Are research grants free from gender bias: an overview of funding pattern of CSIR extramural research projects in life sciences

*Kanta Rani and Rajesh Luthra**

Analysis of life sciences extramural research (EMR) projects, recommended during the period 2004–2008, indicates no apparent gender bias in awarding EMR grants. The success rate of women scientists from universities in getting EMR grants is higher compared to men scientists, unlike R&D institutions where it is relatively lower. Outreach of life sciences research funding to women scientists is limited to mainly Delhi, Karnataka and West Bengal. Relatively lower strength of women in most institutions, rather than gender discrimination, seems to be the reason of lower representation of women in life sciences research funding.

Keywords: Extramural research, funding pattern, gender, life sciences.

THE Council of Scientific and Industrial Research (CSIR) provides grants to promote research in various disciplines of science and technology, viz. life, chemical, physical, mathematical and engineering sciences. The assistance is provided by way of grants to scientists in regular employment in the universities, Indian Institutes of Technology (IITs), post-graduate institutions, and recognized R&D laboratories both in public and private sectors[1]. Research grants help scientists not only in carrying out state-of-the-art research in their area of interest, but also contribute a great deal in creating research facilities and training students in that area. Studies conducted in various countries indicate that women in general get a raw deal when it comes to giving research grants or faculty positions in an organization[2]. 'She Figures 2006' indicates that women are under-employed in research, have poor access to R&D resources, receive lower pay on an average, and have a disproportionately lower chance than men of reaching senior levels or holding positions of influence[2].

Though studies carried all over the world, including India have expressed serious concern over low representation of women in science, the scenario in life sciences indicates that women are relatively well-represented in life sciences compared to other areas of science[3–6]. It is, therefore, worthwhile to study the gender-wise pattern of research proposal received/recommended to get an idea as to how women scientists fare in competing for research grants in life sciences.

The authors are in the Human Resource Development Group, CSIR Complex, Library Avenue, Pusa, New Delhi 110 012, India.
*For correspondence. (e-mail: luthra57@rediffmail.com)

Methodology

Extramural research (EMR) projects received from universities, institutions of national importance and various R&D organizations are considered by specially constituted research committees consisting of distinguished scientists in their respective areas. Merit of the research proposal and track record of the scientist are taken into consideration while recommending the project. Due weightage is also given to the younger scientists to facilitate research in their area of interest.

Data on research projects received/recommended in life sciences were extracted from the minutes of the respective research committee meetings held during 2004–2008. Data of three sub-areas, viz. animal, plant and medical sciences were clubbed so as to get sizeable data on women scientists to compare them with men scientists. The extracted data were analysed to see the gender, institution and state-wise distribution of research projects received and recommended. For state-wise distribution of life sciences research projects, only those states from where at least 10 research projects have been received during the five-year period, were taken into account.

Share of three sub-areas of life sciences research projects

Over the years, biological science has become increasingly interdisciplinary and now receives far more funding than before[5]. Research in life sciences got an impetus with the establishment of new departments, centres and institutions specializing in various sub-disciplines of life sciences. About 40% of the total projects received under

Table 1. Research projects received and recommended in sub-areas under life sciences during 2004–2008

Sub-areas under life sciences	Number of research projects received	Number of research projects recommended	Percentage of research projects recommended
Animal science	375	184	49.06
Plant science	380	119	31.31
Medical science	158	58	36.70
Total	913	361	39.54

Table 2. Gender-wise distribution of received and recommended projects in life sciences during 2004–2008

Gender	Number of research projects received	Number of research projects recommended	Percentage of research projects recommended
Male	681	265	38.91
Female	232	96	41.38

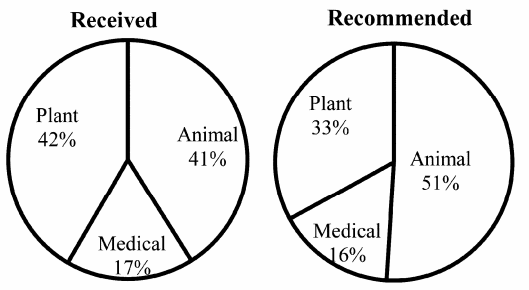

Figure 1. Relative percentage of research projects in three sub-areas under life sciences during 2004–2008.

