Determinants of Developmental Milestones among Children 0-23 Months at Kabale Hospital, Uganda

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Summary

BACKGROUND

Approximately 200 million children globally fail to fulfil their development potential due to malnutrition, poor health, and unstimulating environments. Children in Kabale, Uganda, may be at particularly high risk as the rate of malnutrition in the region is likely to impact development. The study aimed to identify possible determinants influencing developmental milestones of breastfed and non-breastfed children aged 0-23 months.

MATERIALS AND METHODS

The study was conducted at the young child clinic of Kabale hospital, among 250 children aged 0-23 months and their caregivers, for two months. The study adopted a comparative cross-sectional design, and systematic random sampling was used to select the respondents for the study. The socio-demographic characteristics, nutritional status, and feeding practices were assessed using structured pretested questionnaires. Developmental milestones of the children (communication, motor, fine motor, problem-solving, and social skills) were assessed using the modified ages and stages questionnaires. The data collected was tabulated, analysed statistically, and the results interpreted.

RESULTS

Developmental scores were not associated with breastfeeding and minimum meal frequency. A milestone achievement of communication skills was associated with caregiver's education, caregiver's age and length-for-age. Gross motor scores were associated with the caregiver's age, weight-for-age, and length for age. Achievement of fine motor skills was associated with caregiver's education, caregiver's age, child's age, length for age, and children who met the minimum dietary diversity score. Problem-solving scores were associated with child's age, weight for age, length for age, and children who met the minimum dietary diversity. Personal social scores were associated with lower caregiver's age and normal weight for age

CONCLUSION

Developmental scores were not associated with breastfeeding and minimum meal frequency. Development in early childhood was mainly associated with caregiver's age, caregiver's education, child's age, weight for age, length for age, and minimum dietary diversity score. Children under the care of younger caregivers and those who attained normal nutrition status had significantly more developed motor and social skills compared to children with older caregivers and undernourished children, respectively.

RECOMMENDATION

Meeting the minimum meal frequency is commendable; however, caregivers should also strive to meet the minimum dietary diversity, which ultimately contributes to a better nutritional status and hence development in children. Older caregivers should be educated on the importance of developmental milestones and their contribution to optimum development in children.

Keywords: *Child Development, Nutritional Status, Feeding Practices, Uganda*

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Introduction

Approximately 200 million children globally fail to fulfil their development potential. Many of these children are in low and middle-income countries (LMICs) and are exposed to malnutrition, poor health, and unstimulating environments, affecting their development (1-2). Children in Kabale, Uganda, may be at particularly high risk as the rate of malnutrition in the region may impact development.

Developmental milestones are the functional skills or tasks that children are capable of doing at certain ages concerning the motor, communication, personal-social, problem-solving, and fine motor domains (3). A good start in life enables a child to be efficient as the first 1000 days are a crucial period for child growth and development. Genetic disposition plays a role in development, but external factors like nutritional status, socio-economic status, and feeding patterns are also important (4). In the event of delayed development, early interventions that influence these external factors may effectively provide a good start to life and improve developmental milestones in children (5-6). Failure to thrive affects the child and limits national development, and this cycle may be passed on to future generations, increasing health inequality.

Previous studies have shown an association between socio-demographic characteristics like maternal education and occupation with better communication and gross motor scores (7-8), and a better nutritional status has also been associated with better gross motor scores (8). A different study identified weight-for-age and dietary diversity as the strongest determinants of a child's overall score on the developmental milestones; length-for-age, weight-for-age, and weight-for-length were the strongest predictors of motor development (9). A study in Sri Lanka revealed that single, divorced and separated mothers were 10 times more at risk of poor knowledge of developmental milestones compared to married women. This in turn affected the developmental ability of their children (10). Significant interactions have also been found between parental social status and age of attaining developmental milestones, with associations being significantly more substantial in the offspring of parents with lower social status (11-12), children from a low socioeconomic status are also disadvantaged in terms of early development (13). The factors influencing development among Ugandan children have not been sufficiently documented in the past. Therefore, the objective of this study was to identify determinants of development among Ugandan children 0-23 months.

Methods and materials

A comparative cross-sectional design was adopted. The study was conducted for two months at the young child clinic of Kabale Hospital, Uganda. It targeted children 0-23 months of age and their caregivers attending the young child clinic at the Hospital.

Sample size determination

The sample size was determined using the formula no = $n=2z^2pq/d^2$. A sample frame of 1000 children 0-23 months that attend the Young Child Clinic at Kabale Hospital was drawn, and a sampling interval was calculated (1000/250). The reference child was chosen randomly and the subsequent ones were chosen at a calculated interval (4) until the sample size of 250 was achieved.

The recruitment of the participants was done in two stages: The general population of all children attending the clinic was screened for at least one month, which helped determine the two arms of the children. It also assisted in placement into the age groups for infant and young children feeding practices, and the ages and stages questionnaire. A systematic random sampling procedure was used to select the respondents for the two arms.

Data collection procedure

Questionnaires

A researcher-administered questionnaire was used to collect data on the socio-demographic characteristics of both the caregiver and child. Characteristics considered were age, education, marital status, religion, sex of the child, and occupation. It was adopted and modified from the Kenya Health Demographic Survey (14).

Anthropometric assessment

A stadiometer was used to measure the length of a child to the nearest centimetre. For measuring weight, a digital scale (Seca 876) was used to measure children dressed in minimum clothing. The children's ages were obtained from the immunization cards and birth certificates. Nutritional status was determined using z-scores obtained from WHO (2006) child growth standards. MUAC tapes were also used to determine nutritional status. Children whose MUAC was <11.5 cm were considered to have severe acute malnutrition, those whose MUAC was between 11.5 cm and 12.5 cm were considered moderately malnourished, and those whose MUAC was >12.5 cm were considered normal.

Modified Ages and stages questionnaire (ASQ)

The ages and stages questionnaires (15) were used to determine the children's communication, motor, fine motor, problem-solving, and personal-social skills. It is a globally approved tool, and it is valid, authentic, and reliable compared to all other tools. The assessment was carried out by directly testing the child and registering the child's skills as observed by the mother/caregiver. Caregivers responded to questions with yes, sometimes, or not yet, and each of these answers scored 0, 5, and 10, respectively. Then, the child's total scores were compared to the cutoff points listed on the scoring sheet.

24-hour dietary recall

Caregivers stated all the food consumed and if their child was breastfed in the past 24 hours. The 24-hour period started when the child woke up till the time the infant went to sleep at night, asking what was eaten and drunk and how much food the child had eaten (16). The data collected was used to determine the study participants' minimum dietary diversity, minimum meal frequency, and minimum acceptable diet.

Data analysis

Socio-demographic characteristic distributions were calculated and compared between breastfed and non-breastfed children using chi-square tests. Minimum dietary diversity (MDD), minimum meal frequency (MMF), and minimum acceptable diet (MAD) were indicators for feeding practices (17) and were determined considering eight food groups: grains, roots, and tubers legumes and nuts dairy products, meat, fish, poultry, vitamin-A rich

fruits and vegetables, other fruits and vegetables, breastmilk, eggs.

