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SPECIAL FOCUS PAPER

Gender Representation in Engineering Education: A Multi-Year Analysis Using AISHE

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ABSTRACT

With women underrepresented, engineering education in India continues to face persistent gender disparities. Despite various reforms and interventions across the decades, the imbalance is still apparent. This study examines gender representation in engineering education in India using both the systematic literature review and quantitative data analysis. The systematic literature review followed the PRISMA guidelines to review peer-reviewed open-access research articles. The review helped to identify the key factors that influence women's participation in engineering education, such as social, cultural, organizational, and policy-based barriers. For the quantitative data analysis, the authors have referred to the data from the All-India Survey of Higher Education (AISHE) across multiple years (2012–2022). This study aims to understand the trends in female enrollment and graduation in engineering programs. The data was organized, cleaned, and represented. The graphical representation highlights year-wise patterns, progress, and areas where gender gaps persist. With the combined insights from SLR and AISHE data trends, the authors have proposed a conceptual framework that aims to improve female participation. The findings of this study are expected to inform institutions and policymakers on how to make the engineering education system more inclusive for female participants.

KEYWORDS

engineering, education, gender disparity, All-India Survey of Higher Education (AISHE), India, all India, gender gap, female, participation

1 INTRODUCTION

Education as a system shapes the individual's potential and plays a major role in building the economic and social progress of a nation. One such education domain is engineering. It is transformative, yields innovations, and builds infrastructure globally. The authors consider this domain crucial, as it holds a strong position in contributing towards national growth and global identity. At the same time, the promise of engineering education being transformative does not feel supreme due to

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unequal participation across genders. The complete utilization of engineering is only possible when the talent, creativity, and problem-solving capacity of each and every student are fairly used. To aid this, there is a need to maintain gender equity in this educational domain. There are only 35% of STEM graduates worldwide, as indicated by the UNESCO 2024 report [1]. This percentage points toward the minimal improvement over the past decade. It becomes starker in engineering and technology disciplines, where women's participation often falls below 20% across many countries. Following the same route, India also experiences gender disparity in engineering education [2]. Despite various outreach activities and initiatives taken by premier institutes such as IITs and NITs that have introduced reservation policies, the overall progress to minimize the gender disparity remains slow and gradual [3]. The result becomes a disheartening fact that even after having and creating opportunities for women and girls to access higher education, the gender representation in engineering education points towards the inequalities in access, participation, and outcomes.

This gender gap is also influenced by cultural, social, institutional, and psychological parameters [4], [5]. The engineering field is often framed as a male-dominated domain. This perspective becomes a major and significant barrier and is enough to influence a girl's subject preference from an early age [6]. Other factors, such as expectations of society, gendered classroom practices, lack of visible female role models, and limited access to proper career guidance, further hinder women's participation [7].

Against this background, the current study critically examines gender representation in engineering education, synthesizing data, research findings, and policy initiatives from 2012 to 2022. This study will integrate statistical trends with qualitative insights and aims to illuminate both the progress made and the persistent challenges that remain.

2 RESEARCH QUESTIONS

RQ1—What are the multi-year trends in female enrollment in engineering education across India as reflected in AISHE?

RQ2—What are the various factors that influence the gender disparity observed in engineering education, and how can these insights help to formulate targeted interventions aligned with the National Education Policy 2020 to promote gender equality?

3 SYSTEMATIC LITERATURE REVIEW

The gender disparity identified in the literature is one of the major issues that needs to be discussed and talked about in engineering education. This literature review synthesizes peer-reviewed open-access research articles. This review focuses on identifying the key patterns and objectivity of gender roles in engineering education.

3.1 Gender representation in engineering education at the global level

It is evident from the various research studies that gender representation in engineering education is influenced by multiple factors. They are interconnected, involving institutions, society, and interpersonal experiences. There are studies that have examined how textbooks and classroom activities usually reflect and portray masculine norms within STEM disciplines [8], [9]. The gendered perception being a constant barrier is not getting ruled out, even if there is an increase in female enrolment and policy reforms [4], [10].

The women in marginalized sections of society or belonging to lower socioeconomic groups often come up with a feeling of being outcast or excluded. They cannot connect with the initiatives, as they feel it is difficult to have a sense of belongingness in such fields [11], [12]. It is found that major external and internal factors lead to gender inequality in engineering education, thus resulting in continuous underrepresentation.

3.2 Gender representation in engineering education in the Indian context

There are studies that have used AISHE data for analysis across various parameters. The author of this study finds gender representation as an umbrella term for future policy reforms and initiatives in India. The literature reviewed showed that there are studies that have highlighted that there is gradual progress in female participation in the engineering field [2], [3], [13]. Literature also points towards two major barriers—the first one is expectations of society, and the second one is economic constraints. These two factors expand in terms of the role of women in society, limited access to education due to money, lack of female mentors, unavailability of adequate infrastructure, and gender discrimination in the workplace. Various comparative studies from Africa and Europe highlight that barriers such as unequal access to resources, unequal resource distribution, and the potential effectiveness of policies also play a major role in shaping women's participation in engineering [14], [15], [16]. Table 1 lists the key findings and the methodologies employed by the various researchers.

