Original Article

Factors Associated with Early Child Development in Nepal – A Further Analysis of Multiple Indicator Cluster Survey 2019

Sampurna Kakchapati, Saugat Pratap KC, Santosh Giri, Shreeman Sharma

Department of Health, HERD International, Lalitpur, Nepal

Abstract

Introduction: Information on child development is limited in Nepal, where a large number of children suffer from the negative consequences of poverty, nutritional deficiencies, and inadequate learning opportunities. The study aims to determine the proportion of children developmentally on track and its associated factors among 2870 children under 5 years using data from Multiple Indicator Cluster Survey. **Methods:** We used bivariate analysis and multivariate logistic regression to determine the association among household and maternal variables and child characteristics with the Child Development Index. **Results:** The multivariate analysis showed that age, province, educational status, wealth index quintile, health insurance, stunting, and functional disability were associated with the Child Development Index ($P < 0.05$). The odds of child being developmentally on track at 4 years was more than two times (adjusted odds ratio [AOR] = 2; 95% confidence interval [CI]: 1.7–2.37) than of 3 years. Literate mothers had higher odds (AOR = 1.56 [95% CI: 1.29–1.89]) of child being developmentally on track compared to illiterate mothers. The odds of child being developmentally on track in the richest quintile was more than three times (AOR = 3.43 [95% CI: 2.39–4.91]) than child of the poorest quintile. With regard to stunting, there were higher odds of children who were not stunted (AOR = 1.35 [95% CI: 1.12–1.64]) being developmentally on track. Children who lack functional difficulty were more than six times (AOR = 6.7 [95% CI: 3.2–14.02]) on being developmentally on track. Children having health insurance were higher odds (AOR = 1.81 [95% CI: 1.04–3.15] $P = 0.034$) on being developmentally on track. **Conclusion:** The study found different factors such as age, province, educational status, wealth index quintile, health insurance, stunting, and functional disability associated with the Child Development Index providing insights to establish specific interventions based on socioeconomic barriers of household and health outcomes of children for ensuring child development.

Keywords: *Early child development, Multiple Indicator Cluster Survey, Nepal*

Introduction

Early childhood is an elementary period for a child's development as quick gains in physical, cognitive, and socioemotional domains comprise "building blocks" of children's later development.[1,2] Early Childhood Development (ECD) has been generally perceived as conceivably having exceptional yields of life cycle globally.[3] The intellectual, socioemotional and physical well-being improvements of children are contributing factors in schooling attainment, obtaining expertise, and health and socioeconomic status further down in life.[3,4] An estimated 250 million children from developing countries are not able to satisfy their developmental potential in the initial 5 years of life,[5] which probably implies that they are generously less ready to make educational opportunities later in life and have negative consequences on productivity, health and financial status as grown-ups.[1-3] The recent global database shows that the proportion of the Child Development Index was comparatively low in Sub-Saharan and South Asian region. Although only accounting for 53% of live births worldwide in 2020, two regions – Sub-Saharan Africa and Southern Asia – are responsible for more than 80% of the 5.0 million under-five fatalities. The primary causes of death for children under five continue to be congenital malformations, preterm delivery problems, birth asphyxia, and other infectious diseases such pneumonia, diarrhea, and malaria.[6] It is important for a country's health system to focus and invest on early childhood as ECD is a goal of the 2015 Sustainable

How to cite this article: Kakchapati S, Pratap KC, Giri S, Sharma S. Factors associated with early child development in Nepal – A further analysis of multiple indicator cluster survey 2019. Asian J Soc Health Behav 2023;6:21-9.

Received: 14 October, 2022.
Revised: 22 December, 2022.
Accepted: 15 January, 2023.
Published: 10 February, 2023

ORCID:
Sampurna Kakchapati: 0000-0001-5610-8588

Address for correspondence:
Dr. Sampurna Kakchapati, Herd International, Saibu Awas Cr-10 Marga, Bhaisepati, Lalitpur, Nepal.
E-mail: kck_sampurna@yahoo.com

Access this article online

Website: www.healthandbehavior.com

DOI: 10.4103/shb.shb_191_22

Quick Response Code:

