

Are Indian women scientists victims of the 'glass ceiling'?

Upasana Bora Sinha* and Dipak Sinha

Women participation in science in India is quite low. This is an interesting observation in itself given the fact that there is no apparent professional gender discrimination in our country. In this article, we analyse all the factors which create obstacles for women scientists pursuing careers in scientific research.

Keywords: Gender, under-representation, women scientists.

IN recent years, the issue of 'under-representation of women in scientific research' has become a global concern¹⁻¹⁶. There seems to be a universal realization that presence of women in the scientific workforce is essential to increase the diversity and richness of human knowledge and understanding. Moreover, women bring in a gentler and more humane perspective to scientific research which is also necessary for sustainable growth in modern economies. In India too there is a growing concern on the issue of low participation of women in scientific research¹⁰⁻¹⁶ (<http://dst.gov.in/scientific-programme/women-scientists.htm>). In acknowledgement of the problems faced by women scientists, different government agencies like the Department of Science and Technology have been providing active support through various specially-designed schemes. These have been beneficial for many women scientists and aspirants, and have enabled women scientists to make an entry into the scientific workforce even after having breaks in career. Hence, it is surprising that 'Although women have earned 37% of all science PhDs awarded by Indian institutions, they hold fewer than 15% of science faculty positions. Out of India's 114,000 or so government scientists, fewer than 16,000 are women'¹⁷. In fact, it is also surprising that in the 52-year history of India's highest science award, the CSIR Shanti Swarup Bhatnagar Prize, among the 463 recipients of the award, only 14 have so far been women, a mere 3% (http://www.telegraphindia.com/1100928/jsp/frontpage/story_12991055.jsp). Just based on these statistics alone, an observation could be made that although there seems to be no bar on women pursuing scientific research in India, unfortunately however, there seem to be certain difficulties in women scientists achieving professional excellence.

Therefore, while low participation of women in scientific research continues to be a matter of concern to both academicians and policymakers alike, another question that has assumed topical importance, not only in India, but the worldover, is whether there exists a 'glass ceiling' for women scientists which is responsible for the inability of women scientists to succeed¹⁸⁻²⁴.

The term 'glass ceiling' was originally coined by Carol Hymowitz and Timothy Schellhardt²⁵ and can be defined as 'an imaginary barrier to progress in a profession, especially affecting women and members of minorities'. Different types of glass ceiling barriers can exist, ranging from different pay for comparable work; sexual, ethnic, racial, religious discrimination or harassment in the workplace; lack of family-friendly workplace policies; to exclusion from informal networks; stereotyping and preconceptions of women's roles and abilities; failure of senior leadership to assume accountability for women's advancement; lack of role models, and lack of mentoring (http://en.wikipedia.org/wiki/Glass_ceiling). Creation of the 'glass ceiling' is usually not because of a single cause and is also not always a drastic phenomenon. In fact, some of the causal factors are sometimes so trivial in themselves that professionals often do not even realize that they face any barrier in professional advancement. But unfortunately maybe these situations might make an impact on efficiency and productivity of women professionals such as the women scientists.

As has been discussed, in India there is a concern on the issue of low participation of women in scientific research¹⁰⁻¹⁶. One of the most comprehensive studies was conducted by Indian National Science Academy (INSA) in 2004 and some of the problems were identified and recommendations were made in its report on 'science career for Indian women: an examination of Indian women's access to and retention in scientific careers'¹⁰. Other reports have indicated that in our country, gender-bias and patri-focality come in the way of women scientists, creating roadblocks in their careers^{11,14,16}. However,

The authors are in the Department of Chemistry, Nagaland University, Lumami 798 627, India.

