Electronic Journal of General Medicine
2025, 22(3), em643
e-ISSN: 2516-3507
https://www.ejgm.co.uk/

MODESTUM

Original Article

OPEN ACCESS

The impact of health-caregivers emotional nurturance on cognitive development in preschoolers: A nationwide public health cross-sectional study

Prakash Sharma [1], Ioannis Pantelis Adamopoulos [2,3*], Niki Fotios Syrou [4], Chitra Bahadur Budhathoki [1], Pramila Pudasaini Thapa [5]

[1] Butwal Multiple Campus, Faculty of Education, Tribhuvan University, Butwal, NEPAL
[2] Department of Public Health Policy, Sector of Occupational & Environmental Health, School of Public Health, University of West Attica, Athens, GREECE
[3] Hellenic Republic Region of Attica, Department of Environmental Hygiene and Public Health Inspections, Athens, GREECE
[4] Department of Physical Education and Sport Science, University of Thessaly, Karies, Trikala, GREECE
[5] Life Skills Education Institute, Kathmandu, NEPAL
***Corresponding Author:** adamopoul@gmail.com

Citation: Sharma P, Adamopoulos IP, Syrou NF, Budhathoki CB, Thapa PP. The impact of health-caregivers emotional nurturance on cognitive development in preschoolers: A nationwide public health cross-sectional study. Electron J Gen Med. 2025;22(3):em643. https://doi.org/10.29333/ejgm/16184

ARTICLE INFO

Received: 07 Dec. 2024

Accepted: 01 Mar. 2025

ABSTRACT

The study examines the relationship between emotional nurturance and cognitive development in preschool-aged children in Western Tarai, Nepal. The research involved 391 preschoolers from diverse socio-economic backgrounds, analyzing factors such as health-caregiver education, occupation, caste/ethnicity, and family structure. Results showed that age and certain socio-economic factors significantly influenced cognitive outcomes. Children aged 36-48 months had higher cognitive scores, and children from joint families scored higher than those from nuclear families. Children from disadvantaged caste backgrounds showed lower cognitive outcomes compared to those from advantaged castes. Emotional nurturance was positive but not significantly associated with cognitive development after adjustments. Socio-economic disparities, particularly caste and family structure, significantly influence cognitive outcomes among young children. Policies targeting socio-economic inequities are needed to promote equitable cognitive development, preventive public health, especially in pre-school children. Supportive interventions focusing on joint family systems and educational opportunities for mothers may further enhance cognitive outcomes in rural settings.

Keywords: public health, socio-economic factors, preschool children, emotional nurturance, health-caregivers, cognitive development

INTRODUCTION

The literature surrounding the impact of caregivers' emotional nurturance on cognitive development in Nepali preschoolers reveals a complex interplay of healthcare-giving practices, socio-demographic factors, and developmental outcomes [1, 2]. A foundational piece emphasizes the necessity of investing in nurturing care frameworks, which include responsive healthcare giving and early learning activities [3, 4]. The researchers argue that the implementation of the health-care for child development [5] and caring for the health-caregiver packages can significantly enhance caregivers' ability to provide supportive environments for children [6, 7]. The research findings highlight that children raised in nurturing environments exhibit higher intelligence quotient (IQ) scores and improved long-term outcomes [8, 9], including increased earnings in adulthood, thus underlining the critical role of health-caregiver support in early childhood development (ECD) [9]. An essential goal of caregiving is to educate the public on the importance of emotional nurturing when caring for preschool-aged children [10]. Several studies underscore the need for holistic approaches to child development, by empowering health care practitioners to assist caregivers in developing emotionally supportive home environments, we may see a tremendous, far-reaching impact on public health's overall well-being [11]. Home play a crucial role in shaping a child's emotional, social, and intellectual development [11, 12], that prioritize education for caregivers in resource-constrained settings [13-15]. By addressing these challenges, advocating for targeted interventions that can elevate the quality of healthcare-giving practices [16], thereby fostering better developmental outcomes for children in their formative years [17]. Further building on the socio-demographic dimensions of cognitive development [18], explore the associations between various socio-economic factors and cognitive outcomes among preschoolers in Nepal [19]. Findings reveal that family structure, particularly the advantages of nuclear families, alongside religious affiliations like Buddhism, positively correlates with cognitive development [20]. In contrast, children from disadvantaged caste backgrounds and those with working mothers face

