

Empowering Female Participation in Engineering Research: Unmasking Constrains and Developing Gender-Sensitive Research Policies

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Abstract

This research investigates the current research policies to support female academics in engineering and technology research in South Indian higher education institutions (HEIs). It examines how the socio-cultural systems and institutional research policies influence females' employment, opportunities to conduct research (OCR), and overall research productivity (RP). A qualitative method was used to collect data from male and female academics. Findings reveal a stark absence of gender-sensitive policies that acknowledge the unique barriers faced by female academics in engineering. The currently followed gender-neutral policies overlook crucial societal dynamics, hindering females' research opportunities. The study proposes an empirical model accounting for these complex interactions, thus offering insights for HEIs and policymakers to develop equitable policies to foster and recognise female participation in engineering research.

Introduction

This study explores the various factors that influence female academics to be able to conduct research and publish in a developing country scenario. Looking at it from a socio-cultural and policy perspective, this research extends the findings of Bakthavatchalam (2018) and Bakthavatchalam et al. (2020), which identified diverse challenges faced by female academics in engineering concerning their research opportunities and, consequently, their overall RP. This study focuses on SDG (Sustainable Development Goal)4, SDG5 and SDG8 by looking at South India's engineering academics.

In academia, research and publications are crucial indicators of productivity, academic distinction, grant acquisition, and impact on career, promotions, and institutional rankings. RP is influenced by various factors, such as demographics, institutional policies, academic environment, governing bodies, and personal and professional aspects (Callaghan, 2015; Ebadi & Schifauerova, 2016; Rani, 2010). HEIs in developing countries are attempting to rapidly shift from teaching-focused to research-based institutions, with academics pressured to conduct research despite limited resources, infrastructure, and policies (Bakthavatchalam et al., 2021). This research explores this situation with a gender lens.

The literature reveals a common trend of lower RP among women compared to men (Aksnes et al., 2011; Lariviere et al., 2013; Prpic, 2002). Factors contributing to lower female RP include cultural biases, maternity, more teaching duties, unequal time and resource allocation, lack of networking, and a disregard for gender-related issues in the higher education (HE)

system (Abramo et al., 2013; Acker, 2006; Bosanquet, 2017; Gupta, 2017; Huang, 2019; Jayachandran, 2021).

Female academics face challenges such as reduced mobility for data collection, undervaluation of contributions by academic gatekeepers, and parenthood, hindering both RP and career advancement (Bakthavatchalam et al., 2020; Gandhi et al., 2021; Richards, 2006). Gender disparities in networking contribute to collaboration and international publication difficulties (Huang, 2019; Lee & Bozeman, 2005). Additional obstacles include teaching-oriented duties, lack of childcare facilities and cultural biases (Ropers-Huilman, 2002; Sutor et al., 2001).

Astegiano et al. (2019) highlight the prevalence of a male-oriented research environment, particularly in STEM (Science, Technology, Engineering and Mathematics) fields, leading to socio-psychological hurdles for female academics. This dynamic requires women to outperform men for their research potential to be recognised. Furthermore, Ozkanlı et al (2009) point out structural disadvantages within the HE system, affecting women's selection for top institutional roles.

The lack of understanding of gender differences and insufficient equity-building policies exacerbate these challenges (Bakthavatchalam et al., 2020). While gender-related challenges in RP are acknowledged, very few studies have examined this in the context of developing countries. With RP gaining significance for promotions and institutional rankings, it is crucial to assess whether existing research policies address diverse factors influencing RP from a gender perspective.

Methodology

The qualitative methodology was chosen, thus facilitating an in-depth exploration of respondents' perceptions (Denzin & Lincoln, 2011; Galletta, 2013). Data collection involved twenty interviews, lasting one hour each, with engineering academics from various South Indian institutions. The sample included ten male and ten female academics, evenly split between experienced (over ten years) and early-career academics (two to five years, conducting their PhD). This deliberate selection aimed to balance gender and experience. Content analysis was used to identify the categories and meanings and identify theoretical and empirical saturation.

Results and Discussion

Of the range of themes identified in the results, this report expands on the issues faced by female academics and how a range of socio-cultural factors and HE policies influence their research.

Barriers in the opportunities to conduct research

Numerous barriers were identified that impeded female academics' research engagement. These included socio-cultural expectations, family-oriented, financial constraints, institutional factors, workplace harassment and a lack of supportive policies. Comparative analysis with male counterparts reveals the detrimental effects of these barriers on female academics' research endeavours and subsequent career advancement. The results showed how societal expectations dictated women's roles in family care, elder support, and child-rearing, impacting their OCR, which were significantly less for their male counterparts. The changing, yet predominant, gender roles posed considerable challenges to female OCR. As two of the academics commented,

"Women have fewer opportunities for research. They have more family responsibilities."

- (Experienced male academic)

"Females, as they enter home, chores take over, their research stops, compared to men, who continue with research."

- (New female academic)

Travelling for research emerged as a significant barrier, limiting their research engagement, data collection, conference participation, and networking compared to male counterparts, in line with findings by Abramo et al. (2013). A relevant issue noticed was that a range of

academics did not even acknowledge the barriers to females' OCR.

"There are no differences in the factors influencing the research of genders. No need for special policies."

- (New male academic)

There were both systemic, structural, and practical barriers within the institutions, hindering females' research-oriented careers, leading to disparities in employment, promotions, funding, and publications, reflecting the research by Fathima et al. (2020) and Urry (2015). These included disproportionate administrative and pastoral tasks for females, the perception that management favoured male academics for promotion despite equal RP, and ineffective maternity policies, among others.