Development Goals of the United Nations, which is backed by a growing body of evidence and rising worldwide interest in this area. Improved access to high-quality ECD, care, and preprimary education is the goal of target 4.2. Indicator 4.2.1, "the proportion of children under 5 years of age who are developmentally on track in health, learning, and psychosocial well-being, by sex," tracks progress toward reaching this goal. The most efficient and economical ways to avoid future high spending on health and poverty alleviation service costs are to invest in early childhood. Delay in child development is an aggregate interaction that begins as early as in the womb, and once started, might be hard to invert during school years and adulthood.[5] Between birth and 5 years of age, children build up psychological abilities that permit them to look after consideration, comprehend and follow directions, speak with others, and take care of perplexing issues.[7] Children's encounters of early warm and responsive interaction with parental figures and peers can assist them with creating basic social and enthusiastic capabilities, including the capacity to coexist with others and freely oversee negative feelings and make their own decisions. Social determinants play a crucial part in the early stages of conception, pregnancy, and postnatal times of children's development.[7,8] Delicate periods in the brain and natural development start prenatally and proceed all through childhood and adolescence.[8] The degree to which these cycles lead to sound development relies on the characteristics of encouragement, support, and nurturance in the social conditions in which children live, learn, and developed.[9] Along these lines, the social climate is an essential determinant of early child development and, thusly, early child development is a determinant of health, prosperity, and acquiring abilities across the equilibrium of the life course.[8-10]

Family poverty can influence the degree to which children's essential necessities are met: needs such as safe housing, nutritious meal, and high-quality care.[10,11] Destitution expands exposure to psychosocial and biological risk factors that frequently happen all the while and compromise early brain development.[12] Strong connections were shown among poverty and cognitive and language improvement. These deferrals might be interceded through numerous mechanisms, including increased stress, restricted access to material and social assets, deficient stimulation, and poor nutritional status.[10-12] Children suffering from malnutrition may have poorer school achievement and cognitive and language abilities.[13,14] Although many nutrients are necessary for brain development, the impact of nutrient deficiencies depends on the timing and degree of nutrient deprivation, the possibility of recovery, and the child's environment.[15] Undernutrition in a child's earliest years has detrimental impacts on developmental domains, as children in their early years have the most rapid changes in brain development. Stunting is associated with concurrent and later cognitive delay or deficit and poor school achievement.[16-18]

The country faces a number of problems such as poor quality and unequal access, remote location, gender, and social and cultural disparities. Poverty, social marginalization, disability, migration, social norms, and gender bias are major obstacles to enrollment and attendance in early childhood education.[8] Although child development is a growing concern in Nepal, there is a lack of evidence and studies on ECD in Nepal. ECD index (ECDI) was calculated for the first time in the sixth round of the Multiple Indicator Cluster Survey (MICS) of 2019, and, hence, this study will provide an important opportunity for informing national ECD policy in the context of Nepal. The Global MICS was developed by UNICEF in 1995 as an international multi-purpose household survey program to support countries in collecting internationally comparable data on a wide range of indicators in relation to the situation of children and women. The MICS provides a reliable source of information on the survival, development, and protection of children to inform evidence-based decision-making by planners, policymakers and program implementers.[19] The analysis of ECD will provide policymakers with fresh information regarding factors related to ECD in Nepal so as to use the evidence to design the interventions. Children who receive proper support in their early years are healthier, more educated, and more likely to contribute to society and the global economy; thus, long-term investments in child development laws and programs will pay off. We assessed the ECDI data from the MICS to estimate the status of developmentally on-track children and the social determinants associated with it.

Methods

The study extracted the data from the MICS, nationally representative and internationally comparable descriptive cross-sectional household survey. MICS was conducted in 2019 by the Central Bureau of Statistics (CBS) with the technical and financial support from UNICEF.[19,20] The MICS children's dataset included about 6749 children (age ranging from birth to 5 years), among which, we included children of 3 and 4 years where the Child Development Index was assessed, resulting in a subset of 2870 children for analysis. ECD comprises ordered progression of motor, cognitive, language, socioemotional and regulatory skills, and capacities across the first few years of life.[21] Physical growth, literacy and numeracy skills, socioemotional development, and readiness to learn are important domains of overall development of the child, and lead the foundation for later life and set the direction and picture for health, learning, and well-being.[22] A 10-item module was used to calculate the ECDI. The 10 items are used to determine if children are developmentally on track in four domains:

- Literacy-numeracy: Children are identified as being developmentally on track based on whether they can identify/name at least ten letters of the alphabet, whether they can read at least four simple, popular words, and

whether they know the name and recognize the symbols of all numbers from 1 to 10. If at least two of these are true, then the child is considered developmentally on track

- Physical: If the child can pick up a small object with two fingers, like a stick or a rock from the ground and/or the mother/caretaker does not indicate that the child is sometimes too sick to play, then the child is regarded as being developmentally on track in the physical domain
- Socialemotional: Children are considered to be developmentally on track if two of the following are true: If the child gets along well with other children, if the child does not kick, bite, or hit other children, and if the child does not get distracted easily
- Learning: If the child follows simple directions on how to do something correctly and/or when given something to do, can do it independently, then the child is considered to be developmentally on track in this domain.