The indicators for nutritional status were weight for age, length for age, weight for length, and MUAC. Participants were classified according to Z-scores: severe underweight/ severe stunting/ severe wasting (Z-score < -3), moderate underweight/ moderate stunting/ moderate wasting (Z-score ≥-3<-2), normal weight for age/ normal length for age/normal weight for length (Z-score ≥-2≤+2). Children whose MUAC was <11.5 cm were considered to have severe acute malnutrition, those whose MUAC was between 11.5 cm and 12.5 cm were considered moderately malnourished, and those whose MUAC was >12.5 cm were considered normal.

For developmental milestones, each skill presented cutoff scores, and if a child's developmental score was above the cutoff, they were considered to have met the cutoff, and if it was below, they were considered as "not met the cutoff" (18). Data was analysed using SPSS version 22.0 for transformation and exploratory analysis. The data analysis presented percentages and frequency distributions. Continuous variables such as age were categorized into age groups. Chi-square, logistical regression, and odds ratio tests were used to identify the association between variables and developmental milestones with a significance level of $p < 0.05$.

Ethical considerations

Clearance to conduct research was sought from Kenyatta University Graduate School. Ethical approval was obtained from Kenyatta Ethical Review Committee (PKU/2072/11219). A research permit was also obtained from the Uganda National Council for Science and Technology (HS 2687). Permission was sought from the superintendent in charge of Kabale Hospital. Participants gave informed consent after sensitization about the purpose of the study, its benefits, and its role. The participants were assured of the confidentiality of the information obtained, and participation was voluntary.

Results

Socio-demographic characteristics of study participants

The highest proportion (63.6%) of participants was within the age range of 21-30 years. There was a significant difference in the age range between the study groups ($\chi2=10.665$; $p=0.031$). Overall, more than half the participants (50.4%) had completed primary education while 26.8% completed the secondary level of education. There was no difference in education levels between caregivers of the breastfed and non-breastfed children study groups ($\chi2=2.135$; $p=0.545$). Most participants were married and living with their spouses (91.2%), and this was similar across the study groups ($\chi2=1.269$; $p=0.530$). The majority of participants (96.4%) in both breastfed and non-breastfed groups were Christians. There was no significant difference in the religion of the caregivers based on their breastfeeding status.

There were slightly more male children (51.2%) than females (48.8%). There was no significant difference in child sex between the study groups ($\chi2=1.025$; $p=0.376$). From both groups, the highest proportion (37.2%) of the children were within the age ranges; 12-18 months and 2-6 months (23.2%). There was a significant difference in the age range between the study groups (($\chi2=18.385$; $p=0.001$) as presented in Table 2 (see appendix).

Feeding practices and nutritional status of children 0-23 months

More than half the children in both groups did not meet the minimum dietary diversity score (69.4%). The majority (75.9%) of the children who did not meet the minimum dietary diversity were non-breastfed.

Table 1:
Determinants of Communication Skills in Children 0-23 Months

Characteristics		Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
				Lower Bound	Upper Bound
Met Cut-off Value	**Education level**				
	Primary	.000*	3.135E-9	6.805E-10	1.444E-8
	Secondary	.000*	1.073E-8	1.021E-8	2.045E-8
	College	Ref			
	Caregiver's Age (years)				
	≤20	0.061	9.000	0.907	89.265
	21-30	0.008*	16.667	2.099	132.368
	31-40	0.045	9.200	1.054	80.286
	41-50	0.015*	14.903	1.679	132.271
	51-60	Ref			
	Age of child				
	2-6 months	0.615	0.562	0.060	5.302
	7-8 months	0.582	0.500	0.042	5.889
	9-11 months	0.691	0.625	0.062	6.339
	12-18 months	0.381	0.389	0.047	3.224
	19-23 months	Ref			
	Weight for age				
	Normal	0.652	1.635	0.193	13.837
	Moderate underweight	0.497	0.444	0.043	4.607
	Severe underweight	Ref			
	Length for age				
	Normal	0.033*	3.683	1.113	12.188
	Moderate stunting	0.561	1.391	0.457	4.239
	Severe stunting	Ref			
	Minimum dietary diversity score				
	Met	0.069	0.149	0.019	1.156
	Un-met	Ref			
	Minimum meal frequency				
	Met	0.437	1.519	0.529	4.359
	Un-met	Ref			
	Minimum acceptable diet				
	Met	0.249	3.364	0.429	26.398
	Unmet	Ref			
	Breastfeeding status				
	Breastfed				2.860
	Not breastfed	0.811	1.121	0.439	

*** Significant at P value<0.05, Ref-reference category EXP (B)- Odds ratio**

The study further revealed significant differences in meeting minimum dietary diversity between those who breastfed and those who did not ($\chi 2$=4.530; p=0.035). Most of the children met the minimum meal frequency (56.3%), with more non-breastfed children meeting the minimum meal frequency (64.8%) compared to the breastfed children (46.9%).

Table 2:
Determinants of Gross Motor Skills among Children 0-23 Months

Characteristics		Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
				Lower Bound	Upper Bound
Met Cut-off Value	**Education level**				
	Primary	.202	0.481	0.156	1.481
	Secondary	.725	1.271	0.334	4.832
	College	Ref			
	Caregiver's Age (years)				
	≤20	0.063	9.857	0.880	110.425
	21-30	0.020*	15.346	1.536	153.351
	31-40	0.012	22.500	2.004	252.570
	41-50	0.089	15.000	0.663	339.548
	51-60	Ref			
	Age of child				
	2-6 months	0.993	0.994	0.235	4.201
	7-8 months	0.303	3.409	0.330	35.199
	9-11 months	0.150	0.367	0.094	1.436
	12-18 months	0.343	0.531	0.144	1.963
	19-23 months	Ref			
	Weight for age				
	Normal	0.007*	5.875	1.609	21.450
	Moderate underweight	0.289	2.333	0.488	11.167
	Severe underweight	Ref			
	Length for age				
	Normal	0.007*	2.973	1.354	6.529
	Moderate stunting	0.053	2.359	0.988	5.631
	Severe stunting	Ref			
	Minimum dietary diversity score				
	Met	0.688	1.178	0.530	2.617
	Un-met	Ref			
	Minimum meal frequency				
	Met	0.402	1.361	0.662	2.798
	Un-met	Ref			
	Minimum acceptable diet				
	Met	0.762	1.159	0.445	3.019
	Unmet	Ref			
	Breastfeeding status				
	Breastfed				
	Not breastfed	0.403	1.326	0.685	2.567

*** Significant at P value<0.05, Ref-reference category, Exp (B)- Odds ratio**

There was a significant difference in meeting the minimum meal frequency between the study groups ($\chi2$=6.674; p=0.011). Most children did not meet the minimum acceptable diet (81.6%). There was no significant difference in meeting the minimum acceptable diet for both the study groups ($\chi2$=4.538; p=0.047). The majority of the children (94.8%) had a normal weight for length.