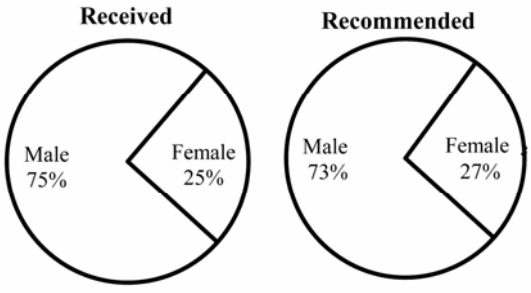

Figure 2. Gender-wise distribution of projects in life sciences during 2004–2008.

EMR funding of CSIR are from life sciences. Out of 913 projects received in the area of life sciences, the relative percentage of projects received in animal, plant and medical science were 42%, 41% and 17% respectively (Figure 1 and Table 1). Selection data show that 40% of the total projects received in life sciences was recommended for support. In the recommended projects, the share of animal science was the highest (51%) followed by plant science (33%) and medical science (16%). Thus, the pool of recommended projects mainly consists of animal science followed by plant science and medical science projects.

Gender-wise distribution

Gender-wise analysis of research projects received in life sciences indicates that the women applicants represent one-fourth of the total (Figure 2 and Table 2). The disparity in the number of applications received from men and women scientists is probably because less number of women seem to practice science. The representative data for biology department in some central universities show that the proportion of women faculty ranges from 10% to 22%, and there are proportionately more women at the junior level than at the senior level[6]. Data on faculty from the top 50 departments ranked by the National Science Foundation (NSF), according to research expenditure in biology, indicate that the percentage of women scientists decreases by 50 from assistant professor to full professor[3]. Though the number of research projects received from women scientists is small compared to men scientists, the success rate of women scientists in getting CSIR life sciences project is slightly better than men scientists. It seems that women scientists fare well or slightly better than their male counterparts in getting support from CSIR. Apparently, the CSIR support system is free of gender discrimination, contrary to the belief that women are, in general, discriminated in science. It seems after attrition at various stages, described by many as a leaky pipeline, the women who finally engage themselves in research, compete well with men scientists.

The Indian National Science Academy report[7] on women scientists reveals that percentage enrolment of women at graduation level is 39, which increases to 42.5 at the post-graduation level and then decreases to 37.2 at Ph D level. Unlike many Western countries, the problem in India is twofold: (1) getting more women to study science and technology and (2) ensuring that those who study are able to pursue a career in science and technology. There is remarkable attrition after Ph D, as women constitute only 15.6% of the total manpower employed in R&D establishment and 12.7% of the total personnel

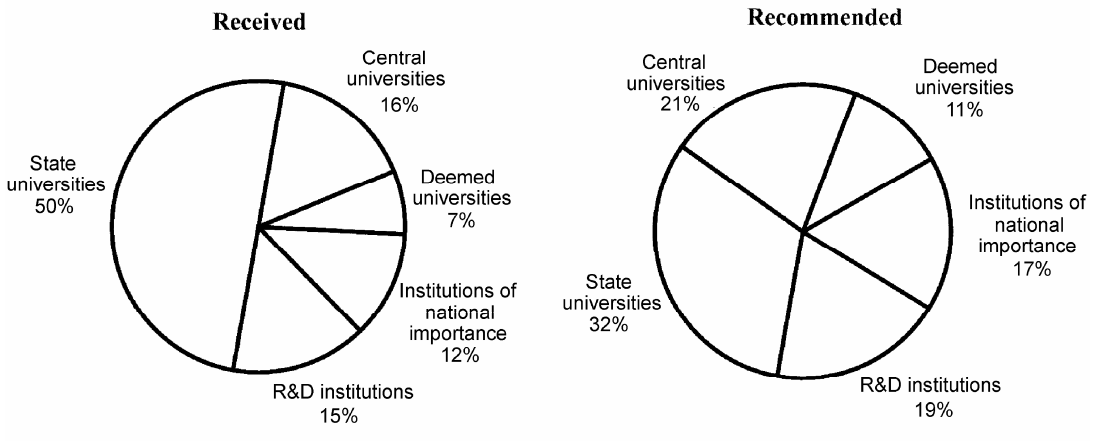

Figure 3. Institution-wise distribution of life sciences research projects from men scientists during 2004–2008.

