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Assessing Gender Equity in Capacity Building Schemes in Indian Research

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The present study analyzed the gender dimension in capacity building schemes of Government of India, using a case study for Junior Research Fellowship Scheme of Council of Scientific and Industrial Research (CSIR-JRF) which is India's top fellowship scheme for capacity building at early career development stage in science. The analysis was done for the scholars who qualified and joined the scheme during the decade 2010–2019. The results indicate that the number of female scholars qualified and enrolled (availed fellowship) under this scheme during the decade is overall considerably lower than male. Female scholars' inclination was more towards life sciences, whereas male counterparts were more inclined towards physical and chemical sciences. The Gender Parity Index (GPI) varies among different states of India, with maximum numbers of qualified scholars (both male and female) were from West Bengal though male pass percentage dominated the qualifying exam, whereas Kerala showed the highest GPI of 3.02 during the last 10 years with more number of enrolled female scholars. However, few states and union territories showed least GPI due to zero enrollment for female scholars despite qualifying exam. This study provides a new dimension for future policy studies based on the knowledge/evidence of gender parity in capacity building schemes.

Keywords: Capacity building, Fellowship, Gender studies, Research scheme, STEM education

Introduction

Gender inequality is an ongoing global issue affecting all aspects of life. Though there have been improvements, women and girls still do not have equal rights, and their capacity to impact the economy, society, and sustainable development is still untapped. Women were alienated from science education, research, and other related careers as a result of the stereotypical image of women, which simply implied that they don't have a place in the field.[1] According to another study[2], women's careers in science have often been undermined while feminine and sexual qualities have become important priorities. This imbalance has also exists in India, which is mostly a patrilineal society that often views women's primary role as household caregivers and may not provide required support for working women. Scenarios of women work in science seems less promising in India owing to the fact that women constitute only 10–15% of science, technology, engineering, and mathematics (STEM) faculty members and researchers in the Indian Institutes of Technology (IITs), Council of Scientific & Industrial Research (CSIR), All India Institutes of Medical Sciences (AIIMS) and private research & development labs.[3]

Gender equality in scientific laboratories and universities is not just a matter of numbers; it is also about various micro- and macro-level factors that work at the organizational level. Different institutions in India have different policies and enabling frameworks, but there is still no common approach or guideline to bridge the gender gap.[4]

For organizations and communities to survive, adapt, and thrive in the quickly changing world, capacity building is the act of enhancing those resources, skills, instincts, abilities, procedures, and behaviors they need.[5] It is one of the transformation processes that is to be initiated and maintained internally over time; not to involve in just doing tasks; but also involves changing people's mindsets and attitudes.[6] Plans for creating initiatives that focus on capacity building, education, and support, as well as initiatives to educate departments about the guidelines' adoption and implementation are necessary for their successful implementation.

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In accordance with the Sustainable Development Goal (SDG) 17 of the United Nations, the Global Partnership for Sustainable Development is required for capacity-building initiatives, which can be achieved through research, innovation, and data collection and analysis, for which universities can serve as hubs.[7] In addition; this can also encompass SDG5 which refers to gender equality and the empowerment of women.[8]

This study aims to analyze the Gender Parity Index (GPI) in Indian research under capacity building scheme, using a case study of CSIR Junior Research Fellowship (CSIR-JRF) scheme that examines their role when seeking to make advances in science. It focuses on gender dimensions in the traditional framework and its implications for the emerging model of multi-disciplinary research. It also focuses on gender equality in socio-economic groups, and demographic variation.

Women Researchers

Women workforce has seen tremendous rise in last few decades even in fields which were previously dominated by the male workforce.[9] Around the world, women scientists are doing groundbreaking research in different (STEM) fields. However, globally, women scientists are still underrepresented and often misreported in research and other scientific careers. The UN global study in the year 2021 showed that only 28% of engineering and 40% of computer science graduates are women.[10] The study reported that women account for 33% of total researchers, and the share of women in grant funding, publication in high profile journals or to first or last author is lesser as compared to male researchers.

Numerous studies have been conducted in US to study under-represented women participation in STEM careers commonly referred to as "Leaky lines".[11] As per National Academy of Sciences US (2007), women occupy only small portion in the institution of scientific research and receive lesser grant as compared to other gender, even in some of the prestigious institutes i.e., Massachusetts Institute of Technology (MIT).[12]

In a study conducted by the American Association of University, Women in the year 2010 showed that although the gender balance at the high school was neutral, by graduation level the participation of women decreased to 20% and became much lesser at workplace.[13] In a study conducted in Canada it was found that the women constituted equal percentage in getting doctorate in biology, however the participation became lesser in higher positions.[14]

An analysis of Web of Science publication data[15], Scopus data[16] and the Nature Index journals[17] highlighted ongoing gender imbalances in academic publishing, with significant gender disparities in productivity, impact and, notably the underrepresentation of women in last author positions, which are often associated with seniority in research. This emphasizes the need for data-driven insights to guide policy initiatives.

