



Trend of Female Enrolment in STEM at Higher Education Level in India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Participation of women in science, technology, and engineering is not only an important aspect in the social and economic development of the nation; it is a critical constituent in the process of improving the quality of life of women themselves. In science, technology, and engineering education only the participation of men is not enough, women's participation is equally important because in India women constitute half of mankind (47.5 %). Women play a very important role in the progress of a family, society, and country and contribute their bit to the national economy. Through science, technology, and engineering education, women contribute to the empowerment of themselves. This study aims to examine the position of women in science, technology, and engineering education programs at higher education in India through the Annual Report of the All-India Survey on Higher Education (AISHE) Department of Higher Education, Ministry of Education, Government of India, from 2013-14 to 2019-2020. This was a qualitative and documentary research. The study found that enrolment trend of female students among Others Backward Classes (OBC) in

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STEM comparatively higher than General SC, ST female students in six years. Enrolment in engineering and technology is not hopeful, the enrolment growth rate is very little and discontinuous, gender gap exists. The study concludes that the enrolment growth rate of female students in STEM in six years gradually increasing. The study suggests remedial measures to overcome constraints faced by females in pursuing science, engineering, and technology education.

Keywords: Science; engineering; technology; higher education; enrolment; India.

1. INTRODUCTION

Now recognized by all modern societies that education and career are not only the right but also a key factor that contributes to the economic and social development of the country [1]. In the Indian context, women have entered all disciplines of science and technology. Science, technology, and engineering all have been part of our human progress. Education of women elevate human capital, expands, and enables economic opportunities, and engage women as leaders [2]. Women and men together have researched and solved each emerging need. They contributed in all the ways there are to the advancement of humanity [3,4]. Women are a powerful force and they were as resourceful and passionate about their work and certainly as creative and they equally contributed to the economic and social development of the country. Without women, science, technology, and engineering to miss out on new innovative ideas. The literature review demonstrates that investment in women, and more specifically women 's education, has numerous positive effects on not only women but also their children and families. These outcomes not only improve the quality of life of women and families but also combat poverty and foster economic growth [5,6]. Science, engineering, and technology can improve or develop concepts, theories, models, techniques instrumentation, software, operational methods, etc [7]. It is a probe that a woman is the main creator of any new creation. So, it is very important to engage girls in the fields of science, engineering, and technology at higher education levels [8].

The present study explored the position of women in science, technology, and engineering education programs at higher education in India through the Annual Report of the All-India Survey on Higher Education (AISHE) Department of Higher Education, Ministry of Education, Government of India, from 2013-14 to 2019-2020.

2. REVIEW OF RELATED LITERATURES

Findings of existing literatures on women in science, engineering and technology indicate

that the underrepresentation of women faculty differs across the STEM disciplines at IITs in India. A significant gap between males and females in faculty positions at IITs also exist. [9]. Gender parity in overall disciplines at under-graduation, post-graduation, and M.Phil. levels. In STEM disciplines, enrolment of females is higher than males in biological sciences at all levels, but physical sciences show lower enrolment of females. Computer engineering, information technology, and electronics engineering have shown improvement in the enrolment of females within the engineering and technology category. Gender parity is poor in mechanical engineering, civil engineering, and electrical engineering at all levels of higher education [10]. The under-representation of women in the science and technology community is depicted, primarily highlighting the male-dominated technology-driven Indian institutions [11]. Women in an engineering college, this article demonstrates that the increase in their participation is specific to computer-related fields in engineering and directly related to a vibrant market. Although there is no radical shift in the traditional "patrifocal" ideology, the trend of a growing number of women engineers reflects the forces of change demonstrating that the masculine "image" is not static either in time or space [12].

Based on the previous literature search, it was evident that previous research has been done variously on different higher education level programs but no research done on the current and updated information on women's enrolment in science engineering, and technology at higher education levels in India. This inspires the researchers to research on this topic.

3. STATEMENT OF THE PROBLEM

The current study stated as "Trend of Female Enrolment in STEM at Higher Education Level in India."

4. RATIONALE OF THE STUDY

- Women are a powerful force and they were as resourceful and passionate

about their work and certainly as creative and they equally contributed to the economic and social development of the country.

- The literature review demonstrates that investment in women, and more specifically women's education, has numerous positive effects on not only women but also their children and families. These outcomes not only improve the quality of life of women and families but also combat poverty and foster economic growth.
- It is a probe that a woman is the main creator of any new creation. So, it is very important to engage girls in the fields of science, engineering, and technology at higher education levels.

From the above-mentioned ground, the study was justified.

5. OBJECTIVES

Objectives of the study were-

1. To examine the enrolment status of women in Bachelor of Science (B.Sc.) in India.
2. To study the enrolment status of women in Masters of Science (M.Sc.) in India.
3. To examine the enrolment status of women in Bachelor of Technology (B.Tech.) in India.
4. To study the enrolment status of women in Masters of Technology (M.Tech.) in India.
5. To examine the enrolment status of women in Bachelor of Engineering (B.E.) in India.
6. To study the enrolment status of women in Masters of Engineering (M.E.) in India.

6. DELIMITATION

Delimitation of the study are-

- In this study, higher education levels consist of undergraduate and postgraduate levels.
- The study has been carried out on the basis of the enrolment of the academic session 2013-14 to 2019-2020 of the All-India Survey on Higher Education (AISHE) Department of Higher

Education, Ministry of Education, Govt. of India.

- This study showed the position of women in science, technology and engineering only.

7. DEFINITION OF TERMS USED IN THE STUDY

- **Science:** Science can be divided into different branches based on the subject of study. In this study, the term 'science' refers to Bachelor of Science and Masters of science (B.Sc. & M.Sc.).
- **Technology:** Technology education is the study of technology. It is designed to teach students to be prepared for several technology-related fields and to learn about technology within specific fields of study. In this study, the term 'technology' refers to Bachelor of Technology and Masters of Technology (B.Tech. & M.Tech.).
- **Engineering:** Engineering education is the activity of teaching knowledge and principles to the professional practice of engineering. It includes an initial education (bachelor's and/or master's degree), and any advanced education and specializations that follow. In this study, the term 'engineering' refers to Bachelor of Engineering and Masters of Engineering (B.E. & M.E.).

