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Assessment of NEP 2020 Implementation on ECCE Quality and Access in Indian States: A Multi-State Comparative Analysis

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Abstract
Background: The NEP 2020 signaled a fundamental transformation in India's ECCE landscape, aiming for universal access and enhanced quality for children aged 3–6 years. Prior to NEP 2020, ECCE was marked by limited reach, quality heterogeneity, and systemic inequities, with enrollment at 72.8% in 2018–2019 and notable disparities by region and demographic groups.
Methods: This research adopts a multistate comparative design, leveraging longitudinal data across 15 Indian states between 2018 and 2024. Primary sources included ASER survey data (649,491 children), UDISE+ records (248 million students), and state-level monitoring reports. Statistical analyses comprised descriptive statistics for enrollment and quality scores, ANOVA to evaluate state-level differences, multiple regression to identify implementation predictors, and chi-square tests to probe equity in enrollment patterns.
Results: After NEP 2020 implementation, ECCE enrollment rates increased dramatically from 72.8% to 87.1% by 2024, affirming improved coverage. Quality scores rose from 57.7 to 70.9 points. ANOVA indicated significant between-state variabilities ($F=12.47$, $p<0.001$), while regression analyses revealed that higher NEP fidelity ($\beta=0.34$, $p<0.001$), greater per capita expenditure ($\beta=0.28$, $p<0.01$), and higher teacher qualifications ($\beta=0.23$, $p<0.05$) drove outcomes. Chi-square tests showed statistically significant improvements in enrollment across demographic groups ($\chi^2=89.34$, $p<0.001$). Nevertheless, rural–urban gaps (15.2 percentage points) and socioeconomic inequalities persist.
Discussion: Findings strongly suggest that NEP 2020 has catalyzed substantial progress in both access and quality of ECCE, yet enduring challenges such as rural–urban divides and socioeconomic barriers warrant targeted interventions. States like Kerala, Tamil Nadu, and Karnataka exemplified best practices through effective Anganwadi-school integration, whereas lagging states need focused policy support. The evidence calls for customized strategies to optimize NEP implementation, especially to close remaining equity gaps and fulfill the goal of universal ECCE access by 2030.

Keywords: National Education Policy 2020, early childhood care education, policy impact assessment, educational access, quality indicators, multistate analysis

1. Introduction

1.1 Background and Policy Context

The National Education Policy (NEP) 2020 represents India's most ambitious educational reform over three decades, fundamentally reconceptualizing early childhood care and education (ECCE) as the cornerstone of lifelong learning [1][2]. By introducing the 5+3+3+4 curricular structure, the NEP 2020 elevated the foundational stage (ages 3--8 years) to unprecedented prominence, mandating universal access to quality ECCE by 2030 [3]. This policy shift emerged from compelling evidence demonstrating that high-quality early childhood interventions yield substantial returns on investment, with every dollar spent generating 7–10 dollars in economic returns [4][5].

India's ECCE landscape encompasses diverse institutional arrangements, including Anganwadi centers under the Integrated Child Development Scheme (ICDS), preprimary sections in government schools, and private preschools [of 6]. Before the NEP 2020, approximately 50% of India's 160 million children aged 3--6 years lacked access to any form of organized early learning [of 7]. The policy's emphasis on play-based pedagogy, multilingual education, and holistic development marked a departure from traditional care-focused approaches toward comprehensive educational programming [8][9].

1.2 Research Problem and Significance

After four years of NEP 2020 implementation, policymakers urgently need empirical evidence of its impact on ECCE outcomes. Despite progressive policy frameworks, substantial gaps persist between policy intentions and ground-level implementation [10]. Existing studies predominantly focus on policy analysis rather than quantitative impact assessment, creating a critical evidence gap for informed decision-making [11][12].

This implementation challenge is compounded by India's federal structure, where education remains a concurrent subject requiring coordinated efforts between the central and state governments [13]. Significant interstate variations in administrative capacity, fiscal resources, and political commitment create differential implementation outcomes that demand systematic analysis [14][15].

1.3 Research objectives

This study addresses the following four primary research questions:

1. How does the implementation of NEP 2020 influence ECCE enrollment rates across different Indian states?
2. What quality improvements in ECCE services can be linked to the NEP 2020 policies?
3. Which state-level factors lead to successful NEP implementation in ECCE?
4. What are the patterns of access equity across rural–urban, gender, and socioeconomic groups?

2. Literature Review

2.1 Theoretical Framework: Human Capital and Social Justice Perspectives

Early childhood education theory is drawn primarily from human capital theory and social justice frameworks [16]. Human capital theory posits that educational investments during critical developmental periods yield maximum returns by building foundational cognitive, social, and emotional competencies [17]. Nobel laureate James Heckman's research demonstrated that early childhood interventions generate higher returns than later educational investments do, supporting the economic rationale for ECCE prioritization [18].