Stuart-Fox and Hauser[18] analyzed gender gap in authorship across STEM fields using data from PubMed and arXiv. They found significant gender disparities in countries like Japan, Germany, and Switzerland, while countries such as Europe, South America, and Africa show greater equity.

In Africa, women's representation among researchers was 34% in 2016, with significant disparities across countries.[19] Further, a study[20] highlights issues like gender-insensitive policies hinder women's career progression in West African universities and research institutions. In Mauritius[21], fewer women enroll in STEM fields, despite support, leading to lower participation and challenges in STEM careers compared to men. Although in Singapore, while 58% of women hold STEM degrees, only 30% pursue careers in these fields, compared to 70% of men, this gap is influenced by lower confidence in mathematics and science, perceived gender barriers, and employer bias.[22]

The abovementioned facts imply that globally more men than women are working in the STEM fields, and hence there is a need to analyze factors behind this gender gap particularly in India which is largely a patriarchal society.

Women Researchers in India

In India, the gap between men and women is primarily attributed to the lack of opportunities that prevent forward progress. Due to limited access to education, employment and various services leading to lower disposable income, including from grants and scholarships, many women are less likely to pursue further education in science.

According to World Economic Forum 2022 global gender report[23], India's position is at 135 out of 145 countries with global gender gap score of 0.63. As per the report, the share of women legislators, senior officials and managers is 17.6%, and the share of women as professional and technical workers is

only 32.9%. Similarly, as per UN Human development report 2022, India has a gender inequality index value of 0.49, ranking it 122 out of 170 countries.[24]

In a study conducted by Sed-National Commission for Women[25] in 1998 on status of women scientists in S&T/ research and development (R&D) institutions in Delhi, nearly 3.08 lakhs personnel were employed in the R&D establishment in our country including in-house R&D units of public and private sector. Out of which, 31% were engaged in R&D activities, 32.6% were engaged in auxiliary tasks, and 36.4% were engaged in non-technical assistance. Only 9701 women, or 9% of all scientists, worked directly in research and development. When compared to their male counterparts, the engagement of women in R&D activities was incredibly low. It is also to be noted that the female literacy rate has increased over the years in India by 14.4% between 2010 and 2021 and reached to 91.95% in 2021 from 80.35 percent in 2010. The female literacy rate increased by 0.6% in 2021 when compared to 2020 on a year-over-year basis.[26]

Further, as per National Institutional Ranking Framework (NIRF), the gender diversity among students enrolled in different programs in engineering discipline during the academic year 2020–21 was 69.45% male vs 30.55 % female, while in respect of faculty it was 65.96% male vs. 34.04% female out of 2674045 students and 153227 faculties, respectively.[27] The All-India Survey on Higher Education (AISHE) Report 2021–22 indicates that women constituted 48% of the total enrollment in higher education, with 2.07 crore female students. At the Ph.D. level, women represented approximately 46.5% (in all fields together) of enrollments. In STEM fields, women made up 43% of undergraduate students, but their representation declined significantly at the doctoral level, with only 3% of Ph.D. candidates in science being women, despite the existence of 17 women-only universities.[28]

Furthermore, only 17 (3%) of the 548 Indian scientists who have been awarded the prestigious Shanti Swarup Bhatnagar (SSB) award for outstanding work in different disciplines of science over the course of the past 50 years from across different institutes in India were women indicating the wide gender parity in STEM research in India.[29] As per report 2024 while women dominate Arts, Education, and Medical Science, men still lead in Engineering, IT and Technology related fields.[30] A recent study highlighted that on an average, women in DST institution is 20% while DBT has an average of 23%, while CSIR has an average of 17% women in S&T cadre.[31]

What is Capacity Building & Human Resource Development?

The process of increasing people's knowledge, skills, and competencies is referred to as capacity building. It is the enhancement of the skills of people and the capacity of institute in resource management education and training.[32]

It is understood that the principal elements of capacity building are human development and social participation. Capacity building can improve organizational performance by increasing individuals' competencies and leadership skills, enhancing their professional knowledge, influencing their attitudes and behaviors, broadening their interests and contacts across different settings, helping them to apply information from diverse sources within decision-making or work processes.

