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Gender Inequality in Undergraduate and Postgraduate Programs: A Study in Some Selected Indian States

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Abstract

India has been facing a remarkable gender inequality in all education sectors. This paper attempts to examine the gender disparity in higher education i.e., in Undergraduate (UG) and Postgraduate (PG) Program and the factors affecting it by taking 12 states in India over the period 2010-11 to 2021-22. The results of UG and PG level analysis shows that in case of UG, for 5 states, enrolment of male pupil is less than the female pupil. For the rest 7 states, the result is just opposite. For PG, GPI is greater than 1 for 9 States and less than 1 for the remaining 3 states. The gross enrolment for female is in better position than male in PG level compared to the UG level. More number of higher education institutions, increase in hostel capacity and rise in pupil-teacher ratio up to a limit can boost gender equality in higher education.

Keywords: Gender Inequality, Higher education, Gender Parity, Indian states, Panel regression

Introduction

One of the most important indicators of inequality in higher education is gender differences. There are wide variations between different states and also across disciplines. The source of primary education of a child is his or her mother. But women are generally found to be lagging behind men in every sector including higher education in India. India has a wide gender gap between male and female in every education sector. The enrolment rate of female is higher than men which reached approximately 2.18 crore as per AISHE report (2024). According to recent estimates 2018-23, 77-80% people are educated out of total population in India. The Gross Enrolment Rate often exceeding 100% (around 112% in 2023) in primary education in India due to under-aged or over-aged students (around 24.69 crore in 2024-25)

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driven by falling birth rates. NEP set a 100% GER goal by 2030. But the total school enrolment decreased from 24.8 crore (2023-24 to 24.69 crore (2024-25). Recent government data and official surveys indicate that number of enrolment in higher education reached approximately to 4.65 crore which 3.3% of India's estimated total 1.42 billion populations. The Gross Enrolment Rate among 18-24 years' students was 32.5% for 2025 which higher than in 2021-22 (28.4%). According to AISHE report (2021-22), the enrolment rate was 78.9% in under graduate and 12.1% in post graduate. The number of higher education institutions in India has grown to 70018, including 1338 universities and approx. 52000 colleges in 2025. Although the enrolment rate in education sector is slightly high than before yet their number of drop-out students in secondary and higher secondary is increasing also. As per 2024-25 UDISE+ report, the drop-out rate in primary education was 2.3%, middle (upper primary) was 3.5%, secondary was 8.2%(economic survey 14.1%) and higher secondary was 6.7% -11.5%.

Government has taken many initiatives to promote girl's education in our country, "Beti Bachao Beti Padhao Scheme was launched in 2015 with the noble purpose to educate girls. 'Sukanya Samriddhi Yojana' scheme was launched in 2015 to meet the expense of the girl child's higher education and marriage" (Ministry of Women and child Devolvement Report, 2015. Many experts told that the gross enrolment rate can be decreased as well as increased due to many factors like, education expenditure, per capita net state domestic product, and drop-out rate and so on. From the above data it can be seen that the drop-out rate in secondary education is higher than other sectors in education. That's why the gross enrolment rate in higher education may be low.

The literature review reveals that there are various studies on gender inequality in education covering various issues. Some of them are due to Jacobs (1996) who reviewed literature on gender difference and higher education. Kingdon (2002) estimated educational enrolment functions and selectivity-corrected educational attainment functions, conditional on enrolment for studying gender difference in educational attainment being decomposed into the part that is explained by men and women's differential characteristics and the part that is not so explained. Chee, Pino & Smith (2005) examined gender inequality in the academic ethics and academic accomplishment among college students. Azam & Blom (2008) examined the trends in enrollment, attainment and access to higher education in India and found the important gap that exist in enrollment between men and women, urban and rural, poor and rich. John (2012) argued that women's education occupied a major place in India but lost prominence with the onset of the women's movement and the introduction of women's studies in the academy in the 1980s and since then. Kumar (2013) looked at the present position of women education by looking at all 35 state-wise and country wise percentage of female literacy in India. Deen (2014) studied the spatial and temporal analysis of the availability and enrollment in higher education for female

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across the Indian states. They found a very high male-female disparity in gross enrollment ratio among the Indian states. Jha & Nagar (2015) postulated a diverse literature on gender and higher education and found the differences between access to higher education, college experience and post collegiate outcomes. Ghara (2016) focused on the development of women education and argued that women education and empowerment are the best indicators of development. Naqvi (2017) focused on gender inequality on the performance scores of undergraduate students. Ghosh (2019) determined the enrolment rate of women in different streams in higher education with respect to men and also tried to find the affective factors of it in higher education during 2010-11 to 2015-16 for 17 major states of India. Jose & Sivaraman (2023) tried to examine the gender inequality in India.