notable cognitive developmental challenges [21]. This suggests that socio-economic and cultural contexts significantly shape the caregiving environment, influencing the cognitive growth of preschoolers [22]. Early childhood is a critical period in human development when foundational cognitive, emotional, and social capacities are established, responsive caregiving is a crucial aspect of ECD, promoting health, nutrition, and security to prevent long-term educational and health issues [23]. Cognitive development during preschool years influences later academic achievement, social behaviors, and mental well-being [24]. Infants' emotional reactivity and self-regulation are heavily influenced by their continuing social interactions, particularly with their caregivers [25], nurturing actions from caregivers can have a major impact on early children's ability to recognize emotions, empathize, understand theory of mind, engage in social conduct, and form supportive peers [26]. Cognitive development differences in preschoolers based on caregiver support, focusing on less measurable but deeply-connected areas like emotional intelligence and curiosity, and the emotional environment within which a child is raised [27]. When caregivers demonstrate responsiveness, warmth, and consistent support, they foster an environment that stimulates neurodevelopmental growth and enables children to explore, learn, and form secure relationships [28]. This secure attachment is critical for healthy brain development, as it supports the regulation of stress and the processing of emotions, factors that are integral to cognitive growth [29]. The concept of responsive caregiving is increasingly recognized as a central component of ECD frameworks worldwide. Researchers argue that responsive healthcare giving, which includes recognizing and responding to children's cues, has profound implications on early brain development, particularly in low- and middle-income countries where children face additional socio-economic challenges [30].

We aim to assess the association between caregivers' emotional nurturing practices and socio-economic factors on cognitive development in Nepali preschoolers. This study, thus, hypothesizes that consistent, emotionally nurturing interactions contribute positively to cognitive development outcomes. This research aims to provide a comprehensive view of the multifaceted influences on cognitive development in Nepali preschoolers, illustrating how emotional nurturance from health-careers, alongside socio-demographic factors, plays a pivotal role in shaping early childhood outcomes. Expanding the scope of this research, conducted a community-based survey that identified several sub-optimal healthcare-giving practices prevalent in lowland Nepal like inadequate dietary diversity and delayed introduction of complementary foods. Also, it presents compelling evidence regarding the long-term economic benefits associated with nurturing care.

MATERIALS AND METHODS

Study Design and Setting

This study employed a cross-sectional design to examine the relationship between health-caregivers' emotional nurturing and cognitive development in preschool children. Conducted between February 14 and April 12, 2021, in the Rupandehi District of Nepal, the research encompassed three local government units representing urban, semi-urban, and rural settings [31]. The Rupandehi District has a population of 1,118,975. It is characterized by a high fertility rate and a large population of young children, making it an ideal setting for exploring ECD patterns [32].

Study Population and Sampling Procedure

The study focused on a target population of 14,358 children aged 36-71 months enrolled in 369 government-funded ECD centers during the 2020 academic year [32]. A multi-stage random sampling technique was used to ensure a representative sample. In stage one, three local government units were randomly selected from different status within the districts–sub-metropolitan city, a municipality, and a rural municipality–ensuring diversity across urban, semi-urban, and rural contexts. In stage two, ECD centers were randomly chosen from each selected unit based on lists provided by local education departments. All children present on the day of the cognitive assessment, along with their primary caregivers, were included. To maintain balanced representation, additional centers were selected as needed within each local type, achieving a comprehensive sample reflective of the district's demographic variety. The sample size was calculated using Eq. (1), as follows:

$$n = \frac{N}{1+Ne^2}, \quad (1)$$

where *n* is the sample population, *N* is the total population, and e is 5% allowable error. Adding a 3% non-respond rate, this calculation yielded an estimated sample of N = 401 children.

Data Collection Tools

Data were collected using a self-administered questionnaire with two sections. Section A included questions evaluating caregivers' emotional nurturing practices based on key behaviors, such as whether the caregiver spends time teaching the child daily, encourages hobbies, provides age-appropriate toys, and maintains close contact (e.g., "do you hug and kiss your child at least twice every day?" yes/no). Responses were scored, as follows: 0 marks for a negative answer or rare positive practices, and 1 mark for a positive answer for each item. Additionally.

Section A incorporated socio-economic variables, including the child's gender and age, family structure, caste/ethnicity, mother's educational background and employment status, and the family's economic standing, as these factors are considered potential influencers of cognitive and emotional development outcomes. Economic status was evaluated using a tool from the 2016 Nepal demographic and health survey [32, 33], which assessed household assets and housing conditions. Wealth scores were categorized into quartiles–poorest, poor, rich, and richest–according to defined score ranges.