Human resource development on the other hand is defined as a process of developing and/or unleashing human expertise through organization, community development and personal training and development for improving performance. When applied to capacity building, human resources involves the systematic cultivation and strengthening of the knowledge, abilities, and competencies of individual employees.[33,34]

The World Health Organization (WHO) glossary from 2021 defines capacity building as enhancing knowledge, skills, partnerships, and systems to support effective health promotion. Its objectives include strengthening capabilities and enhancing health outcomes. This includes increasing the skills of frontline practitioners, expanding organizational support for health promotion, and fostering community partnerships to improve health.[35] The Human Resources Development Program for Health Research, under the Ministry of Health and Family Welfare (MoHFW), GoI, aims to develop skilled health researchers. It trains medical faculty, mid-career scientists, and medical students to create research projects on key health issues. Using advanced technologies, participants will receive specialized training at leading national and international institutions.[36]

Capacity building and human resource development schemes are thus a process of

developing individuals and organizations through mentoring, training, and coaching that aims to improve human capacity and the skills of employees. These schemes are required to keep up with changing needs in an environment of highly competitive pressure, globalization and digital transformation. The number of students is exploding around the world, as emerging economies will have around 63 million more university students in 2025 than in 2015 and the number worldwide is expected to be more than double to 262 million by the same year. Nearly all this growth will take place in the developing nations, more than half of it in China and India alone.[37] To have equity in gender participation, there has never been a greater need for a gender analysis for students.

CSIR- Capacity Building & Human Resource Development Programme

Human resource development is paramount in the nation-building process and the creation of a knowledge society. The Council of Scientific and Industrial Research (CSIR), India, a premier national R&D organization, is among the world's largest publicly funded R&D organization in diverse S&T areas including oceanography, geophysics, chemicals, drugs, genomics, biotechnology and nanotechnology to mining, aeronautics, instrumentation, environmental engineering and information technology. CSIR has been supporting extramural research to scientists working in universities and R&D institutions since 1943 with various 'Research Schemes'. According to a report[38] the development of S&T human resource development has received significant focus from CSIR. CSIR is supporting the creation and nurturing of national S&T human resources, by providing fellowships, grants, and awards to promote, maintain and renew the pool of highly specialized scientists, engineers and technicians in various fields of S&T in the country.[39]

It promotes young science students at the early stages of their career towards scientific research; CSIR conducts CSIR-UGC National Eligibility Test (NET) for Junior Research Fellowship (JRF) to the science undergraduates. The CSIR-JRF scheme as part of CSIR Integrated Skill Initiative aims to bridge skill gaps in science and technology through training for undergraduates, postgraduates, and research students, including marginalized social economic groups/categories like Scheduled caste (SC), Scheduled Tribe (ST), Other Backward Communities (OBC) and Economically Weaker Section (EWS). Under this scheme, CSIR-UGC NET qualified candidates receive the stipend of INR 37000 per month for the initial two years and then stipend of INR 42000 as Senior Research Fellowship (SRF) is provided. In addition, house rent allowance (HRA) as per the tier city and an annual contingency grant of INR 20,000 per scholar is provided.[40] The qualified candidate can avail this fellowship within two years from the date of issue of JRF-NET certificate.

Earlier few studies have been conducted on this CSIR-Scheme; however, most of them were conducted for a limited set of data. Inderpal[41] conducted a research analysis for CSIR-UGC NET for the period of 2002–2006 to determine the ranking of various universities based on the number of students who appeared versus the number of students selected. An additional research analysis on demographic differences in science education in India[42] for the time frame of 2002–2006 was conducted using data from CSIR-UGC NET. Hasan[43] evaluated the CSIR-UGC NET data to evaluate retention rate of the exam based on the number of students availing the fellowship. A socio-economic analysis of CSIR-UGC NET data was done for SC/ST candidates during the period of 2005–2013.[44]

Scope & Objectives

Gender as a social construct defines opportunities and outcomes, emphasizing the pivotal importance of closing gender gaps in realizing fairness and sustainable advancement. There is indispensable role of gender-disaggregated statistics in designing evidence-based policies addressing inequalities in education, employment, and healthcare sectors. As women's experiences vary significantly across socio-economic categories, caste and rural-urban divides further shape disparities[45], hence analyzing female contribution in STEM through socio-economic categories is crucial for understanding disparities in access to resources, opportunities, and outcomes. In the last decade, the CSIR-JRF scheme has been funding research projects on a large scale, and therefore it is imperative to analyze the gender parity in this scheme as well in order to have better understanding of contribution of female scholars in Indian scientific pursuits.

Therefore, objective of the present study is to evaluate the presence of gender dimension in capacity

building and human resource development schemes in India by analyzing the representation of male and female scholars from these schemes conducted by CSIR-JRF during the last decade i.e., 2010 to 2019. Specific objectives of the study are as follows:

- To study the Year wise analysis of male and female scholars availing the scheme.
- To study the state/union territories (UTs)- wise representation of male and female scholars in terms of qualified versus who enrolled for fellowship (availed fellowship).
- To study the subject-wise contribution of male and female scholars in terms of qualified versus who enrolled for fellowship.
- To study the social-economical category-wise contribution of male and female scholars in terms of qualified versus who enrolled for the fellowship.