ECDI is then calculated as the percent of children who are developmentally on track in at least three of these four domains. The independent variables for the study were the individual child-level characteristics, mother characteristics, and household characteristics. Child-level characteristics include the age (36–47 months and 48–59 months), sex of the child, number of siblings (continuous), and the nutritional status measured by stunting (binary), which is profoundly known as a height-for-age *Z*-score <−2.0), underweight (binary) which is known as weight-for-age *Z*-score <−2.0, and wasting (binary) which is known as weight-for-health *Z*-score <−2.0. Moreover, children with functional difficulty or disability as a child experiencing any form of impairment (even among those using assistive devices) in any of these domains: seeing, hearing, walking, communication, learning, controlling behavior, self-care, remembering, concentrating, accepting change, making friends, anxiety, and depression was considered as an independent variable. Child health outcomes, such as diarrhea and acute respiratory infection (ARI), were also used as independent variables. Mother characteristics include the mother's educational attainment (none, illiterate, or literate) and mother's functional abilities. Household-level characteristics include household wealth index (poorest, second, middle, fourth, and richest) as assessed through household amenities, facilities and assets, and the presence of health insurance. The wealth index is a composite indicator of wealth is assumed to capture the underlying long-term wealth through information on the household assets and is intended to produce a ranking of households by wealth, from poorest to richest. In addition, this study includes three community-level variables, as the place of residence (rural, urban), and provincial levels (seven provinces). These variables were selected based on the literature and their availability in the dataset.[23-25]

Ethical approval

The survey protocol was approved by CBS as per the Statistical Act (1958) in September 2018. The Statistical Act enables CBS to carry out surveys according to the government's ethics protocol without involving an institutional review board. Since this study involved the analyses of publicly available anonymized secondary data, ethical approval from respective institutions was not required.

Statistical analysis

Data were extracted in SPSS and the SPSS datasets was imported to R statistical program for further analyses. Data analyses in this study comprise descriptive analysis, bivariate analysis, and logistic regression analysis. All the data were weighted to account for the complex sample design, such as stratified sampling and probabilities of unequal sample selection between regions. Pearson's Chi-squared test was used to determine children's characteristics, mother's characteristics, and household characteristics among children who were developmentally on track. Logistic regression analysis was performed to examine the effects of the determinants on the outcomes. Initially, explanatory determinants were included in the model one at a time to examine their univariate relationship with the outcome. Multivariate logistic regression models were then used to identify the most important determinants for each outcome. A $P < 0.05$ was used to define the statistical significance. Adjusted odds ratios (AORs) as well as their 95% confidence intervals (95% CI) were used to depict the independent relationship between predictors and dependent variables. All statistical analyses for this study were conducted using the R program for statistical analysis.

Results

Background characteristics of the children

Table 1 presents the distribution of children aged 3–4 years by sociodemographic characteristics, including age, place of residence, gender, province, mother's educational status, wealth index quintile, and child's height and weight measurements. More than half (51.8%) of the children were male. The mean age was found to be 3.49 ± 0.5 years. More than three-fifths (65.3%) of the children resided in urban areas and 34.7% resided in the rural areas. The majority of child aged 3–4 years were from Madhesh province (24.6%), followed by Lumbini province and Bagmati province at 18.0% and 17.9%, respectively. Majority (22.7%) of them belonged to the poorest quintile category. Regarding mother's education, one-third (33.4%) had completed their primary education (grades 1–8) and 28.4% of them reported being illiterate. Less than five percent of children had health insurance. Regarding their nutritional status, more than three-fifths (64.3%) of the children were stunted, whereas one-fourth (25.8%) of the children were underweight and 9.3% of the children

Table 1: Sociodemographic characteristics of children

Background characteristics Sociodemographic characteristics	*n*=2870, *n* (%)
Gender	
Male	1487 (51.8)
Female	1383 (48.2)
Age, mean±SD	3.49±0.5
Place of residence	
Urban	1875 (65.3)
Rural	995 (34.7)
Province	
Province 1	465 (16.2)
Madhesh	583 (24.6)
Bagmati	513 (17.9)
Gandaki	195 (6.8)
Lumbini	515 (18.0)
Karnali	189 (6.6)
Sudarpaschim	285 (9.9)
Wealth index quintile	
Poorest	652 (22.7)
Second	584 (20.3)
Middle	590 (20.6)
Fourth	573 (20.0)
Richest	472 (16.4)
Mothers education	
Illiterate	816 (28.4)
Primary	959 (33.4)
Secondary	905 (31.5)
Higher	191 (6.6)
Child's weight (kg), mean±SD	13.69±3.39
Child's height (cm), mean±SD	97.52±41.07
Attendance to early childhood education	
Attending	1782 (62.1)
Not attending	1089 (37.9)
Had health insurance	
Yes	106 (3.7)
No	2764 (96.3)
Nutritional status	
Stunting	
Yes	1817 (64.3)
No	1009 (35.7)
Underweight	
Yes	737 (25.8)
No	2120 (74.2)
Wasting	
Yes	262 (9.3)
No	2569 (90.7)
Child functional abilities	
Yes	42 (1.5)
No	2828 (98.5)
Child health outcomes	
Diarrhea	
Yes	218 (7.6)
No	2652 (92.4)
Acute respiratory infection	
Yes	593 (20.7)
No	2277 (79.3)

SD: Standard deviation

had wasting. Only 1.5% of the children had any form of functional difficulties. Majority (92.2%) of the children did not have an episode of diarrhea in the 2 weeks before the survey. One-fifth (20.7%) of the children had symptoms of ARI.