Table 1. Synthesis of key findings

Author(s)	Country	Population	Methodology	Key Findings	CASP
Choudhury (2015)	India	Engineering graduates	Econometric Analysis	Gender discrimination in employment and earnings post-degree	Medium
Madara and Cherotich (2016)	Kenya	Female engineering students	Qualitative Survey	Socio-cultural and financial barriers impede female participation	High
Peixoto et al. (2018)	Europe	Engineering students	Case Study	Diversity initiatives face structural/ perceptual limitations	Medium
Pehlivanli-Kadayifci (2019)	Turkey	Engineering faculty/students	Case Study	Hidden curriculum perpetuates gender norms	High
Shafina (2020)	Maldives	HE students (subject selection)	Quantitative Survey	Gender influences subject selection at the tertiary level	Medium
True-Funk et al. (2021)	USA	Engineering undergraduates	Mixed Methods (Surveys & Interviews)	Microaggressions affect persistence, especially for intersectional identities.	Very High
Patrick et al. (2021)	USA	Professional engineers	Quantitative Survey	Gender gap influences professional identity formation	Very High
Kenneth (2021)	India	Engineering & medical college students	Quantitative Data Analysis	Male dominance in enrollment, state/regional contrasts	High

(Continued)

Table 1. Synthesis of key findings *(Continued)*

Author(s)	Country	Population	Methodology	Key Findings	CASP
Silfver et al. (2022)	Sweden	Engineering educators	Qualitative Interviews	Gender equality is seen as a resource and a dilemma in practice	Medium
Verdugo-Castro et al. (2023)	Spain	STEM sector gender gap	Mixed Methods (Concept Mapping & SWOT)	Stereotypes & societal norms are the main contributors to the gender gap	High
Fruehwirth et al. (2024)	Germany	Textbooks in STEM and care work	Content Analysis	Gendered depictions reinforce stereotypes in STEM and care work	High
Sarma & Daimary (2024)	India	Higher education enrollment	Quantitative Trend Analysis	Persistent gender disparity despite improvements in overall numbers	High
Nguyen & Riegle-Crumb (2024)	USA	Women engineering students	Qualitative Interviews	Gender typicality shapes engineering attachment and varies by race	Very High
Merayo & Ayuso (2024)	Spain	University students	Quantitative (Statistical Analysis/ Community Detection)	Beliefs, not numbers, perpetuate gender gap perceptions	Very High
Omari et al. (2024)	Ghana	Female engineering students	Qualitative Assessment	Social networks impact engineering access for women	Very High
Mabica et al. (2025)	Mozambique	STEM participants	Case Study	Gender norms limit female participation	Medium

4 METHODOLOGY

A mixed-method approach is adopted to conduct this study. It uses open-access peer-reviewed research articles for systematic literature review. The SLR follows PRISMA (see Figure 1) guidelines, where the initial search across platforms such as Google Scholar, PubMed, Frontiers, Scopus, and Web of Science provided 57 articles using the following search strings: 1. “Gender representation” OR “gender gap” AND “female participation” AND “Engineering” 2. “STEM Education” OR “technical education” AND “AISHE” 3. “Engineering education” AND “females” AND “discrimination” AND “India”. A further 13 records were found to be duplicates and thus removed. For screening, a total of 44 articles were screened, of which 17 articles were not retrieved. The remaining 27 articles were checked for eligibility. Eight articles were removed. They were out of the time period considered for this study, along with three more articles, because they were found not to be relatable to the Indian context. This led to the inclusion of 16 articles for this study. Those 16 articles were next passed through a quality check using the Critical Appraisal Skills Program (CASP) on parameters such as relevance, context, methodology, and utility. For secondary data analysis, AISHE datasets ranging from 2012 to 2022 were used to observe the trends in enrollment and graduation in engineering programs by female participants.

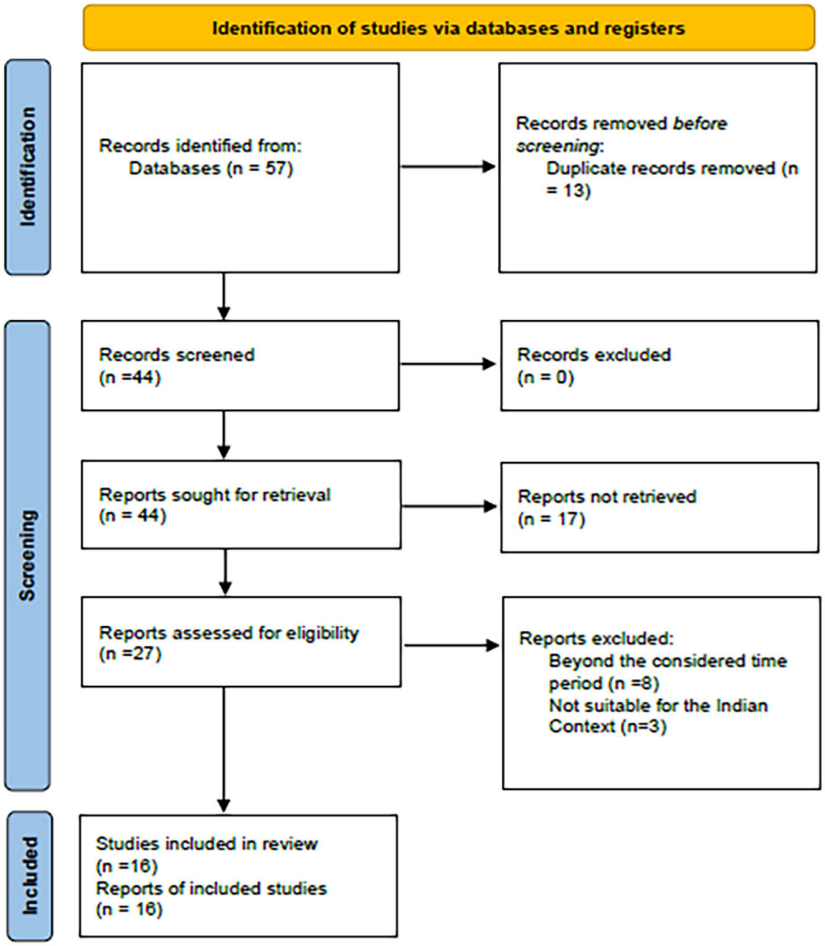

Fig. 1. PRISMA chart

4.1 Inclusion criteria

- Peer-reviewed journal articles
- Conference papers, and authoritative reports
- Articles published between 2015 and 2025
- Studies focused on topics relevant to the study
- Research conducted in India or globally

4.2 Exclusion criteria

- Articles not focused on engineering education or STEM gender issues specifically
- Non-peer-reviewed sources
- Articles published before 2015
- Studies lacking sufficient methodological details were excluded.

