

Comprehensive analysis of early childhood education quality and cognitive development: A study of rural preschool children in Meghalaya

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Abstract

Early childhood education (ECE) serves as the foundation for a child's holistic development in cognitive, social, emotional, language and academic growth. Understanding the quality of early childhood education programs and their direct influence on cognitive development is crucial for policymakers, educators, parents, and researchers alike. This study aims to provide a comprehensive analysis of the intricate relationship between the quality of early childhood education and cognitive development in young children. The study was conducted across seven districts in Meghalaya among 457 randomly selected rural children aged 3 to 6 years from 21 Integrated Child Development Services (ICDS) blocks. Pandey's Cognitive Development Test for Preschoolers (PCDTP) which included both verbal and non-verbal tests was administered individually. The findings indicate noticeable cognitive development differences exist right from the preschool stage. The mean cognitive test score for the entire sample was 46 out of a total score of 65. Rural children attending private preschools achieved a mean score of 37.87, while their counterparts in publicly funded non-formal preschools attained a mean score of 28.33, revealing significant disparities in cognitive development. These distinctions likely arise from various factors including differences in educational approaches, resource availability, home environments, parental involvement and overall quality. The study underscores the critical importance of addressing these disparities in early education to foster equitable development for all children.

Keywords: Cognitive abilities, Anganwadi center (AWCs), private preschool, public preschool education, ICDS

Introduction

Early childhood is widely recognized as a critical period for brain development. During these formative years, neural connections are established and cognitive abilities are shaped, influencing a child's capacity for learning throughout their life. Investigating the quality of early childhood education during this period is imperative to comprehend its lasting impact on cognitive development. Cognitive development encompasses diverse aspects including knowledge assimilation, reasoning cultivation, problem-solving skills, and information processing. This developmental journey commences in infancy extending through adulthood.

The preschool years witness essential cognitive milestones such as letter and numeral recognition, shape identification, and colour differentiation. A myriad of factors intricately impact a child's cognitive development. These factors include the home environment, including parental education, socioeconomic status, cultural context, occupational background, and health circumstances. Additionally, the preschool setting and the quality of early childhood education significantly contribute to this developmental trajectory.

Early exposure to effective programs establishes a strong foundation, enhancing social competence, promoting school adjustment, and facilitating crucial literacy and numeracy skills (World Bank, 2015) ^[21]. Several researchers have consistently underline the correlation between strong cognitive skills in early years and later academic excellence, particularly in high school (Bibi and Ali, 2012; Finn *et al.*, 2005; Taiwo and Tyolo, 2002; Weiss and Offenber, 2002) ^[2, 7, 18, 20]. Magnuson *et al.*, (2007) ^[11] also found that attending preschool emerges as a significant determinant of later academic achievements, with longitudinal research indicating higher academic skills among preschool attendees compared to their peers without such experiences. Further, Fram *et al.*, (2012) ^[8] observed that enrollment age significantly influences the benefits derived from center-based preschool programs, with a notable advantage observed when children join at younger ages, particularly in the enhancement of reading and math skills.

The National Policy on Education underscores the necessity and significance of early childhood education, advocating for its integration into child development initiatives, particularly within the Integrated Child Development Services (ICDS) program. The Integrated Child

Development Services (ICDS) stands as a flagship scheme in India, dedicated to the holistic development of preschool children through six essential components namely supplementary nutrition, immunization, health check-up, referral services, nutrition and health education, and non-formal pre-school education. The non-formal pre-school education within ICDS is a pivotal element of its comprehensive service package. Initiated in 1975, the programme has experienced rapid expansion, with Anganwadi Centres (AWCs) serving as the primary platform for service delivery which is established in every village across the country. Within these AWCs, preschool education is provided to children aged 3 to 6, equipping them with the necessary competencies for a smooth transition into formal education in primary grades, particularly benefiting vulnerable sections of the population. As early childhood education encompasses a diverse range of approaches, curricula, and teaching methods. This study seeks to explore how variations in educational approaches influence cognitive development outcomes. Recognizing the importance of investing in early childhood education, it becomes essential to evaluate the effectiveness of existing programs. By conducting a comprehensive analysis, this study can provide insights into the strengths and weaknesses of current ECE practices, informing policymakers on areas for improvement and optimal resource allocation. Against this backdrop, this study seeks to provide evidence-based insights into the cognitive development of preschool children in Meghalaya, exploring potential disparities in cognitive skills between those preschool children attending non-formal preschool at anganwadi centers and those enrolled in private nursery schools.