8. METHODOLOGY OF THE STUDY

This study was qualitative and documentary in nature. As a source of data researcher used Annual Report of All India Survey on Higher Education (AISHE) Department of Higher Education, Ministry of Education, Govt. of India., 2013-14 to 2019-2020, and information has been collected from various books, Research Article, Magazines, Research Journal, E-journal, Annual Report of UGC, and Report of the Higher Education Department of West Bengal and also from the Higher Education Department of India.

9. DATA ANALYSIS AND INTERPRETATION: OBJECTIVE-WISE

Analysis of objective 1: To examine the enrolment status of women in Bachelor of Science (B.Sc.) in India.

Table 1. Enrolment status of women in Bachelor of Science (B.Sc.) in India

| Year | All Category | | | | Scheduled Caste | | | | Scheduled Tribe | | | | Other Backward Classes | | | |
|---------|-----------------------|--------------|--------------------------|-------------|-----------------------|--------------|--------------------------|-------------|-----------------------|--------------|--------------------------|-------------|------------------------|--------------|--------------------------|-------------|
| | Total (Male & Female) | Total Female | Percentage (%) of Female | Growth rate | Total (Male & Female) | Total Female | Percentage (%) of Female | Growth rate | Total (Male & Female) | Total Female | Percentage (%) of Female | Growth rate | Total (Male & Female) | Total Female | Percentage (%) of Female | Growth rate |
| 2013-14 | 3183423 | 1541143 | 48.41 | .. | 396484 | 183123 | 46.18 | .. | 130109 | 58914 | 45.28 | .. | 1210272 | 609466 | 50.35 | .. |
| 2014-15 | 4036977 | 1921561 | 47.59 | -0.82 | 532175 | 242406 | 45.55 | -0.63 | 164311 | 73876 | 44.96 | -0.32 | 1602297 | 784727 | 48.97 | -1.38 |
| 2015-16 | 4287838 | 2057993 | 47.99 | 0.4 | 572981 | 265735 | 46.37 | 0.82 | 175727 | 81283 | 46.25 | 1.29 | 1760910 | 862935 | 49.00 | 0.03 |
| 2016-17 | 4677516 | 2259760 | 48.31 | 0.32 | 633281 | 292919 | 46.25 | -0.12 | 194170 | 91240 | 46.98 | 0.73 | 1957031 | 967438 | 49.43 | 0.43 |
| 2017-18 | 4819196 | 2375753 | 49.29 | 0.98 | 669793 | 319280 | 47.66 | 1.41 | 204432 | 98423 | 48.14 | 1.16 | 2116488 | 1075927 | 50.83 | 1.4 |
| 2018-19 | 4680159 | 2419059 | 51.68 | 2.39 | 652922 | 329894 | 50.52 | 2.86 | 218151 | 108271 | 49.63 | 1.49 | 2095626 | 1117219 | 53.31 | 2.48 |
| 2019-20 | 4706869 | 2460074 | 52.26 | 0.58 | 661863 | 339715 | 51.32 | 0.8 | 225245 | 115169 | 51.13 | 1.5 | 225245 | 115169 | 51.13 | -2.18 |

Source: Annual report of All India Survey on Higher Education (AISHE) Department of Higher Education, Ministry of Education, Govt. of India., 2013-2014 to 2019-2020.