5 FINDINGS

5.1 Qualitative findings

As synthesized from the literature, the gender representation in engineering education is mainly influenced by cultural, social, and institutional factors. The stereotypes,

which are well entrenched, discourage women with respect to the engineering field [18]. They either save themselves from entering or they don't stay long enough to complete their education. Studies point to other factors, which include a lack of female role models, limited social networks, and family expectations [5], [16]. One very important aspect that is continuously discussed across the literature is intersectionality. The additional challenges can be faced by women based on their ethnic background, racial factors, and marginalization. This can lead to macroaggression and feelings of exclusion at the ground level [11], [12]. The engineering classrooms are also perceived as male-dominated due to hidden aspects of the curriculum and gender-biased educational content [8], [9]. The women's ability to sustain in the engineering field is still questioned, even if there is a gradual boost in enrollment numbers of female participants [19]. Examples from countries like Turkey, Germany, Sweden, and Mozambique support this observation [8], [9], [15], [17]. These insights suggest that these barriers are beyond social dynamics and individual opinion. Organizational culture and structural barriers also sustain the gender gap. It also suggests that simply increasing women's enrollment numbers will not be enough to create lasting change. There is a dire need for deeper cultural change within both educational and professional systems.

5.2 Quantitative findings (Focusing on RQ1)

The AISHE reveals important key patterns related to gender representation in engineering education in India from the time period of 2012–2022. The various trends observed are as follows:

Trend in enrollment of females in engineering (2012–2020). The analysis of AISHE data clearly indicates highs and lows in the enrollment data of both genders at all levels. For males (see Figure 2), the enrollments grew rapidly from about 2.47 million in 2012–2013 to 3.06 million in 2015–2016. The data shows a downfall after 2016 as the number reached 2.62 million by 2020–2021. Then, later on during 2021–2022, it again showed the signs of recovery. Overall, this represents an 11.9% increase in enrollment between 2012 and 2013 and 2021 and 2022.

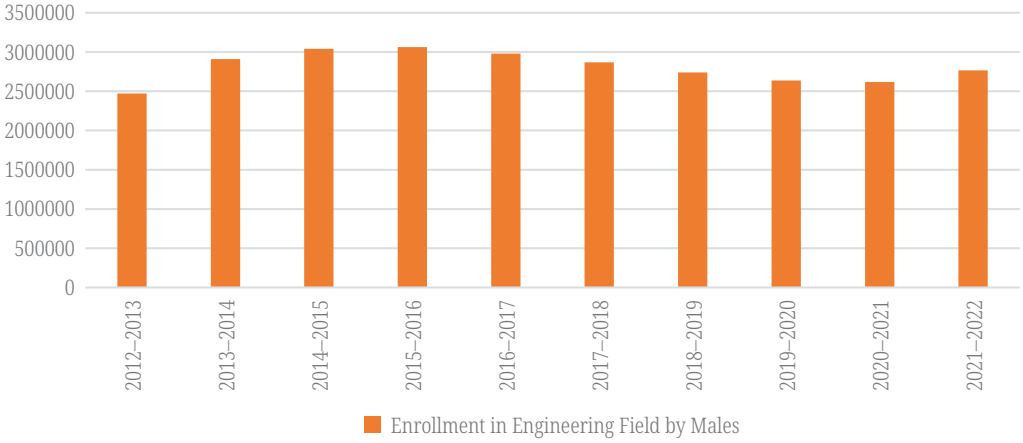

Fig. 2. Enrollment by males for undergraduate degrees in the engineering domain

On the same line, enrollment of female students in undergraduate engineering programs showed progress as it grew by 13.9% between 2012 and 2013 and 2021 and 2022. The peak was observed in 2015–2016 with 1,186,813 enrollments, followed by a decline till 2021 (see Figure 3).

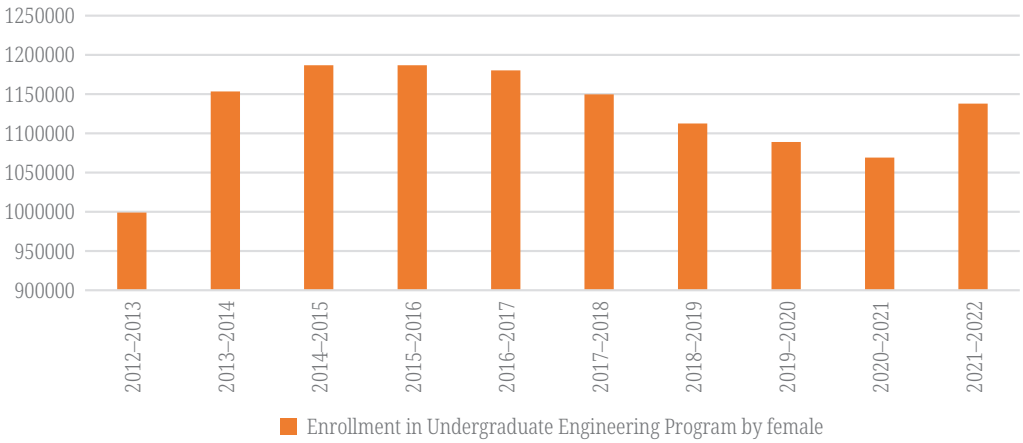

Fig. 3. Enrollment by females for an undergraduate degree in the engineering domain

For the UG program, both male and female enrollments show a similar pattern of rising until 2015–2016, then a decline is seen before a slight recovery in 2021–2022. For enrollments in PG, M.Phil., and PhD by women is shown in Figure 4.