Materials and Methods

This cross-sectional study was carried out in seven districts of Meghalaya. A total of 210 Anganwadi centers (AWC) from 21 ICDS blocks district were included for the study. The sample consisted of 457 children in the age group of 3 to 6 years chosen randomly from all the selected AWC centers. Out of the 457 sample children, 251 children who attended only non-formal preschool education from AWCs were selected randomly and 206 who are ICDS beneficiary children but regularly attended private nursery school were purposively included to assess the differences in cognitive skills. Parents and Anganwadi workers collaboratively identified these children within each AWC. To collect data, a standardized cognitive development test for preschoolers developed by Pandey in 1992 was used. This tool comprises both verbal and nonverbal activities and includes six sub-tests: conceptual skills, information processing, comprehension, visual perception, memory, and object vocabulary assessment.

1. Conceptual skills measures concept of shape, colour, time, classification, number, seriation, weight, size, texture and coins.
2. Information measures ability to comprehend and capacity for associative thinking.
3. Comprehension measures the subjects ability to think, recall, associate and comprehend oral directions and actions of people in the environment and reasoning with abstraction
4. Visual perception requires ability to comprehend

5. Memory measures immediate auditory recall or immediate attention span.
6. Object vocabulary measure child’s richness of ideas, kind and quality of language and degree of abstract thinking.

The tests were administered individually in the local dialect, with the toolkit systematically organized to match the format presented in the booklet. Test results were concurrently recorded on scorecards. Raw scores obtained from individual assessments were then coded, tabulated, and subjected to analysis using statistical tools such as mean, standard deviation, chi-square, and t-test.

Results and Discussion

The mean age of the sample was 4.46 years. The mean score for cognitive abilities was 46 out of 65 total scores. The distribution of preschool children was based on their levels of cognitive abilities. Three distinct categories were used for classification: "High," "Average," and "Low."

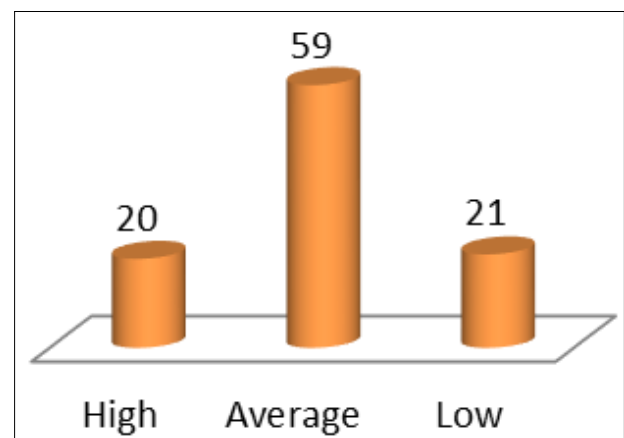


Fig 1: Percentage distribution of preschool children by level of cognitive skills

Among a total of 457 children, the majority (59%) exhibit cognitive abilities within the average range, with 20% demonstrating high cognitive abilities and 21% falling into the category of low cognitive abilities as shown in figure.1. This highlights the importance of recognizing individual differences and tailoring educational interventions accordingly.

Table 1: Mean scores of sample children according to gender wise on cognitive sub test

Sub test	Male (N=194)	Female (N=263)	Overall mean
Conceptual skills	14.42 +6.69	14.24 +6.28	14.32+6.45
Information	3.52 +2.05	3.58 +1.84	3.56 +1.93
Comprehension	3.71 +1.49	3.47 +1.51	3.57 +1.51
Visual perception	4.55 +2.45	4.44 +2.42	4.49 +2.43
Memory	2.79 +2.43	2.78 +2.47	2.78 +2.45
Object vocabulary	4.05 +1.54	4.06 +1.54	4.06 +1.47

Table (1) examined gender differences in cognitive subtest scores. It's noteworthy that while there are certain areas where boy exhibit higher mean scores, such as conceptual skills (14.42), comprehension (3.71) visual perception (4.55) and memory (2.79), girls perform better in

information and object vocabulary dimensions however there is no significance difference between boys and girls in cognitive abilities. These variations in cognitive strengths among genders underline the multifaceted nature of cognitive development. Finding of this study agrees with previous findings [Maldonado, 2008 ^[12], Mohanty and Mishra, 1994 ^[13]] where they found no significant difference in cognitive abilities between boys and girls.

Table 2: Mean and standard deviation scored in cognitive sub test according to age wise

Sub test	3 years (N=110)	4 years (N=160)	5years (N=152)	6 years (N=35)	χ^2
Conceptual skills	7.68 +4.09	13.35 +4.48	18.64 +5.21	20.78+ 4.11	235.07*
Information	2.05 +1.50	3.35+1.66	4.5 +1.78	5.14 +1.30	
Comprehension	2.9 +1.31	3.24 +1.31	4.25 +1.55	4.25 +1.29	
Visual perception	2.24 +2.18	4.42 +2.22	5.77 +1.72	6.28 +0.85	
Memory	0.87 +1.49	2.47 +1.97	4.05 +2.44	4.71 +2.29	
Object vocabulary	2.91 +1.41	3.88 +1.43	4.83 +1.06	5.02 +0.84	

**Significant at 0.01

Table (2) depicts the mean and standard deviation scored of cognitive development subtest of sample children according to age wise. The findings related to age-based differences in cognitive development demonstrate that children of 6 years exhibit relatively higher cognitive scores compared to their younger counterparts. This aligns with developmental psychology theories that suggest cognitive abilities tend to advance with age. This can be substantiated with various studies that have shown that cognitive abilities increase with advances in age [Dhingra and Sharma, 2012 ^[5], Jaswal *et al* 1988 ^[9], Sharma, 2004 ^[16]]. Such insights can guide educators and caregivers in tailoring educational strategies that are developmentally appropriate for specific age groups.