Methodology

CSIR-UGC NET Exam is conducted twice a year in June and December, which upon qualifying, the selected candidate is given a fellowship for five years. For the present study, data pertains to the period from 2010–2019 for students who were awarded CSIR-JRF based on the result of the CSIR-UGC NET examination. The data of the students who availed CSIR-JRF during the decade was taken from the Human Resource and Development Group's (CSIR-HRDG) Extramural Research Division. Then the details about students' gender, age, state, subject and universities were tabulated. The data was then pre-processed and synchronized for analysis. Scholars who qualified for the CSIR-JRF exam but did not enroll as JRF were excluded from the joined scholars' category list but included in qualified numbers. After preprocessing data, a few records were found to be duplicated and were removed from the scope of this study. In addition, the data was considered till March 2021, so the scholars who may have joined afterwards are excluded from the study, as due to COVID-19 pandemic extension in joining period was also provided as exception case.

The Gender Parity Index (GPI) is a socioeconomic index that measures the relative access to education of males and females. It is calculated by dividing the female value for an indicator by the male value for the same indicator. A GPI equal to 1 indicates parity between females and males.[46] Whereas a GPI of less than 1 suggests girls are more disadvantaged than boys in learning opportunities, while a GPI greater than 1 suggests the opposite.[47] The gender parity evaluation of the fellowship schemes is done in terms of qualified and enrolled plus passed researchers state-wise, subject-wise and category wise. The study also involves descriptive statistics i.e. mean and standard deviation; and inferential statistics using t-test at 0.05 significance level comparing the gender parity Index (GPI) of enrolled scholars (EGPI) and qualified scholars (QGPI) over the past decade.

Results and Discussion

In total, 33079 scholars qualified for CSIR-JRF fellowship (20 CSIR-UGC NET exam) during the period of study with an average of 3300 per year and 1635 per exam. The Fig. 1 shows the exam wise graphic representation for qualified scholars. Maximum scholars qualified for the exam conducted in December 2017 which is almost twice the number of scholars who qualified these exams conducted during last decade, whereas minimum was in December 2011. It may have happened due to an increase in number of intake and reduced cutoffs.

The average number of scholars who enrolled as CSIR-JRF from June 2010 to December 2019 is 1,224 per year. The analysis also shows that the average ratio of enrolled versus qualified scholars is around 35% for each exam, with a maximum enrollment of 48% in June 2016 and minimum 22% in December 2010 as shown in Fig. 2. A study by Hasan[43] also showed similar trend during the period of December 2008 to June 2010 during which about 41% scholars qualified NET exam but did not avail fellowship.

Exam Wise Gender Analysis

Analysis shows that the numbers of female scholars who have qualified are lesser than those of male scholars. The distribution of scholars during these 10 years showed that the maximum number of

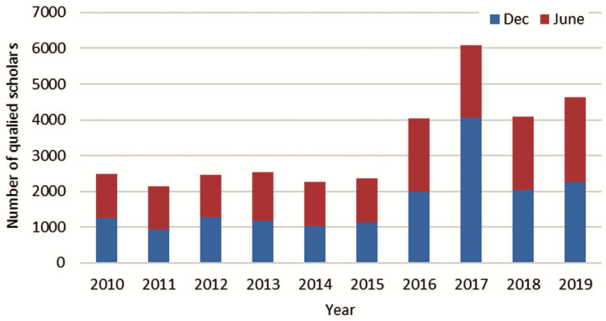

Fig. 1 — Exam wise distribution of scholars qualified as CSIR-JRF

qualified female scholars was in 2017 with 2410 female scholars and the minimum were in 2013 with 542 female scholars. Maximum number of male candidates qualified in 2017 with 3679 scholars and minimum during 2011 with 1418 scholars.

The Fig. 3 shows the distribution in terms of GPI of qualified scholars with a female to male ratio with minimum 0.27 in 2013 and maximum 0.66 in 2017.

