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Predictors of Nutritional Status and Academic Performance of Under-Five Early Childhood Development Children in Zimbabwe

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Abstract

Despite multiple efforts to combat malnutrition of children in Zimbabwe, levels of stunting still fall short of the acceptable target of 20% by UNICEF. Malnutrition at an early age could result in irreversible damage and other far-reaching consequences such as diminished learning and school performance. Thus, this study investigated the factors affecting nutritional status and academic performance of Early Childhood Education under five years children. Nutritional status was determined using the Mid Upper Arm Circumference (MUAC) and academic performance using basic shapes and colours. Structured questionnaires were used to gather data from 216 under-five children, teachers and parents or guardians of the children in Harare and Mashonaland East Provinces of Zimbabwe. Data was analysed using descriptive statistics, frequencies and chi-square test of independence using SPSS version 23. The results showed that academic performance score for urban and rural children were 82.94% and 73.81% respectively. The average MUAC was 15.8 cm for urban and 15.7cm for rural. Academic performance and nutritional status of the ECD child were both significantly related to location of school, ECD grade, value of assets owned and years of schooling of household head. Nutrition status was also affected by marital status of the household head, relationship between the household head and the ECD child, household dietary diversity and residence ownership. Academic performance of ECD children was significantly related to the age of ECD child, distance to school and ECD child household's size, dietary diversity, income sources and total monthly income. Concentric efforts among all stakeholders aimed at reducing distance that children travel to school, improving household income and dietary diversity could reduce the incidence of malnutrition and improve children's academic performance.

Keywords: *Academic performance, early childhood development, under-five children, nutritional status, mid upper arm circumference*

1. Introduction

According to the United Nations International Children Emergence Fund (UNICEF, 2015), for every three people on the planet, one is affected by malnutrition with 50% of all the deaths in children under five being attributed to undernutrition. Malnutrition is a common problem in poor countries and has both long trm and short term adverse consequences on the overall wellbeing of the child (Martorell, 1999). In severe cases, malnutrition translates to the loss lives. UNICEF (2015) estimates that malnutrition has claimed about three million lives of young people ad a greater proportion of the mortalities are in developing countries. Undernutrition does not only result in loss of lives but has a detrimental effect on the wellbeing of children. According to Smith and Haddad (2000), malnutrition at an early age could result in irreversible damage and other far-reaching consequences such as diminished learning and school performance and reduced future earnings. Literature proclaims important synergies between malnutrition and cognitive development (Martorell, 1999 and Hall et al., 2020). Studies on growth rate and nutritional status have been well documented in developed countries but not in developing countries where not much work has been documented on anthropometric evaluations (Onimawo & Cole 2010; Srivastava et al., 2012).

Malnutrition has on several occasions noted as one of the biggest challenge to development. Rani (2018) argued that improved nutrition status of children is an important pre requisite for comprehensive development. The United Nations System Standing Committee on Nutrition (UNSCN), 2013 indicates that: "Food and nutrition security exists when all people at all times have physical, social and economic access to food, which is consumed in sufficient quantity and quality to meet their dietary needs and food preferences, and is supported by an environment of adequate sanitation, health services and care, allowing for a healthy and active life". According to Touwslager, Gielen and Derom (2011), the nutritional status of children in a population is an important indicator of health and quality of life, reflecting on the society in which they live. Emphasis is being put increasingly at global level, on well balanced and adequate nutrition for all people in the various age groups although it is predominantly on the 2-5 years preschool age group (Pinstrup-Andersen, 2009). Undernutrition in early childhood has been associated with developmental deficits of reduced cognitive development and psychosocial functioning (Grantham-McGregor et al.,2005; Scrimshaw 1996 and Walker et al., 2005). In addition, many children who experience undernutrition will be at increased risk of developing chronic diseases (Barker, 2004) as well as later physical and work incapacitation (Grantham-McGregor et al., 2005; Kabubo-Mariara *et al.,* 2006; Gaskin et al., 2014).