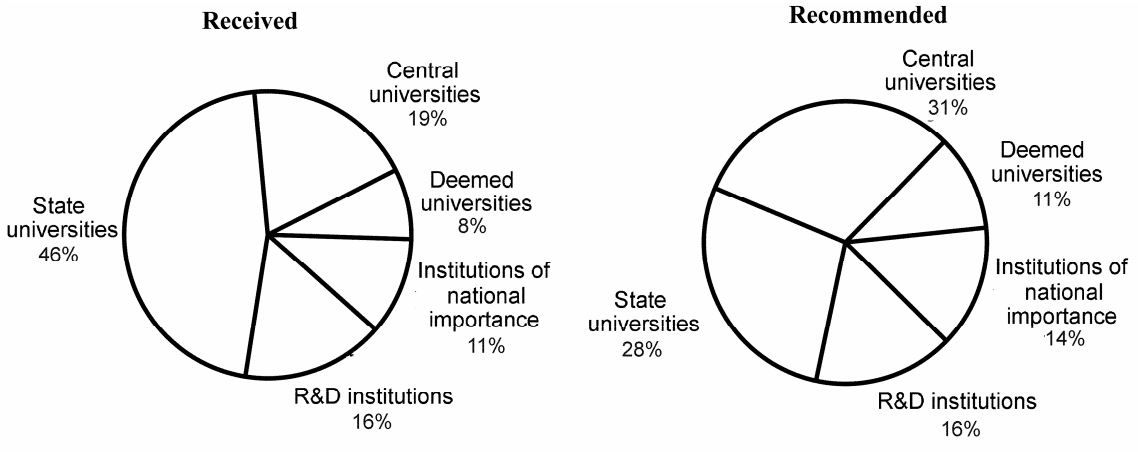

Figure 4. Institution-wise distribution of life sciences research projects from women scientists during 2004–2008.

performing R&D activities[8]. Attrition after higher education is a national waste and impoverishment of Indian science. Taking up jobs in sectors other than R&D, ending up as home-makers or preferring jobs in schools or under-graduate colleges to strike a balance between career and household responsibilities, may be the reason for lower representation of women in R&D.

Gender and institution-wise distribution

Research projects were received from various institutions ranging from universities to R&D institutions. The institution-wise distribution of projects received from both men (Figure 3) and women scientists (Figure 4) indicates that maximum number of projects received in life sciences were from universities followed by R&D institutions and institutions of national importance (Table 3). Though the institution-wise trend was essentially the same in the recommended projects, the proportion of state universities, however, decreased and of other institutions marginally increased in the total recommended projects. This is essentially because the success rate of projects received from state universities, which contribute about half of the total projects received from both men and women scientists, is much lower compared to projects received from other institutions. As the sole criterion for recommending a project is merit, it is evident from the data that state universities, barring a few, need to improve upon the quality of research projects being submitted. Improving infrastructure, starting interdisciplinary courses, encouraging interaction with national laboratories/institutions and creating centres of excellence will help state universities improve their quality of research. Uniform and stringent appointment and promotion criteria need to be evolved by the University Grants Commission (UGC), New Delhi to bring about overall improvement not only in research, but also in teaching.

