eISSN 2583-6986
IDEALISTIC JOURNAL OF ADVANCED RESEARCH IN PROGRESSIVE SPECTRUMS (IJARPS)
A MONTHLY, OPEN ACCESS, PEER REVIEWED (REFEREED) INTERNATIONAL JOURNAL
Volume 04, Issue 04, April 2025

Trends and Challenges in Research Grant Allocation in India

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Received: 15 April 2025 Accepted & Reviewed: 25 April 2025, Published: 30 April 2025

Abstract

The distribution of research grants is essential in influencing a nation's scientific and technological environment. In India, research financing is predominantly facilitated by government entities including the Department of Science and Technology (DST), University Grants Commission (UGC), and Indian Council of Medical Research (ICMR), in addition to support from commercial and foreign financial organisations. This paper examines the changing trends in research funding distribution across several disciplines, highlighting significant patterns in funding allocation, priority research domains, and novel funding modalities. The research identifies significant hurdles, such as bureaucratic delays, inequitable grant distribution, insufficient transdisciplinary financing, and obstacles encountered by early-career academics in obtaining financial assistance. The document analyses policy initiatives and institutional frameworks that affect funding efficiency and its consequences on research output and innovation. This study seeks to enhance the efficacy of research grant allocation in India by analysing funding trends and resolving current difficulties, hence promoting a more inclusive and innovation-oriented research ecosystem.

Key Words: Research Funding, Grant Allocation, Higher Education, Innovation Policy, Funding Challenges.

Introduction

Research funding is an essential element of scientific and technological advancement, directly affecting the calibre and extent of university and corporate research. In India, research grants are predominantly allocated by governmental bodies including the Department of Science and Technology (DST), the University Grants Commission (UGC), the Indian Council of Medical Research (ICMR), the Council of Scientific and Industrial Research (CSIR), the Department of Biotechnology (DBT), and the Indian Space Research Organisation (ISRO). Moreover, financial support from international entities such as the World Bank, UNESCO, and the Bill & Melinda Gates Foundation, along with private sector initiatives from firms and philanthropic foundations, enhances the research environment. India has experienced a consistent rise in research spending, concentrating on critical domains such as healthcare, space exploration, artificial intelligence, renewable energy, and sustainable development. The distribution of these monies frequently mirrors overarching governmental agendas and fiscal limitations, affecting which fields and institutions garner the most assistance.

Notwithstanding the augmented financing, numerous obstacles impede the efficient allocation and application of research grants. Bureaucratic obstacles, delays in money allocation, and a convoluted application procedure frequently dissuade researchers, especially early-career academics, from obtaining funding. The allocation of funding predominantly benefits established institutions like IITs, IISc, AIIMS, and central universities, whilst smaller universities, private institutions, and regional research centres receive minimal financial assistance. This inequitable allocation hinders the advancement of research in nascent and rural institutions, resulting in a skewed academic and innovation landscape. Moreover, insufficient openness in grant distribution, protracted

peer review processes, and the inadequate utilisation of money in certain industries exacerbate inefficiencies in research financing.

Furthermore, transdisciplinary and applied research domains, which necessitate adaptable financing methods, frequently have difficulties in obtaining funds within inflexible financial frameworks. The absence of collaboration between industry and academia in funding channels further constrains the actual implementation of research findings. Despite initiatives such as the Science and Engineering Research Board (SERB), the Atal Innovation Mission (AIM), and the Start-up India Seed Fund Scheme targeting financial deficiencies, there remains a necessity for regulatory reforms, optimised grant application procedures, and equitable funding techniques. Enhancing collaboration between public and commercial sectors, facilitating transparent grant allocation, and guaranteeing financial inclusion for all researchers would be crucial for cultivating a resilient and innovative research environment in India.

Research Methodology:

This study used a qualitative research methodology to examine the trends and issues associated with research grant distribution in India. Data will be gathered via comprehensive interviews and focus group discussions with researchers, academics, policymakers, and funding agency representatives to comprehend their viewpoints on the accessibility, distribution, and utilisation of research grants. Furthermore, policy documents, governmental reports, and scholarly literature will be scrutinised to assess historical trends, institutional funding patterns, and the regulatory frameworks that control research awards. A theme analysis will be performed to identify critical concerns including bureaucratic obstacles, regional inequalities, and discipline-specific funding deficiencies.