Sub-Saharan Africa has one of the highest levels of child malnutrition globally. In Africa, WHO (2010) reports that about 39.4% of the children under 5 years are stunted, 24.9% underweight and 10.3% wasted. The nutritional status of infants and children under five years of age is of particular concern since the early years of life are crucial for optimal

growth and development (UNICEF, 1998; Preschulek *et al.,* 1999; UNICEF et al., 2009; Wüstefeld, 2013). Zimbabwe, continues to battle poverty, child malnutrition and food insecurity just like many other sub-Saharan countries (ZimVAC,2018). According to the Zimbabwe Food and Nutrition Council (FNC), (2018) nationally, 46.5% of the children aged 4-5 years are not in school implying that 53.5% of the same age-group are in school.

The responses to the challenge of malnutrition has a long history, globally and this is well documented in literature (Hall et al., 2020). The WHO, in response to global child malnutrition challenge, set goals to reduce the number of stunted children by 40% and to maintain childhood wasting to less than 5% by 2025 (Hall et al, 2020) and the second Sustainable Development Goal reinforces the need to fight child malnutrition. The evolving nature of global child malnutrition demands a deeper understanding of both the socioeconomics drivers of malnutrition and an assessment of the factors affecting the nutritional status and academic performance of under-five Early Childhood Development children. Zimbabwe has one of the highest level of child malnutrition in the world but research into status and the actual drivers of malnutrition remains scarce. The present study seeks to provide current understanding of children's nutritional status and its key drivers thus developing baseline information that can be used by relevant stakeholders such as government planners of school nutrition programmes and NGOs when providing nutritional assistance in Zimbabwe.

2. Methodology

2.1 Brief description of study area

The study was carried out in Seke and Chitungwiza Districts of the Mashonaland East and Harare Metropolitan Provinces of Zimbabwe respectively. Chitungwiza Town is located 30km South East of Harare, has an area of 49km^2 and is 1435metres above sea level. Harare is the capital city of Zimbabwe and is a province as well. The percentages of children aged 4-5 years who are not in school are 54.7% and 45.9% in Harare and Mashonaland East Provinces of Zimbabwe respectively as shown in Figure 1. These two areas have appalling statistics on both child nutrition and school attendance.
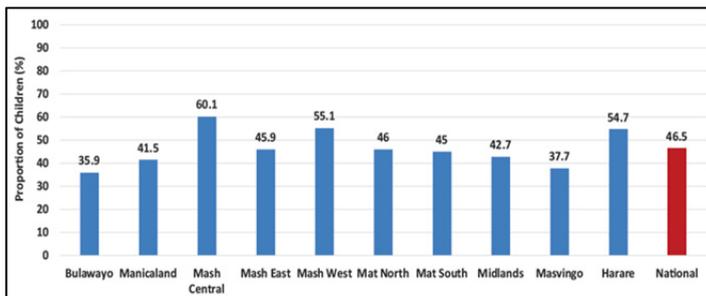

Figure 1: Proportion of ECD children aged 4 to 5 years not in school in Zimbabwe.

According to the Zimbabwe National Statistics Agency (ZimStats) (2012) about 12 percent of population of Seke District had never been to school, 59 percent were still at school while 29 percent had left school. Around 12 percent of males and 12 percent of females had never attended school. Out of the population that had never been to school, 51 percent were males and 49 percent were females. There was a slight difference between proportions of males and females for those who were at school. Furthermore, of those who had already left school, there were more females (53 percent) than males (47 percent). The literacy rate for the District was 96 percent (MoPSE, 2017a). About 10 percent of the Population for Chitungwiza District population had never been to school, while 59 percent were still at school and 34 percent had left school. Around 11 percent of males and 9 percent of females had never attended school. Out of the population that had never been to school, there were almost equal proportions of males and females. There was a slight difference between males and females for those who were at school i.e. 49 and 51 percent respectively. Furthermore, of those who had already left school, there were more females (59 percent) than males (41 percent). The literacy rate for Chitungwiza District is 99% (MoPSE, 2017b).