Early Child Development Index

Developmental potential in early childhood is measured as an index, addressed in the MICS, that evaluates children aged 36–59 months in four areas: literacy/numeracy, physical, socialemotional, and learning. The MICS survey provides index score as the level of a child aged 36–59 months who are on track in at least three of the four domains. Table 2 presents information regarding ECDI. Slightly more than two-fifth (40.4%) were developmentally on track for this literacy-numeracy domain. Majority (96.9%) of the children were developmentally on track for the physical domain. More than half (56%) were developmentally on track for socioemotional domain. Majority (90.4%) of the children were developmentally on track for the learning domain. About 65.2% of children were developmentally on track for four domains.

Association between sociodemographic characteristics, nutritional status, health outcomes, and early Child Development Index

Table 3 shows the association between sociodemographic characteristics of children, mothers, and households with ECDI. The findings revealed that age, area, province, educational status, wealth index quintile, coverage of health insurance, functional difficulties, stunting, underweight, and diarrhea were statistically significant for the child being developmentally on track ($P < 0.05$). Children aged 4 years old were developmentally on track (73%) in comparison to children aged 3 years old (57.8%). Similarly, based on the residential setting, children belonging to urban areas were more developmentally on track (68%) compared to children belonging to rural settings (60%). Province wise, children from Gandaki province were more (79.5%) developmentally on track, followed by Bagmati (73.9%) compared to children from other provinces. Children from Karnali were the least (55%) developmentally on track, followed by Madhesh province (55.8%). In terms of mothers' literacy, children whose mothers were literate were found to be more (70.9%) developmentally on track compared to those whose mothers were not literate. The wealth index quintile results portray that the children from the richest quintile were more (83.7%) developmentally on track in comparison to children from

Table 2: Early child development of children

Early child development	*n*=2870, *n* (%)
Developmentally on track for the literacy-numeracy domain	
Yes	1160 (40.4)
No	1710 (59.6)
Developmentally on track for the physical domain	
Yes	2781 (96.9)
No	89 (3.1)
Developmentally on track for the social-emotional domain	
Yes	1607 (56.0)
No	1263 (44.0)
Developmentally on track for learning the domain	
Yes	2593 (90.4)
No	277 (9.6)
Early Child Development Index score	
Yes	1871 (65.2)
No	999 (34.8)

the poorest quintile (52.9%). Out of the 3.7% of children who had health insurance coverage, 83.5% were found to be developmentally on track. More than two-thirds of children who were not underweight (67.1%) were also developmentally on track. For those children who did not have any functional difficulties were more (65.8%) developmentally on track in comparison to children who were not developmentally on track (34.2%). The result further validates that the children who did not have diarrhea were more (66.8%) developmentally on track in comparison to children who had diarrhea (53.5%).

Factors associated with Child Development Index in multivariate logistic regression

The multivariate logistic regression shows the factors that were significantly associated with the Child Development Index after controlling for other factors, including age, province, educational status, Wealth Index quintile, stunting, presence of health insurance, and absence of functional disability ($P < 0.05$). The odds of children being developmentally on track at 4 years were two times (AOR = 2 [95% CI: 1.7–2.37], $P < 0.001$) more than the children at 3 years. Similarly, literate mothers had nearly two times (AOR = 1.56 [95% CI: 1.29–1.89], $P < 0.001$) of children being developmentally on track than the illiterate mothers. With regard to province, children from Madhesh province, Bagmati province, Lumbini province, Karnali province, and Sudarpashchim province were lower odds for being developmentally on track in comparison to the children from Province 1. The odds of the children being developmentally on track while falling into the richest quintile were more than three times (AOR = 3.43 [95% CI: 2.39–4.91], $P < 0.001$) than the children falling into the poorest quintile. With regard to stunting, children who were not stunted were more likely (AOR = 1.35 [95% CI: 1.12–1.64], $P < 0.001$) of being developmentally on track than children who were stunted. For those children who did not have functional difficulty were more than six times (AOR = 6.7 [95% CI: 3.2–14.02], $P < 0.001$) of the child being developmentally on track than children who had functional difficulty. Likewise, the child having health insurance was nearly two times (AOR = 1.81 [95% CI: 1.04–3.15], $P = 0.034$) on being developmentally on track compared to a child without health insurance as [Table 4].

