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Forecasting GER and Addressing Equity in Indian Higher Education: A Statistical Analysis of Growth, Inequality, and Infrastructure Needs

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Abstract: India's National Education Policy (NEP) 2020 aims to raise the Gross Enrolment Ratio (GER) in higher education to 50% by 2035. This study presents a comprehensive statistical assessment to evaluate the feasibility of this target by forecasting GER trends, estimating institutional and faculty requirements, and analyzing disparities across states, gender, and social groups. In alignment with the Sustainable Development Goal 4 (SDG-4), which emphasizes inclusive and equitable quality education, the analysis examines access gaps and regional inequalities within the higher education system. Based on data from the All India Survey on Higher Education (AISHE) and demographic projections, enrolment is forecasted using time series models. Results show that while GER may reach around 44.02 % by 2035 under baseline trends, achieving the NEP target will require accelerated expansion of institutional infrastructure and recruitment of faculty. The study also reveals persistent state-wise disparities in GER, gender parity, and social group enrolments. Further, the correlation between GER and number of colleges per lakh population has weakened over time, indicating that institutional expansion alone may no longer drive growth. Policy recommendations focus on balanced infrastructural expansion, improving faculty strength, and targeted equity interventions to support inclusive growth in Indian higher education.

Keywords: Gross Enrolment Ratio (GER), Higher Education Inequality, Gini Coefficient, AISHE Data, NEP 2020, SDG-4.

1. INTRODUCTION

India has witnessed significant growth in higher education enrolments over the past two decades, supported by expansion in institutions and increased government focus on accessibility. However, this progress has

not been uniformly distributed across regions, genders, or social groups. The NEP 2020 sets a landmark target of achieving a 50% GER in higher education by 2035. As of AISHE 2021–22, India's GER is 28.4%. This study examines past trends, forecasts future GER trajectories, assesses disparities, and estimates the infrastructural and faculty requirements essential to achieving the national target.

OBJECTIVES OF THE STUDY

- To analyze state-wise and national trends in GER using AISHE data.
- To forecast GER up to 2035 using appropriate statistical models.
- To assess inequality in GER and Gender Parity Index (GPI) across states.
- To estimate the required enrolment, institutional capacity, and faculty to meet NEP targets.
- To study the relationship between institutional expansion and GER growth over time.

The remainder of this paper is structured as follows: Section 2 presents a review of the existing literature on higher education growth and inequality in India. Section 3 describes the data sources and statistical methods employed in the analysis, including time series forecasting and inequality measurement. Section 4 discusses the empirical results related to enrolment trends, GER projections, institutional requirements, and state-wise disparities. Section 5 concludes the study and section 6 highlights key policy implications emerging from the findings, with a focus on equity and the NEP 2020 GER target.

2. LITERATURE REVIEW AND RESEARCH GAPS

Understanding the growth and equity dimensions of higher education in India has attracted significant scholarly attention in recent years. A key finding from Garg, Chowdhury, and Kanchan (2022) is that despite an overall reduction in educational inequality, the rural–urban divide continues to be the dominant source of disparity. Their analysis of national data between 2007 and 2018 also highlighted household wealth, occupation, and digital access as critical determinants of educational attainments, suggesting the need for stronger policy interventions in rural regions. Ghara(2022) emphasized the importance of adopting inequality metrics such as the Education Gini to track progress in higher education, particularly in the context of NEP 2020. Meanwhile, Borooah (2017) applied econometric decomposition techniques to identify structural factors driving unequal access, offering important insights into the roots of state-

level disparities. Forecasting studies such as that by Vanitha and Jayashree (2022) demonstrated the usefulness of statistical and machine learning methods for predicting enrolment trends, though these contributions remain more experimental in nature. Additionally, Mehta (2022) examined the feasibility of achieving a 50% GER by 2035, underscoring the importance of strategic planning and policy alignment with NEP goals.