*For correspondence. (e-mail: upasanaborasinha@gmail.com)

Table 1. Statistical details of the survey

Categories of the respondents	Total number of samples taken	Enthusiastic response	Forced response	No response
Women scientists	30	6	12	12
Husbands of women scientists	10	6	4	0
Women research scholars	25	2	10	13
Male scientists	15	7	5	3
Total	80	21	31	28

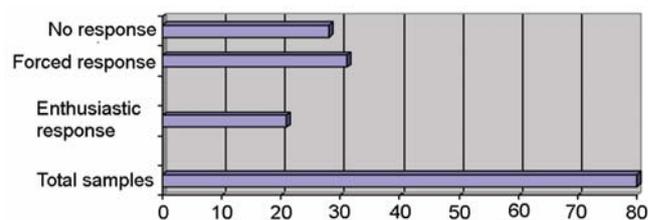
it was considered important to analyse whether gender-bias and patriarchy are the only factors, or there are other important factors which are responsible for hampering the growth of women scientists. Therefore, an effort has been made in this study to understand the status of women in scientific research, examine their challenges, identify their needs and analyse whether there exist a glass ceiling for women scientists.

Methodology

North-east India was chosen for this study because the region is socially different from the rest of the country. Most of the states have tribal societies and in these societies there is almost no gender-based discrimination and women enjoy high positions in society. In fact, Meghalaya boasts of a matriarchal society. The fact that patriarchy is almost non-existent in the north-east was considered useful in the present context as it could allow an analysis of all the other factors which are also responsible for retarding the growth of women scientists. Moreover, the region has a fairly large number of institutes of higher learning, having eight central universities, two state universities and one Indian Institute of Technology. Another reason why this study was considered relevant in this context is because other than a brief overview in the INSA document, reports on the status of women scientists in this part of the country are not available.

Anticipating that most women scientists face similar problems, respondents were drawn from science departments of different institutions. The respondents were selected by a method of non-probability sampling. They were grouped into different categories, viz. (i) the women scientists themselves, (ii) husbands' of the women scientists, (iii) women research scholars and (iv) male scientists (Table 1). The respondents were first contacted through telephone or email and following this, the questionnaires were handed over to the scientists and students. Subsequently, interviews were conducted with the respondents and their deliberations recorded.

Since the main intention had been to analyse the status of women scientists and issues related to the glass ceiling, interviews were focused mainly on the following

**Figure 1.** Attitudes of respondents.

issues: (i) different pay for comparable work; (ii) sexual, ethnic, racial, religious discrimination or harassment in the workplace; (iii) lack of family-friendly workplace policies; (iv) exclusion from informal networks; (v) stereotyping and preconceptions of women's roles and abilities; (vi) failure of senior leadership to assume accountability for women's advancement; (vii) lack of role models; and (viii) lack of mentoring.

Results and discussion

In order to understand some of the reasons which make the profession of scientific research difficult for women, in-depth discussions were held with women scientists, women research scholars, husbands of scientists and male scientist colleagues. The different issues which created obstacles for the women scientists were discussed with different respondents. The following section presents an informal attempt to look at some of the different aspects which seem to influence the status of women scientists in north-east India.

It is relevant to mention that only few respondents were really interested in discussing the issue (Figure 1). It was felt that most women considered it as a personal ability or inability, as the case may be, to manage the dual responsibility of family and profession and did not wish to deliberate on the issue. And probably because of this, the other sections of people also looked at it as a somewhat irrelevant and unconnected subject.

One of the issues discussed was regarding discrimination or harassment in the workplace – while some reports are available from the rest of India¹⁶ that such type of harassment sometimes takes place, but based on the responses of the interviewees, discrimination or harassment