Discussion

The present study contributes to a growing literature on ECD in the context of Nepal. To our knowledge, it is the first study to show the population-level association between factors associated with ECD in Nepal. The findings showed that about 65% of children were developmentally on track. There was still a considerable percentage of children who were not on track and the evidence presented underscores the urgent need to scale up ECD initiatives. The proportion of children on track was slightly higher than that of the South Asian region, which stated that 62% of children were on track.[26] This echoes with a study, stating that ECD service provision in the south asian region appears fragmented and it support for both policy and implementation intervention.[27] Social determinants such as age, province, mother's education, and wealth quintile were associated with ECD as consistent with numerous studies.[9,11,13,17] Children aged 4 years were comparatively developmentally on track compared to children aged 3 years. There is substantial evidence that the effects on ECD increases with child's age, as shown in countries such as India, Indonesia, and Peru.[11] Similarly, having a mother with an educational background was also significantly associated with ECD, as documented in other studies that having a mother in the highest category of education had a positive association with ECD.[28-30] One possibility is that educated women may have greater information and economic resources within the household which leads to more investments in children's nutrition and health care.[28,30] A study in a developing country showed that lower-class mothers of Asian and African origin perceived that infants attain development skills in later ages in their life.[28,29]

Children belonging to Madhesh, Bagmati, Lumbini, Karnali, and Sudurpashchim provinces seemed not to be developmentally on track in comparison to children from Province 1. In Nepal, there exist significant disparities in reproductive, maternal, newborn, and child health outcomes and intervention coverage among seven provinces. Health outcomes and service utilization are generally low in provinces that are comparatively disadvantaged in terms of underlying factors such as geography and socioeconomic status (Madhesh and Karnali provinces) and among the poorest households.[31] Moreover, the provincial comparison of development status in Nepal reinforces these findings where the data obtained from Nepal Human Development reports shows that Karnali, Madhesh, and Sudurpashchim have the

Table 3: Association between selected variables and Child Development Index

Characteristics	Child Development Index			χ^2 (df)	*P*
	Yes, *n* (%)	No, *n* (%)	Total, *n* (%)		
Age (years)					
3	849 (57.8)	619 (42.2)	1468 (51.1)	72.40 (1)	<0.001
4	1023 (73.0)	379 (27.0)	1402 (48.9)		
Gender					
Male	963 (64.8)	523 (35.2)	1487 (51.8)	0.22 (1)	0.633
Female	908 (65.6)	475 (34.4)	1383 (48.2)		
Area					
Urban	1275 (68.0)	601 (32.0)	1875 (56.3)	17.89 (1)	<0.001
Rural	597 (60.0)	397 (40.0)	995 (43.7)		
Province					
Province 1	358 (76.9)	107 (23.1)	465 (16.2)	108.6 (6)	<0.001
Madhesh	395 (55.8)	312 (44.2)	707 (24.6)		
Bagmati	380 (73.9)	134 (26.1)	513 (17.9)		
Gandaki	155 (79.5)	40 (20.5)	195 (6.8)		
Lumbini	309 (60.0)	206 (40.0)	515 (15.2)		
Karnali	104 (55.0)	85 (45.0)	189 (11.3)		
Sudarpaschim	171 (59.9)	114 (40.1)	285 (12.9)		
Educational status					
Illiterate	415 (50.9)	401 (49.1)	816 (27.8)	92.5 (1)	<0.001
Literate	1457 (70.9)	598 (29.1)	2054 (72.2)		
Wealth index quintile					
Poorest	346 (52.9)	305 (47.1)	805 (27.8)	119.3 (4)	<0.001
Second	351 (65.6)	233 (34.4)	587 (20.3)		
Middle	395 (67.9)	195 (32.1)	577 (19.9)		
Fourth	384 (70.1)	164 (29.9)	548 (18.9)		
Richest	319 (83.7)	62 (16.3)	381 (13.1)		
Health insurance coverage					
Yes	89 (83.5)	17 (16.5)	106 (3.7)	17.5 (2)	<0.001
No	1784 (64.5)	981 (35.5)	2764 (96.3)		
Weight, mean±SD	13.9±2.7	13.3±4.4	13.7±3.4		0.066
Height, mean±SD	97.1±18.4	98.4±64.9	97.5±41.1		0.927
Stunting					
No	1268 (69.8)	549 (30.2)	1817 (64.3)	42 (1)	<0.001
Yes	582 (57.7)	427 (42.3)	1009 (35.7)		
Underweight					
No	1423 (67.1)	669 (32.9)	2120 (74.2)	11.6 (1)	<0.001
Yes	443 (60.1)	294 (39.9)	737 (25.8)		
Wasting					
No	1675 (65.2)	894 (34.8)	2569 (90.7)	0.15 (1)	0.375
Yes	174 (66.4)	88 (33.6)	262 (9.3)		
Functional difficulties					
Has functional difficulty	11 (24.8)	32 (75.2)	43 (1.5)	30.2 (1)	<0.001
Has no functional difficulty	1861 (65.8)	967 (34.2)	2828 (98.5)		
Diarrhea					
No	1785 (66.8)	887 (33.2)	2672 (92.2)	16.3 (1)	<0.001
Yes	121 (53.5)	105 (46.5)	226 (7.8)		
Acute respiratory infection					
No	1812 (65.2)	969 (34.8)	2781 (96.9)	0.09 (1)	0.758
Yes	60 (67.4)	29 (32.6)	89 (3.1)		