Although there are some studies on gross enrolment in higher education or on secondary education but there is dearth in the study on gross enrolment ratio (GER) for UG and PG separately for the Indian states. Also the literature lacks on the study which focuses on factors affecting GER according to the above two mentioned programs.

Thus the major objectives of the present study are twofold: First to find the gender disparities in gross enrolment across Under Graduate and Post Graduate programs in some selected states and finally to identify the factors affecting gender disparities for UG and PG levels separately.

Methodology and data

In this paper 12 states in India are considered based on literacy rate as per Periodic Labour Force Survey (2023-24) report. 6 highest literacy rate states and 6 lowest literacy rate states are selected. The states considered are Himachal Pradesh, Nagaland, Kerala, Meghalaya, Goa, Mizoram, Tripura, Jharkhand, Rajasthan, Madhya Pradesh, Bihar, and Andhra Pradesh.

Gender inequality in enrolment is measured using Gender Parity Index (GPI) across the selected states considering UG and PG levels. GPI is calculated as the ratio of gross enrolment of female in higher education divided by Gross enrolment of male students in higher education for 18-23 years old students. Selected states are categorised into two based on the GPI value i.e. states having GPI greater than 1 and less than one. There are three major implication of GPI value. When GPI is less than 1, we can say that Gross Enrolment of male Students is more than female Student; further it means that Enrolment of male pupil (between 18-23 years old) out of total male population is more than the enrolment of female pupil (between 18-23 years old) out of total female population. And when the value of GPI is greater than 1, it means that Enrolment of male pupil (between 18-23 years old) out of total male population is less than the enrolment of female pupil (between 18-23 years old) out of total female

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population. If the value of GPI is equal to 1, it represents that there is no indifference.

Panel regression is done to identify the affecting factors of gender disparities for the above selected states, across under graduate and post graduate programs separately. Hausman test I performed and fixed effect model turned out to be the better model. The determinants of GPI taken for UG and PG levels are College Density (CD) measured by college per lakh population, percentage of number of Universities in a state (U), Education Expenditure as % of GSDP) (EE), Per capita net state domestic product (EG) as indicator of economic growth, Hostel intake capacity (HI), Pupil-teacher ratio (PT) and Drop-out rate (DOR) in secondary education.

After calculating GPI, in the next stage a regression is to be carried out to find out the determinants of GPI. Various models for understanding GPI are run for UG and PG levels and the better fitted ones are reported which are as follows:

$GPI_{UG} = a + \beta_0 (CD) + \beta_1(EG) + \beta_2(HI) + \beta_3(EE) + \beta_4(PT) + \beta_5(DOR) + €$……(1)

$GPI_{PG} = a + \beta_0 (U) + \beta_1(EG) + \beta_2(HI) + \beta_3(EE) + \beta_4(PT) + \beta_5(DOR) + €$……(2)

All the data used in the present study are obtained from Ministry of Education, GOI , MHRD reports available in www.mhrd.gov.in , AISHE Reports -2010-2011 to 2022-23, Central Statistics Office, Ministry of Statistics and Programme Implementation.

Results and Discussions

Gender disparities in Gross Enrolment across Under Graduate and Post Graduate programs in selected states are examined and the results for UG and PG level are represented by figures 1 and 2 respectively.