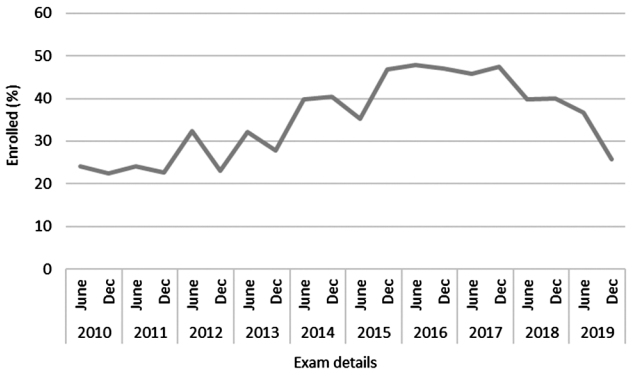

Fig. 2 — Exam wise percentage of enrolled against qualified scholars

State Wise Analysis

During the study an attempt was made to study the state/UT-wise analysis of gender parity. According to the study, fewer students from certain Union Territories and States contribute enough to qualify for the exam. These include UTs such as Daman & Diu, Andaman & Nicobar Islands, Dadra and Nagar Haveli, Lakshadweep whereas in case of states it includes Sikkim, Nagaland, Mizoram, Arunachal Pradesh and Goa (Fig. 4). A striking observation from the data indicates that states/UT such as Andaman & Nicobar Islands, Dadra and Nagar Haveli, Daman & Diu, Lakshadweep Islands, Sikkim & Tripura have Zero enrollment status for female scholars despite

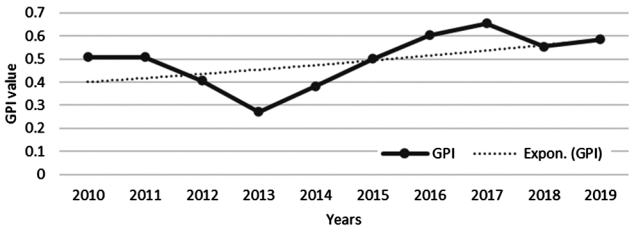

Fig. 3 — Qualified scholars GPI over the years

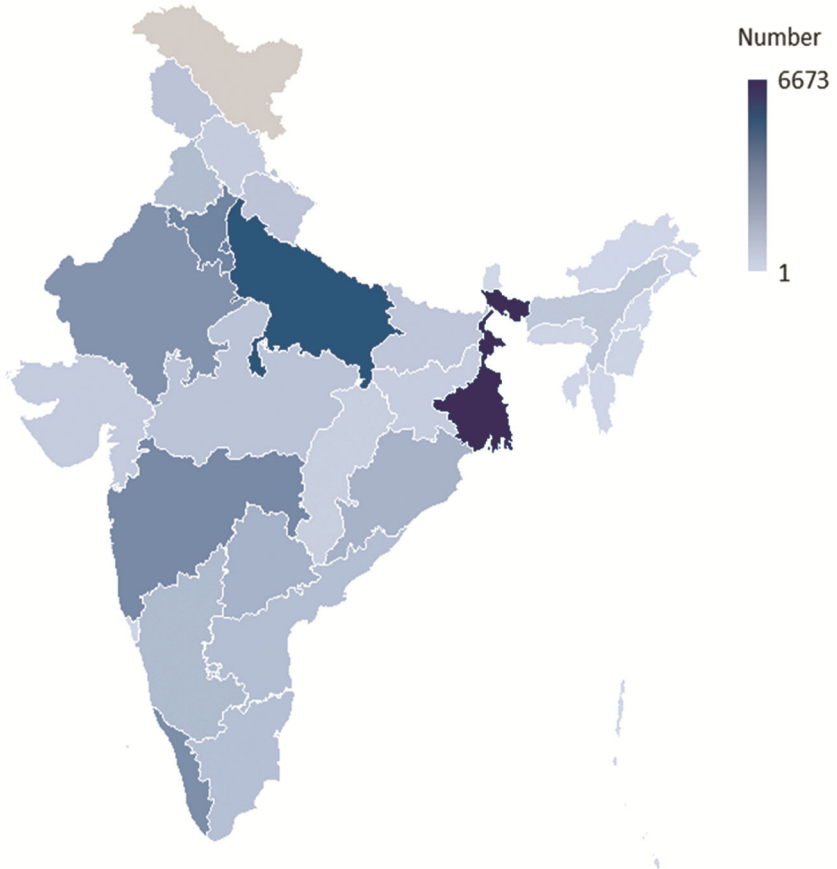

Fig. 4 — State wise distribution of scholars qualified as CSIR-JRF

exam qualification. Mostly the Northeast Indian states recorded poor qualified vs. enrolled rate.

When compared to the ratio of qualified to enrolled scholars, the ratio of enrolled to qualified stays constant by state. West Bengal has the most qualified male and female students, whereas Andaman & Nicobar Islands and Dadra & Nagar Haveli have the fewest, respectively. West Bengal has produced the highest proportion of qualified male and female scholars over the past ten years, indicating a dominance of the male gender over the years. Also Fig. 5 shows the gender contribution of the top ten states in terms of qualified and enrolled scholars.