The study will include case studies of specific universities, research institutes, and individual researchers to offer practical insights into the effects of financial distribution on academic and scientific advancement. This research seeks to identify systemic difficulties in grant distribution through the analysis of narratives and institutional policies, while proposing methods to enhance openness and accessibility in research financing. The results will inform policy deliberations aimed at establishing a more equal and efficient research grant system in India.

Historical Evolution of Research Funding in India:

Since its independence in 1947, India's research funding landscape has undergone substantial transformation, shifting from a state-centric model emphasising fundamental sciences and agriculture to a diversified, innovation-driven paradigm by 2025. In the early post-independence period (1947–1960s), the government emphasised establishing a scientific foundation to facilitate national growth, exemplified by institutions such as the Council of Scientific and Industrial Research (CSIR) and financial assistance for the Green Revolution. This era was predominantly funded by public resources, with limited private participation and an estimated R&D expenditure of 0.2-0.3% of GDP, establishing a basis for future development. The 1970s and 1980s signified a period of expansion, characterised by the formation of specialised bodies such as the Indian Space Research Organisation (ISRO) and the Indian Council of Medical Research (ICMR), which redirected emphasis towards practical research in domains including space, healthcare, agriculture, and defence. Funding primarily originated from governmental sources, experiencing a slight increase to approximately 0.5% of GDP, inside a centralised socialist system that restricted private investment. The institutionalisation enhanced sector-specific research, as demonstrated by ISRO’s satellite launches, however innovation was limited by

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bureaucratic regulation. The economic liberalisation of 1991 initiated a significant transformation in the 1990s and 2000s, facilitating private sector involvement and international cooperation, especially in pharmaceuticals and information technology (IT). Firms such as Infosys and Ranbaxy spearheaded industry-focused research and development, while government funding experienced a modest growth; however, overall R&D expenditure remained between 0.6% and 0.8% of GDP. This period witnessed a shift towards applied research in rapidly expanding fields, while basic research stagnated due to insufficient incentives, underscoring an increasing disparity between commercial and foundational science. Since the 2010s, research funding has emphasised innovation, entrepreneurship, and global competitiveness, driven by initiatives like the National Education Policy (2020) and the Atal Innovation Mission. Private investment escalated in sectors such as clean energy, artificial intelligence, and biopharmaceuticals, with pharmaceuticals leading in research and development expenditure; nonetheless, public health research continued to be inadequately supported in relation to disease burdens. By 2025, research and development expenditure neared 1% of GDP, bolstered by initiatives such as the U.S.-India Initiative on Critical and Emerging Technologies (iCET), exemplifying a combination of public and corporate endeavours to enhance India's international scientific prominence. Contemporary trends in the 2020s indicate substantial expansion in strategic technologies such as semiconductors, while simultaneously facing ongoing difficulties in reconciling scale and equity. Although private research and development is encouraged via tax incentives, financing disproportionately favours commercially viable industries, neglecting social sciences and public health, which are urged to receive increased investment and openness in grant distribution. In contrast to global leaders such as China (2.1% of GDP), India's expenditure on R&D is comparatively low, highlighting the persistent conflict between fostering innovation and equitably meeting societal requirements.

Major Funding Agencies and Their Role in Research Development:

Significant funding agencies, comprising governmental institutions, corporate organisations, and international entities, are crucial in influencing the research landscape across several fields. Government funding agencies, including the National Institutes of Health (NIH) and the European Research Council (ERC), frequently serve as the predominant financiers of research budgets, primarily aiming to bolster national interests, public health, and economic development by investing in projects that correspond with strategic priorities. Private funding entities, including corporations and philanthropic organisations like the Bill & Melinda Gates Foundation, provide an alternative source of support that frequently enhances governmental initiatives, concentrating on particular domains of interest such as global health, education, or technological innovation. Global financing organisations, including the World Health Organisation (WHO) and the United Nations Educational, Scientific and Cultural Organisation (UNESCO), facilitate cross-border collaboration. They seek to address issues that surpass national borders, including pandemics, environmental sustainability, and poverty alleviation. By consolidating resources from various nations, they facilitate extensive, coordinated research initiatives that individual countries may be unable to pursue independently. Their role is essential in assisting underdeveloped nations, where local funding for research is often constrained, thereby addressing global imbalances in scientific capability. Government financing channels are generally defined by stringent peer-review processes and competitive application systems. The NIH utilises a dual-review method in which ideas are assessed for scientific value by specialists and subsequently prioritised according to programming objectives. This guarantees that resources are allocated to high-caliber, significant research; nevertheless, it may also result in conservative decision-making, prioritising established researchers or incremental projects over more daring, original endeavours. Transparency and accountability are essential attributes of these procedures, as public