2.2 Research Design

A quantitative cross-sectional research design using a questionnaire as the main data collection tool was adopted for the study. Quantitative research basically tries to get answer to questions that are concrete by generating facts and numbers (Barnham, 2015; MacDonald and Headlam, 2008). The quantitative design was appropriate in this study for it granted the researchers the opportunity to get at the facts and figures about the nutritional status (MUAC) of the ECD children and their academic performance.

2.3 Sampling procedure

For purposes of data collection, the purposively sampled schools were put in two clusters namely rural and urban. A total of 8 public schools were randomly selected from the two clusters; 4 located in rural and 4 in urban area. The rural primary schools that were randomly selected in Mashonaland East Province were Besa, Marikopo, Seke rural and Jonasi while in Harare the urban schools were Tasimukira, Chinembiri, Tamuka and Fungisai. Although these schools belong to a rural province (Mashonaland East) and an urban province (Harare Metropolitan) the two districts are adjacent to each other and were ideal for the comparative assessment. A total of 216 under five ECD children and their parents/ guardians/caregivers were reached for interviews in this research from the eight randomly sampled schools with 4 from rural and 4 from urban. Both the schools and the ECD children were randomly selected to reduce researchers' biases.

2.4 Data collection methods

Data for the study was collected mainly using measurements (MUAC), questionnaires (infants and their parents/ guardians), key informant (head and 2 teachers per school) and focus group discussions (parents (1) and teachers (1) per school). Data was collected on the day the schools were hosting parents for them to participate and consent for their children to participate in the study. The MUAC of each child was recorded by the enumerator in centimetres to one decimal place from the clinic baby record card or from the area/village health worker's record after verifying with the availed MUAC tape. Figure 2 shows a MUAC measuring tape for children under five years collected while Figure 4 illustrates how MUAC tape reading is taken. The WHO classification and interpretation of MUAC values in children are shown in Table 1
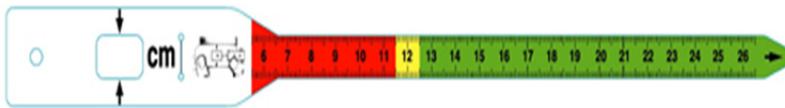

Figure 2: Children's MUAC tape
Source: WHO/UNICEF, 2009

Figure 3: Measurement of MUAC
Source: WHO/UNICEF, 2009

Table 1: MUAC cut off points

MUAC Range	Colour on Tape	Meaning
0-11.5 cm		Severe Acute Malnutrition
11.5 cm-12.5 cm		Moderate Acute Malnutrition (MAM)
12.5cm-13.5cm		Normal but at risk of MAM
13.5^{+} cm		Normal

Source: WHO/UNICEF, 2009; Chand and Shah, 2015

The enlisted enumerators were trained health workers mostly nurses. This ensured accuracy of the information on MUAC. The questionnaire collected information which include demographic and socioeconomic characteristics of the child and guardian factors such as age, gender, household size, number of chronically ill members, vulnerability status of the child whether they are orphans or disabled, their diet scores for food consumed by child in the last 24 hours, income sources and amounts per month for the household, numbers of assets and values of assets in United States (US) dollars for each child's household as well as residential ownership status. All these factors are in line with nutritional status conceptual framework (UNICEF, 1998). Each child was interviewed separately at the schools on academic performance section of the questionnaire. Enumerator had basic shapes and colours for shape naming, colour identification and sorting of coloured objects during the interviews. Each child was also asked to name the required body parts and the responses were weighted. The household dietary diversity was determined using the dietary diversity score using 9 food groups and a 24-hour recall period. The performance score was determined by the answers the child gave to the enumerator and was converted to a percent and recorded on the questionnaire.