at the workplace, especially for women is almost non-existent. The male scientists who also responded did not seem to have any problems with women as research colleagues. When asked for views on lack of family-friendly workplace policies, most respondents, male and female, were of the view that women definitely needed more facilities to be able to effectively take care of both domestic and professional responsibilities effectively. While most women expressed the need for child-care facilities at the workplace and better domestic support system, and some men voiced that introduction of a part-time research scheme for women scientists with familial responsibilities would allow more women to be inducted into the scientific work force. Fresh entrants did not feel the need for any assistance. There was a valid suggestion made by one of the respondents who felt that introduction of child-care allowance would help in some way mostly because financial incentives play a big role in framing decisions. None of the respondents however believed that there was a failure of senior leadership to assume accountability for women's advancement as such but it was mostly because of the official procedures and rules. In this profession there are no special advantages given to women and they are treated at par with men, right from salary to allowances paid for attending conferences. Even in promotion processes, there are no considerations for women scientists. However, since women have additional responsibilities, the official policy of gender neutrality also probably harms the women scientists in the long run.

When asked what they thought about the stereotyping and preconceptions of women's roles and abilities, a few senior male professors expressed that women performed better individually but were sometimes unable to handle administrative responsibilities well. The respondents acknowledged that it was difficult for women to be as effective as men as scientists, given the fact that women have a larger share of family responsibilities. Interviewing of women research scholars provided insight into another aspect of social intervention. Most of the respondents revealed that in most of the cases, their families wanted eagerly for the student to complete her doctoral work so that she could 'settle down', pursuit of post-doctoral studies did not seem to be an immediate option, and regarding career aspirations, most were interested in 'completing their Ph D first'.

Lack of mentoring seemed to be a major contributor to the situation of women scientists, at least in North-east India – the biggest problems young researchers face is when it comes to starting an independent research career. This is especially true for researchers working in teaching organizations, because here the individuals do not usually join any existing research group but have to function independently and individually which makes it very difficult to establish oneself as a researcher. People take many years to establish themselves, and the process is sometimes so tough that many people just get 'burnt out'. It

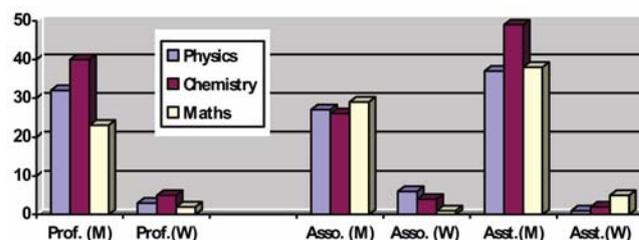


Figure 2. Ratio of the men : women scientists in physics, chemistry and maths (M: men; W: women).

was collectively suggested that the scientific organizations could work out a means through which young scientists could be mentored for a few years till they are able to start out independently. This would be especially beneficial for women. Since collaboration and networking are extremely important for scientific research, it would be helpful if an official/professional procedure could be put in place. Regarding the issue of exclusion from informal networks, because of the remoteness of this region, women scientists are not always able to visit other universities and institutes in other parts of the country and regularly attend seminars and workshops. Therefore, they are unable to create a professional–social network.

Based on the responses and comments received, it was understood that there are many factors which retard the professional advancement of women scientists.

However, it was also observed that there is an incredible difference between the number of men and women scientists working in different institutions, especially in the area of basic sciences, i.e. physics, chemistry and mathematics (Figure 2).

This gave some indication that women, even after adequate training and qualifications often do not desire to join the scientific workforce. The main reason for this could be that the time to start an independent professional career coincides with marriage and starting of family. Therefore, at this professionally crucial time most women have to give priority to social responsibilities. Further, it was expressed that since for most women their social responsibilities were as important as their professional, women felt compelled to attend to their social as well as professional responsibilities with equal dedication. Thus women scientists often have to do a 'balancing act', trying to manage both home and profession, which makes the profession of a scientist tough for majority of women.

Conclusion

The present study revealed that the problems faced by women scientists of this region in north-east India seemed to be similar to those faced by women scientists in other parts of the country. Though there is no 'official' glass ceiling, because there is no gender-based salary

GENERAL ARTICLES

difference, there are other issues which create obstacles for women scientists, and the women scientists may possibly be victims of the glass ceiling. Therefore, policies are needed that help women to enter the scientific profession and also rise in their professions more comfortably and successfully. These policies probably would have been framed sooner had there been more women among the policymakers to discuss and explain the diverse types of strategic and practical problems faced by women scientists.