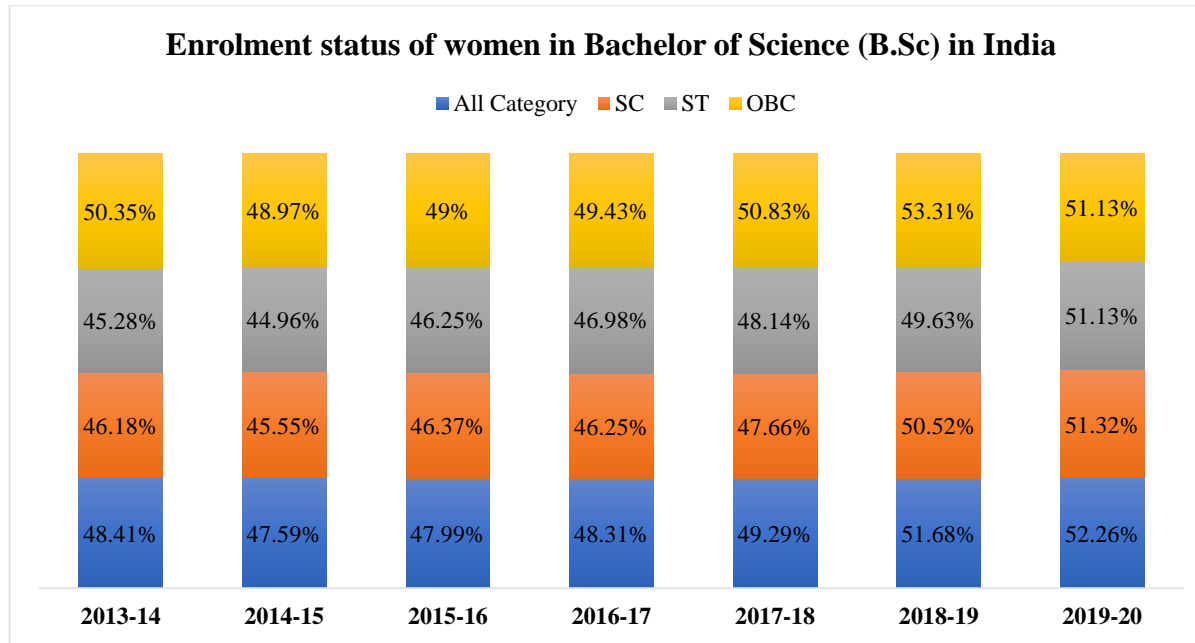


Fig. 1. Enrolment status of women in Bachelor of Science (B.Sc) in India

Interpretation: Table 1 showed social category-wise enrolment status of females in Bachelor of Science (B.Sc) in the last seven years (2013-14 to 2019-20) is hopeful. Highest enrolment of all category females was 52.26% in the academic session of (2019-20) and highest enrolment growth rate was 2.39% in the academic session (2018-19) and lowest enrolment growth rate was -0.82% in the academic session (2014-15). Enrolment status of SC category females is hopeful, highest enrolment of SC category females was 51.32% in the academic session of (2019-20) and highest enrolment growth rate was 2.86 % in the academic session (2018-19) and lowest enrolment growth rate was -0.63% in the academic session (2014-15). Enrolment status of ST category females is hopeful, highest enrolment of ST category females was 51.13 % in the academic session of (2019-20) and highest enrolment growth rate was 1.69% in the academic session (2019-20) and lowest enrolment growth rate was -0.32% in the academic session (2014-15). Enrolment status of OBC category females is hopeful, highest enrolment of OBC category females was 53.31% in the academic session of (2018-19) and highest enrolment growth rate was 2.48% in the academic session (2018-19) and lowest enrolment growth rate was -2.18 % in the academic session (2019-20).

Analysis of objective 2: To study the enrolment status of women in Masters of Science (M.Sc.) in India.

Interpretation: Table 2 showed social category-wise enrolment status of females in Masters of Science (M.Sc.) in the last seven years (2013-14 to 2019-20) is hopeful. Highest enrolment of all category females was 56.04% in the academic session of (2018-19) and highest enrolment growth rate was 8.88% in the academic session (2018-19) and lowest enrolment growth rate was -3.24% in the academic session (2017-18). Enrolment status of SC category females is hopeful, highest enrolment of SC category females was 49.79% in the academic session of (2017-18) and highest enrolment growth rate was 2.34% in the academic session (2017-18) and lowest enrolment growth rate was -1.23% in the academic session (2019-20). Enrolment status of ST category females is hopeful, highest enrolment of ST category females was 49.20% in

the academic session of (2017-18) and highest enrolment growth rate was 11.93% in the academic session (2017-18) and lowest enrolment growth rate was -7.61% in the academic session (2018-19). Enrolment status of OBC category females is hopeful, highest enrolment of OBC category females was 60.56% in the academic session of (2018-19) and highest enrolment growth rate was 15.19% in the academic session (2018-19) and lowest enrolment growth rate was -9.14% in the academic session (2017-18).

Analysis of objective 3: To examine the enrolment status of women in Bachelor of Technology (B.Tech.) in India.

Interpretation: Table 3 showed social category-wise enrolment status of females in Bachelor of Technology (B.Tech.) in the last seven years (2013-14 to 2019-20) is hopeful. Highest enrolment of all category females was 28.48% in the academic session of (2019-20) and highest enrolment growth rate was 0.48% in the academic session (2019-20) and lowest enrolment growth rate was -0.61% in the academic session (2014-15). Enrolment status of SC category females is hopeful, highest enrolment of SC category females was 28.43% in the academic session of (2019-20) and highest enrolment growth rate was 1.13% in the academic session (2018-19) and lowest enrolment growth rate was -1.02% in the academic session (2014-15). Enrolment status of ST category females is hopeful, highest enrolment of ST category females was 25.58% in the academic session of (2019-20) and highest enrolment growth rate was 1.15% in the academic session (2018-19) and lowest enrolment growth rate was -0.34% in the academic session (2014-15). Enrolment status of OBC category females is hopeful, highest enrolment of OBC category females was 30.16% in the academic session of (2013-14) and highest enrolment growth rate was 0.47% in the academic session (2017-18) and lowest enrolment growth rate was -0.93% in the academic session (2014-15).

Analysis of objective 4: To study the enrolment status of women in Masters of Technology (M.Tech.) in India.

Table 2. Enrolment status of women in Masters of Science (M.Sc.) in India

| Year | All Category | | | | Scheduled Caste | | | | Scheduled Tribe | | | | Other Backward Classes | | | |
|---------|-----------------------|--------------|--------------------------|-------------|-----------------------|--------------|--------------------------|-------------|-----------------------|--------------|--------------------------|-------------|------------------------|--------------|--------------------------|-------------|
| | Total (Male & Female) | Total Female | Percentage (%) of Female | Growth rate | Total (Male & Female) | Total Female | Percentage (%) of Female | Growth rate | Total (Male & Female) | Total Female | Percentage (%) of Female | Growth rate | Total (Male & Female) | Total Female | Percentage (%) of Female | Growth rate |
| 2013-14 | 125970 | 60470 | 48.00 | .. | 10222 | 4669 | 45.67 | .. | 2744 | 1060 | 38.62 | .. | 42571 | 24138 | 56.70 | .. |
| 2014-15 | 108962 | 55807 | 51.21 | 3.21 | 9129 | 4258 | 46.64 | 0.97 | 3122 | 1169 | 37.44 | -1.18 | 33751 | 19309 | 57.21 | 0.51 |
| 2015-16 | 96367 | 48964 | 50.80 | -0.41 | 8671 | 3992 | 46.03 | -0.61 | 3004 | 1126 | 37.48 | 0.04 | 31628 | 17153 | 54.23 | -2.98 |
| 2016-17 | 113938 | 57435 | 50.40 | -0.4 | 14904 | 7072 | 47.45 | 1.42 | 3356 | 1251 | 37.27 | -0.21 | 39570 | 21572 | 54.51 | 0.28 |
| 2017-18 | 105507 | 49765 | 47.16 | -3.24 | 10919 | 5437 | 49.79 | 2.34 | 4034 | 1985 | 49.20 | 11.93 | 51201 | 23232 | 45.37 | -9.14 |
| 2018-19 | 74103 | 41529 | 56.04 | 8.88 | 8067 | 4009 | 49.69 | -0.1 | 2474 | 1029 | 41.59 | -7.61 | 34182 | 20703 | 60.56 | 15.19 |
| 2019-20 | 109459 | 60409 | 55.18 | -0.86 | 10699 | 5185 | 48.46 | -1.23 | 3601 | 1506 | 41.82 | 0.23 | 43712 | 24321 | 55.63 | -4.93 |

Source: Annual report of All India Survey on Higher Education (AISHE) Department of Higher Education, Ministry of Education, Govt. of India., 2013-2014 to 2019-2020⁽¹³⁻¹⁸⁾..