monies must be justified to taxpayers and policymakers. Private funding agencies frequently implement more efficient or focused allocation methods, such as utilising internal boards or professional consultants to choose grantees or emphasising initiatives with evident commercial viability. This flexibility can expedite research timeframes and enhance innovation, although it may also introduce biases aligned with the funder's objectives, thereby neglecting wider society demands. International funding agencies enhance research development by promoting a global scientific community, shown by WHO's research activities on infectious illnesses. This worldwide strategy enhances the scope and significance of research, yet it may encounter obstacles such as geopolitical conflicts or disproportionate benefit distribution, with affluent nations frequently prevailing in the results.

Challenges in Research Grant Distribution and Utilization:

India has achieved notable advancements in augmenting research financing via several governmental and private-sector initiatives. The efficient allocation and use of research grants continue to be impeded by bureaucratic inefficiencies, regional disparities, fund mismanagement, and restricted possibilities for early-career researchers. These challenges impede scientific advancement, obstruct innovation, and foster an inequitable research environment. Resolving these difficulties is crucial for ensuring that research grants are distributed and employed to optimise their influence on national growth. A significant issue in the allocation of research grants in India is bureaucratic obstacles. The grant application procedure is frequently onerous, necessitating substantial documentation, numerous approvals, and compliance with stringent regulations. Researchers must traverse intricate administrative processes, which may impede the approval and allocation of funds. Despite obtaining scholarships, researchers often encounter challenges in accessing and utilising the funds due to stringent financial restrictions and sluggish institutional procedures. Bureaucratic inefficiencies deter academics from pursuing funds and impede the progress of significant research projects. Geographical inequalities in funding distribution impede the fair advancement of research nationwide. A disproportionate allocation of funds is channelled towards prestigious schools such as the IITs, IISc, AIIMS, and central universities, whereas several state universities and private colleges face challenges in obtaining sufficient research support. The disproportionate allocation of resources constrains research prospects in smaller universities and deters skilled researchers from engaging in underfunded areas. Consequently, scientific advancement is predominantly centralised in select urban locales, although rural and semi-urban regions persist in encountering obstacles in executing high-caliber research. A notable concern is the mishandling and underutilisation of funds. Despite the allocation of grants, administrative inefficiencies frequently result in delays in money utilisation. Certain research institutions inadequately allocate funding punctually, resulting in the failure to meet project deadlines. In many instances, inadequate financial planning leads to unutilised donations being returned to funding organisations, underscoring inefficiencies in cash distribution. Adequate transparency in the funding process is often absent, resulting in favouritism and misappropriation of funds, with grants being allocated based on institutional or personal affiliations rather than the merit of the study proposal. Enhancing financial accountability and establishing adequate oversight helps mitigate these inefficiencies. Early-career researchers encounter distinct obstacles in obtaining financing owing to their restricted research experience and publication histories. Most research funds preferentially support established scholars with substantial portfolios, hindering the competitiveness of emerging researchers. The absence of mentorship and support in crafting successful grant proposals further dissuades early-career scientists from seeking financing. In the absence of financial assistance, numerous bright researchers find it challenging to do independent research, compelling them to depend on senior faculty members or forsake research careers

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entirely. Establishing targeted financing initiatives and training programs for early-career researchers can mitigate this disparity and foster the advancement of the forthcoming generation of scientists. Moreover, the absence of transdisciplinary funding sources constrains research innovation. Numerous funding agencies adhere to conventional discipline-specific grant distribution strategies, complicating the process for academics engaged in interdisciplinary domains—such as artificial intelligence in healthcare, environmental sustainability, or nanotechnology in medicine—to obtain financing. Interdisciplinary research frequently necessitates collaboration among several fields, a requirement that current financing frameworks do not consistently support. Extending research grants to facilitate interdisciplinary studies can foster creativity and propel progress in nascent scientific domains. Policy reforms and institutional enhancements are essential to optimise the distribution and utilisation of research grants in India. Streamlining the grant application process, fostering transparent and equitable money distribution, and instituting rigorous financial oversight can markedly improve the efficacy of research funding. Moreover, enhancing opportunities for early-career researchers, augmenting assistance for regional institutions, and fostering industry-academia cooperation will fortify India's research ecosystem. By tackling these difficulties, India can establish a more equitable and efficient research financing environment that promotes scientific development and technological progress.

