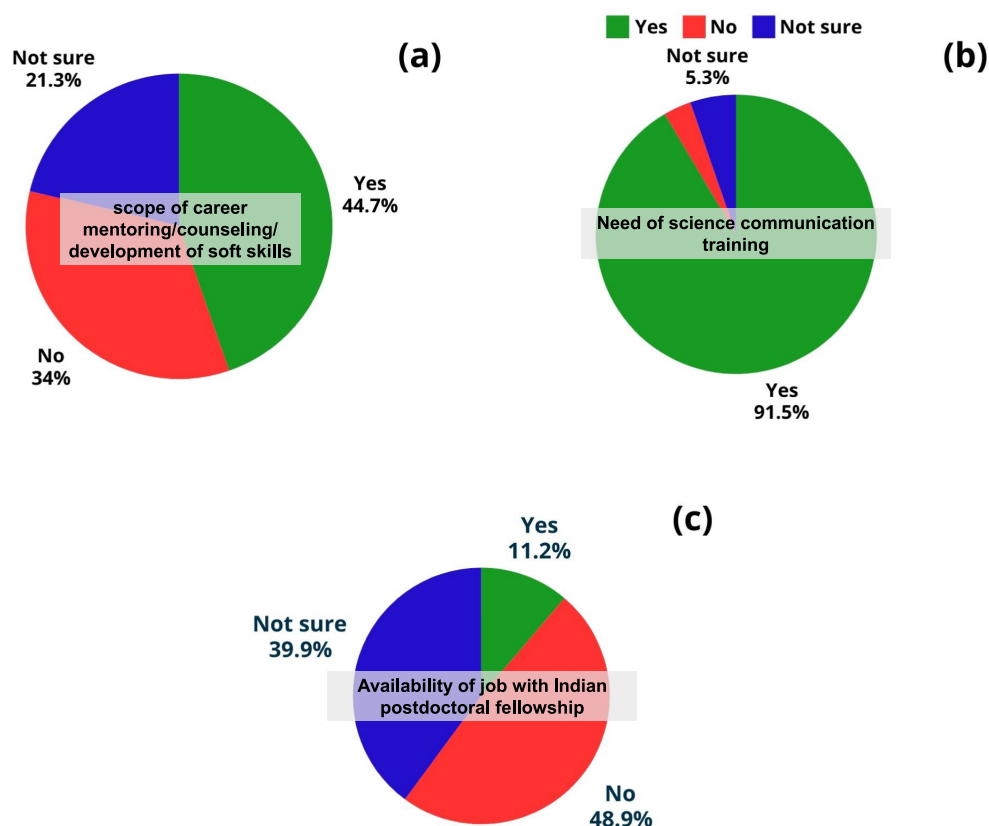


Fig. 4 **a** Distribution of responses based on having a scope of career mentoring/career-counseling/development of soft skills during post-doctoral tenure, **b** distribution of respondents who think science

communication should be an essential part of post-doctoral training, **c** distribution of responses based on enough job opportunities after pursuing Indian postdoctoral fellowship