1. Handelsman, J. *et al.*, More women in science. *Science*, 2005, **309**, 1190–1191.
2. Taeb, M. (ed.), Revisiting women's participation in science and technology – emerging challenges and agenda for reform. *UNU-IAS*, 2005.
3. A strategy for women in science, engineering and technology. A Report from the Office of Science and Technology, UK, 2003.
4. Ásgeirsdóttir, B., Women in scientific careers: unleashing the potential. Speech given at the OECD-French Research Ministry Workshop, Paris, 16 November 2005.
5. One woman is still not enough. *Nature*, 2008, **451**, 865.
6. Action, not words. *Nature*, 2005, **436**, 151.
7. All things equal. *Nature*, 2005, **437**, 296.
8. Normile, D., Getting women scientists back on the career track in Japan. *Science*, 2006, **311**, 1235–1236.
9. Financing for gender equity: women in science, engineering and technology, UN Commission on the Status of Women (CSW), March 2008.
10. Science career for Indian women: an examination of Indian women's access to and retention in scientific careers. INSA Report, 2004.
11. Gupta, N. and Sharma, A. K., Patrifocal concerns in the lives of women in academic science: continuity of tradition and emerging challenges. *Indian J. Gender Studies*, 2003, **10**, 279–305.
12. Munshi, U. M. and Srivastava, D., Gendered science: trends and analysis of contributions of Indian women scientists, www.indianwomenscientists.in/India/genderscience.pdf
13. Gupta, A. K. and Mashelkar, R. A., Women and formal and informal science, www.indianwomenscientists.in/India/womenandformal.pdf
14. Subramaniam, J., Perceiving and producing merit: gender and doing science in India. *Indian J. Gender Studies*, 2007, **14**, 259–284.
15. Status of women scientists in S&T/R&D institutions in Delhi. Report submitted to the National Commission for Women by the Society for Environment and Development, New Delhi, www.ncw.nic.in/pdfreports/WOMEN_SCIENTISTS.pdf
16. Kumar, N. (ed.), *Women and Science in India – A Reader*, Oxford University Press, 2009.
17. Bagla, P., Indian government offers helping hand to women scientists. *Science*, 2008, **319**, 1470.
18. Bal, V., Women scientists in India: nowhere near the glass ceiling. *Curr. Sci.*, 2005, **88**, 872–878.
19. Breaking the Glass Ceiling, Proposals to Adjust the Role of Women in Science; www.irbbarcelona.org/files/Files/breaking-the-glass-ceiling.pdf
20. Ioannidis, J. P. A., Is there a glass ceiling for highly cited scientists at the top of research universities? (article Fj.10-162974 published online). *FASEB J.*, 2010, 1–4.
21. Powell, K., Beyond the glass ceiling. *Nature*, 2007, **448**, 98–100.
22. Rosser, S. V., *The Science Glass Ceiling: Academic Women Scientists and the Struggle to Succeed*, Routledge, UK, 2004.
23. Bagues, M. F. and Esteve-Volart, B., Can gender parity break the glass ceiling? Evidence from a repeated randomized experiment. *Rev. Econ. Stud.*, 2010, **77**, 1301–1328.
24. Hoobler, J. M., Wayne, S. J. and Lemmon, G., Bosses' perceptions of family – work conflict and women's promotability: glass ceiling effects. *Acad. Manage. J.*, 2009, **52**, 939–957.
25. Baker, B. and Lightle, S., Cracks in the glass ceiling: an analysis of gender equity in the federal government auditing career field. *J. Govt. Finan. Mgmt.*, 2001, **1**, 18–26.

Received 28 May 2010; revised accepted 7 January 2011