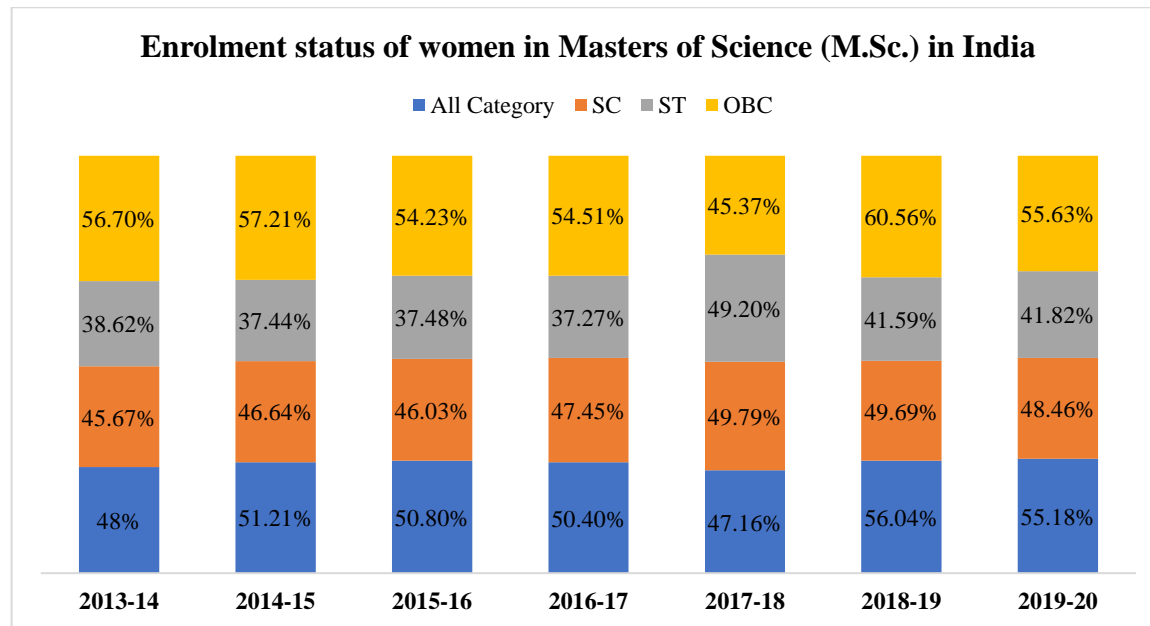


Fig. 2. Enrolment status of women in Masters of Science (M.Sc.) in India

Table 3. Enrolment status of women in Bachelor of Technology (B.Tech.) in India

| Year | All Category | | | | Scheduled Caste | | | | Scheduled Tribe | | | | Other Backward Classes | | | |
|---------|-----------------------|--------------|--------------------------|-------------|-----------------------|--------------|--------------------------|-------------|-----------------------|--------------|--------------------------|-------------|------------------------|--------------|--------------------------|-------------|
| | Total (Male & Female) | Total Female | Percentage (%) of Female | Growth rate | Total (Male & Female) | Total Female | Percentage (%) of Female | Growth rate | Total (Male & Female) | Total Female | Percentage (%) of Female | Growth rate | Total (Male & Female) | Total Female | Percentage (%) of Female | Growth rate |
| 2013-14 | 2115155 | 584408 | 27.62 | .. | 186105 | 49188 | 26.43 | .. | 55980 | 13338 | 23.82 | .. | 566171 | 170810 | 30.16 | .. |
| 2014-15 | 2199213 | 594039 | 27.01 | -0.61 | 211914 | 53868 | 25.41 | -1.02 | 63951 | 15019 | 23.48 | -0.34 | 629995 | 184202 | 29.23 | -0.93 |
| 2015-16 | 2181870 | 583221 | 26.73 | -0.28 | 217663 | 53879 | 24.75 | -0.66 | 63137 | 14863 | 23.54 | 0.06 | 643082 | 184529 | 28.69 | -0.54 |
| 2016-17 | 2172134 | 590194 | 27.17 | 0.44 | 219274 | 55927 | 25.50 | 0.75 | 67218 | 15778 | 23.47 | -0.07 | 650524 | 188566 | 28.98 | 0.29 |
| 2017-18 | 2119942 | 585584 | 27.62 | 0.45 | 221031 | 58630 | 26.52 | 1.02 | 66397 | 15874 | 23.90 | 0.43 | 657834 | 193791 | 29.45 | 0.47 |
| 2018-19 | 2125043 | 595159 | 28.00 | 0.38 | 221003 | 61112 | 27.65 | 1.13 | 68082 | 17060 | 25.05 | 1.15 | 675744 | 200216 | 29.62 | 0.17 |
| 2019-20 | 2147962 | 611831 | 28.48 | 0.48 | 219191 | 62328 | 28.43 | 0.78 | 68635 | 17560 | 25.58 | 0.53 | 685927 | 204473 | 29.80 | 0.18 |

Source: Annual report of All India Survey on Higher Education (AISHE) Department of Higher Education, Ministry of Education, Govt. of India., 2013-2014 to 2019-2020⁽¹³⁻¹⁸⁾