Section B assessed cognitive development using a standardized tool developed in [33] at the National Psychological Corporation of India, based on Piaget's developmental psychology theory. This tool, specifically designed for the pre-operational stage of 3-, 4-, and 5-year-old children, transferred achieved scores into age-specific standard scores and included tasks related to symbolic play and simple problem-solving. A pilot study test was conducted with 10% of the sample to ensure the questionnaire's clarity, relevance, and contextual appropriateness. Minor modifications were made based on feedback to enhance contextual accuracy. The cognitive development tool's

reliability was confirmed with a Cronbach's alpha of 0.90, while the emotional nurturing tool demonstrated an alpha of 0.80.

Data Analysis Process

Data were entered into Microsoft Excel and analyzed data and tables with results using IBM SPSS v. 20 & excluded figures and diagrams using IBM SPSS v. 26. Descriptive statistics, including means and standard deviations for continuous variables and frequencies for categorical variables, were calculated. An independent sample t-test and ANOVA were conducted for group comparisons, with a p-value of < 0.05 considered statistically significant. The Kolmogorov-Smirnov test assessed normality, and data were screened for outliers, resulting in a final dataset of 391 cases. Multiple linear regression analysis was conducted to identify significant factors influencing cognitive development and control for potential confounders.

Ethical Considerations

The study received ethical approval from the Nepal Health Research Council (approval number NHRC: No. 2078-56/2021). Participation was voluntary, and caregivers provided informed consent prior to data collection. Confidentiality was assured for all participants, with the option to withdraw at any stage.

RESULTS

The sample of 391 preschool-aged children displayed a balanced gender distribution, with 50.6% boys and 49.4% girls. The children's ages were grouped into three cohorts: 36-48 months, 49-59 months, and 60-71 months, representing a range that reflects early childhood developmental stages. A notable diversity in caste and ethnicity was evident, with 35.0% from advantaged castes, 28.1% Janajati, 23.8% non-Dalit Terai castes, and 13.0% Dalit. The family structure was almost evenly split, with 47.3% of children from nuclear families and 52.7% from joint families. Examining maternal occupations revealed that nearly half (47.3%) of the caregivers were engaged in labor or household work. In comparison, smaller proportions worked in agriculture (24.0%), business (15.1%), or held jobs (13.6%) in government, private, or self-employment sectors. Educationally, caregivers predominantly had basic education (45.3%), with 23.3% being illiterate and 31.5% having secondary education or higher. Economic status was evenly distributed, with each quartile (poorest, poor, rich, and richest) comprising about one-fourth of the sample, underscoring a representative socio-economic cross-section shown in **Table 1**.

Table 1. Demographic profile of preschoolers (n = 391)

Demographic profile	Frequency (n)	Percentage (%)
Gender of children		
Male	198	50.6
Female	193	49.4
Age of children		
36-48 months		
49-59 months		
60-71 months		
Castes/ethnicities		
Dalit	51	13.0
Janajati	110	28.1
Non-Dalit Terai Castes	93	23.8
Advantages castes	137	35.0
Types of families		
Nuclear	185	47.3
Joint	206	52.7
Caregiver's occupation (mother)		
Jobs*	53	13.6
Businesses	59	15.1
Agriculture	94	24.0
Other occupation*	185	47.3
Caregiver's education (mother)		
Illiterate	91	23.3
Basic level	177	45.3
Secondary and above	123	31.5
Economic status		
Poorest	98	25.1
Poor	98	25.1
Rich	98	25.1
Richest	97	24.8

Note. Jobs: Work involves a regular, fixed monthly salary & Other occupation: Labors and household work

Associated with the demographic data, **Figure 1** shows the warnings of the variable month-wise age of child one instance of variable be created.

Especially the demographic variable selected in **Figure 2** to show the correlations of the G. graph generalized linear mixed models of the main created record of mother's education.

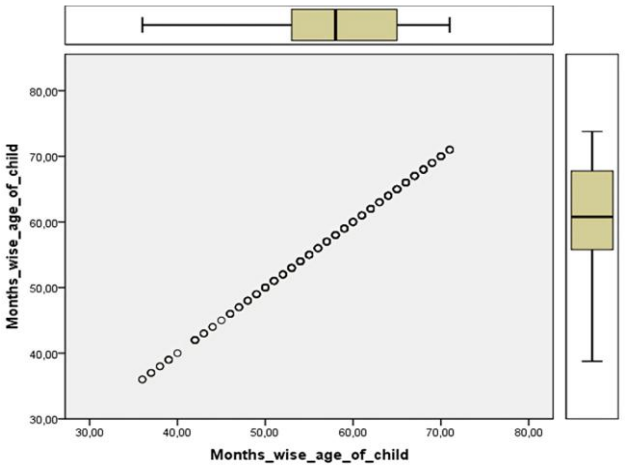

Figure 1. Warnings of the variable months wise age of child one instance of variable be created (Source: Authors' own elaboration, using IBM SPSS 26v. software)