Data pertaining to recommended projects indicate that women scientists from universities fare better in getting competitive research grants than their male counterparts,

Table 3. Institution and gender-wise distribution of received and recommended projects during 2004–2008

	State university		Central university		Deemed university		Institutions of national importance		R&D institutions	
Research project	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Received	342	106	107	45	52	18	80	25	99	39
Recommended	86	27	55	30	30	11	45	13	49	15
Percentage recommended	25.15	25.47	51.40	66.67	57.69	61.11	56.25	52	49	39.47

Table 4. State-wise distribution of received and recommended research projects in life sciences during 2004–2008

State/Union Territory (UT)	Received	State/UT	Recommended
West Bengal	152	West Bengal	72 (47.3)
Uttar Pradesh	114	Delhi	57 (54.8)
Delhi	104	Karnataka	46 (64.7)
Tamil Nadu	103	Uttar Pradesh	44 (38.6)
Andhra Pradesh	75	Tamil Nadu	29 (28.2)
Karnataka	71	Andhra Pradesh	25 (33.3)
Punjab	41	Punjab	19 (46.3)
Uttaranchal	33	Maharashtra	9 (29.0)
Maharashtra	31	Chandigarh	8 (28.6)
Kerala	29	Kerala	7 (24.1)
Chandigarh	28	Assam	7 (33.3)
Madhya Pradesh	23	Gujarat	6 (33.3)
Assam	21	Madhya Pradesh	5 (21.7)
Gujarat	18	Uttaranchal	5 (15.2)
Rajasthan	12	Rajasthan	2 (16.6)
Total	855	Total	341 (39.9)

Only those states from where 10 or more research projects were received during 2004–2008 have been included.
States have been listed in decreasing order in terms of number of research projects received and recommended in life sciences.
Figures in parenthesis represent percent projects recommended.

Table 5. State-wise distribution of received and recommended research projects in life sciences from women scientists during 2004–2008

State/UT	Received	State/UT	Recommended
Delhi	40	Delhi	25 (62.5)
West Bengal	34	West Bengal	21 (61.8)
Uttar Pradesh	28	Karnataka	13 (61.9)
Tamil Nadu	25	Tamil Nadu	7 (28.0)
Andhra Pradesh	23	Uttar Pradesh	7 (25.0)
Karnataka	21	Andhra Pradesh	6 (26.0)
Punjab	13	Kerala	4 (50.0)
Maharashtra	9	Punjab	3 (23.0)
Kerala	8	Maharashtra	3 (33.3)
Madhya Pradesh	7	Chandigarh	2 (50.0)
Uttaranchal	6	Madhya Pradesh	2 (28.6)
Chandigarh	4	Assam	1 (33.3)
Assam	3	Uttaranchal	1 (16.7)
Rajasthan	3		
Gujarat	2		
Total	226	Total	95 (42.0)

States have been listed in the decreasing order in terms of number of received and recommended research projects in life sciences from women scientists.
Figures in parenthesis represent per cent projects recommended.

unlike R&D institutions where their performance is relatively dismal. Success rate of women scientists from universities and R&D institutions was 40% and 39.5% respectively, compared to men scientists – 34% and 49% respectively. It is heartening to note that women scientists in central universities fare better (per cent projects recommended 66.7) than their male counterparts (per cent projects recommended 51.4).

Gender and state-wise distribution

During 2004–2008, a majority (94%) of life sciences project received and recommended were from fifteen States/ Union Territories (Table 4). The number of projects received varied from 12 (Rajasthan) to 152 (West Bengal, WB). About 68% of the projects received were, however, from six states/Union Territories, viz. WB, Uttar Pradesh (UP), Delhi, Tamil Nadu (TN), Andhra Pradesh (AP) and Karnataka. It is surprising to note that from each of the thirteen states/Union Territories, viz. Haryana, Jammu and Kashmir, Orissa, Chhattisgarh, Bihar, Himachal Pradesh, Goa, Puducherry, Manipur, Mizoram, Tripura, Sikkim and Arunachal Pradesh, less than 10 life sciences projects were received and from Sikkim, Chhattisgarh and Puducherry as low as one life sciences research project was received during the 5-year study period. Though there are few good R&D institutions in these states and Union Territories, the onus of doing R&D essentially lies on the university system. Therefore, the university system needs to be strengthened with the opening of new institutions and revamping the old ones to boost R&D in these states. The top six states/Union Territories in terms of the number of projects recommended were WB, Delhi, Karnataka, UP, TN and AP. Maximum percentage of projects recommended were from Karnataka (64.7) followed by Delhi (54.8) and WB (47.3).