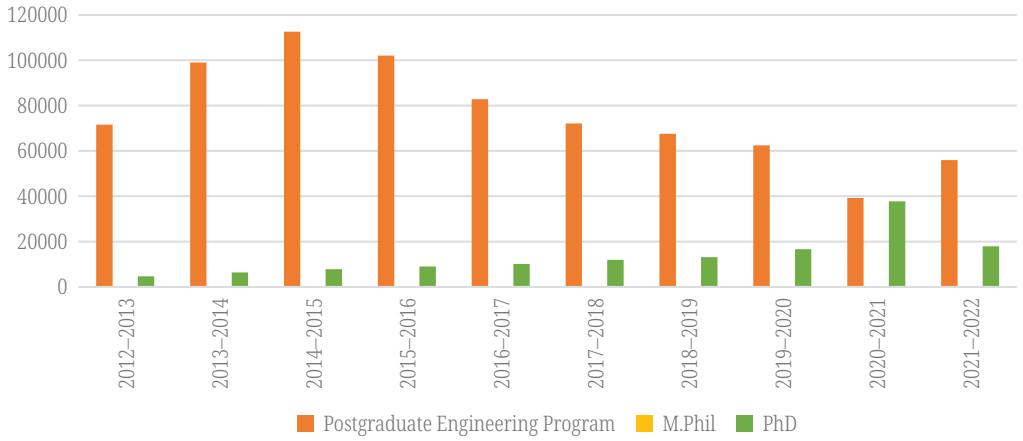

Fig. 4. Enrollment in PG, M.Phil., and PhD engineering programs by females

Looking at the data, it can be said that enrollment in undergraduate programs is the highest among the post-graduation, M.Phil., and Ph.D. in engineering. The total enrollment of females peaked between 2014 and 2016 (1.18 million students). This was followed by a gradual decline to around 1.07 million by 2020–2021. In the year 2021–2022, it again started to show the signs of recovery. Talking about the post-graduate enrollments, they are fewer in number as compared to undergraduate and have experienced a sharp decline after 2016–2017. M.Phil. enrollments are negligible when compared with Ph.D., which rose from 4693 in 2012–2013 to 37750 in 2020–2021. Also, in the reports submitted by AISHE for the years 2012–2013 and 2021–2022, there is incremental improvement in enrollment statistics by female participants in different fields of engineering. The female percentage increased in certain fields with 34% and 38% overall enrollment in computer engineering and electronics engineering, respectively. Though it remains below parity in context. Mechanical and civil engineering are two of the most male-dominated fields with female involvement at a mere 8% and 23%. These patterns reflect disproportionate involvement. It is clear from the information that males across the decade have

outnumbered the women. But there's hope yet, as the trend in data concerning females demonstrates a greater growth rate among females, which signifies gradual yet continual progress intended to close the gender divide.

Trend observed in outturn (Graduation) pattern. There is a clear upward trend in the outcome or graduation number in the case of males (see Figure 5). From 2012–2013 to 2021–2022, the number of males who graduated hiked by 33.47%, increasing from 440,438 to 587,854. The peak was attained in 2016–2017 with 611,296 graduations. After this peak came the minor fluctuation and decline. This trend points towards the long-term growth in male participation. While for females, the number of graduations showed a positive reflection with 22.9% growth from 2012–2013 to 2021–2022 (see Figure 6). With 283,141, graduations, the year 2016–2017 marked the highest peak. After that, a slight decline in graduation was seen. This highlighted that although the exposure to higher education seemed continuous, as discussed in the enrollment trend, retention faced challenges.