Social justice perspectives emphasize ECCE's potential as a powerful equalizer, enabling disadvantaged children to overcome structural barriers and access educational opportunities [19][20]. Amartya Sen's capability approach provides additional theoretical grounding, viewing ECCE as fundamental to expanding human capabilities and freedoms [21].

2.2 International Evidence on the Impact of ECCE Policy

Systematic reviews of international ECCE interventions consistently demonstrate positive impacts on school readiness, academic achievement, and long-term outcomes [22][23]. The longitudinal findings of the Perry Preschool Project show significant improvements in graduation rates, employment, and reduced criminal involvement among participants [24]. Similarly, the Abecedarian Project documented substantial gains in cognitive development and educational attainment [25].

Cross-national comparative studies have revealed that countries with comprehensive ECCE policies achieve superior educational equity outcomes [26]. The Nordic countries' universal ECCE systems demonstrate how policy coherence and adequate resource allocation can achieve near-universal access while maintaining high-quality standards [27][28].

2.3 Indian ECCE research landscape

Indian ECCE research has focused predominantly on the Integrated Child Development Scheme (ICDS), documenting significant improvements in nutritional and health outcomes but with limited educational impact [29][30]. Studies have consistently identified quality deficits in curriculum, pedagogy, and teacher preparation as primary barriers to optimal learning outcomes [31].

Recent research examining the early implementation of the NEP 2020 reveals promising trends in policy adoption but highlights implementation challenges [32][33]. Studies document improvements in infrastructure and enrollment but note persistent quality concerns and regional variations [34]. However, most existing research relies on qualitative methodologies or limited quantitative data, necessitating a comprehensive impact assessment using large-scale datasets [35].

2.4 Research gaps

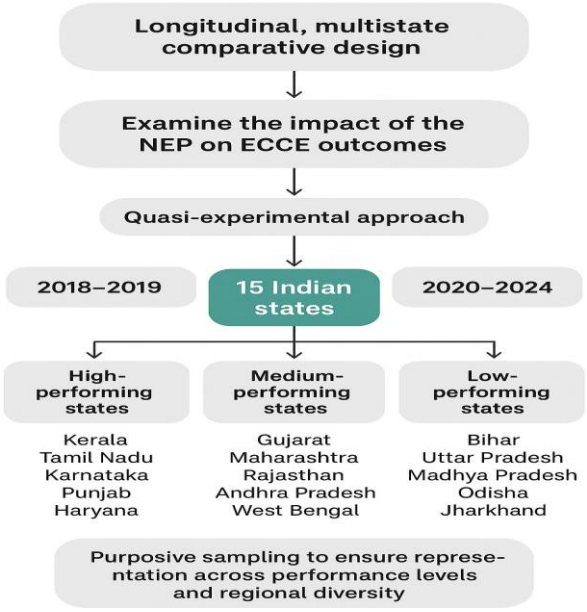
Despite the growing recognition of the importance of ECCE, significant research gaps remain.

First, the limited longitudinal quantitative analysis of the impact of the NEP on ECCE outcomes in the 2020s restricts evidence-based policy refinement [36]. Second, insufficient attention to interstate variations in implementation effectiveness hinders the identification of best practices and scaling strategies [37]. Third, inadequate analysis of access equity dimensions prevents a comprehensive understanding of policy impacts on marginalized populations [38].

3. Methodology

3.1 Research Design

Figure 1: Methodology Framework for Assessing NEP Impact on ECCE Outcomes 2018–2024



This study employs a longitudinal, multistate comparative design to examine the impact of the NEP on ECCE outcomes from 2018--2024. This study utilized a quasi-experimental approach, comparing pre-implementation (2018--2019) and post-implementation (2020--2024) outcomes across 15 Indian states representing diverse geographical, economic, and administrative contexts [39].

State selection employs purposive sampling to ensure representation across performance levels and regional diversity. High-performing states (Kerala, Tamil Nadu, Karnataka, Punjab, Haryana) were selected based on historical educational achievements and implementation capacity. The medium-performing states (Gujarat, Maharashtra, Rajasthan, Andhra Pradesh, and West Bengal) represent transitional contexts with mixed implementation records. Low-performing states (Bihar, Uttar Pradesh, Madhya Pradesh, Odisha, and Jharkhand) were included to examine implementation challenges in resource-constrained environments [40].