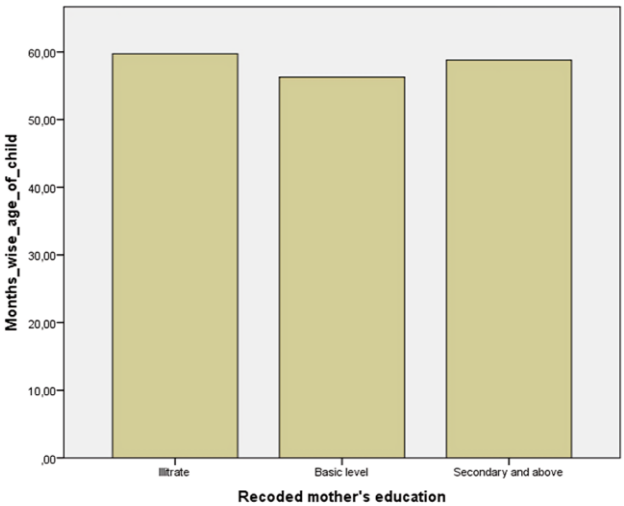

Figure 2. G. graph generalized linear mixed models of variables be created (Source: Authors' own elaboration, using IBM SPSS 26v. software)

Table 2. Association between emotional nurturance score and socio-economic factors(n = 391)

Socio-economic characteristics	Unadjusted β (95%CI)	p-value	Adjusted β (95%CI)	p-value
Sex of children				
Male	-0.138 (-0.068, -0.408)	0.006	-0.132 (-0.056, -0.400)	0.010
Female	Reference	-	Reference	-
Age of children				
36-48 months	0.008 (0.687, -0.584)	0.874	0.020 (0.769, -0.526)	0.713
49-59 months	-0.036 (0.242, -0.117)	0.496	0.048 (0.264, -0.097)	0.364
60-71 months	Reference		Reference	
Family structure				
Joint	0.174 (0.585, -0.100)	0.165	0.085 (0.643, -0.067)	0.111
Nuclear	Reference	-	Reference	-
Caste/ethnicity				
Dalit	-0.060 (0.236, -0.844)	0.269	-0.054 (0.294, -0.843)	0.343
Janajati	-0.064 (0.086, -0.334)	0.247	-0.054 (0.118, -0.330)	0.353
Non-Dalit Tarai caste	0.010 (0.182, -0.150)	0.851	0.000 (0.185, -0.185)	0.994
Advantageous caste	Reference	-	Reference	-
Mothers' education				
Uneducated	0.018 (0.545, -0.394)	0.753	0.044 (0.732, -0.371)	0.-520
Basic level	0.048 (0.281, -0.117)	0.417	0.064 (0.339, -0.117)	0.339
Secondary level and above	Reference	-	Reference	-
Mothers' occupation				
Employment	0.132 (1.189, 0.139)	0.013	0.128 (1.176, -0.110)	0.018
Business	0.052 (0.378, -0.126)	0.327	0.038 (0.348, -0.167)	0.491
Agriculture	0.088 (0.156, -0.015)	0.105	0.080 (0.167, -0.038)	0.216
Other	Reference	-	Reference	-
Economic status				
Poorest	0.052 (0.692, -0.277)	0.400	0.014 (0.636, -0.525)	0.850
Poorer	-0.040 (0.162, -0.322)	0.516	-0.052 (0.154, -0.361)	0.429
Rich	0.083 (0.271, -0.051)	0.181	0.071 (0.257, -0.069)	0.260
Richest	Reference	-	Reference	-

The analysis in **Table 2** examined the association between emotional nurturance scores and various socio-economic factors among preschoolers.

Healthy Eating Encouragement Adjusted for Socio-Economic Factors

Male children had a significantly lower emotional nurturance score compared to females, both in unadjusted (p = 0.006) and adjusted models (p = 0.010). Mothers' occupations revealed that those employed with a regular, fixed monthly salary contributed positively to emotional nurturance scores in both unadjusted (p = 0.013) and adjusted models (p = 0.018), indicating that employment might provide unique benefits for nurturing. The data suggested gender and maternal employment as the primary socio-economic factors associated with emotional nurturance among the children in this study. Additionally, **Figure 3** shows the valuable analysis of Predictors importance of variables targeted on cognitive development.