In order to study the gender wise contribution of states, GPI in terms of qualified scholar's analyses

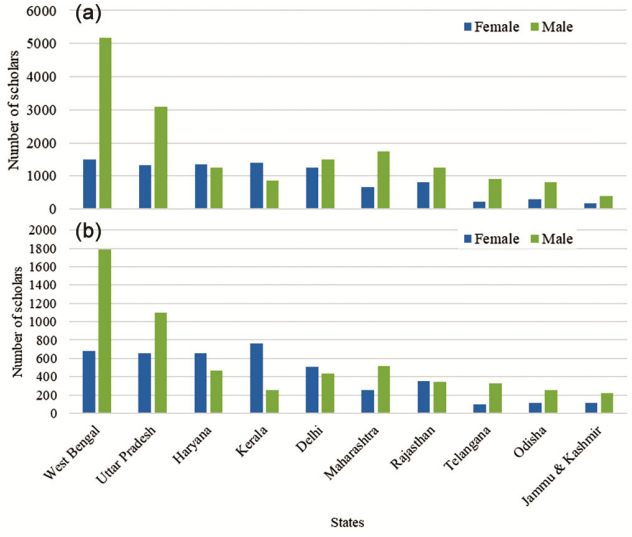

Fig. 5 — Top 10 state wise scholar's distribution for the period 2010–2019: (a) Qualified scholars, (b) Enrolled scholars

was done, which showed Kerala, Chandigarh, Goa, Arunachal Pradesh, Haryana, and Punjab to have the GPI above 1 which indicates that the number of females scholars have exceeded the number of male scholars in qualifying the exam from these states. On the other hand, states such as Sikkim, Andhra Pradesh, Tripura, Dadra & Nagar Haveli indicated the worst GPI of 0.18. In terms of enrolled candidates, Kerala showed a very high GPI i.e., 3.02 indicating almost thrice number of female scholar's enrollment compared to the male scholars from here. Similar findings were observed by Sarkar and Lakshmana[48] in a study that showed the state with the highest GPI of literacy is Kerala with a score of 0.99, while Rajasthan has the lowest score of 0.67. The findings of the analysis revealed that majority of the states with high enrollment and qualifying numbers are almost in line with the earlier study done by Inderpal[42] for the period of 2002–2006. Whereas Fig. 6 shows the GPI comparison for qualified and enrolled scholars during the last 10 years, with maximum scholars from West Bengal and max GPI from Kerala. Further Table 1 shows overall the GPI of enrolled scholars almost follows the pattern of GPI of qualified scholars but in some states such as Delhi, Jharkhand, Kerela, Punjab the female scholars catch up with the male scholars.

The SD analysis of state wise GPI of scholars shows that the gender ratio becomes equitable in terms of enrolled scholars vs. the qualified scholars although the deviation becomes deeper across states (Table 2). A p-value of 0.36 during t-test, performed at 0.05 significance level showed a relation between qualified GPI vs. the enrolled GPI.

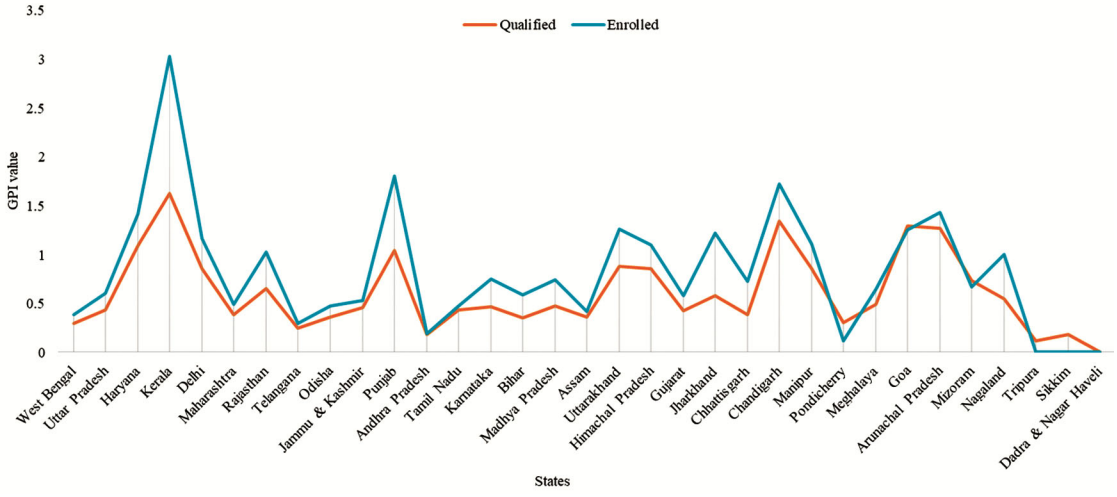

Fig. 6 — State wise distribution of GPI for qualified & enrolled scholars for the period 2010–2019

Table 1 — State wise gender distribution for qualified and enrolled scholars in the period (2010–2019)