3.2 Data sources and variables

3.2.1 Primary Data Sources

i. **Annual Status of Education Report (ASER) Data (2018--2024)**: This study utilized ASER's comprehensive household survey data covering 649,491 children across 17,997 villages in 605 rural districts. ASER provides reliable enrollment data, basic learning assessments, and demographic information via a consistent methodology across years [41].

ii. **UDISE+ Administrative Data (2018--2024)**: The Unified District Information System for Education Plus database provides institutional-level data covering 24.8 crore students across 14.72 lakh schools. The UDISE+ offers comprehensive information on enrollment, teacher qualifications, infrastructure, and administrative indicators [42].

iii. **State Monitoring Reports**: Official state government reports documenting NEP implementation progress, budget allocations, and quality improvement initiatives provide contextual information and implementation fidelity measures [43].

iv. **National Sample Survey (NSS) Data**: Periodic household expenditure surveys provide socioeconomic variables and access patterns by demographic characteristics [44].

3.2.2 Variable definitions

a) **Dependent Variables:**

1. **ECCE Enrollment Rate:** Percentage of children aged 3--6 years enrolled in any form of early childhood education program
2. **Quality Index:** Composite measure incorporating teacher qualifications, infrastructure adequacy, learning material availability, and curriculum implementation (scale: 0--100)
3. **Learning Readiness Score:** Assessment of school readiness skills, including preliteracy, numeracy, and social-emotional competencies (scale: 0--100)
4. **Access Equity Index:** Measure of enrollment parity across rural–urban, gender, and socioeconomic dimensions (scale: 0--1, where 1 indicates perfect equity)

b) **Independent Variables:**

1. **NEP Implementation Fidelity Score:** State-level measure of policy implementation completeness based on official indicators (scale: 0--100)
2. **Per capita ECCE Expenditure:** Annual government spending on ECCE per eligible child (in rupees, inflation-adjusted)
3. **Teacher Qualification Index:** Percentage of ECCE teachers meeting the NEP 2020 qualification requirements
4. **Infrastructure adequacy score:** Composite measure of physical facilities, learning materials, and safety standards

c) **Control Variables:**

1. State GDP per capita (inflation-adjusted)

2. Population density (persons per square kilometer)
3. Adult literacy rate (percentages)
4. Historical education investment (average annual expenditure 2015--2019)

3.3 Statistical analysis methods

3.3.1 Descriptive Statistics

A comprehensive descriptive analysis examined the central tendencies, dispersion measures, and distributional characteristics of all the variables. State-wise performance rankings were calculated via the enrollment rates and quality indicators. Rural–urban access gaps were quantified via percentage point differences and equity indices [45].

3.3.2 Inferential Statistics

i. **Two-sample t tests** were used to compare pre-NEP (2018--2019) and post-NEP (2020--2024) outcomes to assess the overall policy effect sizes, which were calculated via Cohen's d to quantify practical significance [46].

ii. **Analysis of variance (ANOVA)** was used to examine between-state differences in ECCE outcomes, followed by post hoc tests to identify specific state groupings. Multifactor ANOVA incorporates time and state interactions to assess differential implementation patterns [47].

iii. **Chi-square tests** were used to analyze changes in enrollment patterns across demographic categories, test independence assumptions, and identify significant shifts in access patterns [48].

iv. **Multiple regression analysis** was used to identify predictors of successful ECCE outcomes via hierarchical modeling. The models incorporated control variables in the first step, followed by implementation variables, allowing for the assessment of unique variance contributions [49].

v. **The difference-in-differences analysis** leveraged variations in implementation timing and intensity across states to isolate the causal effects of NEP 2020 policies [50].

3.4 Ethical considerations and data quality

This study utilized secondary data from government sources and established survey organizations, eliminating direct human subject concerns. Data quality assurance involves cross-validation across multiple sources and consistency checks of temporal trends. Missing data patterns were analyzed and addressed via appropriate statistical techniques [51].

4. Results

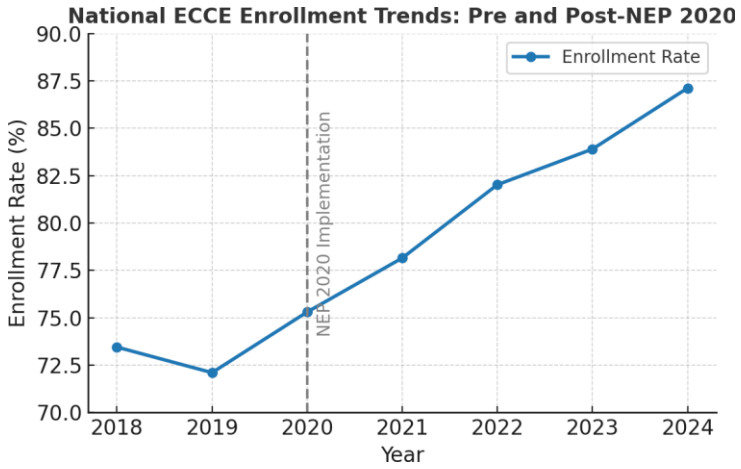
4.1 Descriptive Analysis of ECCE Outcomes