In **Table 3**, The emotional nurturance index showed a minimal association with cognitive development, with an unadjusted β of 0.029 (95% confidence interval [CI]: 1.149, -0.632; p = 0.568) and an adjusted β of 0.023 (95% CI: 1.08, -0.66; p = 0.637) in model-II. This suggests that the emotional nurturance index, while positively related to cognitive development, did not reach statistical significance. Age had a significant impact on cognitive development, particularly for children aged 36-48 months compared to those aged 60-71 months (reference group). In the unadjusted model, children aged 36-48 months showed a strong positive association (β = 0.150, 95% CI: 2.57, 13.81; p = 0.004), which remained significant in both adjusted models (model-II: β = 0.159, 95% CI: 14.26, 3.13; p = 0.002). This suggests that younger children within this range have comparatively higher cognitive development scores, possibly due to accelerated developmental stages at younger ages.

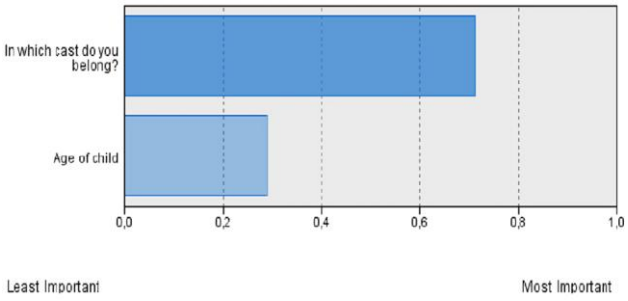

Figure 3. Predictors' importance of variables target cognitive development of importance (Source: Authors' own elaboration, using IBM SPSS 26v. software)

Table 3 presents the associations between emotional nurturance, socio-economic factors, and cognitive development scores among the 391 children in the sample. Both unadjusted and adjusted regression models (model-I adjusting for socio-economic factors alone and model-II. Adjusting for both socio-economic factors and emotional nurturance index) were used to analyze the predictors of cognitive development.

Children from nuclear families exhibited lower cognitive development scores compared to those from joint families, with a statistically significant association in both the unadjusted (β = -0.123, 95% CI: -0.36, -3.41; p = 0.015) and adjusted models (model-II: β = -0.122, 95% CI: -0.32, -3.44; p = 0.018). This finding suggests that joint family structures may provide additional social support and interactions beneficial to cognitive development. Caste and ethnicity showed significant

Table 3. Association among emotional nurturance index, socio-economic factors and cognitive development

Characteristics	Unadjusted β (95% CI)	p-value	Adjusted β (95% CI) Model-I	p-value	Adjusted β (95% CI) Model-II	p-value
Emotional nurturance index	0.029 (1.149, -0.632)	0.568	-	-	0.023 (1.08, -0.66)	0.637
Socio-economic factors						
Sex of children						
Male	-0.016 (1.773, -1.292)	0.758	-0.009 (1.61, -1.34)	0.858	.012 (1.67, -1.31)	0.810
Female	Reference	-	Reference	-	Reference	-
Age of children						
36-48 months	0.150 (2.57, 13.81)	0.004	0.160 (14.28, 3.16)	0.002	0.159 (14.26, 3.13)	0.002
49-59 months	0.039 (-0.98, 2.19)	0.453	0.039 (2.14, -0.95)	0.449	0. 038 (2.13, -0.97)	0.463
60-71 months	Reference		Reference		Reference	
Family structure						
Nuclear	-0.123 (-0.36, -3.41)	0.015	-0.124 (-0.36, -3.46)	0.016	-0.122 (-0.32, -3.44)	0.018
Joint	Reference	-	Reference	-	Reference	-
Caste/ethnicity						
Dalit	-0.146 (-11.38, -1.98)	0.005	-0.139 (-1.46, -11.22)	0.011	-0.138 (-1.39, -11.18)	0.012
Janajati	-0.217 (-5.61, -1.95)	< 0.001	-0.215 (-1.82, -5.66)	0.000	-0.214 (-1.79, -5.64)	0.000
Non-Dalit Tarai caste	-0.189 (-4.08, -1.18)	< 0.001	-0.140 (-0.35, -3.54)	0.017	-0.140 (-0.35, -3.54)	0.017
Advantageous caste	Reference	-	Reference	-	Reference	-
Mothers' education						
Uneducated	-0.167 (-10.20, -1.93)	0.004	-0.066 (2.34, -7.12)	0.321	-0.067 (2.31, -7.16)	0.314
Basic level	-0.174 (-4.44, -0.93)	0.003	-0.073 (0.82, -3.09)	0.257	-0.075 (0.80, -3.11)	0.248
Secondary level and above	Reference	-	Reference	-	Reference	-
Mothers' occupation						
Employment	-0.112 (-9.71, -0.35)	0.035	-0.144 (-1.90, -11.06)	0.006	-0.147 (-2.00, -11.23)	0.005
Business	0.015 (-1.92, 2.57)	0.776	-0.024 (1.70, -2.72)	0.649	-0.025 (1.68, -2.74)	0.637
Agriculture	-0.118 (-1.61, -0.08)	0.029	-0.050 (0.521, -1.24)	0.442	-0.052 (0.51, -1.25)	0.406
Other	Reference	-	Reference	-	Reference	-
Economic status						
Poorest	-0.103 (-7.94, 0.66)	0.097	-0.054 (3.05, -6.91)	0.448	-0.055 (3.05, -6.92)	0.446
Poorer	-0.106 (-4.02, 0.27)	0.087	-0.024 (1.78, -2.63)	0.705	0.023 (1.80, -2.61)	0.720
Rich	0.044 (-0.91, 1.95)	0.475	0.073 (2.26, -0.53)	0.224	0.072 (2.25, -0.55)	0.235
Richest	Reference	-	Reference	-	Reference	-

