The Association of Poor Nutrition and Cognitive Outcomes among 4-6 Year Old Children in KZN, South Africa.

O. R. Ajayi[1], G. Matthews[2], J. Kvalsvig[3], M. Taylor[4]
[1,2]School of Mathematics, Statistics and Computer Science.
[3,4]Discipline of Public Health Medicine, University of Kwazulu-Natal, South Africa.

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Background

- The study investigated 4-6year old children's health, nutritional status and cognitive development in a predominantly rural area of Kwazulu-Natal, South Africa.
- From the literature, studies have focused on the influence of poor nutrition and other predictors of cognitive performance of children younger than school age. [1-4]

Variables of interest

- ✓ Our analysis included Site (one of five adjacent geographic areas), Sex, Education (whether or not the child attended or had attended a pre-school or crèche), Child's HIV status (ChildHIV) (whether the child was HIV infected), Haemoglobin (ChildHb), height-for-age (zhaz), weight–for–age (zwhaz), and Age (in months).

- ✓ We hypothesized that effect of Site, Sex, Education, ChildHIV, ChildHb, zhaz, and Age would be associated with the cognitive test outcomes of the child on Atlantis, Grover counter test, Hand movement, and Conceptual thinking.

Data Analysis

- A general linear regression model was used to determine which variables were associated with each of the child's cognitive scores.

- Following this, a factor analysis was used to create a global score based on the child's four cognitive scores using the method of principal components with a varimax rotation.

- A linear model was once again employed to ascertain which of the variables of interest showed a significant association with the factor.

Results

Characteristics of participating children

Of 1581 children enrolled in the study anthropometric and cognitive data were collected from 1386 children. We report in this paper on the 1386 children from five geographic areas (1, 2, 3, 4, and 5). Approximately 50% (n= 698) of the children were male and 65% (n = 883) had received pre-school education. (Table 1a). The study recorded 62 HIV positive children, 1278 HIV negative children and 241 children with unknown HIV status. (Table 1a).

Table 1a: Descriptive statistics for categorical variables

Variable		Frequency	Percent
Site	1	222	16.0
	2	241	17.4
	3	312	22.5
	4	461	33.3
	5	150	10.8
	Total	**1386**	**100**
Sex	Male	698	50.4
	Female	688	49.6
	Total	**1386**	**100**
Pre-school	None (0)	481	35.3
	Received (1)	883	64.7
	Total	**1364**	**100**
HIV Status	Positive	62	3.9
	Negative	1278	80.8
	Unknown	241	15.2
	Total	**1581**	**100**

Table 1b: Descriptive statistics for continuous variables

Variable	n	Minimum	Maximum	Mean	Standard Deviation
Age in Months	1386	44	77	59.06	6.984
Height for age Z -score	1382	-5	3	-.94	1.015
Weight for age z -score	1384	-4	3	-.16	.949
Weight for height z-score	781	-3	4	.74	.931
Haemoglobin level	1574	6	16	10.95	1.187
Atlantis	1383	0	76	30.58	14.280
Conceptual Thinking	1369	0	20	5.06	3.661
Grover	1355	0	74	24.34	14.188
Hand movement	1366	0	15	4.51	1.907

Table 2: Results for the four cognitive tests

Cognitive test	Atlantis		Conceptual thinking		Grover		Hand movement	
source	F	p-value	F	p-value	F	p-value	F	p-value
Corrected model	21.758	.000	29.932	.000	50.357	.000	28.259	.000
Intercept	.120	.729	4.317	.038	33.884	.000	6.873	.009
site	9.058	.000	33.891	.000	14.470	.000	5.667	.000
sex	.043	.835	1.754	.186	13.393	.000	0.024	.877
education	18.279	.000	8.188	.004	41.241	.000	18.458	.000
HIV status	1.235	.291	4.233	.015	.652	.521	4.064	.017
Age in(months)	80.280	.000	82.833	.000	217.323	.000	136.289	.000
Height-for-age z-score	19.875	.000	6.071	.014	37.203	.000	13.711	.000
Haemoglobin level	.022	.882	.134	.715	3.972	.046	5.484	.019

Table 3 : F and p-values for variables in a linear regression model using factor scores based on four cognitive scores

Source	F –value	P-value
Corrected model	66.716	.000
Intercept	156.764	.000
Site	29.605	.000
Sex	3.637	.057
Pre- school Education	46.009	.000
HIV status	4.135	.016
Age (in months)	274.444	.000
Height-for-age z-score	37.012	.000
Haemoglobin level	2.635	.105

Conclusion.

This study shows a strong association of poor nutrition and cognitive outcomes among 4-6 year old children in KwaZulu-Natal, South Africa.

Pre-school education is very important in early child development.

The negative impact of HIV is evident in this study which emphasises the importance of preventing mother-to-child transmission, monitoring child's HIV status and immediate treatment of any HIV infected infants.

Local authorities in the region need to provide funds for feeding programmes and pre-school education.

References

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