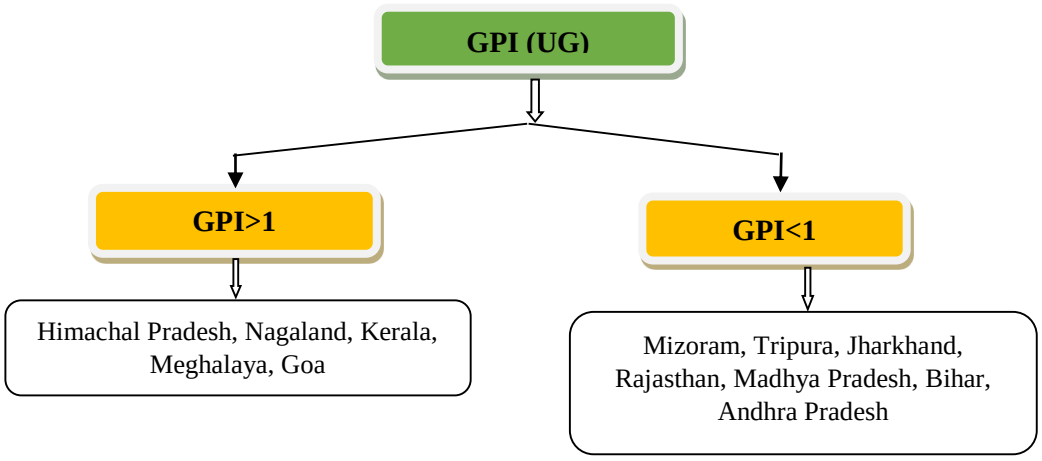

Figure 1: Gender disparity in Gross Enrolment across Undergraduate Students
Source: Authors' Own Representation

The above figure 1 shows the classification of the sample states based on their GPI

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values. It can be observed that the value of GPI is greater than 1 in case of under graduate level for Himachal Pradesh (1.231748572), Nagaland (1.053412161, Kerala (1.34949275), Meghalaya (1.085352363) and Goa (1.485608628). i.e., the gross enrolment rate of male student in those states is more compared to female Students. On the other hand, the value of GPI is less than 1 for other 7 states (like Mizoram, Tripura, Jharkhand, Rajasthan, Madhya Pradesh, Bihar, Andhra Pradesh). These states have low enrolment rate of male student compared to female.

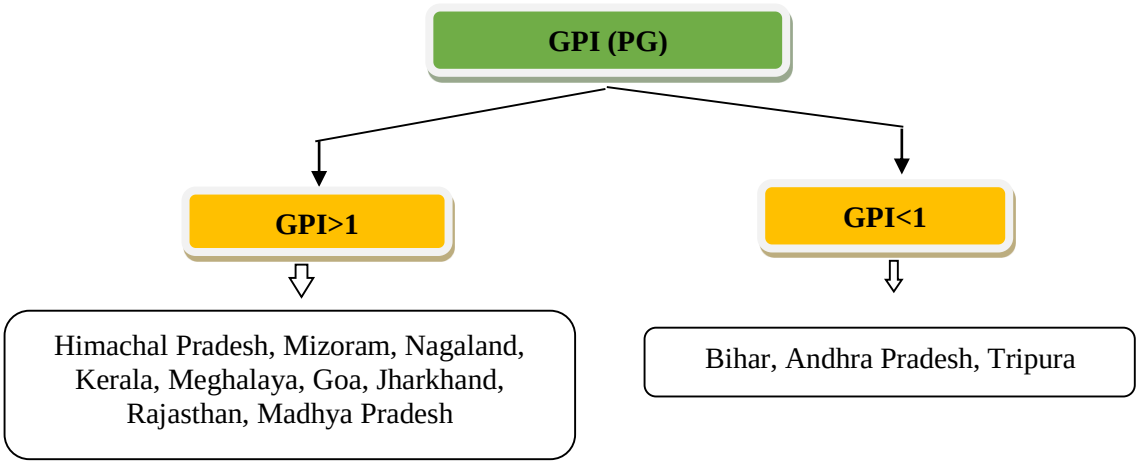

Figure 2: Gender disparity in Gross Enrolment across Postgraduate Students
Source: Authors' Own Representation

Comparing the average value of GPI during 2010-11 to 2021-22 in case of post graduate students of the selected states, it can be concluded that among the sample states, 9 states like Himachal Pradesh, Mizoram, Nagaland, Kerala, Meghalaya, Goa, Jharkhand and Madhya Pradesh have GPI value greater than 1. Thus, these states have higher gross enrolment rate for female than male students. On the other hand, another 3 states namely Bihar, Andhra Pradesh and Tripura have less than 1 GPI value indicating that they have less gross enrolment rate for female compared to male students.