associations with cognitive development. Dalit children had lower cognitive scores compared to children from advantaged castes, with an unadjusted β of -0.146 (95% CI: -11.38, -1.98; p = 0.005), which remained significant in model-II (β = -0.138, 95% CI: -1.39, -11.18; p = 0.012).

Figure 4 shows the plot diagram of the estimated means of the charts at the significant effects (0 < .05).

Also similarly, Janajati children and non-Dalit Tarai caste children had lower cognitive scores, which remained significant across all models. These results indicate that socio-economic disparities linked to caste/ethnicity may impact early cognitive development. The mother's education level was associated with cognitive development, but the association weakened after adjusting for other variables. In the unadjusted model, children of uneducated mothers had lower cognitive scores (β = -0.167, 95% CI: -10.20, -1.93; p = 0.004), although this association lost statistical significance in the adjusted models. This suggests that while maternal education is relevant, other factors may mediate its impact on cognitive development. **Figure 5** shows the histogram of the standardized contributions of studies.

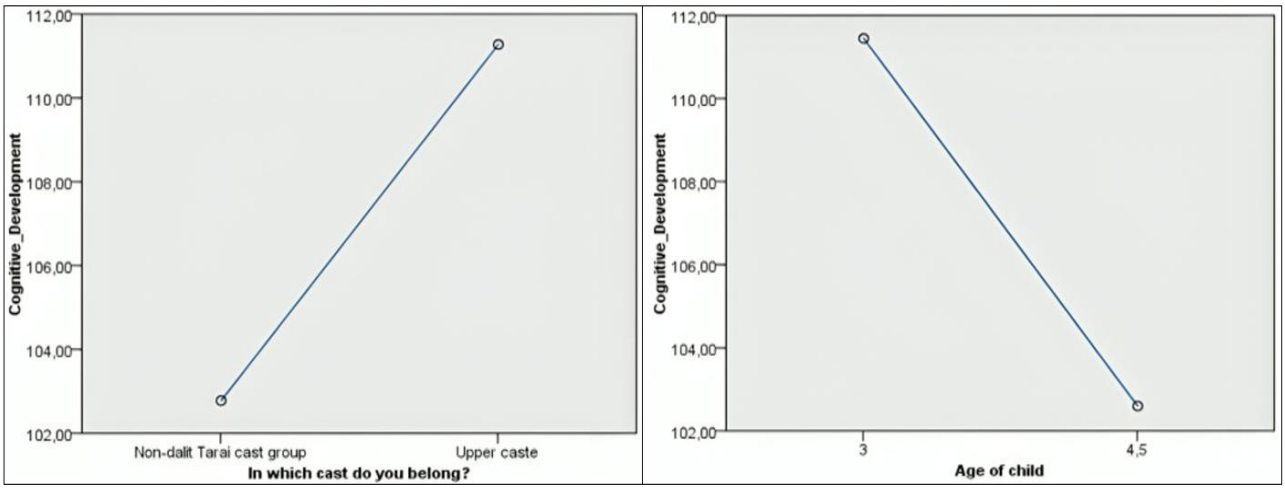

Figure 4. Estimated means of the charts at the significant effects (0 < .05) (Source: Authors' own elaboration, using IBM SPSS 26v. software)