	Qualified scholars				Enrolled scholars			
State	Female	Male	Total	GPI	Female	Male	Total	GPI
Andaman & Nicobar Islands	1	1	2	1.00	0	0	0	0.00
Andhra Pradesh	116	653	769	0.18	38	204	242	0.19
Arunachal Pradesh	19	15	34	1.27	10	7	17	1.43
Assam	123	344	467	0.36	50	121	171	0.41
Bihar	124	352	476	0.35	64	109	173	0.59
Chandigarh	94	70	164	1.34	43	25	68	1.72
Chhattisgarh	68	177	245	0.38	31	43	74	0.72
Dadra & Nagar Haveli	0	4	4	0.00	0	3	3	0.00
Daman & Diu	1	0	1	0.00	0	0	0	0.00
Delhi	1262	1487	2749	0.85	507	437	944	1.16
Goa	22	17	39	1.29	10	8	18	1.25
Gujarat	111	261	372	0.43	48	83	131	0.58
Haryana	1361	1249	2610	1.09	660	467	1127	1.41
Himachal Pradesh	148	173	321	0.86	79	72	151	1.10
Jammu & Kashmir	180	398	578	0.45	115	218	333	0.53
Jharkhand	111	193	304	0.58	56	46	102	1.22
Karnataka	277	595	872	0.47	80	107	187	0.75
Kerala	1397	863	2260	1.62	765	253	1018	3.02
Lakshadweep Islands	1	2	3	0.50	0	1	1	NA
Madhya Pradesh	176	373	549	0.47	73	99	172	0.74
Maharashtra	675	1752	2427	0.39	253	517	770	0.49
Manipur	57	67	124	0.85	32	29	61	1.10
Meghalaya	30	62	92	0.48	9	14	23	0.64
Mizoram	11	15	26	0.73	4	6	10	0.67
Nagaland	12	22	34	0.55	4	4	8	1.00
Odisha	290	818	1108	0.35	118	251	369	0.47
Pondicherry	17	57	74	0.30	3	26	29	0.12
Punjab	409	395	804	1.04	182	101	283	1.80
Rajasthan	817	1260	2077	0.65	357	348	705	1.03
Sikkim	2	11	13	0.18	0	7	7	NA
Tamil Nadu	214	495	709	0.43	67	141	208	0.48
Telangana	222	897	1119	0.25	96	331	427	0.29
Tripura	3	27	30	0.11	0	7	7	NA
Uttar Pradesh	1325	3101	4426	0.43	655	1096	1751	0.60
Uttarakhand	146	378	524	0.88	70	113	183	1.25
West Bengal	1502	5171	6673	0.29	680	1785	2465	0.38

Table 2 — State wise GPI distribution of scholars in period (2010–2019)

Sample	Size	Mean	Standard deviation
Qualified scholars GPI	37	0.5779	0.3882
Enrolled scholars GPI	37	0.733	0.6255

Subject Wise Analysis

A subject wise analysis is also done to understand the scholar's inclination towards subjects' selection for CSIR-UGC NET exam. The exam is conducted in six subjects, i.e., Physical, Chemical, Mathematical, Earth, Engineering and Life sciences, in which Engineering was introduced for a short duration only and then discontinued. The maximum number of scholars qualified were in Life Sciences, whereas minimum was in Earth Sciences over the decade (as engineering science was for a limited period hence excluded in comparison) (Fig. 7).

A comparison was made of the number of scholars who availed/enrolled for the fellowship in different subject categories. It was observed that maximum number were from life sciences, followed by chemical sciences whereas minimum was in Earth science. It signifies that there is direct connection between qualified versus enrolled scholars in subject wise distribution.

Further, data analysis for subject-wise gender distribution over the years reveals that more than 50% of the enrolled female scholars were inclined towards life sciences, whereas the male scholar distribution was more inclined towards chemical sciences. Moreover, the general enrolled scholar's inclination was in line with the qualified scholars. An earlier study indicated similar subject-related tendencies.[44]