Despite these contributions, few research gaps remain. First, existing studies tend to analyse enrolment growth and inequality separately, without examining their interdependence or how improvements in GER could influence equity outcomes across states and social groups. Second, although forecasting methods have been applied in prior work, they are rarely linked to actionable policy needs such as future infrastructure or faculty requirements. Third, while structural factors of inequality have been explored, quantitative projections at the state level—particularly those aligned with the NEP 2020 GER target—are scarce. This creates a need for comprehensive statistical assessment that combines forecasting with equity evaluation and planning for institutional expansion.

The present study bridges these gaps by combining:

- Time series analysis for forecasting of GER for the year 2035,
- Equity analysis through the Gini index (including GER, GPI, and institutional distribution),
- Correlation analysis of GER with the number of higher education institutions per lakh population, and
- Concrete estimations of institutional and faculty needs aligned with the NEP 2020 targets.

3. DATA AND METHODOLOGY

3.1. Data Sources

The analysis relies on secondary data collected from national statistical repositories and policy documents. Multiple datasets were integrated to study enrolment growth, GER trends, and state-wise inequalities in higher education.

- AISHE Reports (2010–11 to 2021–22) – for state-wise enrolment, GER, institutional distribution, and social group-wise participation
- World Population Prospects (UN DESA, 2024) – for projected 2035 population of the 18–23 age group, required for GER forecasting
- National Education Policy 2020 – for policy targets and benchmark comparison

3.2. Variables Used

The study utilizes key quantitative indicators from AISHE to examine growth, disparities, and resource needs in higher education in India. The primary variables are:

Gross Enrolment Ratio (GER), Gender Parity Index, State-wise enrolments, institutional numbers, demographic projections.

3.3. Methodological Framework

- Trend Analysis: Descriptive statistics and graphical analysis
- Forecasting: ARIMA (0,1,0) with drift
- Scenario-Based Estimation: Infrastructure and faculty needs calculated based on projected enrolment gaps
- Equity Analysis: Gini Index for GER (male, female, total), for GER (SC, ST and Total), for Gender Parity Index (GPI) and colleges per lakh population (18-23) across states
- Correlation Study: Pearson correlation between GER and number of colleges per lakh population across states over time

4. RESULTS AND ANALYSIS

4.1. Trend Analysis of GER (2010–2022)

A consistent upward trend in higher education participation has been recorded in India over the last decade. The Gross Enrolment Ratio (GER) shows steady improvements, reflecting the expanding reach of higher education across the country. At the national level, GER increased from 19.4% in 2010–11 to 28.4% in 2021–22, with Cumulative Average Growth
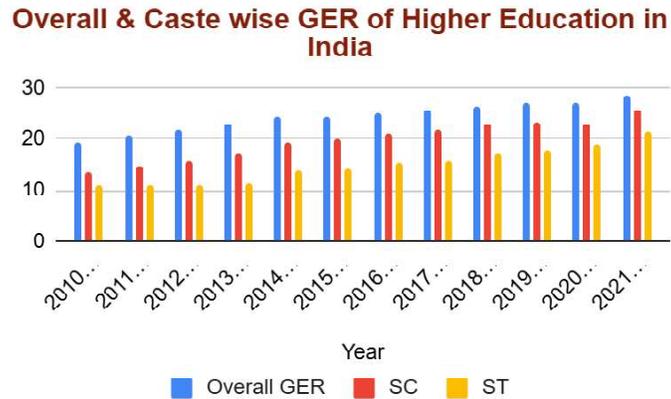

Figure 1: Overall and Caste wise GER of Higher Education in India

Rate of 3.53%. Similar upward trends are observed for GER of Scheduled Castes (SC) and Scheduled Tribes (ST), indicating gradual reductions in social disparities. SC GER rose from 13.5% to 25.9%, while ST GER improved from 11.2% to 21.2% during the same period.

4.2. State wise analysis of GER

Understanding regional differences in access to higher education is critical for targeted policy planning; therefore, state-wise and year-wise GER patterns were analyzed.