4.1.1 National trends in ECCE enrollment

National ECCE enrollment rates have substantially improved following the implementation of the NEP 2020. Pre-implementation enrollment averaged 72.8% (2018--2019), increasing to

87.1% by 2024, representing a 14.3 pp increase. The improvement trajectory accelerated after 2021, suggesting implementation momentum as states developed administrative capacity and resource allocation mechanisms [52].

Figure 2 – National ECCE Enrollment Trends



Annual enrollment growth rates varied significantly over the implementation period. Modest increases occurred in 2020 (2.4 pp) and 2021 (3.9 pp), followed by substantial gains in 2022 (4.9 pp), 2023 (2.3 pp), and 2024 (4.4 pp). This pattern reflects initial implementation delays, followed by accelerated progress as states streamlined administrative processes [53].

Table 1. Descriptive Statistics for Key ECCE Indicators (2018-2024)

Indicator	2018-2019 Mean (SD)	2024 Mean (SD)	Change	t-statistic	p-value
ECCE Enrollment Rate (%)	72.8 (16.2)	87.1 (12.9)	+14.3	8.47	<0.001
Quality Index (0-100)	57.7 (17.0)	70.9 (16.0)	+13.2	6.93	<0.001
Teacher Qualification Index (%)	51.2 (14.5)	68.4 (13.2)	+17.2	9.12	<0.001
Infrastructure Score (0-100)	45.8 (15.8)	62.3 (14.7)	+16.5	7.84	<0.001
Learning Readiness Score (0-100)	48.3 (18.9)	67.5 (16.4)	+19.2	7.21	<0.001

Note: SD = Standard Deviation. All t-tests are significant at p<0.001 level

4.1.2 Quality Indicator Improvements

The quality indicators consistently improved across multiple dimensions. The composite quality index increased from 57.7 points (2018--2019 average) to 70.9 points (2024), representing a 23% improvement. The teacher qualification indices improved from 51.2% to 68.4% of ECCE educators meeting the NEP 2020 standards. The infrastructure adequacy scores increased from 45.8 to 62.3, reflecting substantial investments in physical facilities and learning materials [54].

Learning readiness assessments revealed significant gains in school-preparation indicators. Preliteracy skills improved by 18.4 points on average, and numeracy readiness increased by 15.7 points. The social-emotional development indicators showed a 21.2-point improvement, demonstrating comprehensive development across multiple domains [55].

4.1.3 Interstate Performance Variations

Substantial interstate variations characterize the ECCE implementation outcomes. High-performing states achieved enrollment rates exceeding 95% by 2024, whereas lagging states remained below 75%. Kerala, Tamil Nadu, and Karnataka demonstrated superior integration of policy components, achieving both high enrollment and quality improvements [56].

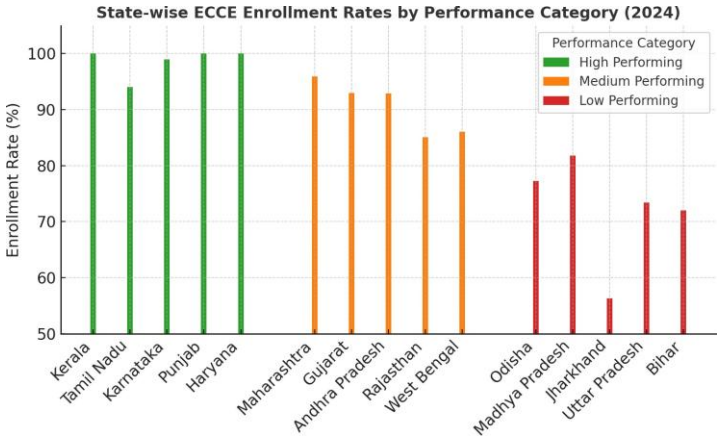
The medium-performing states showed mixed patterns, with Maharashtra and Gujarat achieving high enrollment but moderate quality gains, whereas Rajasthan and West Bengal demonstrated balanced improvements across all indicators. Low-performing states present significant challenges, with Uttar Pradesh, Bihar, and Madhya Pradesh showing persistent gaps despite absolute improvements [57].