Impact of Research Grants on Innovation and Scientific Advancements:

India wants to be a global leader in technology and knowledge, and research funds have driven innovation and scientific progress. By sponsoring basic and applied research, government funding bodies like the DST and DBT have contributed to this advancement. These grants have supported ISRO space exploration milestones, biotechnology, and AI development. Research funds have spurred technical innovation and global competitiveness in India by prioritising high-priority topics. Research funds influence technical developments in India, as shown by the DST-supported National Initiative for Developing and Harnessing developments (NIDHI). Through this program, Technology Business Incubators (TBIs) and Science & Technology Entrepreneur's Parks (STEPs) support companies and turn research into solutions. Renewable energy and healthcare innovations like portable medical refrigeration units produced with financing from the Centre for Cellular and Molecular Platforms (C-CAMP) show how funding accelerates lab-to-market. These projects solve local problems and establish India as a hub for affordable, scalable tech. Patents, a sign of innovation, have increased in India thanks to research funding. Patent filings have increased due to deep tech research initiatives by the Science and Engineering Research Board (SERB) and Intel India. NASSCOM reports that over 50% of technology patents registered by Indian residents between 2015 and 2021 were in emerging disciplines like AI. The updated Patents Rules (2021) cutting educational institution fees have further incentivised academic researchers to preserve their intellectual property, compounding the influence of grants on patent production. Indian industry-academia interactions have grown thanks to research funding that bridge theoretical and commercial expertise. The Anusandhan National Research Foundation (NRF), which aims to transform R&D, promotes university-industry cooperation. The Australia-India Strategic Research Fund and Indo-French Call for Joint Research have funded green hydrogen and sustainable energy initiatives, boosting local innovation. These cooperation have produced the IITB-Monash Research Academy, which supports transdisciplinary research with industry financing. Pharmaceutical and IT sectors benefit most from research funds. Pharmaceuticals, which account for 50% of India's R&D spending, have received DBT grants to further vaccine research and drug innovation, including the COVID-19 pandemic's Colchicine clinical trials backed by the CSIR. AI and cybersecurity investments by the Ministry of Electronics and Information Technology (MeitY) have made Indian IT enterprises global players. These sector-specific advances show how targeted

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funding matches research with market demands, boosting innovation and growth. Indian technology has also been driven by funding for high-risk, high-reward "moonshots." DST support of quantum computing research and ISRO's Gaganyaan mission show how government financing enable ambitious projects that produce intermediate technologies with vast applicability. These initiatives boost national pride and spur private investment and R&D. ISRO's satellite technology is used in agricultural and disaster management, demonstrating grant-funded research's multiplier effect. Patent and innovation growth is linked to industry-academia synergies, boosted by the Atal Innovation Mission. AIM sponsors incubators and tinkering laboratories to help young researchers solve real-world challenges with industries. NASSCOM reports that Indian startups filed over 400 technology patents between 2015 and 2021, a 45% increase. Collaborations help grant-funded research translate into scalable goods and services, improving India's innovation environment. However, research funds have drawbacks. R&D spending in India, at 0.64% of GDP, is lower than in China (2.1%) and the U.S. (3%), limiting innovation. Grant disbursement delays and an emphasis on applied rather than basic research might slow scientific progress. Strategic investment may overcome systemic constraints and accelerate progress, as shown by the National Mission on Interdisciplinary Cyber-Physical Systems, which built 25 Technology Innovation Hubs and delivered 311 inventions and 549 products by 2023. Research funds affect scientific developments and human resource development, a key part of India's innovation pipeline. Over 8,573 researchers have been taught to use advanced infrastructure by programs like STUTI. Grant-supported capacity building assures a consistent supply of talent for academia and industry, increasing the long-term impact of funding on technological discoveries and patent generation. The outcome is research funds have greatly impacted India's creativity and scientific progress by promoting technical advances, patent output, and industry-academia relationships. Government support has created a solid basis, but private and multinational collaborations indicate a bright future. India must boost R&D spending, streamline grants, and balance fundamental and applied research to maximise impact. Research funds can help India become a science and technology powerhouse with these changes.