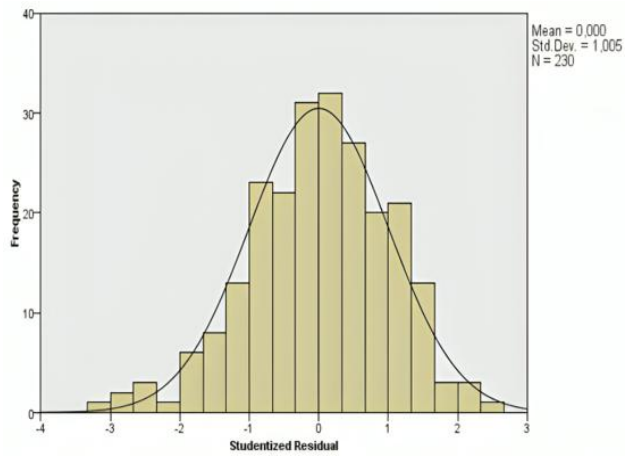

Figure 5. The histogram of standardized residuals of the distributions compares the research (Source: Authors' own elaboration, using IBM SPSS 26v. software)

The mother's employment status was significantly associated with lower cognitive scores. Employed mothers had children with lower cognitive scores in both the unadjusted model (β = -0.112, 95% CI: -9.71, -0.35; p = 0.035) and adjusted Model II (β = -0.147, 95% CI: -2.00, -11.23; p = 0.005). This may reflect the reduced time spent by employed mothers with their children, affecting cognitive nurturing. Economic status showed a non-significant association with cognitive development in most categories after adjustment. However, children from the poorest households had marginally lower cognitive scores, although this was not statistically significant in the adjusted models (model-II: β = -0.055, 95% CI: 3.05, -6.92; p = 0.446). This suggests that while economic conditions play a role, other socio-demographic factors have a more consistent association with cognitive outcomes.

DISCUSSION

This study explored the relationship between emotional nurturance, socio-economic factors, and cognitive development among preschool-aged children in a southern Nepalese population. While emotional nurturance alone did not show a direct, significant association with cognitive outcomes, specific socio-economic factors, particularly age, family structure, caste/ethnicity, maternal education, and employment, had notable impacts on cognitive development scores. Emphasize that effective ECD transcends mere biomedical interventions [23], advocating for a holistic approach that includes responsive healthcare giving, early learning activities, and the emotional well-being of caregivers [24, 25]. The positive association between age (especially 36-48 months) and cognitive development aligns with developmental theories, indicating that early childhood is a period of rapid cognitive growth driven by children's interaction with their surroundings and caregivers. Interestingly, joint family structures were associated with higher cognitive scores compared to nuclear families. The implementation of the caring for the health-caregiver package is also addressed, focusing on the social and emotional well-being of caregivers [26]. This dual approach not only enhances healthcare-giving practices but also fosters a healthier developmental environment for children, thereby reducing the risks of abuse and neglect [27, 28]. Caste/ethnicity emerged as a significant predictor, with Dalit and Janajati children exhibiting lower cognitive scores than those from more advantaged castes. Maternal employment showed a positive association with cognitive development, especially when mothers held jobs outside traditional household labor. Contrary to expectations, emotional nurturance did not significantly predict cognitive outcomes when adjusted for socio-economic variables, suggesting that structural socio-economic factors may more strongly influence early cognitive development. The literature on the impact of health caregivers' emotional nurturance on cognitive development in Nepali preschoolers illustrates a multifaceted relationship influenced by healthcare practices, socio-demographic factors, and developmental outcomes [2, 29, 30]. The foundational study shows the importance of nurturing care frameworks, which encompass responsive healthcare giving and early learning activities [4, 6, 31]. Another research suggests that children in nurturing environments demonstrate higher IQ scores and improved long-term outcomes, reinforcing the significance of caregiver support in ECD [24, 32]. This study highlights the critical role of socio-economic and demographic factors in early cognitive development and suggests targeted interventions that address unique challenges faced by marginalized communities in Nepal [7, 33, 34]. Addressing barriers related to caste, fostering supportive family environments, and promoting educational and economic opportunities for mothers could provide pathways for improving cognitive outcomes among preschoolers in similar socio-economic settings [28, 35]. Collectively, highlights the critical role of emotional nurturance from caregivers in shaping cognitive development in Nepali preschoolers [36]. Illustrate how socio-demographic factors intertwine with healthcare-giving practices to influence early childhood outcomes [37], emphasizing the need for targeted interventions that address both caregiver support and systemic barriers to enhance cognitive development [38, 39]. One of the key insights from this research is the critical role of health-caregiver emotional nurturance in shaping cognitive outcomes in children, highlighting that caregivers who receive support and training in responsive health-care giving can significantly enhance the developmental trajectories of their children. This is particularly relevant in the context of Nepali preschoolers, as the nurturing environment provided by health caregivers is linked to improved cognitive development outcomes, such as higher IQ scores. Inspections of all institutions and educational institutes play an important role in promoting and protecting caregivers' occupational health from burnout syndrome [40, 41], which is associated with job satisfaction and emotional nurturing on cognitive development in preschoolers and medical personnel [42-45]. The key role of management challenges in the context of climate change and human influence, especially during the period of the COVID-19 pandemic and extreme weather events that increase job risks [46, 47], and the importance of regulations on environmental risk factors, air quality indoors, and water resources correlated with training of health caregivers on public health issues [48-51]. Emotional nurturance plays a crucial role in cognitive development, as it fosters a healthy relationship between caregivers and children [52]. However, the focus on quantitative studies may overlook the nuanced qualitative aspects of caregiving and child development during the pandemic [53]. The crucial role in the emotional and physical development of preschoolers, especially in community facilities caregivers play at the relationship between caregivers and preschoolers can be