Table 1: State wise GER of Higher Education in India from 2011-12 to 2021-22

State	2011-12	2012-13	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2021-21	2021-22	CAGR
Andaman & Nicobar Islands	11.4	12.3	20.2	25.6	23.2	23.5	22.8	21.8	23.2	20	24.3	22.6	6.4
Andhra Pradesh	28.4	29.9	27.3	30.8	31.2	30.8	32.4	30.9	32.4	35.2	37.2	36.5	2.3
Arunachal Pradesh	26.9	21.3	19	26.1	28.3	28.7	28.9	29.7	29.7	35.4	33.7	36.5	2.8
Assam	13.4	14.7	13.8	15.8	14.8	15.4	17.2	18.2	18.7	17.3	17.5	16.9	2.1
Bihar	10.5	12.5	13.1	13	13.9	14.3	14.4	13	13.6	14.5	15.9	17.1	4.5
Chandigarh	41.4	42.2	54.6	55.8	56.1	57.6	56.1	56.4	50.6	52.1	66.1	64.8	4.2
Chhatisgarh	13.6	10.5	12.4	14	14.6	15.1	16.1	18.4	18.6	18.5	19.6	19.6	3.4
Dadra & Nagar Haveli	3.6	6.4	6.2	7.4	8.3	9.1	9.2	9.1	9.3	9.4	10.4	11.2	10.9
Daman & Diu	3.5	3.9	4.3	4.7	5.7	5.7	5.5	5.2	5.5	6.1	NA	NA	6.4
Delhi	32.5	38.9	39.6	43.1	43.5	45.4	45.3	46.3	46.3	48	47.6	49	3.8
Goa	33.2	23.5	24.9	26.4	27.7	27.6	28.1	28	30.1	28.4	33.8	35.8	0.7
Gujarat	21.3	16.5	18.3	19.5	20	20.7	20.2	20.1	20.4	21.3	22.2	24	1.1
Haryana	24.1	28	27.8	27.5	27.6	26.1	29	28.7	29.2	29.3	31.1	33.3	3.0
Himachal Pradesh	26	24.8	25.8	29.3	31.2	32.5	36.7	37.9	39.6	40.8	38.7	43.1	4.7
Jammu & Kashmir	16.8	22.8	25.6	25.6	24.8	24.8	25.6	27.7	30.9	32.4	25	24.8	3.6
Jharkhand	8.1	9.9	12.1	13.1	15.4	15.5	17.7	18	19.1	20.9	17	18.6	7.9
Karnataka	25.5	23.8	25.4	26.2	26.4	26.1	26.5	27.8	28.8	32	36	36.2	3.2
Kerala	21.9	21.8	22.1	24.9	28.7	30.8	34.2	36.2	37	38.8	43.2	41.3	5.9
Ladakh	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.9	8.4	11.5	20.7
Lakshadweep	0	11.5	11.8	12	4	7.1	7.3	7.6	7.4	7.5	7.2	1.1	-20.9
Madhya Pradesh	13.6	18.5	19.2	19.6	19.6	19.6	20	21.2	21.5	24.2	27.1	28.9	7.1
Maharashtra	27.6	26.3	22.9	26.3	27.9	29.9	30.2	31.1	32	32.3	34.9	35.3	2.3
Manipur	35.9	30.2	29.9	37.7	35.9	34.2	35	31.8	33.7	38.3	37.8	35.4	-0.1
Meghalaya	17.5	17.4	19.2	19.3	20.5	20.8	23.5	24.7	25.8	26.1	25.8	25.4	3.4
Mizoram	21.6	19	22.2	23.2	23.3	24.1	24.5	22.9	25.7	26.1	26.8	32.3	3.7
Nagaland	21.5	15.8	14.7	15.4	15.6	14.9	16.6	17.8	18.7	18.5	17.3	18.8	-1.2
Odisha	16.1	16.6	16.3	16.4	17.7	19.6	21	22	22.1	21.7	20.7	22.1	2.9
Puducherry	31.2	38.3	44.1	47.7	46	43.2	43.1	45.4	46.4	46.3	60.8	61.5	6.4
Punjab	19.4	23	23.9	25.4	27.1	27	28.6	30.3	29.5	28.2	26.3	27.4	3.2
Rajasthan	18.2	18.2	18.3	19.7	20	20.2	20.5	21.7	23	24.1	26.1	28.6	4.2
Sikkim	24.2	28.2	24.3	27.8	30.3	37.6	37.3	37.4	53.9	75.8	39.9	38.6	4.3
Tamil Nadu	32.9	40	42	43	45.2	44.3	46.9	48.6	49	51.4	46.9	47	3.3
Telangana	NA	NA	33.1	35.5	36.1	36.3	35.8	35.7	36.2	35.6	39.1	40	2.1
Tripura	13.6	12.4	14.1	15.4	16.8	16.9	19.1	21.2	19.2	20.2	19.2	20.7	3.9
Uttar Pradesh	16.3	17.4	19.5	21.6	25	24.5	24.9	25.9	25.8	25.3	23.2	24.1	3.6
Uttrakhand	27.8	31.1	33.3	33.8	33.9	33.3	33.4	36.3	39.1	41.5	45.7	41.8	3.8
West Bengal	12.4	13.6	15.1	16.3	17.4	17.7	18.5	18.7	19.3	19.9	21.3	26.3	7.1