Strategies for Improving Research Grant Allocation in India:

Ensuring effective and equitable allocation of research grants is essential for promoting innovation and scientific advancement in India. Despite increased financing for research and development from both the government and commercial sector, systemic inefficiencies in fund distribution impede its optimal potential. To tackle these difficulties, reforms should concentrate on policy enhancements, openness, equitable allocation, and improved accessibility for all researchers, particularly early-career scientists and institutions in underprivileged areas. Executing these initiatives will enable India to establish a more inclusive and efficient research ecosystem. A significant strategy for enhancing grant distribution is the revision of policies to streamline the funding process. The existing application system is frequently intricate, necessitating comprehensive documentation and numerous approvals. Enhancing efficiency by centralising the procedure on a digital platform that allows researchers to apply for multiple grants, monitor their application status, and get funds promptly. Moreover, minimising bureaucratic obstacles and establishing specific timetables for grant approvals can avert superfluous delays in resource allocation. Guaranteeing equal allocation of research money among institutions and regions is an additional vital objective. A disproportionate amount of financing is being directed towards prestigious schools such as the IITs, IISc, and AIIMS, whilst other state universities and private research entities receive scant assistance. Funding organisations should designate a set percentage of grants for institutions in rural and semi-urban areas to promote research development in underserved regions. Targeted grant programs for regional colleges can facilitate equitable research advancement nationwide.

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Improving transparency and accountability in grant distribution is crucial to avert favouritism and mismanagement. Forming independent review panels of diverse specialists from multiple disciplines helps guarantee that funding selections are based only on merit. Furthermore, disclosing funding decisions along with the rationale for approvals or rejections can enhance trust in the system. Establishing a real-time money tracking system can mitigate misallocation and guarantee that funding are utilised efficiently for research objectives. Dedicated funding schemes should be implemented to assist early-career researchers in establishing their scientific careers. Numerous grant programs presently prioritise seasoned academics with substantial publication records, hence hindering young researchers' ability to obtain funding. Establishing mentorship and training programs in grant writing, proposal creation, and research management can enhance their success rate. Providing modest seed grants for creative initiatives by emerging scholars can foster novel insights and pioneering research. Promoting transdisciplinary and industry-academia partnerships in research financing can stimulate innovation and the practical implementation of scientific findings. Numerous global challenges—such as climate change, artificial intelligence, and public health—necessitate a multidisciplinary approach. Grant programs ought to be designed to facilitate interdisciplinary research initiatives, with funding organisations promoting partnerships across institutions, companies, and entrepreneurs. Private-sector involvement in financing efforts via corporate social responsibility (CSR) programs and innovation awards might enhance India's research ecosystem. Ultimately, augmenting public and private investment in research financing is crucial for maintaining sustained long-term research advancement. India's investment on research as a percentage of GDP is comparatively low relative to developed nations. The government ought to prioritise increasing the R&D budget and implementing rules that incentivise private enterprises and international organisations to invest in Indian research programs. The establishment of a National Research Foundation (NRF), as advocated in India's National Education Policy (NEP) 2020, can facilitate the consolidation of research funding and foster a more systematic and effective allocation process. By employing these measures, India may enhance its research financing framework, rendering it more accessible, transparent, and effective.

The impact of research funds on scientific progress is also evident in human resource development, an essential element of India’s innovation pipeline. Initiatives such as the Synergistic Training Program Utilising the Scientific and Technological Infrastructure (STUTI) have educated over 8,573 researchers, providing them with the expertise to utilise modern infrastructure. This capacity building, facilitated by grants, guarantees a consistent influx of talent for academics and business, enhancing the enduring effects of funding on scientific advancements and patent creation. In summary, research funds have significantly influenced India's path in innovation and scientific progress by promoting technical developments, enhancing patent production, and reinforcing relationships between industry and academics. The establishment of a solid foundation through government funding, along with increasing participation from corporate entities and international collaborations, indicates a promising future. To optimise this impact, India must enhance R&D spending, refine grant procedures, and equilibrate basic and applied research. These modifications will enable research funding to further advance India's status as a global leader in science and technology.

Suggestions:

Recommendations for enhancing research funding distribution in India, informed by the trends and problems detailed in the research article. These ideas seek to rectify bureaucratic inefficiencies, regional inequalities, obstacles for early-career researchers, and the overall influence of funding on innovation.