Data pertaining to state-wise distribution of projects received in life sciences from women scientists indicate that a majority (97%) of the projects considered were from 15 states/Union Territories (Table 5). The number of projects considered varied from 2 (Gujarat) to 40 (Delhi). The top six states/Union Territories in terms of the number of projects considered and recommended to

women scientists were Delhi, WB, UP, TN, AP and Karnataka. Delhi, WB and UP led the country in terms of number of life sciences projects received, whereas Delhi, followed by Karnataka and WB led in terms of number of life sciences projects recommended. Directed efforts are required to encourage more women to take science as a career.

Keeping in view the difficulties involved in the case of women pursuing a career in science, the Department of Science and Technology (DST), New Delhi has started a programme to provide opportunities to women scientists and technologists in the age group of 30–50 years who desire to return to mainstream science and work as bench-level scientists. Age relaxation of five years is also given to women applying for research fellowships and postdoctoral associateships (JRF, SRF and RA), and DST's fast-track scheme for young scientists. All these schemes are helping women return to mainstream science after a gap, which most women are likely to have due to marriage, child-bearing and rearing etc. However, such schemes only provide a stop-gap arrangement and thereafter women often become over-aged for lower positions or find it hard to compete with their male counterparts for senior positions. After having spent 15–20 years in research, it is really pathetic if women are forced to quit a science career just because of precious time lost due to family responsibilities. Whole-hearted efforts are required to bring about radical changes in recruitment policies like doing away with the age bar, and ignoring the gaps in career while making selection of deserving women candidates.

Conclusion

Success rate of women scientists in getting CSIR projects in the area of life sciences clearly indicates that they compete well with men scientists. Apparently, there is no discrimination against women in the selection process. The success rate of women scientists from universities in getting EMR grants is higher compared to men scientists, unlike R&D institutions where it is relatively lower. However, in state universities from where maximum number of research grant proposals are received, the success rate is quite low, both for men and women scientists. As universities are the training grounds for students and future scientists, the quality of education and research in state universities, barring a few, requires special attention. State-wise distribution of life sciences projects recommended to women scientists shows that the outreach of life sciences research funding to women scientists is limited mainly to Delhi, Karnataka and WB. National-level efforts are required for holistic participation of women from all parts of the country in life sciences research.

The women scientists' pool can be enlarged by cutting down attrition and making research more gender-friendly. Mentoring of bright, young women candidates and encouraging them to interact with eminent scientists at the national and international level will encourage more women to pursue a career in research. The Department of Biotechnology, New Delhi has instituted the 'National Women Bioscientists Awards' to recognize outstanding contributions of women scientists in the areas of biosciences and biotechnology, including agricultural, biomedical and environmental sciences with potential for application/product and technology development. Recognition of successful women scientists in order to create new role models for aspiring young women and involving women in various decision-making bodies to sensitize the authorities to the various problems that women face, and enhancing their professional visibility will go a long way in making life sciences research an attractive career option for women.

1. CSIR Research Grants: Terms and Conditions Booklet, Human Resource Development Group, CSIR, 2005.
2. She Figures 2006, Women and Science, Statistics and Indicators, European Commission, Directorate-General for Research, Brussels; http://europa.eu.int/comm/research/index_en.cfm
3. Handelsman, Jo. *et al*., Policy Forum, Careers in Science: More Women in Science. *Science*, 2005, **309**, 1190–1191.
4. Desai, P. N., Gender in Indian Science and Technology: Recognition of Excellence, Presented at the International Workshop on Empowerment of Women through Science and Technology Interventions, Tehran, Iran, 14–16 December 2008.
5. Arunachalam, S., Mapping life sciences research in India: a profile based on BIOSIS 1992–1994. *Curr Sci.*, 1999, **76**, 1191–1203.
6. Bal, V., Women scientists in India: nowhere near the glass ceiling. *Curr. Sci*., 2005, **88**, 872–875.
7. Indian National Science Academy Report, New Delhi, 2004; http://www.insaindia.org/scienceservice/science.htm
8. Research and Development Statistics 2007–08, Department of Science & Technology, Government of India.

Received 24 April 2010; accepted 12 October 2010