Figure 2 shows the clustering of the states based on GER using K-means clustering with Principal Component Analysis.
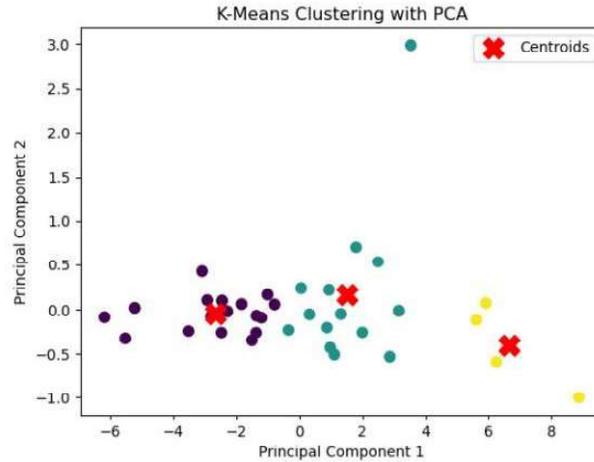

Figure 2: Clustering of the states of the basis of GER

A hierarchical cluster analysis of state-wise GER data grouped the states into following three clusters.

Cluster 1 (High GER): Chandigarh, Delhi, Puducherry, and Tamil Nadu—states with consistently high GER and strong higher education infrastructure.

Cluster 2 (Medium GER): Thirteen states showing moderate GER and gradual improvement in access and institutional expansion.

Cluster 3 (Low GER): Eighteen states with persistently low GER, reflecting regional imbalance, limited capacity, and socio-economic barriers.

The analysis highlights regional disparities in higher education access. Targeted policy measures are needed for medium- and low-GER states to progress toward the NEP 2020 goal of 50% GER by 2035.

4.3. GER Forecast for 2035

Using the ARIMA (0,1,0) with drift model, the projected enrollment for the year 2035 is estimated to be 6,33,37,094, corresponding to a projected population of 14,38,81,000 in the relevant age group. Based on these projections, the Gross Enrolment Ratio (GER) for 2035 is expected to reach 44.02%. This indicates that while progress is evident, achieving the NEP 2020 target of 50% GER by 2035 will require an accelerated rate of enrolment expansion and targeted policy interventions to enhance access and retention in higher education.

4.4. Institutional Requirement Estimation

To achieve the 50% Gross Enrolment Ratio (GER) target envisioned for the year 2035, the projected enrolment must reach approximately 71.9 million students. Based on the current trends in institutional capacity and the average enrolment per college (709), this would necessitate the establishment of nearly 40,338 additional higher education institutions including colleges, universities, and standalone institutes to accommodate the increased student population. Furthermore, maintaining a desirable Pupil–Teacher Ratio (PTR) of 20:1 would require the recruitment of approximately 1.43 million new faculty members across the country. These projections highlight the scale of infrastructural and human resource expansion essential for achieving the NEP 2020 goal of inclusive and equitable growth in higher education.

4.5. Inequality in GER

In order to evaluate how state-wise disparity in higher education participation has evolved over time, Gini indices for overall, male, and female GER were calculated annually. Figure 3 presents these trends.