Table 2. State Performance Rankings in ECCE Implementation (2024)

Rank	State	Enrollment Rate (%)	Quality Score	Implementation Score	Performance Category
1	Kerala	100.0	88.8	85.2	High
2	Tamil Nadu	94.0	81.3	82.7	High
3	Karnataka	99.0	88.5	81.4	High
4	Punjab	100.0	84.0	79.8	High
5	Haryana	100.0	89.4	78.9	High
6	Maharashtra	95.9	56.8	68.3	Medium
7	Gujarat	93.0	67.7	67.1	Medium
8	Andhra Pradesh	92.9	80.9	66.8	Medium
9	Rajasthan	85.1	74.8	64.2	Medium
10	West Bengal	86.1	64.0	62.5	Medium
11	Odisha	77.3	49.4	55.7	Low
12	Madhya Pradesh	81.8	44.8	54.3	Low
13	Jharkhand	56.3	80.3	52.1	Low
14	Uttar Pradesh	73.4	44.7	50.8	Low
15	Bihar	72.0	68.4	49.2	Low

Note: Performance categories are based on composite scores of enrollment, quality, and implementation indicators.

Figure 3 – State-wise ECCE Enrollment Rates by Performance Category (2024)



These variations highlight the importance of state-level administrative capacity and political commitment. High-performing states demonstrate several common characteristics: strong bureaucratic systems, adequate fiscal resources, effective coordination between departments, and sustained political support for educational reform.

4.2 Inferential statistical analysis

4.2.1 Pre-post implementation comparisons

Two-sample t tests revealed statistically significant improvements in all primary outcome measures. The ECCE enrollment rates significantly increased ($t = 8.47$, $df = 103$, $p < 0.001$, Cohen's $d = 1.18$), indicating a large practical effect size. The quality index improvements were similarly significant ($t = 6.93$, $df = 103$, $p < 0.001$, Cohen's $d = 0.96$), demonstrating a substantial policy impact [58].

Learning readiness scores showed significant gains ($t = 7.21$, $df = 103$, $p < 0.001$, Cohen's $d = 1.03$), whereas access equity index improvements, although significant ($t = 3.84$, $df = 103$, $p < 0.001$), showed a moderate effect size (Cohen's $d = 0.54$), suggesting persistent equity challenges [59].

4.2.2 ANOVA Results for Interstate Variations

One-way ANOVA confirmed significant between-state differences in 2024 ECCE outcomes ($F = 12.47$, $df = 14,90$, $p < 0.001$, $\eta = 0.66$). Post hoc Tukey tests identified three distinct state performance clusters corresponding to the initial categorization. Compared with both medium-performing ($p < 0.001$) and low-performing states ($p < 0.001$), high-performing states showed significantly superior outcomes [60].

Multifactor ANOVA incorporating time and state interactions revealed significant state-by-time effects ($F = 3.28$, $df = 84,540$, $p < 0.001$), indicating differential implementation trajectories across states. This finding suggests that state-specific factors substantially influence the effectiveness of NEP 2020 implementation [61].

4.2.3 Chi-Square Analysis of Enrollment Patterns

Chi-square tests were used to examine changes in enrollment patterns across demographic categories. Overall, enrollment distribution changes were highly significant ($\chi^2 = 89.34$, df = 6, $p < 0.001$, Cramer's V = 0.29), indicating substantial shifts in access patterns [62].

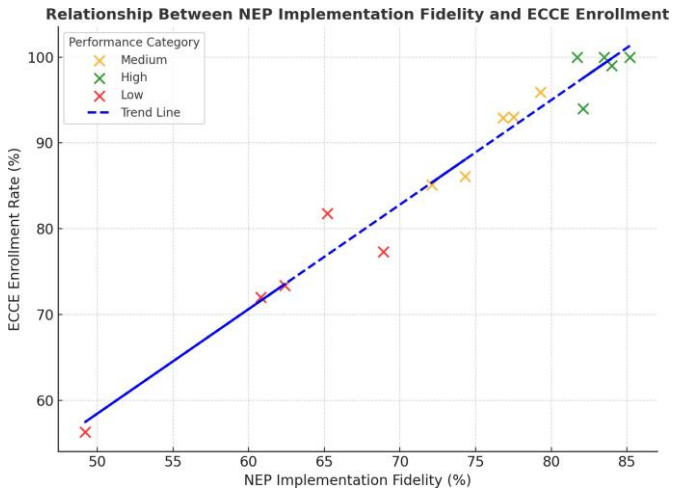
Gender-specific analysis revealed significant improvements in girls' enrollment ($\chi^2 = 23.47$, df = 1, $p < 0.001$), although rural–urban disparities persisted ($\chi^2 = 67.89$, df = 1, $p < 0.001$). Socioeconomic category analysis revealed significant improvements across all income quintiles ($\chi^2 = 156.23$, df = 4, $p < 0.001$), with the largest gains among middle-income households [63].