challenging and interpersonally difficult [54]. Researchers have explored the connection between caregivers' emotional nurturing and cognitive development, considering age and the impact of paternal and maternal nurturing, highlights the need for better understanding and support for caregivers in health families [55]. Caregivers play a crucial role in children's cognitive development, especially during times of crisis [56]. Providing emotional nurturance and supportive interventions is essential for fostering secure attachments and enhancing cognitive outcomes in young children, especially during times of crisis [57, 58].

Limitations, Strengths, and Implications of the Study, and Future Studies

This study offers meaningful insights into how socio-economic, demographic, and family-related factors influence cognitive development among preschool-aged children in a low-income, rural setting in Nepal. One strength is its focus on a large, diverse sample, enhancing the generalizability of findings. By exploring dimensions such as caste/ethnicity, family structure, and maternal education, the study provides a comprehensive perspective on key factors influencing early development. Additionally, the use of direct cognitive assessments offers more accurate developmental measures compared to studies that rely only on self-reported data. Some limitations, however, should be noted. The cross-sectional design limits causal inferences between socioeconomic factors and cognitive outcomes, as longitudinal data provide clearer insights into developmental trajectories and causal links. Additionally, the use of self-reported data to measure emotional nurturance may introduce bias, potentially skewing its estimated impact. Furthermore, Nepal-specific cultural aspects, such as caste hierarchies and extended family norms, may limit the applicability of these findings to other socio-cultural contexts. Despite these limitations, the findings highlight critical implications for supporting ECD in Nepal and similar contexts. Efforts to reduce socio-economic disparities, particularly among marginalized groups, are essential to improve developmental opportunities. Initiatives that expand early education access and support low-income families could help address inequities, while extended family or community-based programs may offer additional cognitive enrichment for rural children. Finally, the positive association found between maternal employment and cognitive outcomes suggests that policies supporting women's education and employment could further benefit children's cognitive development in low-income settings.

CONCLUSIONS

This study provides insights into the multi-faceted determinants of cognitive development among preschool-aged children in Nepal, underscoring the importance of socio-economic and demographic factors. Findings suggest that while emotional nurturance alone may not significantly influence cognitive development, factors such as family structure, caste/ethnicity, maternal employment, and age are crucial contributors. These results highlight the potential benefits of joint family systems, advantageous socio-economic standing, and maternal employment for early cognitive growth. Future policies and interventions should prioritize addressing socio-economic disparities and population preventive public health, especially in pre-school children. Particularly among marginalized groups and promoting enriched family and educational environments to support optimal cognitive development in early childhood.

Author contributions: PS: conceptualization, data curation, investigation, methodology, supervision, software validation, visualization, writing–original draft, and writing–review and editing; **IPA:** data curation, investigation, methodology, software validation, visualization, supervision, project administration, writing–original draft, and writing–review and editing; **NFS:** data curation, visualization, methodology, writing–review and editing, and formal analysis; **CBB:** conceptualization, formal analysis, validation, visualization, writing–original draft, and validation; & **PT:** validation, visualization, methodology, writing–original draft, and writing–review and editing. All authors have agreed with the results and conclusions.

Funding: No funding source is reported for this study.

Acknowledgments: The authors would like to thank the respondents who participated in this study. The authors would also like to thank Professor Antonios Valamontes, the Editor-in-Chief, editors, and reviewers for their valuable feedback and insightful suggestions for improving this study. The authors further express their sincere gratitude to Prof. Valamontes Antonios for his invaluable guidance, expertise, and critical insights throughout the revisions of this study, and proofreading language editing assistance.

Ethical statement: The authors stated that the study was approved by the Nepal Health Research Council with approval number NHRC: No. 2078-56/2021. Written informed consents were obtained from the participants.

Declaration of interest: No conflict of interest is declared by the authors.

Data sharing statement: Data supporting the findings and conclusions are available upon request from the corresponding author.

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