Gini Index for Overall GER declined from 0.267 (2010-11) to 0.239 (2021-22), indicating a moderate but consistent convergence in enrolment levels across states. This reduction suggests that the expansion of higher education opportunities during this period has been geographically more inclusive, though minor fluctuations in 2019–20 and 2020–21 reflect
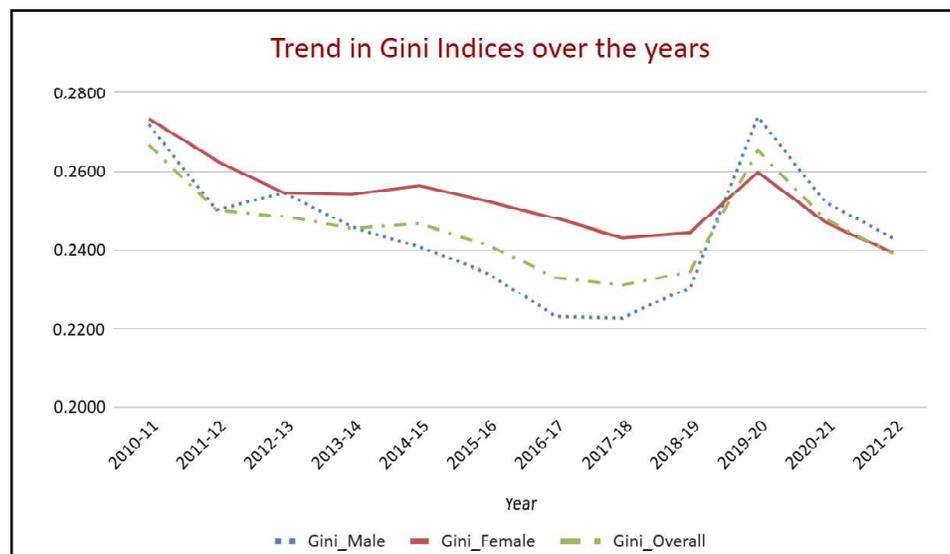

Figure 3: Trend in Gini Indices for Overall, Male and Female GER

temporary disruptions likely associated with pandemic-related factor. Gini index for male GER and female GER follows a similar declining trend with slight variations. Gini Index for Male GER declined from 0.271 (2010-11) to 0.243 (2021-22) and Gini Index for Female GER declined from 0.273 (2010-11) to 0.239 (2021-22)

Given the importance of equitable access across social groups, Gini indices for SC, ST and Others (Excluding SC, ST from Total) GER were analyzed to capture the extent of state-level disparities in enrolment. Figure 4 provides the trend of inequality across these categories over time.

In contrast, the patterns for Scheduled Caste (SC) and Scheduled Tribe (ST) populations display greater volatility and relatively higher inequality throughout the period. For the SC category, the Gini index dropped sharply from 0.47 in 2010–11 to 0.28 in 2016–17, showing substantial improvement in the early part of the decade. However, a reversal is observed after 2017–18, with the index rising again to 0.42 in 2021–22, suggesting that the gains in equity were not uniformly sustained across states. This re-emergence of inequality could reflect uneven policy implementation, varying institutional capacities, or socio-economic disparities affecting participation among SC students.

The ST category, meanwhile, shows the highest initial inequality (0.50 in 2010–11) but a more consistent improvement over time. The Gini value declined to 0.27 by 2018–19, indicating notable progress in reducing regional disparities. However, a mild increase to 0.36 in 2021–22 points to persisting challenges in ensuring equitable access for tribal populations,
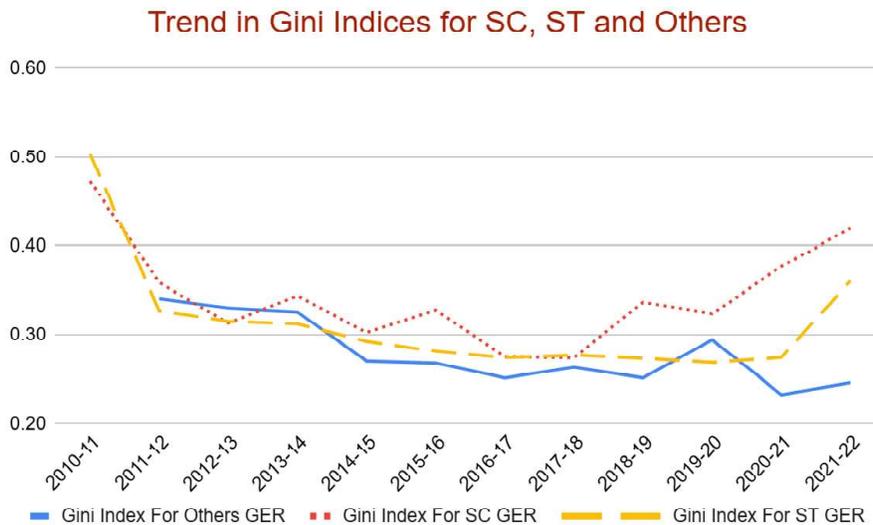