2.5 Data analysis procedure

Data was entered and cleaned using Microsoft Excel. Data clearing was done through running of frequencies and/or means for all the variables. Data was analysed using Statistical Package for Social Sciences, SPSS (version 23). The demographic characteristics of participants, MUAC and performance scores were analysed using descriptive statistics namely frequencies and means. Statistical significance was set at $p < 0.05$ for all tests. To determine whether performance of urban and rural ECD children vary, the 2-way ANOVA test was used. Chi-square test of independence which is also known as the Pearson Product Moment Correlation Coefficient or the Pearson's chi-square (χ^2) test of independence, was used to analyse whether there was a significant relationship between nutritional status, and academic performance of the ECD children and selected variable. The variables which were examined were location of school, ECD grade, relationship with child, marital status of head of household, gender of child and head of household, OVC/disability of child, age of child and household head, no. of chronically ill in the household, diet composition, total value of assets owned, residence ownership, years of schooling by household head, distance from school, total income per month and total number of assets owned.

2.6 Ethical considerations

Permission to carry out a study makes the research authentic and makes it possible to conduct it (Christians, 2005). Permission to conduct the study was obtained, firstly; from the Permanent Secretary in the Ministry of Primary and Secondary Education and

secondly; from Provincial Education Officers for Mashonaland East in Marondera and Harare Metropolitan Provinces and lastly; the eight school heads. Permission from the MoPSE was granted on two conditions which were getting written consent from parents and /or caregivers of the minor children since minor children were to be interviewed and also that a copy of the thesis will also be submitted to the Ministry. The researcher also secured permission from the selected school teachers and selected ECD learners' parents. Confidentiality of information and anonymity of participants were assured to the participants and observed by the researchers and enumerators.

3. Results and discussion

3.1 Nutritional status and location of school

Of the 216 children interviewed, males and females were equally constituted and none of the children were in the Moderate Acute Malnutrition or Severely Acute Malnutrition categories although 2% of those from the urban schools had MUAC in the 'at risk' range of 12.5-13.5cm while their rural counterparts had 2.7% falling in this category. The rest of the interviewed children had normal MUAC measurements. The mean MUAC for urban and rural children was 15.8 cm and 15.7 respectively. The minimum MUAC values were 13.5 cm and 13.2 cm for urban and rural schools respectively as shown Figure 4. These results are in line with what was also found in Morabadad community of India and Sudan where the rural schools had children that were more malnourished than their urban counterparts (Rani, 2018; Fatima and Mohamed, 2011). The study results could be the basis for the current situation in Zimbabwe where all rural schools are supposed to get food assistance through School Feeding Programme (SFP) with the assistance of UN urgencies like WFP and NGOs like World Vision (WFP, 2018). This olive had should also be extended to urban schools since the variation in nutritional status of urban and rural school going infants is not significant. The small variation in nutritional status may probably be due to rural areas in Seke District visibly fast urbanising due to their proximity to city of Harare and Chitungwiza town.
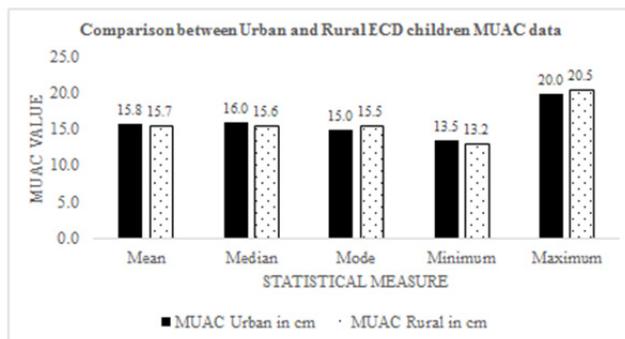

Figure 4: Comparison between urban and rural ECD children MUAC data
Source: Survey data, 2019

The mean Household Dietary Diversity score for urban (5.53) was lower than that for rural (8.30). During the research period, rural households were harvesting their food crops and selling the access to markets hence, they had a variety of food in their basket and had capital to purchase food that they require to supplement their produce. In urban areas food is becoming more and more expensive while salaries are not increasing so children end up eating mainly '*sadza*' and ordinary vegetables and rarely orange vegetables, fruits, meat, fish and eggs.