Table 3:
Determinants of Fine Motor Skills in Children 0-23 Months

Characteristics		Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
				Lower Bound	Upper Bound
Met Cut-off Values	**Education level**				
	Primary	0.127	0.418	0.137	1.280
	Secondary	0.039*	0.294	0.092	0.941
	College	Ref			
	Caregiver's Age (years)				
	≤20	0.141	6.000	0.551	65.290
	21-30	0.050	9.892	0.999	97.963
	31-40	0.070	8.769	0.837	91.873
	41-50	0.006*	22.548	0.956	196.436
	51-60	Ref			
	Age of child				
	2-6 months	0.002*	7.594	2.063	27.954
	7-8 months	0.185	2.362	0.662	8.430
	9-11 months	0.327	1.688	0.593	4.802
	12-18 months	0.962	1.023	0.407	2.568
	19-23 months	Ref			
	Weight for age				
	Normal	0.205	2.327	0.631	8.574
	Moderate underweight	0.606	0.667	0.143	3.107
	Severe underweight	Ref			
	Length for age				
	Normal	0.006*	2.794	1.345	5.805
	Moderate stunting	0.688	1.166	0.551	2.468
	Severe stunting	Ref			
	Minimum dietary diversity score				
	Met	0.013*	2.542	1.218	5.304
	Un-met	Ref			
	Minimum meal frequency				
	Met	0.303	1.371	0.752	2.501
	Un-met	Ref			
	Minimum acceptable diet				
	Met	0.204	1.728	0.742	4.024
	Unmet	Ref			
	Breastfeeding status				
	Breastfed		0.958		
	Non breastfed	0.884		0.541	1.697

*** Significant at P value<0.05, Ref-reference category, Exp(B)- Odds ratio**

Severe wasting was, however, more in non-breastfed children (2.4%) than breastfed children (0.8%). A similar trend was observed in moderate wasting where 3.2% and 4% of children were breastfed and non-breastfed, respectively. However, these differences were not statistically significant ($\chi 2=1.196$; $p=0.550$).

Table 4:
Determinants of Problem-Solving Skills in Children 0-23 Months

Characteristics		Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
				Lower Bound	Upper Bound
Met Cut-off Value	**Education level**				
	Primary	0.154	0.532	0.224	1.267
	Secondary	0.849	0.911	0.347	2.392
	College	Ref			
	Caregiver's Age (years)				
	≤20		0.333	0.031	3.579
	21-30	0.364	0.959	0.097	9.482
	31-40	0.972	0.729	0.070	7.563
	41-50	0.791	0.333	0.021	5.329
	51-60	0.437			
	Age of child	Ref			
	2-6 months		1.046	0.382	2.865
	7-8 months	0.931	5.647	1.064	29.981
	9-11 months	0.042*	2.353	0.758	7.302
	12-18 months	0.139	0.624	0.245	1.589
	19-23 months	0.322			
	Weight for age	Ref			
	Normal		3.910	1.066	14.334
	Moderate underweight	0.040*	1.833	0.392	8.566
	Severe underweight	0.441			
	Length for age	Ref			
	Normal		2.453	1.242	4.845
	Moderate stunting	0.010*	1.600	0.766	3.341
	Severe stunting	0.211			
	Minimum dietary diversity score	Ref			
	Met		2.701	1.296	5.630
	Un-met	0.008*			
	Minimum meal frequency	Ref			
	Met		0.789	0.432	1.442
	Un-met	0.442			
	Minimum acceptable diet	Ref			
	Met		2.739	1.082	6.932
	Unmet	0.033*			
	Breastfeeding status	Ref			
	Breastfed				
	Not breastfed	0.272	1.354	0.788	2.327

*** Significant at P value<0.05, Ref-reference category, Exp (B) - Odds ratio**

There were significantly higher malnutrition cases with weight for age ($\chi2$=7.855; p=0.020) among non-breastfed children (7.2%) compared to the breastfed children (0.8%). Stunting was significantly higher in the non-breastfed children ($\chi2$=9.477; p=0.009).

Table 5:
Determinants of Personal Social Skills in Children 0-23 Months

Characteristics		Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
				Lower Bound	Upper Bound
Met Cut-off Values	**Education level**				
	Primary	0.549	1.421	0.451	4.479
	Secondary	0.591	1.404	0.407	4.839
	College	Ref			
	Caregiver's Age (years)				
	≤20	0.000*	3.789E-8	1.037E-8	1.384E-7
	21-30	0.000*	2.850E-8	1.205E-8	6.739E-8
	31-40	0.000*	3.133E-8	1.362E-8	2.341E-8
	41-50	0.998	2.283E-8	1.029E-8	5.247E-8
	51-60	Ref			
	Age of child				
	2-6 months	0.284	2.500	0.468	13.346
	7-8 months	0.307	0.455	0.100	2.063
	9-11 months	0.837	1.173	0.256	5.366
	12-18 months	0.215	0.440	0.120	1.611
	19-23 months	Ref			
	Weight for age				
	Normal	0.005*	6.333	1.729	23.193
	Moderate underweight	0.101	4.000	0.765	20.920
	Severe underweight	Ref			
	Length for age				
	Normal	0.531	1.310	0.563	3.044
	Moderate stunting	0.475	1.419	0.543	3.703
	Severe stunting	Ref			
	Minimum dietary diversity score				
	Met	0.077	2.214	0.918	5.342
	Un-met	Ref			
	Minimum meal frequency				
	Met	0.114	1.772	0.872	3.603
	Un-met	Ref			
	Minimum acceptable diet				
	Met	0.641	1.255	0.484	3.255
	Unmet	Ref			
	Breastfeeding status				
	Breastfed				
	Not breastfed	0.601	1.200	0.605	2.381

*** Significant at P Value<0.05, Ref-reference category, Exp(B)- Odds ratio**

There was a higher percentage of non-breastfed children (28.8%) than breastfed children (13.6%) who were severely stunted. Despite the significant differences in length age and weight for age between the study groups, MUAC indicated no significant differences, with overal1 89.8% of the children having a normal nutritional status. However, more non-breastfed children (11.1%) were moderately malnourished

compared to breastfed children (4.1%), as presented in Table 2 (see appendix).

Determinants of communication skills

The determinants of communication skills were the education level of the caregiver, the caregiver's age, and length of age. Children whose caregivers had primary education were 3.13 times more likely to meet the cut-off value compared to those whose caregivers attended college (AOR=3.13, p<0.001). Those whose caregivers had secondary education were 1.07 times more likely to meet the cut-off than those whose caregivers had college education (AOR=1.07, p<0.001). Children whose caregivers were in the age group 21-30 years were 16.66 times more likely to meet the cut off value compared to those whose caregivers were 51-60 years (AOR=16.67, p=0.008), while children whose caregivers were 41-50 years were 14.90 times more likely to meet than those whose caregivers were 51-60 years (AOR=14.90, p=0.015). Children with a normal length for age were 3.68 times more likely to meet the cut-off value compared to children with severe stunting (AOR=3.68, p=0.033).

Determinants of gross motor skills

Gross motor skills are the abilities required to control the body's large muscles for head movement, sitting, walking, crawling, and running. They were assessed by observing the child's activity and questioning the caregiver. The determinants included caregiver's age, weight for age, and length for age. Children whose caregivers were 21-30 years were 15.34 times more likely to meet the cut-off value compared to those whose caregivers were 51-60 years (AOR =15.34, p=0.020). Children with a normal weight for age were 5.87 times more likely to meet the cut-off value than those who were severely underweight (AOR =5.87, p=0.007). Children with a normal length for age were 2.97 times more likely to meet the cut-off value than those who were stunted (AOR =2.97, p=0.007).