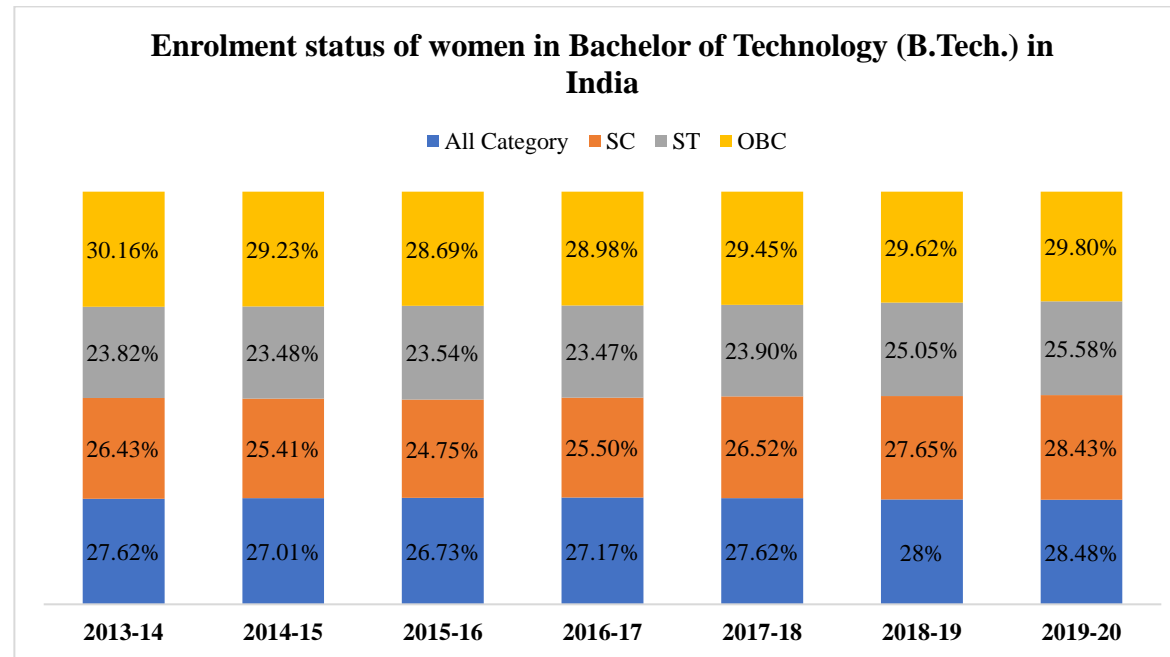


Fig. 3. Enrolment status of women in Bachelor of Technology (B.Tech.) in India

Table 4. Enrolment status of women in Masters of Technology (M. Tech.) in India

| Year | All Category | | | | Scheduled Caste | | | | Scheduled Tribe | | | | Other Backward Classes | | | |
|---------|-----------------------|--------------|--------------------------|-------------|-----------------------|--------------|--------------------------|-------------|-----------------------|--------------|--------------------------|-------------|------------------------|--------------|--------------------------|-------------|
| | Total (Male & Female) | Total Female | Percentage (%) of Female | Growth rate | Total (Male & Female) | Total Female | Percentage (%) of Female | Growth rate | Total (Male & Female) | Total Female | Percentage (%) of Female | Growth rate | Total (Male & Female) | Total Female | Percentage (%) of Female | Growth rate |
| 2013-14 | 178325 | 64992 | 36.44 | .. | 16596 | 5304 | 31.95 | .. | 4550 | 1311 | 28.81 | .. | 46133 | 16534 | 35.83 | .. |
| 2014-15 | 208905 | 77537 | 37.11 | 0.67 | 20858 | 7085 | 33.96 | 1.74 | 6401 | 1777 | 27.76 | -1.05 | 58940 | 21512 | 36.49 | 0.66 |
| 2015-16 | 192066 | 71590 | 37.27 | 0.16 | 20823 | 7222 | 34.68 | 0.72 | 11594 | 5846 | 50.42 | 22.66 | 123051 | 59641 | 48.46 | 11.97 |
| 2016-17 | 160895 | 59259 | 36.83 | -0.44 | 18099 | 6258 | 34.57 | -0.11 | 4954 | 1582 | 31.93 | -18.49 | 46540 | 17335 | 37.24 | -11.22 |
| 2017-18 | 142084 | 50596 | 35.60 | -1.23 | 16312 | 5658 | 34.68 | 0.11 | 4305 | 1367 | 31.75 | -0.18 | 41850 | 15158 | 36.21 | -1.03 |
| 2018-19 | 135500 | 47420 | 34.99 | -0.61 | 15762 | 5482 | 34.77 | 0.09 | 4196 | 1285 | 30.62 | -1.13 | 40112 | 14366 | 35.81 | -0.4 |
| 2019-20 | 137051 | 45498 | 33.19 | -1.8 | 15920 | 5450 | 34.23 | -0.54 | 4294 | 1250 | 29.11 | -1.51 | 40927 | 14106 | 34.46 | -1.35 |

Source: Annual report of All India Survey on Higher Education (AISHE) Department of Higher Education, Ministry of Education, Govt. of India., 2013-2014 to 2019-2020^[13-18]