Table 3: Cognitive Level distribution of children attending private preschool and Anganwadi Centers

Cognitive level	Private preschool (N=206)	ICDS Anganwadi (N=251)	χ^2
High	69 (33.49)	24 (10.25)	49.34**
Average	114 (55.33)	155 (66.23)	
Low	23 (11.16)	72 (30.76)	

Significant at 0.01

Children are reflections of their environment, and the influence of environmental factors on a child's development can either be positive or negative. Studies have demonstrated that the link between school quality and cognitive development becomes apparent within the first two years of preschool Borghans, *et al* 2015 ^[3]. This is evident from the data presented in table (4), which clearly demonstrates that private preschool children outperform their ICDS counterparts in all assessed cognitive domains. The difference was found statistically significant. The significant differences in cognitive abilities observed between children attending private preschools and those in public preschools (ICDS) underscore the need to explore the factors contributing to these disparities. The higher

cognitive skills exhibited by private preschool children, even though both groups predominantly fall into the "Average" category, point to potential differences in the quality of education, resources, and teaching methods between these settings. These findings highlight the urgency of addressing disparities in access to quality education, particularly in public preschools.

Table 4: Mean and standard scored of cognitive dimension of children according to private preschool and public preschool (ICDS)

Sub test	Public (N=251)	Rural Private (N=206)	Overall mean	t- value
Conceptual skills	12.87+6.24	16.41+6.17	14.32+6.45	5.41**
Information	3.10 +1.78	4.19+1.99	3.56+1.93	6.17**
Comprehension	3.15+1.41	4.07+1.45	3.57+1.51	7.11**
Visual perception	3.95+2.48	5.25+2.14	4.49+2.43	5.48**
Memory	2.15+2.11	3.73 +2.60	2.78+2.45	6.94**
Object vocabulary	3.86 +1.50	4.37+1.47	4.05+1.49	3.15**

Significant $p \leq 0.01$

The table (4) reveals substantial differences in cognitive dimensions between children attending private preschools and those in public preschools (ICDS). Children in private preschools generally outperformed their counterparts in various cognitive domains, including conceptual skills, information, comprehension, visual perception, memory, and object vocabulary. The significant t-values further emphasize the meaningful distinctions observed in these cognitive abilities between the two groups. These findings align with earlier research [Claessens, 2012 ^[4], Sagi *et al*, 2002 ^[14], Santos *et al* 2013 ^[15], Sylva *et al* 2011^[17]] that has reported relatively lower cognitive performance among children aged two to six years who attend public daycare centers when compared to those attending private daycare centers. This contrast might be attributed to variations in the functioning and oversight of these institutions. Private nursery schools typically provide a more structured learning environment, regular attendance, predefined working days and holidays, consistent classes, better infrastructure and enhanced guidance to ensure the attainment of age-specific educational objectives. Additionally, private schools often maintain close monitoring by their school heads or principals, contributing to academic excellence. In contrast, non-formal preschool education of ICDS Anganwadi Centers found considerable flexibility in timings across centers, a lack of uniformity, and reported irregularities in preschool education implementation. The timing irregularities, coupled with delayed supply of supplementary foods, often disrupted the preschool component. Many AWCs only opened when supplementary foods were in stock, contrary to the intended daily schedule of 2-3 hours. This situation is further exacerbated by inadequate infrastructural development and untimely supply of provisions.

Conclusion

In conclusion, the research findings underscore the intricate interplay of factors influencing cognitive development among preschool children. The observed disparities in cognitive abilities between private and public preschools underline the pressing need to address issues within public

settings. Focusing on enhancing the quality of education, allocating adequate resources, and refining teaching methods in public preschools is crucial for narrowing the cognitive gaps evident in the study. Early intervention programs should be implemented to specifically target and support children with lower cognitive abilities during their formative preschool years. Furthermore, investing in teacher training and providing essential resources is essential, particularly in public preschools, to empower educators in addressing the diverse cognitive needs of their students effectively. Lastly, advocating for and conducting further research on environmental factors influencing cognitive development can contribute to the creation of more equitable learning environments for all preschool children. By implementing these recommendations, education systems can strive towards ensuring equal opportunities for every child in their crucial early years

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