Determinants of fine motor skills

Fine motor skills generally refer to the small movement of the hands, wrists, fingers, feet, toes, lips, and tongue. The predictors included the caregiver's education level, caregiver's age, age of the child, length for age, and minimum dietary diversity score. Children whose caregivers had secondary education were 0.29 times less likely to meet the cut-off compared to children whose caregivers went to college (AOR=0.29, p=0.039). Children whose caregivers were 41-50 years were 22.54 times more likely to meet the cut-off than those whose caregivers were 51-60 years (AOR=22.548, p=0.006). Children 2-6 months were 7.59 times more likely to meet the cut-off than those 19-23 months (AOR=7.59, p=0.002). Children with a normal length for age were 2.79 times more likely to meet the cut-off than those who were severely stunted (AOR=2.79, p=0.006). Children who met the minimum dietary diversity (MDD) score were 2.54 times more likely to meet the cut-off than those who did not meet the MDD (AOR=2.54, p=0.013).

Determinants of problem-solving skills

Problem-solving skills refer to how a child perceives, thinks, and understands his or her world and include remembering and decision making. The predictors included child age, weight for age, length for age, minimum dietary diversity score, and minimum acceptable diet. Children 7-8 months were 5.64 times more likely to meet the cut-off than those 19-23 months (AOR=5.64, p=0.042). Children with a normal weight for age were 3.91 times more likely to meet the cut-off than those severely underweight (AOR=3.91, p=0.040). Children with a normal length for age were 2.45 times more likely to meet the cut-off than those who were severely stunted (AOR=2.45, p=0.010).

Children who met the minimum dietary diversity score were 2.70 times more likely to meet the cut-off than those who did not meet the minimum dietary diversity score (AOR=2.701, p=0.008).

Determinants of personal social skills

Personal social skills are abilities required for children to understand themselves and interact with others; they include responsive smiling, showing frustration, preferring their primary caregiver to others, and recognizing themselves in the mirror. The determinants for these included the caregiver's age and weight for age. Children whose caregivers were ≤20 years were 3.78 times more likely to meet the cut-off than those whose caregivers were 51-60 years (AOR =3.78, p<0.001). Children whose caregivers were 21-30 years were 2.85 times more likely to meet the cut-off than those whose caregivers were 51-60 years (AOR =2.85, p<0.001). Children whose caregivers were 31-40 years were 3.13 times more likely to meet the cut-off compared to those whose caregivers were 51-60 years old (AOR =3.13, p<0.001). Children with a normal weight for age were 6.33 times more likely to meet the cut-off than those severely underweight (AOR =6.33, p=0.005).

Discussion

The study aimed at identifying determinants of early child development. It showed that several socio-demographic characteristics, nutritional status, and feeding patterns were associated with the different domains of development.

Socio-demographic characteristics of study participants

A study in Morocco established a statistically significant association between the mother's level of education and breastfeeding (19). Those with higher levels of education knew the nutritional health outcomes of exclusive breastfeeding. In this study, the level of education among caregivers was generally low. However, there was no relationship with breastfeeding. Concerning maternal age, some studies established that older mothers were less likely to breastfeed than younger mothers, but younger mothers were susceptible to early cessation of breastfeeding (20). The findings of this study showed similar results as more caregivers below 20 years had non-breastfed children. Child age has a significant influence on breastfeeding as a study in Poland suggested more breastfed children below six months (68.6%). However, beyond infancy, the number of breastfed children declined significantly to 14% (21). This is different from a study done in Ghana (22), which showed high rates of breastfeeding among children aged 12 months. Sustainable breastfeeding for up to 2 years has been associated with support from primary health care providers and family; this would prevent mothers from concealing their breastfeeding practices for fear of being judged (23).

Feeding practices and nutritional status of children 0-23 months

A study done in Amibara, Ethiopia, shows that more breastfeeding infants met the minimum meal frequency compared to the non-breastfeeding infants (24). This was attributed to one meal reduction in breastfed children to meet the criteria for achieving minimum meal frequency (MMF). The current study defers from the above findings, as more non-breastfed children (64.8%) met the MMF compared to the breastfed (46.9%). This can be attributed to an increase in meal frequency to compensate for the lack of breastfeeding among caregivers of non-breastfed children.

The number of children that met the minimum acceptable diet (MAD) was low (18.4%) but higher than that of another study in which children receiving the minimum

acceptable diet was 6.1% (25). More breastfed children met the MAD (24.5%) compared to the non-breastfed children (13%). This could be due to a lack of nutrition knowledge for caregivers of non-breastfed children. During complementary feeding, children may develop diarrhoea due to poor hygiene, but caregivers related it to the introduction of unfamiliar foods, preventing the continuous introduction of new foods.

The prevalence of stunting was 47.2%, underweight 7.2%, and wasting 4% among breastfed children and stunting was 52%, underweight 16.8%, and wasting 6.4% in non-breastfed children. The findings of this study are similar to a study done in Kaduna state, Nigeria (26), where they found that 65.5%, 32.3%, 8.4% of children were stunted, wasted, and underweight in the study community, and 71.9%,31.7%, 8.4% were malnourished in the control community.

Findings from another study indicated stunting among children that did not receive adequate complementary foods even with optimum breastfeeding (27). This agrees with the current study as stunting among breastfed children was relatively high. A different study (28) demonstrated that the severity of stunting, underweight, and wasting decreased with optimum breastfeeding, a trend similar to this current study.

Findings from a study in Pakistan observed that children with longer durations of breastfeeding had better weight-for-age scores (29). The current study corroborates this, which indicates a significant difference in weight for age scores for breastfed and non-breastfed children. There was no significant difference in weight for length and MUAC scores between breastfed and non-breastfed children. This could be due to wasting being an acute form of malnutrition only present with absolute food shortage.

Determinants of developmental milestones

Caregiver's education

A study in Iraq demonstrated that a mother's education level increased knowledge of child development and increased alertness and observational skills by the mother (30). In Turkey, knowledge of the relationship between motor development and caregiver support was found to be vital in bringing out a child's motor abilities (31). This is observed in the current study as children whose caregivers attended college were more likely to meet the fine motor cut-off value than those whose caregivers had secondary school education. Another study suggested that lack of exposure from a child specialist may deprive a mother of valuable knowledge on child development (32). This lack of exposure may result from a low socioeconomic status, which affects education level and consequently child development (33). Caregiver education has also been associated with parenting behaviour, better stimulation (18-19), and increased problem-solving skills (36). These studies differ from the current study, which found that children of caregivers with less education are more likely to meet the communication cut-off value. This can be explained simply as less education and more casual work with flexible hours allowing the caregiver to be present at home (37).

Caregiver's age

Different studies have shown an association between a caregiver's age and a child’s development (22-24). It has been noted that older caregivers may be less involved than younger parents and could be too busy pursuing their careers rather than making parenting their primary focus (40). Grandparents raising their grandchildren usually have parenting practices that differ from expert suggestions, which is likely to affect child development (41). Another study found that older motherhood was related

to delayed development of personal social skills for children compared to those born to younger mothers (42). However, older maternal age has also been associated with a higher education level (43) and better nutritional status (44), presenting better cognitive skills in children. The findings from the current study suggest that children whose caregivers were 21-30 years were more likely to meet the cut-off value for personal social skills compared to children whose caregivers were 51-60 years old.