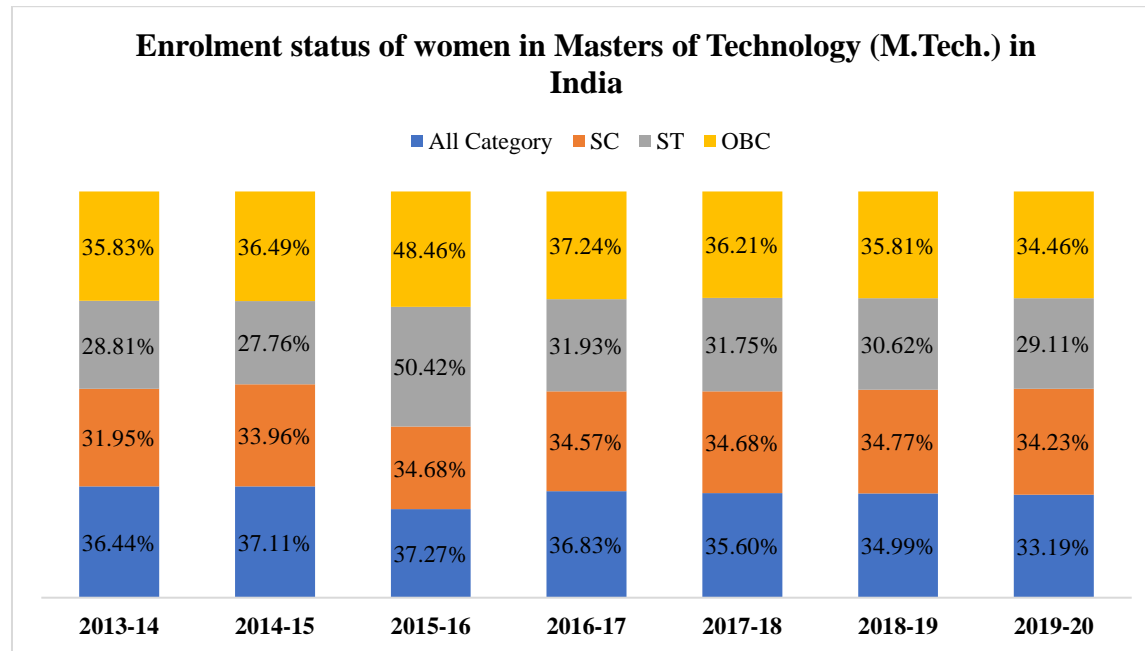


Fig. 4. Enrolment status of women in Masters of Technology (M.Tech.) in India

Interpretation: The table 4 shows that social category-wise enrolment status of females in Masters of Technology (M.Tech.) in the last seven years (2013-14 to 2019-20) is hopeful. Highest enrolment of all category females was 37.27% in the academic session of (2015-16) and highest enrolment growth rate was 0.67% in the academic session (2014-15) and lowest enrolment growth rate was -1.23% in the academic session (2019-20). The enrolment status of SC category females is hopeful, highest enrolment of SC category females was 34.77% in the academic session of (2018-19) and highest enrolment growth rate was 1.74% in the academic session (2014-15) and lowest enrolment growth rate was 0.54% in the academic session (2019-20). Enrolment status of ST category females is hopeful, highest enrolment of ST category females was 31.93% in the academic session of (2016-17) and highest enrolment growth rate was 22.66% in the academic session (2015-16) and lowest enrolment growth rate was -18.49% in the academic session (2016-17). Enrolment status of OBC category females is hopeful, highest enrolment of OBC category females was 48.46% in the academic session of (2015-16) and highest enrolment growth rate was 11.97% in the academic session (2015-16) and lowest enrolment growth rate was -11.22% in the academic session (2016-17).

Analysis of objective 5: To examine the enrolment status of women in Bachelor of Engineering (B.E. in India.

Interpretation: Table 5 showed social category-wise enrolment status of females in Bachelor of Engineering (B.E.) in the last seven years (2013-14 to 2019-20) is not hopeful. Highest enrolment of all category females was 28.98% in the academic session of (2019-20) and highest enrolment growth rate was 0.13% in the academic session (2019-20) and lowest enrolment growth rate was -0.11% in the academic session (2017-18). Enrolment status of SC category females is hopeful, highest enrolment of SC category females was 34.48% in the academic session of (2019-20) and highest enrolment growth rate was 1.25% in the academic session (2017-18) and lowest

enrolment growth rate was 0.09% in the academic session (2018-19). Enrolment status of ST category females is hopeful, highest enrolment of ST category females was 29.25% in the academic session of (2019-20) and highest enrolment growth rate was 1.05% in the academic session (2016-17) and lowest enrolment growth rate was -1.08% in the academic session (2014-15). Enrolment status of OBC category females is hopeful, highest enrolment of OBC category females was 30.59% in the academic session of (2013-14) and highest enrolment growth rate was 0.31% in the academic session (2019-20) and lowest enrolment growth rate was -0.36% in the academic session (2017-18).

Analysis of objective 6: To study the enrolment status of women in Masters of Engineering (M.E.) in India.

Interpretation: Table 6 showed social category-wise enrolment status of females in Bachelor of Engineering (M.E.) in the last seven years (2013-14 to 2019-20) is hopeful. Highest enrolment of all category females was 64.43% in the academic session of (2019-20) and highest enrolment growth rate was 22.22% in the academic session (2019-20) and lowest enrolment growth rate was -1.9% in the academic session (2016-17). Enrolment status of SC category females is hopeful, highest enrolment of SC category females was 66.78% in the academic session of (2019-20) and highest enrolment growth rate was 23.15% in the academic session (2019-20) and lowest enrolment growth rate was -1.74% in the academic session (2016-17). Enrolment status of ST category females is hopeful, highest enrolment of ST category females was 33.69% in the academic session of (2014-15) and highest enrolment growth rate was 5.45% in the academic session (2014-15) and lowest enrolment growth rate was -2.37% in the academic session (2017-18). Enrolment status of OBC category females is hopeful, highest enrolment of OBC category females was 48.14% in the academic session of (2015-16) and highest enrolment growth rate was 1.74% in the academic session (2014-15) and lowest enrolment growth rate was -1.92% in the academic session (2016-17).