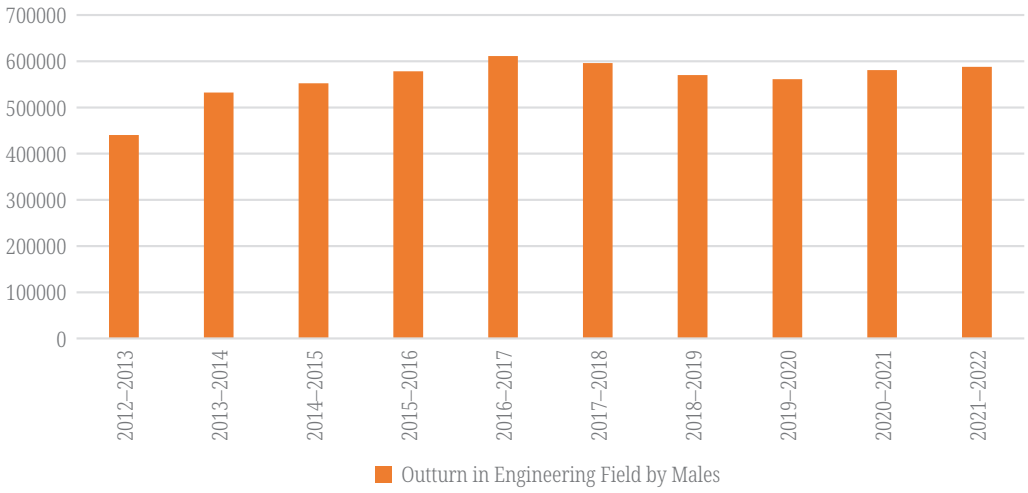

Fig. 5. Male outturn in undergraduate engineering program

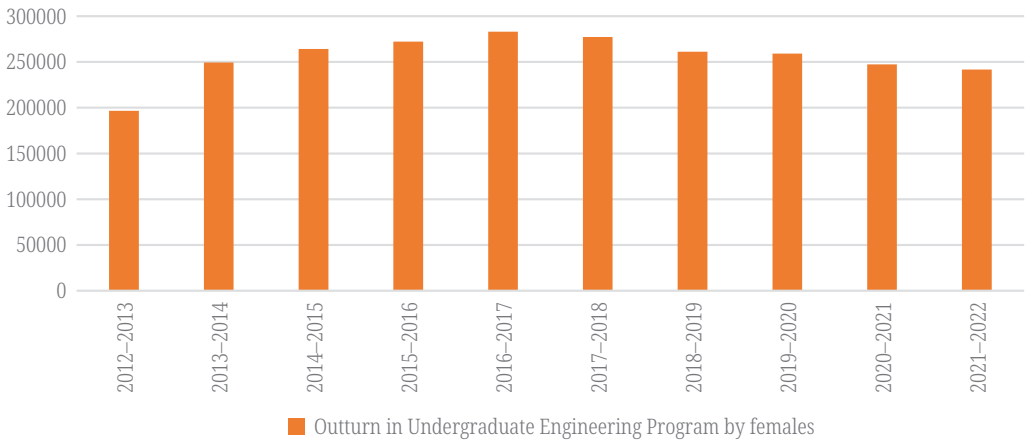

Fig. 6. Outturn in the undergraduate engineering program by females

The AISHE reports reveal consistent completion rates of undergraduate levels by females in engineering education as compared to postgraduate and M.Phil. They remain much lower in both numbers and growth rates. However, PhD completion recorded steady growth. This reflected the positive effect of increased doctoral enrollments.

This trend is portrayed in Figures 6 and 7, where it is clear that undergraduate completion tops the chart, followed by postgraduate, PhD, and M.Phil., respectively.

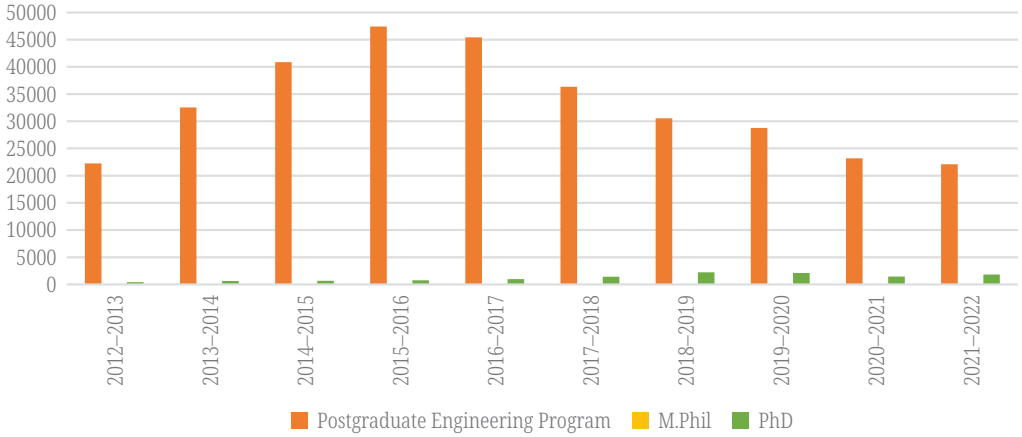

Fig. 7. Outturn in engineering education by females across other levels

Also, both male and female outturns followed a similar trajectory in that they peaked during 2016–2017 and then showed a decline. However, it is important to note that the growth rate was comparatively higher in males (33.47%) than in females (22.98%). This indicates that while both genders saw progress in graduation rates, the gender gap in engineering graduates has not significantly narrowed.

Gender parity index. The gender parity index shows a marked improvement in terms of overall enrollment across various subjects, not limited to engineering. The threshold of 1.0 was crossed in 2017–2018. While the rise in GPI demonstrates that women are enrolling in equal or even slightly higher numbers compared to men nationally, the participation of females in engineering is still not at par. It peaked between 2014 and 2016 (see Figure 3) and then began to decline until 2020–2021. Recently, it has started to recover. This disparity highlights that national stabilization of gender equity gains of gender in higher education is not proportional to an engineering background. Figure 8 illustrates the GPI trend. In comparison with Figures 3 and 4, it is evident that engineering still requires targeted interventions to have the systematic gains, especially at postgraduate and doctoral levels.

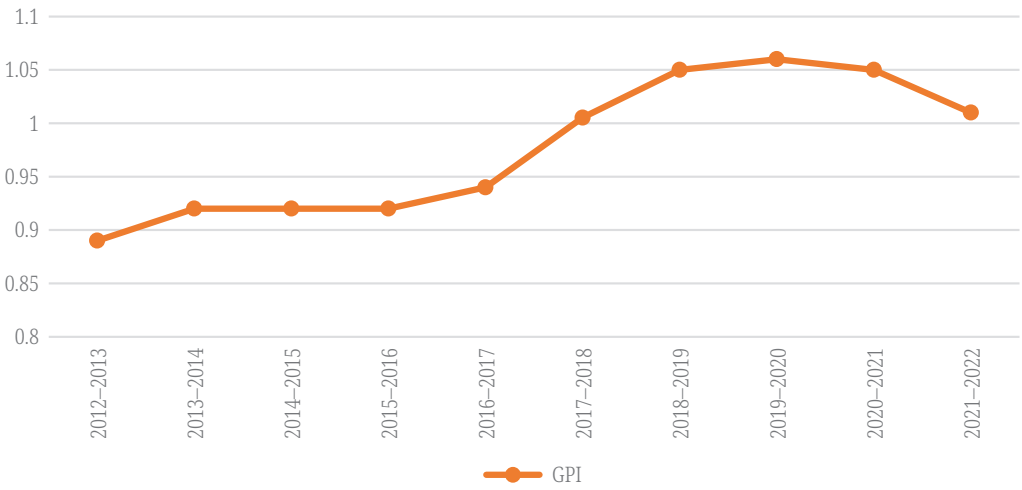

Fig. 8. Gender parity index across higher education (Years 2012–2022)

6 DISCUSSION

Our approach to performing the analysis of AISHE data ranging from 2012 to 2022 and integrating quantitative analysis in this study highlighted the fact that gender disparity in the Indian engineering education system remains a common and long-standing issue. The graphical representation shows that women are gradually becoming more involved in engineering over time. However, it is still true that there are fewer women than men in this field. These make it clear that gender imbalance is still a problem that needs to be fixed [2], [3]. The qualitative review elucidates the diverse factors that influence the disparity (refer to Table 2).