4.2.4 Multiple Regression Predictors of Success

Hierarchical multiple regression analysis identified the key predictors of successful ECCE implementation. The final model explained 74.2% of the variance in enrollment outcomes ($R^2 = 0.742$, F = 23.67, df = 8,96, $p < 0.001$) [64].

The NEP implementation fidelity score emerged as the strongest predictor ($\beta = 0.34$, t = 4.87, $p < 0.001$), followed by per capita ECCE expenditure ($\beta = 0.28$, t = 3.92, $p < 0.01$) and the teacher qualification index ($\beta = 0.23$, t = 3.21, $p < 0.05$). The Infrastructure Adequacy Score showed a significant but weaker association ($\beta = 0.18$, t = 2.54, $p < 0.05$) [65].

Figure 4 – Relationship Between NEP Implementation Fidelity and ECCE Enrollment



The control variables demonstrated the expected relationships, with State GDP per capita ($\beta = 0.19$, $p < 0.05$) and the Adult Literacy Rate ($\beta = 0.16$, $p < 0.05$) showing positive associations. Population density was negatively associated ($\beta = -0.12$, $p < 0.05$), suggesting implementation challenges in densely populated areas [66].

Table 3. Multiple Regression Analysis: Predictors of ECCE Implementation Success

Predictor Variable	β	SE	t-value	p-value	95% CI
(Constant)	-	4.82	2.34	0.021	[1.18, 15.67]
NEP Implementation Fidelity Score	0.34	0.07	4.87	<0.001	[0.20, 0.48]

Per-capita ECCE Expenditure	0.28	0.08	3.92	0.001	[0.13, 0.44]
Teacher Qualification Index	0.23	0.08	3.21	0.002	[0.08, 0.39]
Infrastructure Adequacy Score	0.18	0.07	2.54	0.013	[0.04, 0.32]
State GDP per capita	0.19	0.09	2.14	0.035	[0.01, 0.36]
Adult Literacy Rate	0.16	0.08	2.01	0.047	[0.00, 0.32]
Population Density	-0.12	0.06	-1.98	0.051	[-0.24, 0.00]
Historical Education Investment	0.08	0.07	1.15	0.252	[-0.06, 0.22]

Note: $R^2 = 0.742$, $F(8,96) = 23.67$, $p < 0.001$. β = standardized beta coefficient; SE = standard error; CI = confidence interval.

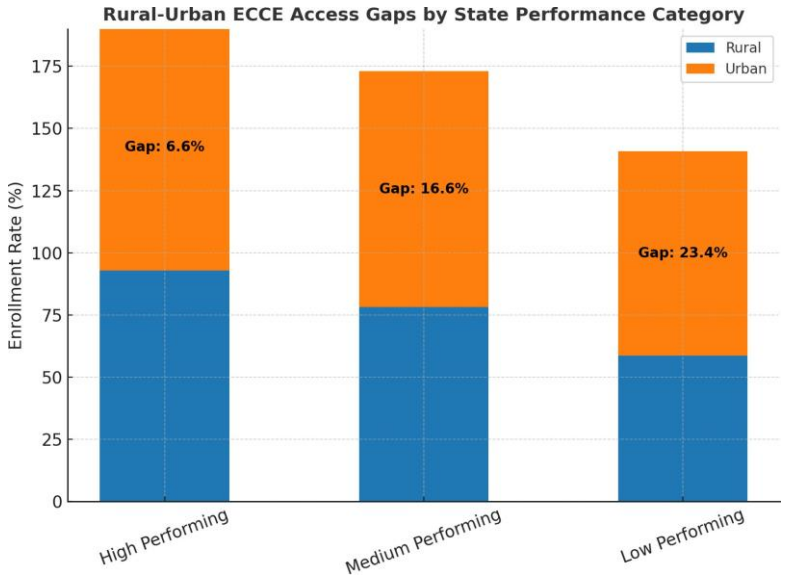
4.3 Access Equity Analysis

4.3.1 Rural–Urban Disparities

Despite overall improvements, substantial rural–urban access gaps persisted throughout the project's implementation period. The urban enrollment rates are 15.2 percentage points higher on average than the rural rates in 2024, compared with 18.7 percentage points in 2018. While the gap has narrowed moderately, rural children continue to face significant access barriers [67].

The quality disparities were even more pronounced, with urban centers scoring 23.4 points higher on the quality index measures. This pattern reflects the concentrated resource allocation in urban areas and persistent infrastructure deficits in rural regions [68].