Table 5. Enrolment status of women in Bachelor of Engineering (B.E.) in India

| Year | All Category | | | | Scheduled Caste | | | | Scheduled Tribe | | | | Other Backward Classes | | | |
|---------|-----------------------|--------------|--------------------------|-------------|-----------------------|--------------|--------------------------|-------------|-----------------------|--------------|--------------------------|-------------|------------------------|--------------|--------------------------|-------------|
| | Total (Male & Female) | Total Female | Percentage (%) of Female | Growth rate | Total (Male & Female) | Total Female | Percentage (%) of Female | Growth rate | Total (Male & Female) | Total Female | Percentage (%) of Female | Growth rate | Total (Male & Female) | Total Female | Percentage (%) of Female | Growth rate |
| 2013-14 | 1896153 | 541884 | 28.57 | .. | 175395 | 53520 | 30.51 | .. | 36564 | 9866 | 26.98 | .. | 736651 | 225346 | 30.59 | .. |
| 2014-15 | 1968107 | 561809 | 28.54 | -0.03 | 195691 | 60753 | 31.04 | 0.53 | 40407 | 10467 | 25.90 | -1.08 | 786881 | 240556 | 30.57 | -0.02 |
| 2015-16 | 2003022 | 570043 | 28.45 | -0.09 | 212084 | 67264 | 31.71 | 0.67 | 43519 | 11295 | 25.95 | 0.05 | 809352 | 246354 | 30.43 | -0.14 |
| 2016-17 | 1913625 | 552190 | 28.85 | 0.4 | 219883 | 71711 | 32.61 | 0.9 | 44845 | 12109 | 27.00 | 1.05 | 797453 | 243964 | 30.59 | 0.16 |
| 2017-18 | 1820155 | 523220 | 28.74 | -0.11 | 223426 | 75669 | 33.86 | 1.25 | 42828 | 11981 | 27.97 | 0.97 | 782629 | 236646 | 30.23 | -0.36 |
| 2018-19 | 1645906 | 474971 | 28.85 | -0.11 | 204110 | 69298 | 33.95 | 0.09 | 40071 | 11396 | 28.43 | 0.46 | 717463 | 217241 | 30.27 | 0.04 |
| 2019-20 | 1496083 | 433689 | 28.98 | 0.13 | 180920 | 62385 | 34.48 | 0.53 | 35568 | 10405 | 29.25 | 0.82 | 659640 | 201734 | 30.58 | 0.31 |

Source: Annual report of All India Survey on Higher Education (AISHE) Department of Higher Education, Ministry of Education, Govt. of India., 2013-2014 to 2019-2020[13-18]

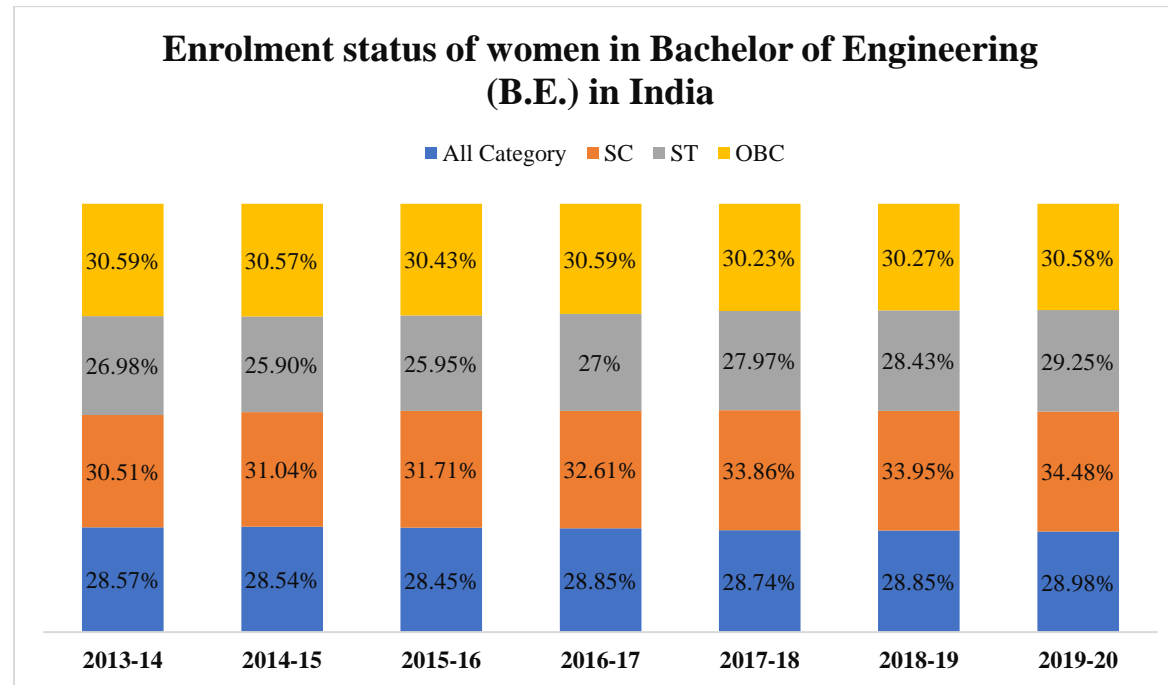


Fig. 5. Enrolment status of women in Bachelor of Engineering (B.E.) in India

Table 6. Enrolment status of women in Masters of Engineering (M.E.) in India

| Year | All Category | | | | Scheduled Caste | | | | Scheduled Tribe | | | | Other Backward Classes | | | |
|---------|-----------------------|--------------|--------------------------|-------------|-----------------------|--------------|--------------------------|-------------|-----------------------|--------------|--------------------------|-------------|------------------------|--------------|--------------------------|-------------|
| | Total (Male & Female) | Total Female | Percentage (%) of Female | Growth rate | Total (Male & Female) | Total Female | Percentage (%) of Female | Growth rate | Total (Male & Female) | Total Female | Percentage (%) of Female | Growth rate | Total (Male & Female) | Total Female | Percentage (%) of Female | Growth rate |
| 2013-14 | 77130 | 32674 | 42.36 | .. | 6697 | 2616 | 39.06 | .. | 963 | 272 | 28.24 | .. | 32421 | 15323 | 47.26 | .. |
| 2014-15 | 76721 | 33589 | 43.78 | 1.42 | 7519 | 3091 | 41.10 | 2.04 | 1012 | 341 | 33.69 | 5.45 | 32153 | 15756 | 49.00 | 1.74 |
| 2015-16 | 64405 | 28479 | 44.21 | 0.43 | 6968 | 2962 | 42.50 | 1.4 | 1007 | 333 | 33.06 | -0.63 | 24857 | 11968 | 48.14 | -0.86 |
| 2016-17 | 50315 | 21290 | 42.31 | -1.9 | 6695 | 2729 | 40.76 | -1.74 | 948 | 327 | 34.49 | 1.43 | 19169 | 8861 | 46.22 | -1.92 |
| 2017-18 | 45481 | 18982 | 41.73 | -0.58 | 7483 | 3118 | 41.66 | 0.9 | 800 | 257 | 32.12 | -2.37 | 17811 | 8300 | 46.60 | -0.38 |
| 2018-19 | 41166 | 17379 | 42.21 | 0.48 | 6683 | 2916 | 43.63 | 1.97 | 779 | 256 | 32.86 | 0.74 | 16477 | 7803 | 47.35 | 0.75 |
| 2019-20 | 31329 | 20187 | 64.43 | 22.22 | 2887 | 1928 | 66.78 | 23.15 | 821 | 252 | 30.69 | -2.17 | 13390 | 6103 | 45.57 | -1.78 |