After calculating GPI, in the next stage a regression has been carried out. The variables that appear in the regression analysis may be highly correlated. Hence, the usual tests for multicollinearity using variance inflation factor (VIF) test have been performed which are presented in Appendices 1 and 2, respectively, indicating multicollinearity is not present. Also tests for normality and heteroscedasticity are done using Goldfeld-Quandt Test and Jarque Bera test respectively suggesting no heteroscedasticity and normality respectively.

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The results of determinants of GPI for UG and PG levels separately are presented in Tables 1 and 2 respectively.

Table 1: Result of Panel Regression of GPI for UG level

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.642212	0.069661	9.219094	0.0000
CD	0.005011	0.002294	2.18445	0.0308
HI	3.69E-07	1.08E-07	3.413443	0.0009
EG	-1.04E-06	4.66E-07	-1.244632	0.1266
PT	0.01397	0.003287	4.249922	0.0000
PT2	-0.00014	3.85E-05	-3.6062	0.0004
PT*EG	2.97E-08	1.40E-08	2.125848	0.0355
DOR*EE	1.70E-06	1.01E-06	-1.678259	0.0958
R-squared	0.903278			
Adjusted R-squared	0.889351			
F-statistic	64.85388			
Prob (F-statistic)	0.0000			

Source: Authors' Calculation

The availability of local colleges and better physical access to colleges helps to reduce barriers to higher education among students. This may encourage more women enrolment in higher education. Thus with more number of colleges, gender parity improves.

Hostel intake is found to have positive impacts on gender parity in higher education. Good accommodation increases the enrolment, bridging geographical gaps and thus reducing inequality in enrolment between male and female.

Relation between GPI and PT is found to be nonlinear i.e. inverted U shaped. As PT ratio increases up to a certain point, the GPI improves and then GPI decreases. It means the higher value of PT ratio implies the participation of female in higher education sector to be greater than participation of male students up to a certain limit but after that participation of female in higher education sector is less than participation of male students.

The interaction effect of pupil teacher ratio and economic growth is positive and statistically significant with Gender parity. This may be due to the fact that with increase in economic growth, the average income of households increases. Parents may enroll their daughters or sons relatively more in education. This further increases the pupil-teacher ratio in higher education and thereby improving GPI.

The interaction effect of DOR*EE is obtained as encouraging GPI. This significant result indicates that if the government increase the expenditure on education then institutions can reduce their fees and improve education system, and then drop-out rate

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will be reduced. This will further increase the enrolment rate in higher education and thereby GPI may improve.

Table 2: Result of Panel Regression of GPI for PG level

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.490582	0.281426	1.743197	0.0838
U	0.022891	0.010521	2.175667	0.0315
U2	-0.00018	8.98E-05	-2.02963	0.0445
EG	2.24E-06	8.42E-07	2.657219	0.0089
PT	0.030083	0.010552	2.850833	0.0051
PT2	-0.00034	0.000119	-2.81268	0.0057
EE	-0.03833	0.031223	-1.2276	0.2219
DOR	-0.01206	0.004873	-2.47372	0.0147
HI	6.03E-07	3.40E-07	1.772994	0.0787
R-squared	0.746559			
Adjusted R-squared	0.707725			
F-statistic	19.22451			
Prob(F-statistic)	0			

Source: Authors' Calculation

With more number of universities there will be less transaction cost, more availability of seats for both genders and more participation rate in higher education, which may reduce the gender gap. The relation between number of Universities and GPI is obtained as nonlinear i.e. inverted U shaped. As number of universities increases up to a certain point, the GPI improves and then GPI decreases. This indicates that initially there is relative increase in female students up to a threshold limit but after that there is relatively more male enrolment in PG level.

Economic growth is positively and statistically significant to GPI indicating that if PCNSDP increases then the gross enrolment of female students will increase due to migration of male students to other states for high profile jobs, females are trying to enrol in their home town, after marriage most of the family ask to female to continue their study from local higher institutions thereby improving the GPI.