Table 2. Factors influencing persistent gender disparity in engineering education

Factor Category	Key Factors
Socio-Cultural [5], [8], [19]	Gender stereotypes and societal norms
	Familial expectations and early career socialization
	Limited female role models in STEM
	Cultural biases affecting subject choice
Institutional [9], [11], [16]	Lack of mentorship and support networks
	Gender-insensitive pedagogy and curricula
	Insufficient infrastructure (e.g., safe spaces, transport)
	Macroaggressions and exclusionary peer cultures
Policy-Related [2], [3], [13]	Limited effectiveness and reach of reservation policies
	Inadequate implementation and monitoring
	Financial constraints, despite scholarships
	Gaps in bridging education and workforce transition

Another problem, or more accurately, a “leaky pipeline” from education to work, needs to be fixed by specific actions and interventions [3]. It will take a long time and need long-term support systems to keep women in school and help them get ahead in their careers. These challenges can be managed or mitigated through strategic interventions from the socio-cultural environment, institutions, and policy. The inputs have to be practical and transformative, as the authors have proposed. Implementing mentorship programs, pedagogy preparation in which gender roles and lenses are taken into account, and regular assessment of AISHE data are some examples. A robust and sustainable support system will have to ensure the longevity of the initiatives. This sustainable support system needs to take note and involve marginalized groups as well [18], [11]. This study also states that there is a need for evidence-based strategies that can be context-specific and intersectional in nature. It will aid in promoting gender equality and will close the gap that India is currently facing.

7 RESEARCH GAPS

The research area, which invites the discussion for gender inequality in engineering education despite multiple initiatives and policy frameworks, still feels unexplored. The key research gaps associated with this study are depicted in Figure 9.

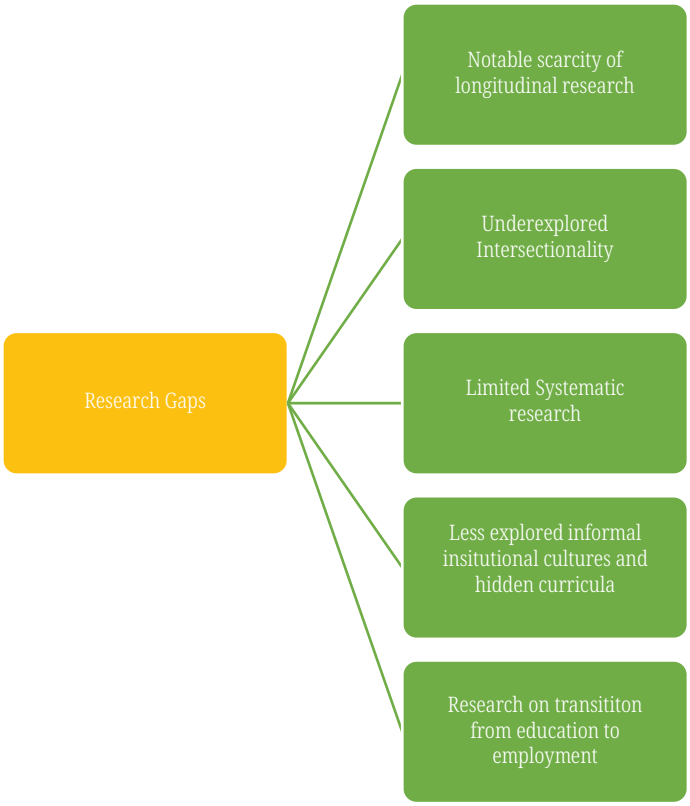

Fig. 9. Key research gaps

There is still a need for longitudinal and systematic research in order to explore various aspects of the role of female participation in higher education, including the engineering sector. Also, the dimensions across which frameworks are framed need to be intersectional and inclusive in nature. Institutional cultures and curriculum-based discussions are still in their nascent era. As per the expectations of a student, the transition from education to employment is the ultimate goal and thus needs to be studied thoroughly. One of the study highlights is that persistent gender discrimination in hiring and wages is common [13]. Understanding the subtle dynamics revolving around gender inequality will lead to an increase in productive research and will be able to shape the ideologies that can be called sustainable in education pedagogy.

8 PROPOSED FRAMEWORK (SUPPORTS RQ2)

The proposed framework strongly aligns with the National Education Policy (NEP) 2020 (see Figure 10). This framework adopts a multi-level approach and supports the advancements in gender equity in engineering education. To improve the access, infrastructure, and enrollment retention of female participants, the very first pillar of this framework is the Gender Inclusion Fund. It aims to use the resources for the betterment and initiate customized steps in order to address regional disparity, if any. The second pillar is curriculum and pedagogy. It should be gender sensitive and be able to dismantle the previously discussed stereotypes. STEM-focused modules can be integrated along with training the teachers. It will promote bias reduction and inclusive classroom practices. Institutional-level practices are the third pillar of this proposed framework. It helps to prioritize scholarships, stipends, safe infrastructure,

secure transport, and anti-discrimination measures. It will enhance the strength of the framework and female students' confidence if it is backed up with mentorship programs, visits for exposure, and networking opportunities. The last and final pillar is partnership with government, NGOs, industry, and local communities to enhance societal engagement. This will help run advocacy campaigns and workshops that can help girls' participation. The regular feedback, monitoring, and evaluation of AISHE-based data will help to keep a record of the progress made and utilization of resources. It will translate NEP's vision of gender inclusion into actionable change.