Source: Annual report of All India Survey on Higher Education (AISHE) Department of Higher Education, Ministry of Education, Govt. of India., 2013-2014 to 2019-2020 [13-18]

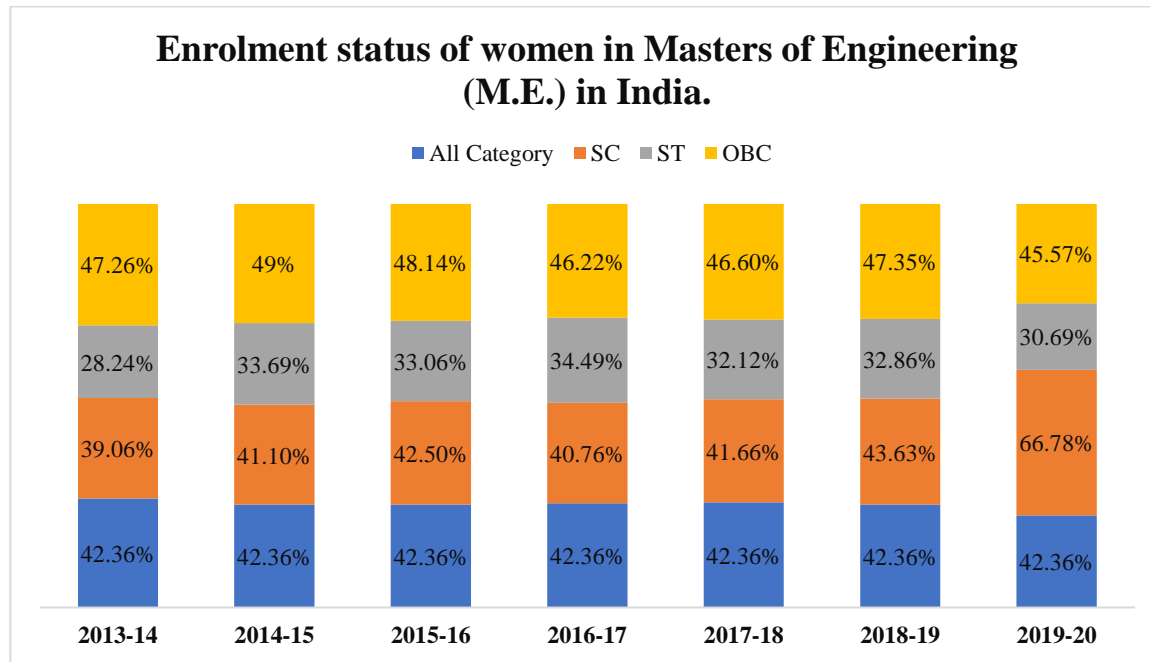


Fig. 6. Enrolment status of women in Masters of Engineering (M.E.) in India

10. FINDINGS

Study revealed the following findings-

1. It was found that enrolment of females in Bachelor of Science (B.Sc.) in the last seven years (2013-14 to 2019-20) is hopeful. Enrolment growth rate is increasing gradually.
2. It was found that enrolment of females in Masters of Science (M.Sc.) in the last seven years (2013-14 to 2019-20) is hopeful except Scheduled Tribe category. Enrolment growth rate is increasing gradually.
3. It was found that enrolment of females in Bachelor of Technology (B.Tech.) in the last seven years (2013-14 to 2019-20) is not hopeful. Enrolment growth rate is very little and discontinuous, gender gap exists.
4. It was found that enrolment of females in Masters of Technology (M.Tech.) in the last seven years (2013-14 to 2019-20) is not hopeful. Enrolment growth rate is very little and discontinuous, gender gap exists.
5. It was found that enrolment of females in Bachelor of Engineering in the last seven years (2013-14 to 2019-20) is not hopeful. Enrolment growth rate is very little and discontinuous, gender gap exists.
6. It was found that enrolment of females in Masters of Engineering in the last seven years (2013-14 to 2019-20) is hopeful. Enrolment Masters of Engineering is higher than Bachelor of Engineering. Also, Enrolment growth rate is increasing gradually.

11. CONCLUSION AND DISCUSSION

Researchers concluded that the participation of women in science at the higher education level has been hopeful in the last seven years. It was also observed that the gender gaps between male and female enrolment rates are narrowing down gradually. The progress of women enrolment has been increasing in the last seven years in India, in the field of science, women have made remarkable improvements [8,5,1]. But enrolment of women in the field of engineering, and technology at higher education level is not hopeful in the last seven years. Enrolment growth rate is very low and discontinuous and, a significant gender gap has persisted throughout the last seven years at all levels of, technology, and engineering disciplines all over India [3,6]. Even though women have

made tremendous progress toward increasing their participation in higher education, they are still under-represented in these fields [8]. Girls' achievements and interests in science, technology, and engineering are shaped by the environment around them [2]. Hence, societal beliefs and the growth environment around them influence the future [4]. Negative stereotypes about girls' abilities compared to boys in math can indeed measurably lower girls' test performance. Such stereotypes can lower girls' aspirations for science and engineering careers over time [5].

There is a need for more incentives in education and the participation of women in engineering and technology [19-21]. The government needs special attention to women's educational grants and subsidies that ensure the full participation of women in science and technology which brings changes in society [7,22-24].

ETHICAL STANDARD

This is documentary research and the research has been done keeping in mind all the ethical aspects of documentary research.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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