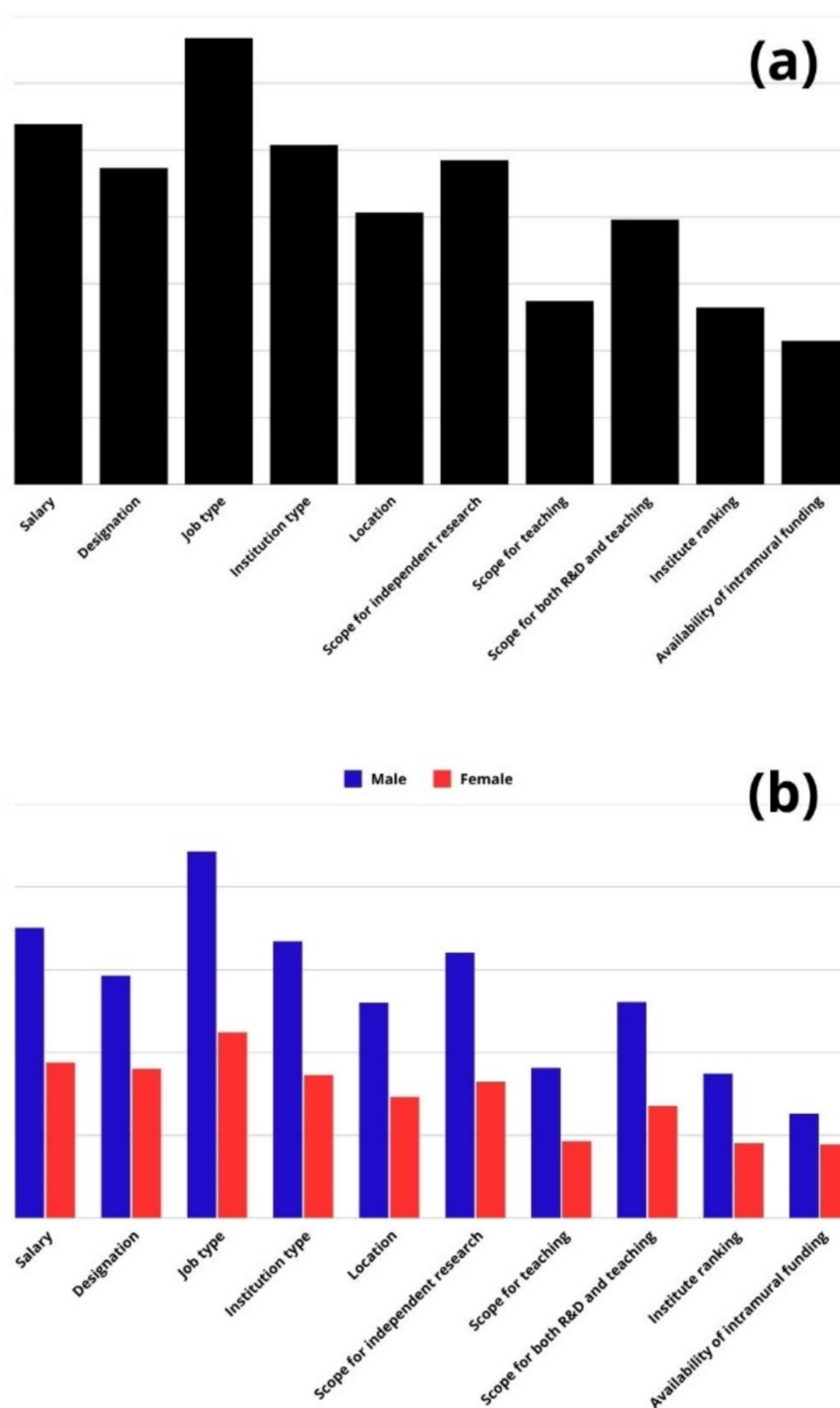
identify gaps and challenges faced by post-doctoral fellows and implement necessary interventions (<https://indiabioscience.org/columns/indian-scenario/is-india-ready-to-boost-its-post-doctoral-training>). Further examination of responses regarding the lack of job opportunities revealed that national postdoctoral experiences are often viewed as mere additions, with candidates possessing foreign postdoctoral experiences being preferred in job selections. Some participants noted that postdoctoral experiences do not enhance credentials in university job selections. The survey identified several factors contributing to the scarcity of job opportunities in the country's R&D sector. These include an imbalance between the number of PhD holders and available job vacancies, limited opportunities in academia and industry due to a lack of tech companies, recruitment biases such as nepotism and favoritism, low pay packages, corruption in state universities, population pressure, and inadequate government schemes, among others. Respondents also observed that postdocs are often considered overqualified for industries and private institutions, leading to the departure of highly educated manpower and contributing to brain drain, which

is detrimental to the development of a country. Furthermore, certain prestigious fellowships like the DST-INSPIRE Faculty fellowship and Ramanujan fellowship have unclear policies, as the usual five-year tenure of these fellowships is not considered in the recruitment process. One effective approach to addressing career transition challenges could be to adopt a model similar to the UK Research and Innovation (UKRI) fellowships (<https://www.ukri.org/>), which provide a structured pathway to permanent academic positions upon the successful completion of a prestigious fellowship. Addressing these issues is essential to ensure equitable opportunities and retention of talent within the country's research and development landscape.

To comprehend the factors influencing career choices and expectations following postdoctoral tenure, respondents were presented with several options to consider. Job security, particularly whether the job is permanent or contractual, emerged as the most crucial criterion among all provided options (Fig. 5). The hierarchy of preferences appears to follow the order (from highest to lowest): nature of the job > salary > type of institution (Central/ State/



Fig. 5 **a** Distribution of factors influencing career choices and expectations following postdoctoral tenure, **b** gender-dependent distribution of factors influencing career choices and expectations following postdoctoral tenure



Private funded) > potential for an independent research career > designation > location > balance between research and teaching > organization ranking > availability of intramural funding (Fig. 5a). Notably, there is a discernible

difference in preference order between female and male respondents. Female respondents prioritize designation over the type of institution and prioritize location over job scope (Fig. 5b).

It is noteworthy to mention that respondents listed independence in one's research career as one of their top priorities. The survey also sought to gauge the perspectives of postdoctoral fellows regarding the essential skills they believe are necessary to acquire during their post-doctoral tenure to embark on an independent career. Research problem formulation and execution emerged as the top priority among the given criteria. The priority order as observed in this survey is as follows: research problem formulation and execution > research collaboration setup > mentorship > research infrastructure development > grant writing ability > team leadership > scientific discourse > administrative responsibilities management.