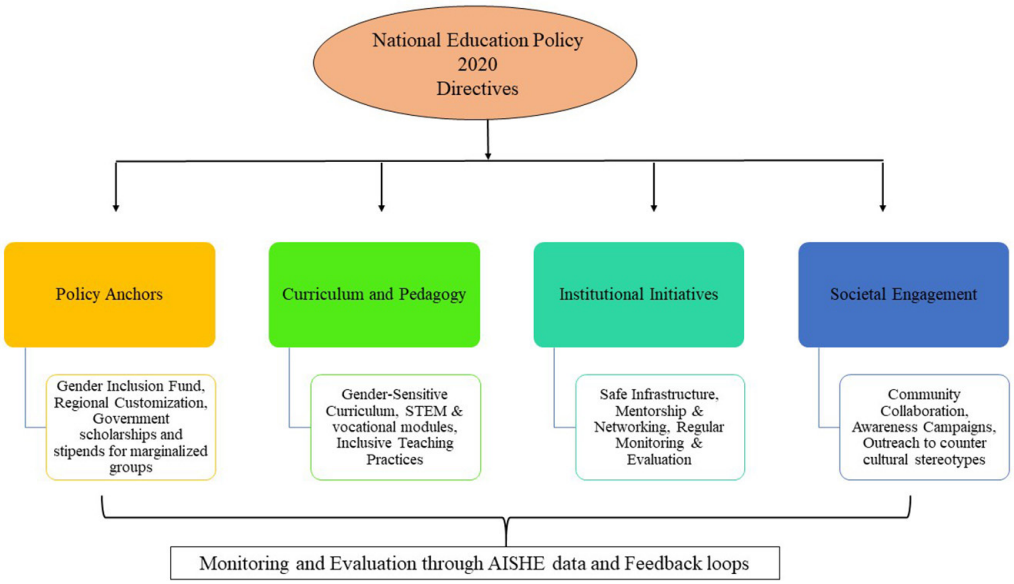

Fig. 10. Proposed conceptual framework, which aligns with NEP 2020 and focuses on increasing female enrollment

9 FUTURE DIRECTIONS

The policy frameworks, which are non-biased, have to be incorporated to maintain the integrity of engineering education. We also have to work hand in hand to ensure gender equality. According to all the studies carried out and feedback gathered, it is the responsibility of the stakeholders to conduct strategic actions that are multidimensional in nature. The present study would like to suggest some future avenues. They are as follows:

9.1 Research studies

This showcase of gender in engineering education necessitates further examination. Longitudinal qualitative research and intersectional research should be given the highest priority. The ideas can be given the highest priority. The ideas can be illustrated through a narrative detailing a female engineering student's transition from education to employment, highlighting the challenges she faced along the way [11], [3]. The effects on engineering education due to caste, class, ethnicity, and demography can also be researched [2]. This will also provide an insight into a better realization of the needs of a group. Policymakers will find it easy to make them more inclusive and sensitive to the gendered view and marginalized groups.

9.2 Regular feedback and monitoring

The regulatory system, which can track and gather constant feedback about government programs, institutional policies, and programs operated specifically to address this issue, must be ready [9]. To allow for exemplary performance and a better understanding of what is really going on at the grassroots level, the adequacy and efficiency of measures already in place and how they are enforced are being closely examined. Councils and forums should respond to new barriers as soon as they can, and the response should be useful and relevant to the new situation. It is also important to know that gender diversity in engineering education can't be achieved just by hiring more women. Keeping them, supporting them, and making changes in a planned way are just as important. As emphasized in contemporary strategic HRM studies, "by hiring a greater number of women and bestowing them with key roles, the organizations can differentiate themselves, but without training, the chances of conflicts exist" [21]. Therefore, though enhancing women's participation is crucial, this has to be accompanied by holistic capacity-building and continuous professional development so that an inclusive, harmonious, and high-performance culture can be facilitated. Only then can efforts be lasting institutional greatness and genuine equity.

9.3 Reliability of institutional practices

We need to think carefully about programs that try to fix the big gender gap in engineering education. Instead, we need to create mentorship programs and advocacy groups. The institution's objective regarding employment is to cultivate and bestow a specific level of expertise in a particular field. The change from learning to earning is a very important step that every student wants to take. Mismatches between education and jobs will finally help keep people and promote consistency. Also, using ICT in polytechnics, technical schools, and higher education is very important for teaching and learning [20]. The strategic application of ICT can make learning more stimulating and multifaceted for students, thereby enhancing broader participation. By following these approaches, these institutions will be closer to achieving the broader aim of enhancing gender equity in engineering education.

10 CONCLUSION

The study that was carried out, integrating critical SLR and secondary analysis of AISHE data, aimed at discussing the issue of gender inequality in engineering education in India. The gender parity index is nearly on par with the participation of males, according to AISHE data. However, the clear and consistent trends show that there is still a gap in the education of engineers when it comes to female enrollment. Even though more and more women are enrolling in engineering programs, very few of them stay in school at any level. This is especially interesting because the rate of women dropping out at the undergraduate level is much higher than at the postgraduate and doctoral levels. This seems to be due to multicultural and societal exclusion, with infrastructural exclusion at its core. Numerous studies, both internationally and within India, have identified a variety of barriers, including restrictive gender norms and curricular and institutional inequalities that significantly impede women's participation in engineering education. We need to know where we stand as a country when it comes to higher education. This is also about making a secure

setting to uphold female students' retention in studying engineering. This research seeks to bridge the gap by offering important insights optimized using the assistance of SLR and AISHE data. The concept of peaceful coexistence of female students in India and the field of engineering is to be attained.