SD: Standard deviation

least Human Development Index compared to Province 1.[32] These factors are associated with a comparatively higher proportion of children being developmentally on track in these provinces. Children belonging to higher-income households did better on all indicators of ECDI compared with their peers in lower-income households.

Table 4: Factors associated with child development index in multivariate logistic regression

Variables	Crude OR (95% CI)	*P*	AOR (95% CI)	*P*
Age (years)				
3	1		1	
4	1.97 (1.68-2.3)	<0.001	2 (1.7-2.37)	<0.001
Place of residence				
Rural	1		1	
Urban	1.41 (1.2-1.66)	<0.001	1.06 (0.88-1.28)	0.535
Province				
Province 1	1		1	
Madhesh	0.38 (0.29-0.49)	<0.001	0.35 (0.26-0.47)	<0.001
Bagmati	0.85 (0.63-1.14)	0.276	0.54 (0.39-0.75)	
Gandaki	1.16 (0.77-1.75)	0.475	1.02 (0.66-1.56)	
Lumbini	0.45 (0.34-0.59)	<0.001	0.43 (0.32-0.58)	
Karnali	0.37 (0.26-0.53)	<0.001	0.62 (0.42-0.92)	
Sudhurpashim	0.45 (0.33-0.62)	<0.001	0.59 (0.42-0.82)	
Educational status				
Illiterate	1		1	
Literate	2.35 (1.99-2.78)	<0.001	1.56 (1.29-1.89)	<0.001
Wealth quintile index				
Poorest	1		1	<0.001
Poorer	1.33 (1.06-1.66)	0.015	1.47 (1.12-1.92)	0.005
Medium	1.79 (1.42-2.25)	<0.001	2.01 (1.52-2.65)	<0.001
Richer	1.89 (1.49-2.38)	<0.001	1.89 (1.42-2.53)	<0.001
Richest	4.15 (3.13-5.5)	<0.001	3.43 (2.39-4.91)	<0.001
Underweight				
Yes	1		1	
No	1.34 (1.13-1.6)	<0.001	0.9 (0.73-1.11)	0.313
Stunting				
Yes	1		1	
No	1.65 (1.41-1.94)	<0.001	1.35 (1.12-1.64)	0.002
Functional disability				
Yes	1		1	
No	5.83 (2.9-11.73)	<0.001	6.7 (3.2-14.02)	<0.001
Health insurance				
No	1		1	
Yes	2.79 (1.66-4.69)	<0.001	1.81 (1.04-3.15)	0.034
Diarrhea				
Yes	1		1	
No	1.67 (1.27-2.21)	<0.001	1.3 (0.96-1.75)	0.091

OR: Odds ratio, AOR: Adjusted OR, CI: Confidence interval

There is substantial evidence that inequalities in early childhood care and development in low-/middle-income countries (LMICs) also show that in most countries, children living in the wealthiest household fared markedly better on the child being developmentally on track.[3,26,33] This study also demonstrated the findings of the 2016 MICS study that postulated the family poverty affects ECD.[3,5] Evidence shows that low-income families have insufficient schooling, limiting their ability to provide their children with a sensitive, stimulating environment.[34,35] Children with health insurance were more likely to be developmentally on track. Prior research on health insurance and health outcomes shows evidence that families who had access to health insurance had a positive effect on infants between birth and 5 years of age.[33] It showed that health insurance improves the health status of children as it reduces medical costs and increases family consumption on food which eventually leads to the development of children's well-being.[33] Underweight and stunting showed a positive association with ECD through bivariate analysis. However, stunting was associated with ECD in our population-level analysis. This could be because nutritional status based on the height index for age has a direct impact on children's central nervous system. Stunted children have multiple functional disadvantages that can persist throughout their lifetime.[36,37] Our findings showed 42.3% of children were stunted that were not developmentally on track, which is similar to a study that looked into early childhood developmental

status in LMICs.[3,5] Our result aligns with literature that associates stunting with childhood development. A study that examined child stunting and development indicators using MICS-Round 4 data from four countries reported a positive association between stunting and child development in Bangladesh and in the Punjab provinces of India.[17] In an analysis of another study looking at the factors associated with the risks of developmental delay in 3 and 4 years in a low-resource setting, showed evidence that stunting was closely associated with ECD.[14,15] We also found that children's functional difficulties were significantly associated with ECD. Functional difficulty has been linked to suboptimal development of early childhood, especially in LMICs.[37,38] Literatures and our finding suggest that functional disability can expose the growing child to delay in development. A WHO review report states that functional difficulties in early childhood could potentially cause developmental difficulties and affect brain development across the lifespan.[39]

Limitations

The study had some limitations. However, the cross-sectional nature of the data collection also limits this study from attempting to establish a causal association.