Age of child

The early stages of development in children are vital for lifelong learning. Higher parental involvement in childhood was found to be a significant predictor of a child's cognitive ability (45). The current study demonstrated that children 7-8 months were more likely to meet the problem-solving skill cut-off value compared to those 19-23 months old. This can be attributed to parental involvement as children 7-8 months have started solid food hence more interaction with the caregivers during feeding time. A major transformation in motor development occurs at 3-4 months in most typically developing infants (46). However, a study in Ireland noted that children's fine motor skill proficiency was not progressing at the expected rate as children increased in age (47). This corroborated with the current study as children 2-6 months were more likely to meet the fine motor skill cut-off than children 19-23 months.

Weight for age

Having a normal weight for age was related to the likelihood of meeting the cut-off for different development domains compared to being severely underweight. This correlates with another study that found a high prevalence of underweight contributed to delayed attainment of milestones (48). More studies have also shown a close positive link between nutritional status and development in children (34-35). Underweight children were also found to have executive dysfunction in a different study (51). Similarly, other studies have found that weight for age is highly associated with communication and personal social skills (37-38). All this could be due to chronic energy deficiency arising from poor nutritional status leading to inadequate brain nutrition and delay in milestone attainment. Also being underweight increases irritability and depression and in turn, may affect the development of social skills (54).

Length for age

Children with a normal length for age were more likely to meet the cut-off for communication, gross motor, fine motor, and problem-solving skills. This is similar to other studies that found associations between length-for-age and all developmental domains (40-42). A different study in Haiti indicated that an increase in length-for-age contributed to better motor and communication skills than other anthropometric indicators (58). A study in India also found that length for age Z-scores was a more important correlate for development than weight for length (59). A meta-analysis of data from 29 LMICs confirmed that length for age was significantly associated with motor and cognitive abilities (60). Stunted children usually have a poorer immune system, brain function, and organ development, leading to delays in different developmental domains.

Minimum dietary diversity score

Those who met the minimum dietary diversity score (MDD) had a better likelihood of meeting the cut-off for fine motor and problem-solving skills than those who did not meet the MDD score. An initiative in Bangladesh showed that developmental advancement in children 6-23 months was partially explained through an improved minimum dietary diversity score (61). This is similar to findings that suggest interventions designed to improve water quality and nutrition (47-48) have cumulative benefits on a child's development. Another study showed

motor development as a mediator of the relationship between dietary diversity and mental development (59). Dietary diversity score was also linked to the acquisition of motor developmental milestones (64) by improving nutritional outcomes, therefore, improving developmental milestones (65).

Study limitations

This study adopted a comparative cross-sectional design that obtained information on development using a recall basis, and children were not followed up for further observation. To minimize recall bias, well-trained interviewers were used in conducting the in-depth probing during interviews, aided by various items that determined growth and development. Health-seeking behaviour was not determined. The study was carried out in a hospital setting. The cross-sectional design aspect did not holistically assess feeding patterns that may only be realized in a longitudinal study.

Conclusion

Findings from this study show that breastfed children had a better minimum dietary diversity score and attained the recommended nutritional status compared to non-breastfed children, however, there was no overall significant difference in developmental milestones between the study groups. This suggests that optimum breastfeeding is not a direct determinant of developmental milestones, but several other factors like caregiver's age, caregiver's education, child's age, weight for age, length for age, and minimum dietary diversity score are possible determinants of developmental milestones.

Recommendations

Meeting the minimum meal frequency is good; however, caregivers should also strive to meet the minimum dietary diversity, which ultimately contributes to a better nutritional status and development in children. The current study's high prevalence of stunting (49.6%) calls for effective interventions like growth monitoring and promotion, effective nutrition counselling, and the education of caregivers. Similar studies could be done within the home environment to observe its effect on developmental milestones. The government should implement policies that guide and inform parents and guardians on their role in a child's development.

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Conflict of interest

The authors declare that there is no conflict of interest.

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Author contributions

IK: came up with the concept, worked on the proposal, carried out the research with the research assistants, and analyzed and interpreted the data.

JK and JM: provided guidance and correction of the concept, proposal, and thesis writing.

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References

1. 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

[Internet]. 2016 Jun 1 [cited 2021 Feb 22];13(6). Available from: https://pubmed.ncbi.nlm.nih.gov/27270467/
2. Samwel M, Eddison M, Faith N, Richard S, Elizabeth KM, Douglas N. Determinants of diarrhea among young children under the age of five in kenya, evidence from kdhs 2008-09. Etude la Popul Africaine. 2014;28(2):1046–56.
3. David D, Toppo KJ, Saini K. David D, Toppo KJ, Saini K. Research Article a Study To Assess the Knowledge of Mothers ' Regarding Developmental Milestones of Infants. 2014; 2014; Available from: http://www.gmferd.com/journalcra.com/sites/default/files/5791_1.pdf
4. Scharf RJ, Scharf GJ, Stroustrup A. Developmental milestones. Pediatr Rev [Internet]. 2016 Jan 1 [cited 2021 Mar 16];37(1):25–38. Available from: http://pedsinreview.aappublications.org/
5. Cannon J, Kilburn M, Karoly L, Mattox T, Muchow A, Buenaventura M. Investing Early: Taking Stock of Outcomes and Economic Returns from Early Childhood Programs [Internet]. Vol. 7, Investing Early: Taking Stock of Outcomes and Economic Returns from Early Childhood Programs. RAND Corporation; 2017 [cited 2021 Mar 16]. Available from: /pmc/articles/PMC6075808/
6. Patra K, Greene MM, Patel AL, Meier P. Maternal Education Level Predicts Cognitive, Language, and Motor Outcome in Preterm Infants in the Second Year of Life. Am J Perinatol [Internet]. 2016 Jul 1 [cited 2021 Mar 5];33(8):738–44. Available from: /pmc/articles/PMC4919155/
7. Vilaseca RM, Rivero M, Bersabé RM, Cantero MJ, Navarro-Pardo E, Valls-Vidal C, *et al*. Demographic and parental factors associated with developmental outcomes in children with intellectual disabilities. Front Psychol [Internet]. 2019 [cited 2021 Mar 16];10(APR):872. Available from: /pmc/articles/PMC6491580/
8. Ribe IG, Svensen E, Lyngmo BA, Mduma E, Hinderaker SG. Determinants of early child development in rural Tanzania. Child Adolesc Psychiatry Ment Health [Internet]. 2018 Mar 20 [cited 2021 Feb 23];12(1):18. Available from: https://capmh.biomedcentral.com/articles/10.1186/s13034-018-0224-5
9. Larson L, Mehta R, Kekre P, Verma P, Young M, Girard AW, *et al*. Determinants of Developmental Milestones in Infants and Young Children in Bihar, India. FASEB J [Internet]. 2016 [cited 2021 Feb 23];30:44.5-44.5. Available from: https://faseb.onlinelibrary.wiley.com/doi/full/10.1096/fasebj.30.1_supplement.44.5
10. Fayaz F, Goonawardane S. Determinants of maternal knowledge on developmental milestones of children attending immunization clinics in the district of Colombo, Sri Lanka. J Coll Community Physicians Sri Lanka [Internet]. 2017 Sep 30 [cited 2021 Feb 23];23(2):71. Available from: https://jccpsl.sljol.info/article/10.4038/jccpsl.v23i2.8093/
11. Flensborg-Madsen T, Mortensen EL. Infant developmental milestones and adult intelligence: A 34-year follow-up. Early Hum Dev. 2015 Jul 1;91(7):393–400.
12. Flensborg-Madsen T, Grønkjær M, Mortensen EL. Predictors of early life milestones: Results from the Copenhagen Perinatal Cohort. BMC Pediatr [Internet]. 2019 Nov 9 [cited 2021 Mar 16];19(1):420. Available from: https://bmcpediatr.biomedcentral.com/articles/10.1186/s12887-019-1778-y
13. Li W, Li M, Jin Y, Wang S, Zhang Y. Double Jeopardy in Contemporary China: Intersecting the Socioeconomic Gradient and Geographic Context on Early Childhood Development. Int J Environ Res Public Health [Internet]. 2020 Jul 8 [cited 2021