Relation between GPI and PT is nonlinear i.e. inverted U shaped. As PT ratio increases up to a certain point, the GPI improves and then GPI decreases. This is indicative off the fact that initially participation of female in higher education sector is greater than participation of male students up to a certain limit but after that participation of female in higher education sector is less than participation of male students in Post Graduate level.

Hostel intake is positively and statistically significant to GPI. It implies that if the accommodation increases in higher education institutions then more female students

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will participate than male. That's why GPI will improve.

An increase in education expenditure in higher education can improve the infrastructure of university and colleges. More colleges and universities will be established, more opportunities and more enrolment in various institutions will take place.

There is a negative relationship between Drop-out rate and GPI which means if there are lower drop-out rate, enrolment will rise and GPI will increase. That means gross enrolment rate will increase in higher education for female students compared to male.

Conclusion

The present paper attempts to examine the gender disparity in higher education i.e. in under graduate and post graduate program and the factors affecting it by taking 12 Indian states during the period 2010-11 to 2021-22 using data obtained from Ministry of Education, GOI , MHRD reports available in www.mhrd.gov.in , AISHE Reports - 2010-2011 to 2022-23, Central Statistics Office, Ministry of Statistics and Programme Implementation. 6 highest literacy rate states and 6 lowest literacy rate states are selected. The states considered are Himachal Pradesh, Nagaland, Kerala, Meghalaya, Goa, Mizoram, Tripura, Jharkhand, Rajasthan, Madhya Pradesh, Bihar and Andhra Pradesh.

To understand gender disparity in UG and PG levels, GPI are calculated separately for each programs and states considered are categorised based on their values. In the next stage, a regression is carried out to find out the determinants of GPI. Various models for understanding GPI are run for UG and PG levels and the better fitted ones are reported. The determinants of GPI taken for UG and PG levels are College Density (CD) measured by college per lakh population, percentage of number of Universities in a state (U), Education Expenditure as % of GSDP) (EE), Per capita net state domestic product (EG) as indicator of economic growth, Hostel intake capacity (HI), Pupil-teacher ratio (PT) and Drop-out rate (DOR) in secondary education.

The results of UG level analysis shows that for Himachal Pradesh, Nagaland, Kerala, Meghalaya and Goa, the percentage of enrolment of male pupil is less than the percentage of enrolment of female pupil. For the rest states, Mizoram, Tripura, Jharkhand, Rajasthan, Madhya Pradesh, Bihar and Andhra Pradesh, the result is just opposite. In case of PG, GPI is greater than 1 for 9 States and less than 1 for the remaining 3 states. So, it may be concluded that the gross enrolment rate for female is in better position than male in PG level compared to the UG level across the selected states. Again it is seen that the GPI is greater than 1 for states having higher literacy rate and less than 1 which are having low literacy rates for UG level. While in PG, among the 12 states Tripura has highest literacy rate but GPI is less than 1, which indicate that the gross enrolment rate for female is lower than male and Jharkhand,

Rajasthan and Madhya Pradesh have low literacy rate but GPI is greater than 1 which indicate that the gross literacy rate for female is higher than male in PG.

Gender equality in UG level may be encouraged by increased college density, increase in hostel capacity and surge in pupil-teacher ratio. Whereas increase in number of Universities, economic growth, pupil-teacher ratio and more hostel seats may boost gender equality in PG level. Thus more number of higher education institutions, increase in hostel capacity and rise in pupil-teacher ratio up to a limit can boost gender equality in higher education.

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Appendix 1: Result of Multicollinearity test for Model UG

Variable	VIF	1/VIF
CD	2.62	0.38
HI	1.37	0.73
EG	1.58	0.63
PT	2.67	0.37
Mean VIF	2.06	

Source: Source: Author's calculation

Appendix 2: Result of Multicollinearity test for PG

Variable	VIF	1/VIF
U	1.54	0.65
EG	1.39	0.65
PT	2.33	0.43
EE	1.89	0.53
DOR	1.79	0.51
Mean VIF	1.79	

Source: Source: Author's calculation