11 REFERENCES

[1] Global Education Monitoring Report Team, "Support girls and women to pursue STEM subjects and careers," UNESCO, 2024. https://doi.org/10.54676/BPSL3344

[2] M. Sarma and P. Daimary, "Gender disparity in enrolment in higher education institutions: Trend analysis," *National Journal of Education*, vol. XXII, no. 1, pp. 173–187, 2024. https://www.researchgate.net/profile/Moyuri-Sarma/publication/379436100_Gender_Disparity_in_Enrolment_in_Higher_Education_Institutions_Trend_Analysis/links/6609265510ca867987303e14/Gender-Disparity-in-Enrolment-in-Higher-Education-Institutions-Trend-Analysis.pdf

[3] A. Kenneth, "Gender gap in engineering and medical colleges in India," *J. Res. Sci. Math. Technol. Educ.*, vol. 4, no. 3, pp. 225–237, 2021. https://doi.org/10.31756/jrmste.434

[4] S. Verdugo-Castro, M. C. Sánchez-Gómez, and A. García-Holgado, "Factors associated with the gender gap in the STEM sector: Comparison of theoretical and empirical concept maps and qualitative SWOT analysis," *Heliyon*, vol. 9, no. 6, 2023. https://www.cell.com/heliyon/fulltext/S2405-8440(23)04707-2?uuid=uuid%3Ad1162d0b-ee26-468b-b283-d3e27bfa39ca

[5] D. S. Madara and S. Cherotich, "Challenges faced by female-students in engineering education," *Journal of Education and Practice*, vol. 7, no. 25, pp. 8–22, 2016. https://eric.ed.gov/?id=EJ1115817

[6] A. Peixoto, C. S. G. González, R. Strachan, and P. Plaza, "Diversity and inclusion in engineering education: Looking through the gender question," in *2018 IEEE Global Engineering Education Conference (EDUCON)*, 2018, pp. 2071–2075. https://doi.org/10.1109/EDUCON.2018.8363494

[7] R. C. S. Kee, W. N. W. Othman, Z. N. Zainudin, and Y. M. Yusop, "Factors affecting women's participation in careers: A systematic review," *International Journal of Academic Research in Business and Social Sciences*, vol. 10, no. 9, pp. 509–521, 2020. https://doi.org/10.6007/IJARBSS/v10-i9/7829

[8] B. Fruehwirth, M. Heilemann, and H. Stoeger, "The gender representation of women and men in the occupational areas of STEM and care work in German textbooks," *Linguistics and Education*, vol. 80, p. 101284, 2024. https://doi.org/10.1016/j.linged.2024.101284

[9] E. Pehlivanli-Kadayifci, "Exploring the hidden curriculum of gender in engineering education: A case of an engineering faculty in Turkey," *International Journal of Engineering Education*, vol. 35, no. 4, pp. 1194–1205, 2019.

[10] N. Merayo and A. Ayuso, "Identifying beliefs about the gender gap in engineering professions among university students using community detection algorithms and statistical analysis," *Computer Applications in Engineering Education*, vol. 32, no. 4, p. e22751, 2024. https://doi.org/10.1002/cae.22751

[11] A. True-Funk, C. Poleacovschi, G. Jones-Johnson, S. Feinstein, K. Smith, and S. Luster-Teasley, "Intersectional engineers: Diversity of gender and race microaggressions and their effects in engineering education," *Journal of Management in Engineering*, vol. 37, no. 3, p. 04021002, 2021. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000889

[12] U. Nguyen and C. Riegle-Crumb, "Gender typicality and engineering attachment: Examining the viewpoints of women college engineers and variation by race/ethnicity," *Behavioral Sciences*, vol. 14, no. 7, p. 573, 2024. https://doi.org/10.3390/bs14070573

[13] P. K. Choudhury, "Explaining gender discrimination in the employment and earnings of engineering graduates in India," *Journal of Educational Planning and Administration*, vol. 29, no. 3, pp. 225–246, 2015. https://www.niepa.ac.in/download/Publications/JEPA_(15%20years)/JEPA%202015_Vol-29%20(1-4)/JEPA_JUL-2015-VOL29_3%20Final.pdf#page=5

[14] A. Peixoto *et al.*, "Diversity and inclusion in engineering education: Looking through the gender question," in *2018 IEEE Global Engineering Education Conference (EDUCON)*, 2018, pp. 2071–2075. https://doi.org/10.1109/EDUCON.2018.8363494

[15] E. Silfver, A. J. Gonsalves, A. T. Danielsson, and M. Berge, "Gender equality as a resource and a dilemma: Interpretative repertoires in engineering education in Sweden," *Gender and Education*, vol. 34, no. 8, pp. 923–939, 2022. https://doi.org/10.1080/09540253.2021.1963419

[16] R. Omari *et al.*, "Barriers to women's participation in higher engineering education: A qualitative assessment of the role of social networks of students in a Ghanaian university," *Discover Education*, vol. 3, p. 90, 2024. https://doi.org/10.1007/s44217-024-00186-8

[17] A. P. Mabica, R. A. Mabasso, M. T. G. Pena, O. A. Lasekan, and C. M. M. Alarcón, "Gender norms and female STEM participation in Mozambique," *International Research Journal of Multidisciplinary Scope (IRJMS)*, vol. 6, no. 1, pp. 1019–1030, 2025. https://doi.org/10.47857/irjms.2025.v06i01.01928

[18] A. Patrick, C. Riegle-Crumb, and M. Borrego, "Examining the gender gap in engineering professional identification," *Journal of Women and Minorities in Science and Engineering*, vol. 27, no. 1, pp. 31–55, 2021. https://doi.org/10.1615/JWomenMinorScienEng.2020030909

[19] A. Shafina, "Exploring the gender differences in selection of subjects at higher education levels," *International Education Journal: Comparative Perspectives*, vol. 19, no. 2, pp. 87–105, 2020. https://openjournals.test.library.sydney.edu.au/IEJ/article/view/14633

[20] R. Banagiri, A. Kumar, and A. Pandey, "Use of ICT in teaching vocational subjects," *International Journal of Education and Development using Information and Communication Technology*, vol. 17, no. 4, pp. 148–158, 2021. https://eric.ed.gov/?id=EJ1335793

[21] M. A. Kumar, "Strategic HRM practices to deal with gender diversity problems in organizations," *JSHRM*, vol. 8, no. 3, pp. 74–79, 2019. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3720803

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