Policy requirements and failings

Several categories emerged in terms of the policy requirements and failings. Initially, the findings underscore the absence of visible institutional policies that considered the barriers female academics face in their research.

"Policies, what policies?"

-(Experienced female academic)

Respondents commented that there are some research policies at the national or governing body levels but were unaware of them in detail. Even the few governmental policies that exist in theory are not consistently implemented at the institutional level. These include inadequate job security during maternity, inflexible timings for child rearing, glass ceiling impeding career progression, inadequate policies countering passive harassment, etc. Comments on the absence of robust maternity policies in terms of job security came up often.

"Institutions ask the female to quit their job to deliver a baby. After maternity leave, we have to apply for the same post – if there is a vacancy."

-(New female academic)

The data suggests that academic managers and policymakers within HEIs favour gender-neutral policies for research and promotion opportunities. Yet, these gender-neutral policies fail to account for the various barriers females face, hence becoming gender-inequitable, negatively impacting their research.

The quantitative measures used for academic promotion, coupled with gender-neutral policies, create further pressure for females to compete with their male

peers who do not face these barriers. For instance, the ‘Motherhood penalty’, as commented by Sewell and Barnett (2019), affected female academics more than male academics. Even when producing equivalent research outputs, females perceived a glass ceiling for promotion, which was easier for males to overcome. These findings align with Aguinis et al. (2018), emphasising the need for female academics to accrue higher social and scientific capital to attain comparable RP and promotions compared to their male counterparts.

Surprisingly, the senior female academics involved in policymaking regrettably internalised discrimination as the norm within the male-dominated environment. To ‘fit in’ the predominantly male culture, there were instances when female academics adopted a ‘male-like’ attitude. As Powell et al. (2009) note, this does little to help a female cause and resulted in them overlooking the challenges faced by other female academics, thus adopting an unintentional anti-female stance. This needs to be looked at in detail.

“I went through a test of fire and, hence, I am strong. It is important that new female academics go through the same to be strong”.

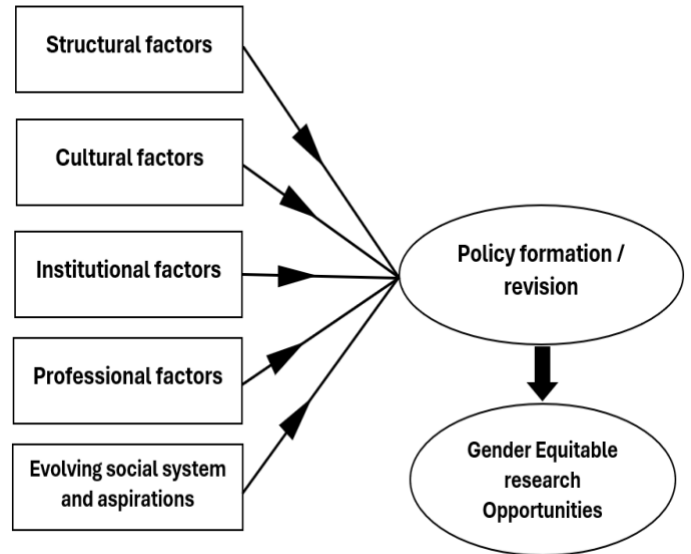
- (Senior female academic)

Another serious issue highlighted regards harassment towards female academics from lead researchers, male colleagues, senior academic peers, or research supervisors. Most of the harassment went unreported. Passive harassment behaviours included flirting and frequent invitations for casual conversations. This needs to be carefully looked at in the policy development. ILO (International Labour Organisation) (2022) notes various factors impeding individuals from reporting harassment, including a perception that reporting is futile and a fear of reputational damage. There is a notable gap in evidence-based research and reliable data concerning both overt/subtle harassment, as well as the efficacy of institutional committees investigating such incidents. This needs to be looked at.

Seron et al. (2018) comment that females, despite articulating criticisms of their experiences in engineering, often refrain from acknowledging the structural inequities or translating their own marginalisation into a broader commentary on the profession. The policies formed should address not only individual factors but also inequities at the structural and cultural levels (Bakthavatchalam et al., 2020; O'Connor, 2020), thus developing culturally sensitive research policies.

For institutions to address these barriers, they must first acknowledge their existence at both a policy and a practical level and not accept them as a norm. Based on the results, the conceptual model depicted in Figure 1 was designed.

Figure 1. Model on gender sensitive research policies.



Data source: Authors.

Conclusions

In the context of the expanding Indian HE system and its aspirations to emerge as Asia’s research hub, it is essential for HEIs and governing bodies to formulate culturally sensitive research policies that would address both the structural and practical issues. The aim is to bolster support for female academics in their research endeavours, thereby fostering equitable research opportunities for male and female academics. This work serves as a reference not only for the broader HE labour-market but also for similar developing countries. Extensive consultations with stakeholders are imperative to address the multifaceted issues identified, considering evolving socio-cultural dynamics, academic systems, and stakeholder aspirations. Institutional policies must be crafted to initiate tangible steps towards addressing these challenges.

Limitations and future work

Limited empirical research in this field in India hampers a comparative analysis. Generalisability is limited in any qualitative study. Applying the results of this research to a different cultural and socio-economic context should be done with caution. Future research should consider nationwide or international comparative

studies of policies and their impacts. It could also have a longitudinal look into the evolution of gender policies and their impact on female academics and their lived experiences. Further work is needed to explore how this contributes to social justice within policymaking and the resulting impact not only on female academics' RP but also on their impact on the overall society.

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