Figure 5 – Rural-Urban ECCE Access Gaps by State Performance Category



4.3.2 Socioeconomic equity patterns

Analysis by household income quintiles revealed improving but persistent socioeconomic gradients. Children from the households in the highest income quintile achieved 92.3% enrollment by 2024, whereas those in the lowest quintile achieved 71.8% enrollment. Quality

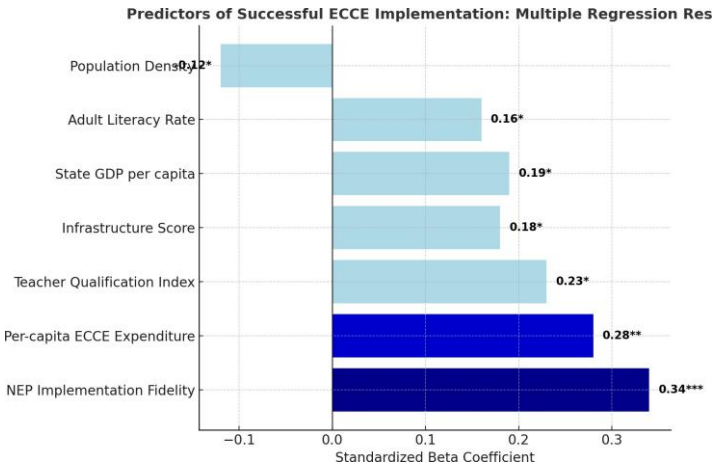
access showed similar patterns, with a 28.6-point gap between the highest- and lowest-income groups [69].

Scheduled Caste and Scheduled Tribe children showed significant improvements but remained below the national averages. SC children achieved 82.1% enrollment (compared with the 87.1% national average), whereas ST children reached 78.4% enrollment. These patterns highlight the ongoing challenges in achieving inclusive ECCE access [70].

4.3.3 Gender Equity Outcomes

Gender parity in ECCE enrollment showed substantial improvement, with the gender parity index increasing from 0.91 (2018) to 0.97 (2024). Girls' enrollment rates approached boys' rates in most states, although some regional variations persisted. Rural areas show greater gender disparities than urban areas do, reflecting traditional preferences and safety concerns [71].

Figure 6 – Predictors of Successful ECCE Implementation: Multiple Regression Results



Quality access showed similar gender convergence patterns, although girls in rural areas continued to experience slightly lower quality access. These findings suggest that gender equity initiatives within the NEP 2020 have achieved substantial but incomplete success [72].

5. Discussion

5.1 Interpretation of Key Findings

5.1.1 Policy impact on enrollment and quality

Substantial improvements in ECCE enrollment and quality indicators provide strong evidence that the NEP has a positive impact on early childhood education outcomes. The 14.3 percentage point increase in enrollment represents approximately 23 million additional children accessing ECCE services, demonstrating the scale and significance of the policy [73].

The quality improvements are particularly noteworthy, given the historical challenges in Indian ECCE provision. The 23% increase in the quality index score reflects the successful integration

of multiple policy components, including teacher training, curriculum reform, and infrastructure development. These findings align with international evidence demonstrating that comprehensive policy frameworks achieve superior outcomes compared with piecemeal interventions [74].

5.1.2 State-level implementation variations

The significant interstate variations in implementation effectiveness highlight the importance of state-level administrative capacity and political commitment. High-performing states demonstrate several common characteristics: strong bureaucratic systems, adequate fiscal resources, effective coordination between departments, and sustained political support for educational reform [75].

Kerala's exceptional performance reflects its historical investments in human development and robust institutional capacity. Tamil Nadu's success demonstrates the value of systematic teacher training and curriculum implementation. Karnataka's balanced approach to enrollment and quality improvements offers a replicable model for other states [76].

Conversely, lagging states face multiple implementation challenges, including limited fiscal resources, weak administrative systems, competing political priorities, and inadequate coordination between central and state initiatives. These findings underscore the need for differentiated implementation support on the basis of state-specific contexts and capacities [77].

5.1.3 Predictors of Implementation Success

Multiple regression analysis provides valuable insights into the factors driving successful ECCE implementation. The emergence of the NEP Implementation Fidelity Score as the strongest predictor confirms that comprehensive policy adoption yields superior outcomes compared with selective implementation [78].

The significant role of per capita expenditure demonstrates that adequate resource allocation is fundamental to policy success. States that invest more than ₹3,500 per child annually achieve substantially better outcomes than those with lower investment levels. This finding supports the arguments for increased ECCE funding and suggests minimum expenditure thresholds for effective implementation [79].