Conclusion

Favorable socioeconomic circumstances, the level of education of the mother, geography, and access to health insurance are the primary elements that increase a child's chances of realizing their developmental potential. These findings provide insights for the developing, rolling out, and expanding ECD policies and initiatives in Nepal and other nations with comparable characteristics. More studies are required to gain a greater insight into how specific cultural and geographic circumstances affect the outcome of the interaction between social determinants. We have the chance to reduce inequity that has affected ECD of millions of children and families in LMICs like Nepal by investing in ECD programs.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Bornstein MH, Britto PR, Nonoyama-Tarumi Y, Ota Y, Petrovic O, Putnick DL. Child development in developing countries: Introduction and methods. Child Dev 2012;83:16-31.
2. Bornstein MH, Putnick DL. Cognitive and socioemotional caregiving in developing countries. Child Dev 2012;83:46-61.
3. Lu C, Cuartas J, Fink G, McCoy D, Liu K, Li Z, *et al.* Inequalities in early childhood care and development in low/middle-income countries: 2010-2018. BMJ Glob Health 2020;5:e002314.
4. Nilsen CE. The expansion of early childhood development services and the need to reconceptualize evidence. Contemp Issues Early Child 2017;18:269-80.
5. Black MM, Walker SP, Fernald LC, Andersen CT, DiGirolamo AM, Lu C, *et al.* Early childhood development coming of age: Science through the life course. Lancet 2017;389:77-90.
6. Vardell E. Global health observatory data repository. Med Ref Serv Q 2020;39:67-74.
7. Blakeney EL, Herting JR, Bekemeier B, Zierler BK. Social determinants of health and disparities in prenatal care utilization during the great recession period 2005-2010. BMC Pregnancy Childbirth 2019;19:390.
8. Maggi S, Irwin LJ, Siddiqi A, Hertzman C. The social determinants of early child development: An overview. J Paediatr Child Health 2010;46:627-35.
9. Tierney L, Nelson CA. Brain Development and the Role of Experience in The Early Years; 2009. Available from:http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC3722610. [Last accessed on Jul 17 2022].
10. Fernald LC, Kariger P, Hidrobo M, Gertler PJ. Socioeconomic gradients in child development in very young children: Evidence from India, Indonesia, Peru, and Senegal. Proc Natl Acad Sci U S A 2012;109 Suppl 2:17273-80.
11. Engle PL, Black MM. The effect of poverty on child development and educational outcomes. Ann N Y Acad Sci 2008;1136:243-56.
12. Walker SP, Wachs TD, Grantham-McGregor S, Black MM, Nelson CA, Huffman SL, *et al.* Inequality in early childhood: Risk and protective factors for early child development. Lancet 2011;378:1325-38.
13. Miller AC, Garchitorena A, Rabemananjara F, Cordier L, Randriamanambintsoa M, Rabeza V, *et al.* Factors associated with risk of developmental delay in preschool children in a setting with high rates of malnutrition: A cross-sectional analysis of data from the IHOPE study, Madagascar. BMC Pediatr 2020;20:108.
14. Kar BR, Rao SL, Chandramouli BA. Cognitive development in children with chronic protein energy malnutrition. Behav Brain Funct 2008;4:31.
15. Kang Y, Aguayo VM, Campbell RK, West KP Jr. Association between stunting and early childhood development among children aged 36-59 months in South Asia. Matern Child Nutr 2018;14 Suppl 4:e12684.
16. Thorne-Lyman AL, Shrestha M, Fawzi WW, Pasqualino M, Strand TA, Kvestad I, *et al.* Dietary diversity and child development in the far west of Nepal: A cohort study. Nutrients 2019;11:1799.
17. Bhutta ZA, Das JK, Rizvi A, Gaffey MF, Walker N, Horton S, *et al.* Evidence-based interventions for improvement of maternal and child nutrition: What can be done and at what cost? Lancet 2013;382:452-77.
18. Sincovich A, Gregory T, Zanon C, Santos DD, Lynch J, Brinkman SA. Measuring early childhood development in multiple contexts: The internal factor structure and reliability of the early Human Capability Index in seven low and middle income countries. BMC Pediatr 2019;19:471.
19. Nepal Central Bureau of Statistics (CBS). Nepal Multiple Indicator Cluster Survey 2019, Survey Findings Report. 2015. p. 96-7. Available from: https://www.unicef.org/nepal/media/486/file /MICS 2014.pdf. [Last accessed on 2020 Feb 28].
20. Kakchapati S, KC SP, Giri S, Bhattarai S, Baral SC. Factors associated with access to sexual and reproductive health services among women with disabilities in Nepal. Dialogues Health 2022;1:100068.