Mar 16];17(14):4937. Available from: https://www.mdpi.com/1660-4601/17/14/4937
14. National Bureau of Statistics-Kenya and ICF International. Kenya 2014 Demographic and Health Survey Key Findings. 2015;6:24. Available from: https://www.dhsprogram.com/pubs/pdf/sr227/sr227.pdf%0Ahttps://dhsprogram.com/pubs/pdf/FR308/FR308.pdf%0Ahttps://www.dhsprogram.com/pubs/pdf/SR227/SR227.pdf
15. J. Squires DB. Ages & Stages Questionnaires (3rd edition): user's guide. 2009;
16. Carpenter CL. Dietary Assessment. Nutr Oncol. 2006;(May):367–75.
17. WHO. Indicators for assessing infant and young child feeding practices. 2010;
18. Batts-hatfield PMA. Training Module : Interpreting Results and Next Steps • Learn how to review the Information. 2018;1–22.
19. Habibi M, Laamiri FZ, Aguenaou H, Doukkali L, Mrabet M, Barkat A. The impact of maternal socio-demographic characteristics on breastfeeding knowledge and practices: An experience from Casablanca, Morocco. Int J Pediatr Adolesc Med. 2018 Jun;5(2):39–48.
20. Colombo L, Crippa BL, Consonni D, Bettinelli ME, Agosti V, Mangino G, *et al*. Breastfeeding determinants in healthy term newborns. Nutrients. 2018 Jan 5;10(1).
21. Tracz J, Gajewska D. Journal of Mother and Child FACTORS INFLUENCING THE DURATION OF BREASTFEEDING AMONG POLISH WOMEN. J Mother Child [Internet]. 2020 Jul 29 [cited 2021 Jan 6];24(1):39–46. Available from: https://content.sciendo.com/view/journals/jmotherandchild/24/1/article-p39.xml
22. Asare BYA, Preko JV, Baafi D, Dwumfour-Asare B. Breastfeeding practices and determinants of exclusive breastfeeding in a cross-sectional study at a child welfare clinic in Tema Manhean, Ghana. Int Breastfeed J [Internet]. 2018 Mar 6 [cited 2021 Jan 6];13(1):12. Available from: https://internationalbreastfeedingjournal.biomedcentral.com/articles/10.1186/s13006-018-0156-y
23. Brockway M, Venturato L. Breastfeeding beyond infancy: a concept analysis. J Adv Nurs [Internet]. 2016 Sep 1 [cited 2020 Jun 8];72(9):2003–15. Available from: http://doi.wiley.com/10.1111/jan.13000
24. Mohammed W, A S, M K, O A. Minimum Meal Frequency Practice and Its Associated Factors Among Children Aged 6-23 Months in Amibara District, North East Ethiopia. J Environ Public Health. 2019;2019.
25. Abay A, Dejen Y, Bekele A, Meressa B. Title: Determinants of Minimum Acceptable Diet among 6–23 Months Age Children in Ethiopia: A Multilevel Analysis of The Ethiopian Demographic Health Survey. CC-BY 40 Int Licens. 2018 Aug 16;(September):1–24.
26. Onoja-Alexander M, Idris S, Gobir A, Onoja A, Igboanusi CJC, Olorukoba A, *et al*. Integrated nutritional intervention among mothers of under-five children in two rural communities of Kaduna State, Nigeria: Its effects on maternal practice of exclusive breast feeding and children's nutritional status. Arch Med Surg [Internet]. 2017 [cited 2020 Jun 9];2(2):60. Available from: http://www.archms.org/text.asp?2017/2/2/60/231634
27. Lohia N, Udipi SA. Infant and child feeding index reflects feeding practices, nutritional status of urban slum children. BMC Pediatr [Internet]. 2014 Nov 30 [cited 2020 Jun 9];14(1):290. Available from: http://bmcpediatr.biomedcentral.com/articles/10.1186/s12887-014-0290-7
28. Kumar A, Singh VK. A Study of Exclusive Breastfeeding and its impact on Nutritional Status of Child in EAG States. J Stat Appl Probab An Int J [Internet]. 2015 [cited 2020 Jun 9];4(3):435. Available from:

http://dx.doi.org/10.12785/jsap/040311
29. Syeda B, Agho K, Wilson L, Maheshwari GK, Raza MQ. Relationship between breastfeeding duration and undernutrition conditions among children aged 0–3 Years in Pakistan. Int J Pediatr Adolesc Med. 2020 Jan 25;
30. Alkhazrajy LA, Aldeen ERS. Assessment of Mothers Knowledge Regarding the Developmental Milestone among Children Under Two Years in Iraq. Am J Appl Sci. 2017 Sep 1;14(9):869–77.
31. Özal C, Bayoğlu B, Karahan S, Günel MK, Anlar B. Gross motor development of preschool children: Effects of socioeconomic status and maternal education. Turk J Pediatr [Internet]. 2020 [cited 2020 Jun 21];62(1):10–8. Available from: https://pubmed.ncbi.nlm.nih.gov/32253861/
32. Karuppannan A, Ramamoorthy T, Rammamoorthi A, Ravichandran L. Mother's Knowledge on Child's Developmental Milestones and Parenting Skills in Kanchipuram District, Tamilnadu - A Descriptive Cross Sectional Study [Internet]. Vol. 10, International Journal of Health Sciences and Research (www.ijhsr.org). 2020 [cited 2020 Jun 21]. Available from: www.ijhsr.org
33. (APA). Education and Socioeconomic Status Factsheet. 2017;2. Available from: https://www.apa.org/pi/ses/resources/publications/education
34. Jeong J, McCoy DC, Fink G. Paternal and maternal education, caregivers' support for learning, and early child development in 44 low- and middle-income countries. Early Child Res Q. 2017 Mar 4;41:136–48.
35. Chernov DN. The role of maternal education in regulating genetic and environmental contributions to the development of child's language competencies. Bull Russ State Med Univ. 2017;6(3):65–74.
36. Asztalos E V., Church PT, Riley P, Fajardo C, Shah PS. Association between Primary Caregiver Education and Cognitive and Language Development of Preterm Neonates. Am J Perinatol [Internet]. 2017 Mar 1 [cited 2021 Mar 18];34(4):364–71. Available from: http://www.thieme-connect.de/DOI/DOI?10.1055/s-0036-1592080
37. Jampaklay A, Richter K, Tangchonlatip K, Nanthamongkolchai S. The impact of parental absence on early childhood development in the context of Thailand. Asian Pacific Migr J [Internet]. 2018 Jun 19 [cited 2021 Mar 18];27(2):209–30. Available from: http://journals.sagepub.com/doi/10.1177/0117196818767439
38. Demirci A, Kartal M. The prevalence of developmental delay among children aged 3-60months in Izmir, Turkey. Child Care Health Dev [Internet]. 2016 Mar 1 [cited 2020 Jun 21];42(2):213–9. Available from: https://pubmed.ncbi.nlm.nih.gov/26493366/
39. Falster K, Hanly M, Banks E, Lynch J, Chambers G, Brownell M, *et al*. Maternal age and offspring developmental vulnerability at age five: A population-based cohort study of Australian children. Myers JE, editor. PLOS Med [Internet]. 2018 Apr 24 [cited 2021 Mar 18];15(4):e1002558. Available from: https://dx.plos.org/10.1371/journal.pmed.1002558
40. Duncan GJ, Lee K, Th Rosales-Rueda M, Lee KTH, Rosales-Rueda M, Kalil A. UC Irvine UC Irvine Previously Published Works Title Maternal Age and Child Development. Publication Date Maternal Age and Child Development. 2018 [cited 2020 Jun 21]; Available from: https://doi.org/10.1007/s13524-018-0730-3
41. Khotsing T, Bhanthumnavin D, Bhuket Prn. Relation Between Family Socioeconomic Determinants And Child Development : A Discriminant Analysis. J Crit Rev.

2020;7(14):2553–9.
42. Falster K, Hanly M, Banks E, Lynch J, Chambers G, Brownell M, *et al*. Maternal age and offspring developmental vulnerability at age five: A population-based cohort study of Australian children. Myers JE, editor. PLOS Med [Internet]. 2018 Apr 24 [cited 2020 Jun 21];15(4):e1002558. Available from: https://dx.plos.org/10.1371/journal.pmed.1002558
43. Tearne JE. Older maternal age and child behavioral and cognitive outcomes: A review of the literature. Fertil Steril [Internet]. 2015;103(6):1381–91. Available from: http://dx.doi.org/10.1016/j.fertnstert.2015.04.027
44. Fall CHD, Sachdev HS, Osmond C, Restrepo-Mendez MC, Victora C, Martorell R, *et al*. Association between maternal age at childbirth and child and adult outcomes in the offspring: A prospective study in five low-income and middle-income countries (COHORTS collaboration). Lancet Glob Heal. 2015 Jul 1;3(7):e366–77.
45. Malhi P, Menon J, Bharti B, Sidhu M. Cognitive Development of Toddlers: Does Parental Stimulation Matter? Indian J Pediatr [Internet]. 2018 Jul 1 [cited 2020 Jun 21];85(7):498–503. Available from: https://link.springer.com/article/10.1007/s12098-018-2613-4
46. Hadders-Algra M. Early human motor development: From variation to the ability to vary and adapt. Vol. 90, Neuroscience and Biobehavioral Reviews. Elsevier Ltd; 2018. p. 411–27.
47. Gaul D, Issartel J. Fine motor skill proficiency in typically developing children: On or off the maturation track? Hum Mov Sci. 2016 Apr 1;46:78–85.
48. Ibeanu VN, Onyechi UA, Ani PN, Omeh OA. Dietary Pattern, Anthropometric Indices and Developmental Milestone of Children Aged 6-60 Months in Peri-Urban Communities East of Nigeria. 2018 [cited 2020 Jun 22]; Available from: http://repository.unn.edu.ng/handle/123456789/6487
49. Agarwal D, Singh Chaudhary S, Sachdeva S, Misra SK, Agarwal P. Prevalence of Developmental Delay and Factors Affecting the Development Status among Under 5 Children in an Urban Slum of Agra City [Internet]. Vol. 9, National Journal of Community Medicine | Volume. 2018 [cited 2020 Jun 22]. Available from: www.njcmindia.org
50. Ribe IG, Svensen E, Lyngmo BA, Mduma E, Hinderaker SG. Determinants of early child development in rural Tanzania. Child Adolesc Psychiatry Ment Health [Internet]. 2018 Mar 20 [cited 2021 Mar 18];12(1):18. Available from: https://capmh.biomedcentral.com/articles/10.1186/s13034-018-0224-5
51. Selvam S, Thomas T, Shetty P, Thennarasu K, Raman V, Khanna D, *et al*. Development of norms for executive functions in typically-developing Indian urban preschool children and its association with nutritional status. Child Neuropsychol [Internet]. 2018 Feb 17 [cited 2020 Jun 22];24(2):226–46. Available from: https://pubmed.ncbi.nlm.nih.gov/27907279/
52. Jimoh AO, Anyiam JO, Yakubu AM. Relationship between child development and nutritional status of under-five Nigerian children. South African J Clin Nutr [Internet]. 2018 Jul 3 [cited 2019 Mar 5];31(3):50–4. Available from: https://www.tandfonline.com/doi/full/10.1080/16070658.2017.1387434
53. Muhoozi GKM, Atukunda P, Mwadime R, Iversen PO, Westerberg AC. Nutritional and developmental status among 6- to 8-month-old children in southwestern Uganda: A cross-sectional study. Food Nutr Res [Internet]. 2016 May 27 [cited 2020 Jun