Figure 4: Trend in Gini Indices for SC, ST and Others GER

particularly in geographically remote and educationally disadvantaged regions.

Overall, the results demonstrate that while the expansion of higher education has contributed to reducing interstate inequality in general enrolment, the benefits have not been evenly distributed among marginalized social groups. The persistently higher Gini indices for SC and ST populations highlight the need for targeted interventions, state-specific strategies, and inclusive institutional planning to ensure equitable participation in line with the objectives of the National Education Policy (NEP) 2020.

4.6. Gender Parity Inequality (GPI Gini)

Gender Parity Index is the ratio of female to male enrolment in Higher Education. Gender Parity Index of India for enrolment in Higher Education has improved from 0.86 (2010–11) to 1.01 (2021–22). The Gini index calculated to measure the inequality among the states over the years are shown in the figure 5.
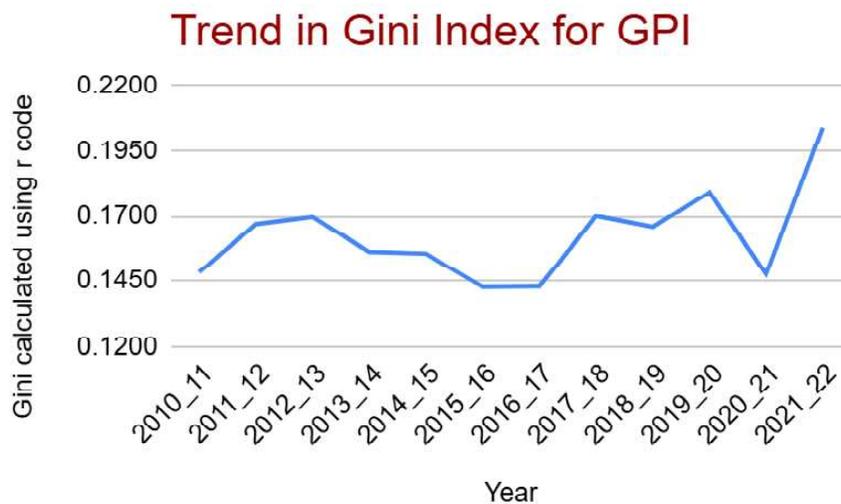

Figure 5: Trend in Gini Indices for Gender Parity Index

The Gini Index for GPI is declining but fluctuating in recent years, showing some persistent disparities in certain states.

4.7. Institutional Distribution Inequality

To understand how evenly higher education institutions are distributed across states, the Gini Index for the number of colleges per lakh population was computed for each year. Figure 6 presents the trend in infrastructure disparity over time.
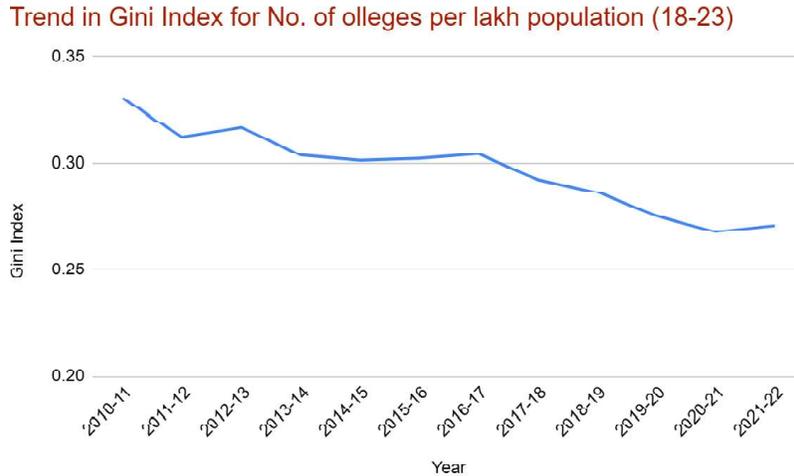
Figure 6: Trend in Gini Indices for Number of colleges per lakh population (18-23)