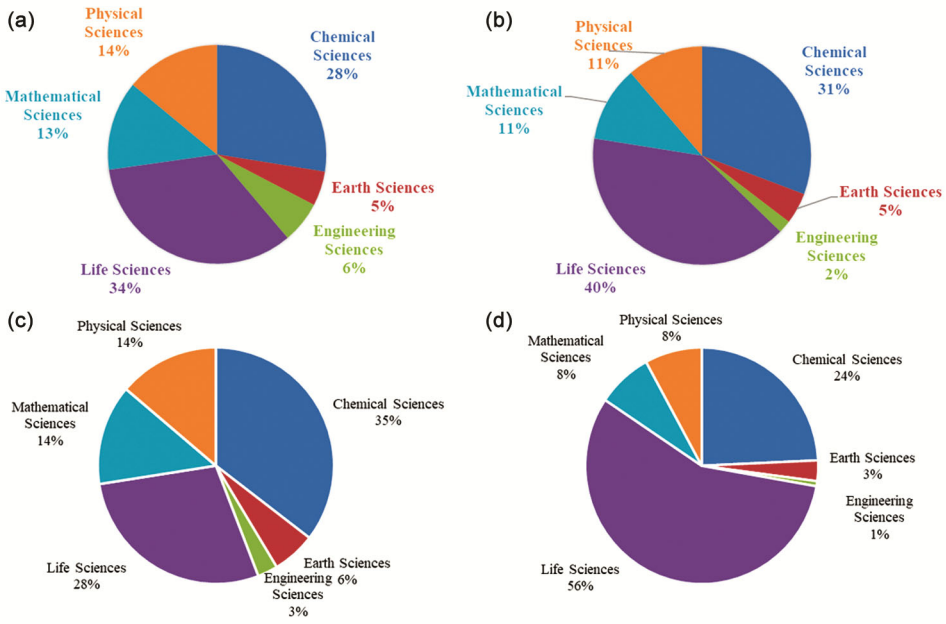

Fig. 7 — Subject distribution: (a) Qualified scholars, (b) Enrolled scholars, (c) Enrolled male scholars, (d) Enrolled female scholars

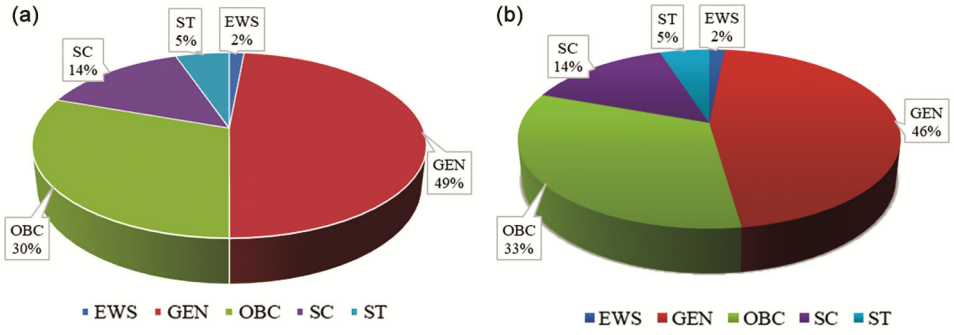

Fig. 8 — Category wise distribution: (a) Qualified scholars, (b) Enrolled scholars

Especially for engineering sciences even if the tenure of this subject was limited to a small period, the number of male inclinations towards this subject was significant whereas female inclination was insignificant.

Category Wise Analysis

A socio-economic group category wise analysis was also done to understand the category wise scholar's distribution in CSIR-UGC NET exam over the selected period. The analysis indicated that the GPI for EWS category is high in terms of both qualified and enrolled scholars. Number of female scholars enrolling from SC, ST and OBC categories is less than the male scholars. However, it is observed that the GPI is less than one for General category, but it is better than the other categories (Table 3). Further,

Table 3 — Category wise GPI for qualified and enrolled scholars

Category	GPI	
	Qualified scholars	Enrolled scholars
EWS	0.62	0.95
GEN	0.59	0.86
OBC	0.45	0.64
SC	0.42	0.56
ST	0.57	0.68

Fig. 8 shows the category wise distribution of qualified and enrolled scholars. A prior study showed similar fluctuation in the percentage of SC/ST categories.[44]

Conclusions

CSIR-JRF is one of the most prominent schemes for nurturing & promoting young talent in pursuing higher education in various STEM fields in India. The

study reflects trends in gender parity, demographic variation & socioeconomic distribution across the scheme. A significant increase is observed in the number of scholars qualifying and enrolling in the scheme with a modest increase in GPI. Though gender parity was evident, with higher females enrolling for fellowship in 12 states/UT with Kerala leading the list, gender disparity was observed in majority of the states/UT with poor female enrolment. It indicates the need to focus on increasing state-wise GPI in research and additional outreach initiatives focused on promoting STEM education for girls in India. Category-wise GPI for SC, ST, and OBC is 0.56, 0.68, and 0.64, indicating a need for programs specifically for socioeconomic groups. These findings can help create policy directives for programs focusing on human resources & capability building. New innovative programs may be launched to encourage females to study mathematics, engineering, and physical science at the school level. A more in-depth analysis of other GoI schemes/programs aimed toward capacity building and human resource development could help investigate gender parity thoroughly.

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Statements and Declarations

The authors hereby certify that there is no conflict of interest regarding the publication of this manuscript and authors have no financial interests that are directly or indirectly related to the work submitted for publication.

Conflict of Interest

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