8];60(1):30270. Available from: http://foodandnutritionresearch.net/index.php/fnr/article/view/1013
54. Jimoh AO, Anyiam JO, Yakubu AM. Relationship between child development and nutritional status of under-five Nigerian children. South African J Clin Nutr [Internet]. 2018 Jul 3 [cited 2020 Jun 22];31(3):50–4. Available from: https://www.tandfonline.com/doi/full/10.1080/16070658.2017.1387434
55. Workie SB, Mekonen T, Mekonen TC, Fekadu W. Child development and nutritional status in 12-59 months of age in resource limited setting of Ethiopia. J Heal Popul Nutr [Internet]. 2020 Apr 14 [cited 2021 Mar 19];39(1):6. Available from: https://jhpn.biomedcentral.com/articles/10.1186/s41043-020-00214-x
56. Muhoozi GKM, Atukunda P, Mwadime R, Iversen PO, Westerberg AC. Nutritional and developmental status among 6- to 8-month-old children in southwestern Uganda: A cross-sectional study. Food Nutr Res [Internet]. 2016 May 27 [cited 2020 Jun 22];60(1):30270. Available from: http://foodandnutritionresearch.net/index.php/fnr/article/view/1013
57. Miller AC, Murray MB, Thomson DR, Arbour MC. How consistent are associations between stunting and child development? Evidence from a meta-analysis of associations between stunting and multidimensional child development in fifteen low- and middle-income countries. Public Health Nutr [Internet]. 2016 Jun 1 [cited 2020 Jun 22];19(8):1339–47. Available from: /core/journals/public-health-nutrition/article/how-consistent-are-associations-between-stunting-and-child-development-evidence-from-a-metaanalysis-of-associations-between-stunting-and-multidimensional-child-development-in-fifteen-low-and-middleincome-countries/4C5E8A8FFAFE9A317464FF2D0804820E
58. Iannotti L, Dulience SJL, Wolff P, Cox K, Lesorogol C, Kohl P. Nutrition factors predict earlier acquisition of motor and language milestones among young children in Haiti. Acta Paediatr [Internet]. 2016 Sep 1 [cited 2020 Jun 22];105(9):e406–11. Available from: https://onlinelibrary.wiley.com/doi/full/10.1111/apa.13483
59. Larson LM, Young MF, Ramakrishnan U, Webb Girard A, Verma P, Chaudhuri I, *et al*. A Cross-Sectional Survey in Rural Bihar, India, Indicates That Nutritional Status, Diet, and Stimulation Are Associated with Motor and Mental Development in Young Children. J Nutr [Internet]. 2017 Aug 1 [cited 2020 Jun 22];147(8):1578–85. Available from: https://academic.oup.com/jn/article/147/8/1578-1585/4584674
60. Sudfeld CR, McCoy DC, Danaei G, Fink G, Ezzati M, Andrews KG, *et al*. Linear growth and child development in low- and middle-income countries: A meta-analysis [Internet]. Vol. 135, Pediatrics. American Academy of Pediatrics; 2015 [cited 2020 Jun 22]. p. e1266–75. Available from: https://pediatrics.aappublications.org/content/135/5/e1266
61. Frongillo EA, Nguyen PH, Saha KK, Sanghvi T, Afsana K, Haque R, *et al*. Large-Scale Behavior-Change Initiative for Infant and Young Child Feeding Advanced Language and Motor Development in a Cluster-Randomized Program Evaluation in Bangladesh. J Nutr [Internet]. 2017 Feb 1 [cited 2020 Jun 22];147(2):256–63. Available from: https://academic.oup.com/jn/article/147/2/256-263/4585034
62. Haile D, Gashaw K, Nigatu D, Demelash H. Cognitive function and associated factors among school age children in Goba Town, South-East Ethiopia. Cogn Dev. 2016 Oct

1;40:144–51.
63. Tofail F, Fernald LC, Das KK, Rahman M, Ahmed T, Jannat KK, *et al*. Effect of water quality, sanitation, hand washing, and nutritional interventions on child development in rural Bangladesh (WASH Benefits Bangladesh): a cluster-randomised controlled trial. Lancet Child Adolesc Heal. 2018 Apr 1;2(4):255–68.
64. Geletu A, Lelisa A, Baye K. Provision of low-iron micronutrient powders on alternate days is associated with lower prevalence of anaemia, stunting, and improved motor milestone acquisition in the first year of life: A retrospective cohort study in rural Ethiopia. Matern Child Nutr [Internet]. 2019 Jul 15 [cited 2020 Jun 22];15(3). Available from: https://onlinelibrary.wiley.com/doi/abs/10.1111/mcn.12785
65. Symonds AE, Kasper J, Cortez R, Martinez A, Umana E. Scholarly Report submitted in partial fulfillment of the MD Degree at Harvard Medical School. 2017.

Appendices

Table 2:

Feeding practices and nutritional status of children 0-23 months

Minimum dietary diversity score	**37(37.8)**	**26(24.1)**	**63(30.6)**	**4.530**	***0.035**
Minimum meal frequency	46(46.9)	70(64.8)	116(56.3)	6.674	***0.011**
Minimum acceptable diet	24(24.5)	14(13.0)	38(18.4)	4.538	0.047
Weight for length					
Normal	120(96.0)	117(93.6)	237(94.8)	1.196	0.550
Moderate wasting	4(3.2)	5(4.0)	9(3.6)		
Severe wasting	1(0.8)	3(2.4)	4(1.6)		
Weight for age					
Normal	116(92.8)	104(83.2)	220(88.0)	7.855	***0.020**
Moderate underweight	8(6.4)	12(9.6)	20(8.0)		
Severe underweight	1(0.8)	9(7.2)	10(4.0)		
Length for age					
Normal	66(52.8)	60(48.0)	126(50.4)	9.477	***0.009**
Moderate stunting	42(33.6)	29(23.2)	71(28.4)		
Severe stunting	17(13.6)	36(28.8)	53(21.2)		
MUAC	N=98	N=108	N=206		
Severe malnutrition	2(2.0)	3(2.8)	5(2.4)	3.907	0.142
Moderate malnutrition	4(4.1)	12(11.1)	16(7.8)		
Normal	92(93.9)	93(86.1)	185(89.8)		

***Significant at P< 0.05 means the test hypothesis is false and therefore it is rejected.**

Table 1:
Socio Demographic Characteristics of Children 0-23 Months and their Caregivers

Characteristics	Breastfed N=125 n (%)	Non-breastfed N=125 n (%)	Total N=250 n (%)	Chi-square value	p-value (2 sided)
Age (years)					
≤20	12(9.6)	18(14.4)	30(12.0)	10.665	***0.031**
21-30	84(67.2)	75(60.0)	159(63.6)		
31-40	28(22.4)	23(18.4)	51(20.4)		
41-50	1(0.8)	5(4.0)	6(2.4)		
51-60	0(0.0)	4(3.2)	4(1.6)		
Education level					
Primary	61(48.8)	65(52.0)	126(50.4)	2.1350	0.545
Secondary	36(28.8)	31(24.8)	67(26.8)		
Tertiary/ University	20(16.0)	16(12.8)	36(14.4)		
No education	8(6.4)	13(10.4)	21(8.4)		
Marital status					
Single	10(8.0)	8(6.4)	18(7.2)	1.269	0.530
Married	114(91.2)	114(91.2)	228(91.2)		
Divorced/ Widowed	1(0.8)	3(2.4)	4(1.6)		
Religion					
Christian	122(97.6)	119(95.2)	241(96.4)	1.057	0.500
Muslim	3(2.4)	6(4.8)	9(3.6)		
Occupation					
Formal Employment	14(11.2)	8(6.4)	22(8.8)	6.746	0.240
Casual employment	17(13.6)	20(16)	37(14.8)		
Commercial farming	4(3.2)	2(1.6)	6(2.4)		
Peasant farming	54(43.2)	47(37.6)	101(40.4)		
Sex of the child					
Male	68(54.4)	60(48.0)	128(51.2)	1.025	0.376
Female	57(45.6)	65(52.0)	122(48.8)		
Age of child					
2-6 months	35(28)	23(18.4)	58(23.2)	18.385	**0.001***
7-8 months	15(12)	11(8.8)	26(10.4)		
9-11 months	27(21.6)	21(16.8)	48(19.2)		
12-18 months	45(36)	48(38.4)	93(37.2)		
19-23 months	3(2.4)	22(17.6)	25(10)		

Significant at P< 0.05 means the test hypothesis is false and therefore it is rejected