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1. Increase R&D Investment: Increase India's Gross Expenditure on Research and Development (GERD) from the present 0.7% of GDP to a minimum of 1–2%, in alignment with global leaders such as China and the U.S. This would provide a more substantial financing reservoir to support varied projects and bolster India's competitiveness in research and technology.

2. Streamline Bureaucratic Processes: Streamline grant application and disbursement processes by minimising documentation, expediting review periods, and utilising digital platforms for submissions and monitoring. This would reduce delays and enable researchers to concentrate on scientific endeavours rather than administrative tasks.

3. Prioritize Early-Career Researchers: Implement specialised funding initiatives for early-career researchers (ECRs), including the establishment of a "Young Scientist Grant" including lenient qualifying requirements and mentorship assistance, to facilitate the development of independent research careers and promote innovation.

4. Address Regional Disparities: Implement specialised funding initiatives for early-career researchers (ECRs), including the establishment of a "Young Scientist Grant" including lenient qualifying requirements and mentorship assistance, to facilitate the development of independent research careers and promote innovation.

5. Balance Basic and Applied Research: Designate a specific number of funding (e.g., 30–40%) for basic research, promoting long-term discoveries that, while lacking immediate applications, are essential for scientific progress, so enhancing India's existing emphasis on applied results.

6. Enhance Fund Utilization Oversight: Enforce more rigorous financial oversight and training initiatives for researchers and institutions about budget management to avert misuse and guarantee the efficient and transparent utilisation of given funds.

7. Foster Industry-Academia Collaboration: Augment efforts such as the Anusandhan National Research Foundation (NRF) by providing matching money or tax incentives for private enterprises collaborating with universities, thereby expediting the conversion of research into patents and commercial products.

8. Increase Flexibility in Grant Use: Facilitate enhanced flexibility in budget allocation, including the authorisation of mid-project reallocations to explore interesting new avenues, thereby addressing the inherent unpredictability of research and optimising its impact.

9. Boost International Partnerships: Enhance global collaboration by augmenting involvement in initiatives such as the Indo-U.S. Science and Technology Forum or Horizon Europe, consolidating resources and skills to address significant challenges while elevating India's prominence in the international research community.

10. Promote Capacity Building: Implement nationwide training initiatives akin to the Synergistic Training Program Utilising the Scientific and Technological Infrastructure (STUTI) to enhance researchers' grant-writing capabilities, project management proficiency, and access to state-of-the-art facilities, thereby ensuring a strong talent pipeline. Implementing these recommendations could enhance India's research grant allocation system, making it more efficient, inclusive, and impactful, thereby advancing scientific advancement and establishing the nation as a global leader in innovation.

Conclusion:

India's research funding allocation has significantly increased over the past century, propelled by government entities such as the Department of Science and Technology (DST), Department of Biotechnology (DBT), and the Council of Scientific and Industrial Research (CSIR). Nonetheless, this expansion has failed to align with India's economic potential or international standards, as GERD continues to remain below 0.7% of GDP. The obstacles in grant distribution persist, compromising the efficacy and fairness of India's research environment. Bureaucratic obstacles, like lengthy application procedures and postponed disbursements, impede researchers' capacity to implement projects expeditiously. Regional differences advantage well-endowed institutions in urban centres such as Delhi and Bangalore compared to those in underdeveloped areas. Early-career researchers encounter supplementary obstacles, as funding structures frequently favour experienced scientists, hindering fresh innovators in obtaining initial grants. Emphasising applied research at the expense of basic science jeopardises fundamental discoveries, which are crucial for sustained innovation. The effects of these trends and difficulties are varied, with revolutionary innovations such as ISRO's space missions, the Green Revolution, and COVID-19 vaccine development exemplifying successful strategic funding. Collaborations between industry and academics, enhanced by programs such as the Anusandhan National Research Foundation (NRF), have intensified this effect. Unlocking India's complete scientific potential necessitates a diversified strategy to address the trends and problems in research funding allocation. Elevating GERD to a minimum of 1-2% of GDP, optimising bureaucratic procedures, and prioritising assistance for early-career researchers and marginalised regions could augment the breadth and inclusivity of funding. Equilibrating funding in fundamental and applied research, while enhancing supervision to avert mismanagement, would guarantee that grants result in lasting innovation.

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