21. Black MM, Walker SP, Fernald LCH, Andersen CT, DiGirolamo AM, Lu C, *et al*. Early childhood development coming of age: science through the life course. Lancet. 2017;7;389(10064):77-90. doi: 10.1016/S0140-6736(16)31389-7.
22. National Research Council and Institute of Medicine. The Developing Brain. From Neurons to Neighborhoods Science of Early Childhood Development. Ch. 8. Washington (DC): National Academies Press (US); 2000. Available: https://www.ncbi.nlm.nih.gov/books/NBK225557/. [Last accessed on 2022 Jul 26].
23. Ahulu LD, Gyasi-Gyamerah AA, Anum A. Predicting risk and protective factors Of generalized anxiety disorder: A comparative study among adolescents in Ghana. Int J Adolesc Youth 2019;25:574-84. [doi: 10.1080/02673843.2019.1698440]. Available from: https://www.tandfonline.com/doi/full/10.1080/02673843.2019.1698440 [Last accessed on 2022 Nov 8].
24. Bello AI, Quartey JN, Appiah LA. Screening for developmental delay among children attending a rural community welfare clinic in Ghana. BMC Pediatr 2013;13:119.
25. Shrestha M, Strand TA, Ulak M, Chandyo RK, Ranjitkar S, Hysing M, *et al.* The feasibility of the ages and stages questionnaire for the assessment of child development in a community setting in Nepal. Child Care Health Dev 2019;45:394-402.
26. McCoy DC, Peet ED, Ezzati M, Danaei G, Black MM, Sudfeld CR, *et al.* Early childhood developmental status in low- and middle-income countries: National, Regional, and global prevalence estimates using predictive Modeling. PLoS Med 2016;13:e1002034.
27. Richter LM, Daelmans B, Lombardi J, Heymann J, Boo FL, Behrman JR, *et al*. Investing in the foundation of sustainable development: pathways to scale up for early childhood development. Lancet. 2017;389:103-18.
28. Cui Y, Liu H, Zhao L. Mother's education and child development: Evidence from the compulsory school reform in China. J Comp Econ 2019;47:669-92.
29. Ertem IO, Atay G, Dogan DG, Bayhan A, Bingoler BE, Gok CG, *et al.* Mothers' knowledge of young child development in a developing country. Child Care Health Dev 2007;33:728-37.
30. Shrestha M, Ulak M, Strand TA, Kvestad I, Hysing M. How much do Nepalese mothers know about child development? Early Child Dev Care 2017;189:135-42. [doi: 10.1080/03004430.2017.1304391].
31. Sapkota VP, Bhusal UP, Acharya K. Trends in national and subnational wealth related inequalities in use of maternal health care services in Nepal: An analysis using demographic and health surveys (2001-2016). BMC Public Health 2021;21:8.
32. Dhungel S. Provincial comparison of development status in Nepal: An analysis of human development trend for 1996 to 2026. J Manag Dev Stud 2018;28:53-68.
33. Peng X, Conley D. The implication of health insurance for child development and maternal nutrition: Evidence from China. Eur J Health Econ 2016;17:521-34.
34. Liang YL, Tsai MC, Lin YC, Strong C, Lin CY. Poverty and the prediction of health status in adolescents from low-income families in Taiwan. J Public Health (Oxf) 2020;42:44-52.
35. Lee TH, Kuo JH, Liu CY, Yu YF, Strong C, Lin CY, *et al.* Trajectory of food insecurity and its association with longitudinal mental health and sleep outcomes in adolescents from economically disadvantaged families. Nutrients 2021;13:1696.
36. Tran TD, Luchters S, Fisher J. Early childhood development: Impact of national human development, family poverty, parenting practices and access to early childhood education. Child Care Health Dev 2017;43:415-26.
37. Ekholuenetale M, Barrow A, Ekholuenetale CE, Tudeme G. Impact of stunting on early childhood cognitive development in Benin: Evidence from demographic and health survey. Egypt Pediatr Assoc Gaz 2020;68:1-1. [doi: 10.1186/s43054-020-00043-x].
38. World Health Organization. Early Childhood Development and Disability: A Discussion Paper. Psyc CRITIQUES; 2012.
39. World Health Organization. Developmental Difficulties in Early Childhood: Prevention, Early Identification, assessment and intervention in low- and middle-income countries. Geneva, Switzerland: World Health Organization; 2012.