The survey included a concluding question on the general opinion of post-doctoral research experience in India. While respondents reported various concerns, it was encouraging to observe that many of them also shared some positive remarks. Some respondents mentioned that the post-doctoral research helped them emerge as better and independent researchers. In some cases, moving out of the home institution (where one is awarded a Ph.D.) for post-doctoral research has been cited as a reason for new collaborations and growth. The improvement in the overall status of post-doctoral research in India over the last decade has also been acknowledged. Undoubtedly, the need and importance of post-doctoral research is not denied anymore. However, addressing the existing issues is imperative for further progress. It has been consistently highlighted that there is a shortage of post-doctoral fellowships in India. Moreover, the available fellowships are often non-uniform and deemed insufficient for sustaining families, particularly when dependents are involved. Additionally, there are concerns regarding the inadequate disbursement of fellowships, especially when the funding agency is not the host institution. A significant concern raised by several respondents is the lack of sufficient job opportunities even after completing post-doctoral research. Many feel that candidates with post-doctoral experience abroad are given preference for job positions, exacerbating the issue of unfair placements due to various biases. For post-doctoral fellows in Indian institutions, the working conditions and status are perceived as less than ideal, discouraging them from continuing their research in India. It was also reported earlier that bureaucratic procedures and administrative obstacles can hinder the seamless operation of postdoctoral research by causing delays in approvals and the disbursement of funds, thereby disrupting the research timeline (Singhvi 2022).

Important recommendations

Concerns about postdoctoral training and recruitment are growing worldwide. Even data from developed countries like the U.S. also indicate a gradual decline in the supply

of postdoctoral researchers (<https://acd.od.nih.gov/working-groups/postdocs.html>). It is vital to implement effective policy recommendations to address the challenges faced by postdoctoral researchers and to create a more supportive and structured research environment. These recommendations aim to standardize postdoctoral policies across institutions, improve working conditions, foster industry collaborations, and ensure a sustainable and inclusive research ecosystem. It is expected that by adopting these measures, policymakers can help bridge existing gaps and enhance India's global competitiveness in research and development. Based on the analysis of the responses to the survey, a list of suggestions for policymakers is distilled as follows:

- A significant disparity exists between the number of graduates from Indian academia and the availability of post-doctoral fellowships. Consequently, there is an urgent need to increase the number of these fellowship opportunities. Additionally, the exploration of industrial post-doctoral positions is warranted. These positions could provide short-term (12–18 months) training for recent Ph.D. graduates, allowing them to gain real-life industrial experience and refine industry-specific skills. Such initiatives would enable industries to cultivate a skilled workforce tailored to their needs and create a distinctive career path for Ph.D. graduates, fostering non-academic career opportunities early in their careers.
- There is an urgent need to improve and update the teaching and, if feasible, administrative roles for Ph.D. students. Notably, Prime Minister Research Fellows (PMRFs) are now required to teach approximately 40 h in classrooms, which has positively impacted most of them. Therefore, a similar arrangement for revising teaching assignments for current Ph.D. students should be considered. Similarly, teaching and administrative experience may be provided to postdoctoral fellows to enhance their career readiness. Early career researchers may also have representation in institutional decision-making bodies, fostering a sense of inclusion and career progression. Institutions must adopt a holistic approach, integrating infrastructure, housing, healthcare, career support, and administrative assistance to create a thriving research ecosystem.
- The timely and transparent announcement of postdoctoral fellowship application results is a critical factor in ensuring a smooth transition for early career researchers. Funding agencies and academic institutions should establish clear application timelines with well-defined deadlines for submission, review, and announcement of results. Regularity in the announcement cycle (e.g., semi-annual or annual calls) must be ensured. Usage of digital platforms for application processing may enhance efficiency and reduce administrative delays. Automated



status updates and direct communication with applicants may keep candidates informed about their application progress. Providing feedback to unsuccessful applicants will help to improve future applications and explore alternative funding opportunities.