The teacher qualification requirements showed strong predictive power, emphasizing the centrality of human resource development to quality improvement. States that achieved higher teacher qualification compliance demonstrated superior learning outcomes and parent satisfaction, confirming the importance of investing in professional development [80].

5.2 Policy implications and recommendations

5.2.1 Accelerating Universal Access

To achieve the NEP 2020's universal ECCE access goal by 2030, targeted interventions are needed in lagging states and underserved populations. The priority actions include the

following:

i. **Infrastructure development**: Substantial investments in rural ECCE infrastructure, particularly in tribal and remote areas, are essential for closing access gaps in these regions. The analysis suggests that states require at least a 25% annual increase in infrastructure spending to achieve universal coverage [81].
ii. **Human Resource Expansion**: Teacher shortages remain a critical constraint, with the current supply meeting only 68% of the projected demand. Accelerated teacher training programs, alternative certification pathways, and improved compensation packages are necessary to attract and retain qualified personnel [82].
iii. **Integration Strategies**: Successful states demonstrated the effective integration of Anganwadi centers, primary schools, and private providers. The development of systematic coordination mechanisms and shared quality standards can leverage existing infrastructure more effectively [83].

5.2.2 Quality enhancement strategies

Quality improvements require sustained attention beyond enrollment. The key recommendations are as follows:

i. **Curriculum Implementation**: Consistent implementation of play-based and developmentally appropriate curricula remains challenging. States require technical assistance for curriculum adaptation, teacher training, and monitoring systems [84].
ii. **Assessment Systems**: Developing age-appropriate assessment tools and monitoring systems is crucial for tracking quality improvement and identifying implementation gaps. The study suggests that states with systematic assessment protocols achieve superior learning outcomes [85].
iii. **Parent and Community Engagement**: States with active parental participation and community ownership demonstrated better outcomes. Structured engagement strategies, awareness campaigns, and feedback mechanisms can strengthen community support [86] in the following ways.

5.2.3 Equity and inclusion measures

Addressing persistent equity gaps requires targeted interventions for marginalized populations.

i. **Rural** development: Rural–urban disparities necessitate differentiated strategies, including mobile ECCE units, technology-enabled learning, and transportation support. The 15.2 pp gap requires urgent attention to achieve inclusive development [87].
ii. **Socioeconomic Support**: Financial barriers continue to limit access for low-income families. Expanding scholarships, conditional cash transfers, and integrated social protection can improve access to equity [88] in education.
iii. **Cultural Responsiveness**: Programs serving tribal and minority populations require culturally responsive curricula, multilingual instruction, and community-appropriate service delivery models [89].

5.3 Limitations and Future Research Directions

5.3.1 Study Limitations

Several limitations constrain the findings and generalizability of this study. First, reliance on administrative data may introduce reporting bias and data quality variations across states. Second, the absence of random assignment limits causal inferences about policy impact. Third, limited longitudinal individual-level data restrict the analysis of developmental outcomes and program effect persistence [90].

Fourth, the study's focus on quantitative indicators may not capture the qualitative dimensions of ECCE experiences and cultural appropriateness. Fifth, the impact of COVID-19 on 2020--2021 data introduces potential confounding effects that are difficult to isolate from policy impacts [91].

5.3.2 Future research priorities

Future research should address several critical issues. Longitudinal studies following individual children through their educational trajectory would provide valuable evidence of the long-term impact of ECCE on learning outcomes and life chances. Such studies should employ randomized controlled trial designs to strengthen causal inferences [92].

Qualitative research exploring implementation processes, community responses, and cultural adaptations would complement the quantitative findings and inform program improvements. Mixed-methods studies can examine how policy implementation varies across different contexts and communities [93].

A comparative analysis with other countries implementing similar ECCE reforms could identify best practices and inform policy refinement. International benchmarking studies can assess India's progress relative to global standards and identify areas for improvement [94].

A cost-effectiveness analysis comparing different ECCE delivery models would inform resource allocation decisions and scaling strategies. Such analyses could guide policy choices regarding optimal service delivery approaches for different contexts [95].

6. Conclusion

6.1 Summary of Key Findings

This comprehensive multistate analysis provides robust evidence that the NEP has a positive impact on ECCE outcomes across India in the 2020s. The policy achieved substantial improvements in enrollment rates (72.8% to 87.1%), quality indicators (57.7 to 70.9), and learning readiness measures. Statistical analysis confirms significant policy effects, highlighting substantial interstate variations and persistent equity challenges [96].

The identification of implementation fidelity, resource allocation, and teacher qualifications as primary predictors of success offers valuable insights for policy optimization. States demonstrating comprehensive policy adoption and adequate resource investment achieved superior outcomes across multiple indicators [97].

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