The Gini Index for number of colleges per lakh population fell from 0.3304 (2010–11) to 0.2707 (2021–22), indicating improvement in equity of institutional distribution across states. Slight increase in 2021 may reflect disruptions during COVID-19.

4.8. Correlation between GER and Number of Colleges per Lakh Population (18-23)

Recognizing that institutional density may play a role in promoting enrolment, a state-wise correlation analysis was conducted between GER and the number of colleges per lakh population (18–23 age group). Figure 7 illustrates the variation in this relationship across states and over time.
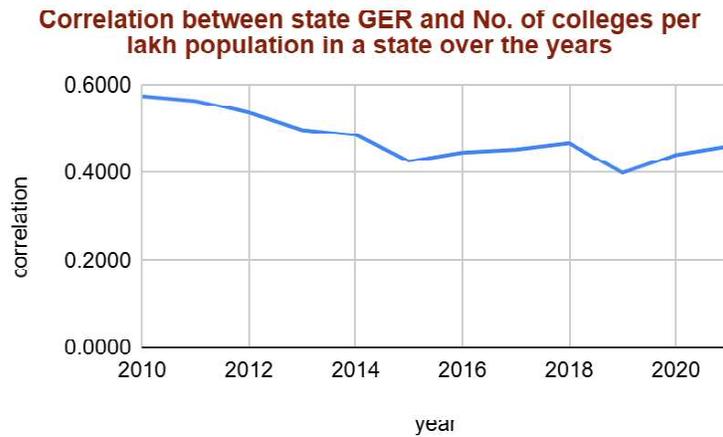

Figure 7: Correlation between GER and Number of colleges per lakh population

In the initial years (2010–2014), the correlation between state-wise GER and the number of institutions per lakh population was moderately positive (around 0.57), indicating that states with more higher education institutions tended to have higher enrolment levels. In the subsequent years (2018–2021), the correlation weakened to around 0.46, suggesting that the relationship between institutional expansion and enrollment has become less direct over time. This indicates that while institutional growth initially contributed substantially to GER improvement, its influence has reduced in recent years, possibly reflecting a maturing higher education system where enrolment growth is stabilizing.

5. DISCUSSION AND CONCLUSION

The analysis indicates a steady rise in enrolment and GER over the study period, accompanied by a gradual decline in interstate inequality in total GER. However, the Gini indices for SC and ST GER remain consistently higher than that of the others GER, showing that the pace of improvement has not been uniform across social groups. This suggests that despite national progress, certain states continue to lag in providing equitable access to higher education for SC and ST populations. The study also found that although the expansion of higher education institutions initially contributed to an increase in GER, the correlation between GER and institutional density has weakened in recent years, indicating that the addition of institutions alone may no longer drive enrolment growth to the same extent as before. These findings highlight the need for more focused efforts in states and social groups where disparity remains relatively high. While the overall trend is positive, achieving the NEP 2020 target of 50% GER by 2035 will require sustained improvement in both enrolment and equity. Strengthening state-specific strategies and continuing to monitor inequality across social groups will be essential to ensure balanced progress in the higher education landscape.

6. POLICY RECOMMENDATIONS

- Accelerate Institutional Growth in low-GER states. (in cluster 3)
- Strengthen Faculty Recruitment to meet PTR norms.
- Promote Equity through targeted scholarships, outreach for SC/ST communities, and localized access strategies.
- Improve Data Collection systems for real-time monitoring of GER, GPI, and institutional capacity.
- Develop Region-Specific Plans based on inequality and enrolment projections.

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