- A competitive and equitable fellowship structure should be introduced to ensure postdoctoral fellows can focus entirely on their research, aligning with global standards and preventing the loss of talent to better-funded international positions. Additionally, a uniform fellowship structure would eliminate any disparities and create a level playing field, ensuring that all postdoctoral researchers receive equal financial support irrespective of their funding source.
- Candidates with Indian post-doctoral research, particularly those with significant societal impact, should be prioritized in job placements. A structured mechanism for integrating these candidates into faculty and industry positions would encourage more Ph.D. graduates to pursue postdoctoral research domestically, thereby fostering a sustainable and self-reliant research ecosystem.
- Expanding the number of postdoctoral fellowships in India is essential to retaining top talent, advancing research, and strengthening the country's innovation ecosystem. A performance based multi-year (3 + 2 years) postdoctoral fellowships may be introduced to provide researchers with stability and time to produce impactful work. Thematic fellowships focusing on national priorities may be introduced to align research expertise with strategic needs. Industries must be encouraged to establish postdoctoral fellowships in collaboration with academic institutions, enabling knowledge transfer and application-driven research.
- Biases related to the reputation of an institution and the influence of a supervisor sometimes significantly impact the career progression of postdoctoral researchers. This issue must be addressed through systemic changes in evaluation processes, transparency in recruitment, and greater recognition of individual contributions. Funding agencies and recruitment panels should implement double-anonymized review/evaluation methods.
- Many women early career researchers are married to professionals in academia or industry. Institutions should offer spousal engagement/employment assistance to help families remain in the same location. An inclusive environment must be ensured so that maternity leave or caregiving responsibilities do not negatively impact job opportunities or career progression of female researchers.
- To enhance the postdoctoral research ecosystem, an independent administrative body may be established to oversee various aspects of postdoctoral fellowships. This entity would serve as a centralized authority responsible for monitoring, regulating, and improving the working

conditions and career prospects of postdoctoral researchers in India. Its role would be establishing clear policies on career advancement, including pathways to faculty positions, industry collaborations, and permanent research roles, conducting regular nationwide surveys to assess the evolving challenges and needs of postdoctoral researchers, compiling data on postdoctoral career trajectories to inform policy decisions and funding allocations, providing periodic recommendations to government bodies, research institutions, and funding agencies to improve the postdoctoral experience. By establishing a well-structured postdoctoral administrative body, India can create a more sustainable and attractive environment for early-career researchers. This initiative will not only enhance research productivity but also improve talent retention and career progression within the country's academic and industrial sectors.

- A well-structured mentoring and networking platform should be established to equip postdoctoral researchers with the necessary skills for diverse career pathways, including academia, industry, and allied professions. To enhance transparency and accessibility, a centralized database should be developed to provide information on available postdoctoral positions, funding opportunities, and career progression.
- To further strengthen career prospects, a comprehensive professional development initiative should be introduced. This should include structured mentorship programs that connect postdoctoral fellows with senior researchers, industry leaders, and alumni networks. Additionally, large-scale training in grant writing, project management, leadership, and interdisciplinary research should be promoted. Dedicated career transition programs must also be implemented to support postdoctoral fellows in navigating opportunities across various sectors, including academia, industry, entrepreneurship, and beyond.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s43538-025-00422-1>.

Acknowledgements The authors acknowledge the support from Indian National Young Academy of Science (INYAS) and Indian National Science Academy (INSA).

Data availability The data will be made available upon request, subject to applicable policies.

Declarations

Conflict of interest The authors declare no competing interests.



References

- Agashe, D., et al.: "Career challenges for young independent researchers in India. *Curr. Sci.* **122**(02), 135–143 (2022)
- Dasgupta, S.: Bridging the gap: the need for structured career support for Indian postdocs. *J. Sci. Policy Res.* **15**(2), 89–102 (2022)
- Gupta, R., Sharma, P.: Assessing India's postdoctoral landscape: opportunities and challenges. *Curr. Sci.* **120**(4), 642–648 (2021)
- Ie, B., Liv, O., Lin-B, A., Gdan, O.: Celebrating and supporting early career researchers within underrepresented groups in materials science. *Nat. Commun.* **15**, 4030 (2024). <https://doi.org/10.1038/s41467-024-48495-8>
- Lakhotia, S.C.: Promoting and nurturing post-doctoral research culture in India. *Proc. Indian Natl. Sci. Acad.* **81**(3), 549–551 (2015)
- Laudel, G., Gläser, J.: From apprentice to colleague: the metamorphosis of early career researchers. *High. Educ.* **55**, 387–406 (2008)
- Muniyappa, K.: The role of postdoctoral training for careers in research and higher education. *Curr. Sci.* **92**, 450–454 (2007)
- Nxele, S.R.: A wish list to improve postdoctoral life. *Nat. Rev. Bioeng.* **2**, 631–632 (2024)
- Sharma, G.: Making'in India: understanding Makerspaces and Fablabs in the Indian Informal Innovation Context. No. 2024/2. Lund University, CIRCLE-Centre for Innovation Research (2024)
- Singhvi, A.K.: Improving the STI landscape through an augmented and revitalized postdoctoral fellowship programme. *Curr. Sci.* **122**(6), 660–663 (2022)
- Van der Weijden, I., et al.: Career satisfaction of postdoctoral researchers in relation to their expectations for the future. *Higher Educ.* **72**, 25–40 (2016)
- Woolston, C.: Postdocs under pressure: Can a scientific career ever be secure? *Nature* **585**(7824), 309–312 (2020)

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.