3.2 The relationship between Nutritional Status and demographic characteristics of the under-five ECD children

The demographic factors which were significantly related to nutritional status were ECD grade of the child (χ^2=70.294; p=0.007), marital status of the household head (parent, guardian or caregiver) (χ^2=197.803; p=0.006), and the relationship between the household head and the ECD child (χ^2=227.286; p=0.006) as shown in Table 1. The older the child, the better their nutrition status while those children from homes with married households had higher values of MUAC. On relationship of child, those children who were staying with their parents had higher MUAC values than those who were related otherwise. This agrees with what was discovered in Kweneng West district of Botswana where children staying with guardians had lower nutrition status than those staying with their parents (Kadima, 2012). On age it is possible that older children would have become more used to going to school and the associated eating habits such that their nutrition status would be better than the young ones. On marital status, parenting by two probably enhances food availability to the household.

3.3 The relationship between nutritional status and socioeconomic characteristics of under-five ECD children.

Household Dietary diversity (χ^2=1122.161; p=0.000), total value of assets owned by ECD child's household (χ^2=6210.828; p=0.000), residence ownership of ECD child's household (χ^2=117.315; p=0.020) as well as the years of schooling of the household head (χ^2=1074.419; p=0.000) were the variables that were significantly related to nutritional status of the under-five ECD children. Those children with higher diet scores had higher MUAC values than those with lower scores. Households with higher values of assets, owned their residence and whose household heads with more years of schooling had children with higher MUAC implying that the more wealth and educated the parents are, the higher the MUAC. This should be mainly because these people can afford to buy more food which is diverse and nutritious for their children or dependents and this concurs with what was found in Sri Lanka by Galgamuwa et al (2017) and in South Africa by Oldewage-Theronand and Egal (2010).

Table 2: Relationship between MUAC and socio-economic characteristics of ECD child and geographic location of school.

Aspect	Pearson's chi square value	significance (p value)
Location of school	81.504	0.001**
ECD Grade	70.294	0.007**
Relationship with child	227.286	0.006**
Marital status of HHD HD	197.803	0.000**
Gender of child	55.591	0.113
OVC/Disability of child	42.19	0.549
Age of child	1223.307	0.564
Age of HHD HD	1497.61	0.483
Gender of HHD Hd	80.458	0.704
No. of chronically ill in HHD	82.513	0.643
Household Dietary Diversity	1122.161	0.000**
Total value of assets owned	6210.828	0.000**
Residence ownership status	117.315	0.020**
Years of schooling by HHD HD	1074.419	0.000**
Distance from school	382.905	0.124
Total income per month	264.567	0.099
Total no. of assets owned	390.393	0.570

**shows significant factor which has a p value which is less than 0.05 (p<0.05)

Source: Survey data, 2019

3.4 Academic performance

The mean academic performance score for urban and rural ECD children was 82.94% and 73.81% respectively. There was significant variation in the performance of rural and urban under-five ECD children (P<0.05). The mean marks ranged from 5-100% in urban schools while in rural schools it was from 0-100%.

3.5 Relationship between academic performance and demographic characteristics of the ECD child and household.

Age of the ECD child (χ^2=2969.840; p=0.000), ECD grade of the child (χ^2=126.161; p=0.000), ECD child household's size (χ^2=672.487; p=0.035) were significantly related to academic performance of the ECD children. Older children tend to perform better especially in urban areas as they are exposed to preschool education from an early age due to challenges with payment and accessing of maids in many homes. Consequently, for the same reason those from ECD B performed better than their EDC A counterparts. The size of the ECD household affects performance with children from larger households performing lower probably due to resource constraints associated with larger families.

3.6 Academic Performance and socioeconomic factors.

The socio-economic variables that were significantly related to academic performance of ECD children are household dietary diversity (χ^2=1419.489; p=0.000), total value of assets owned by ECD child's household (χ^2=9991.764; p=0.030), total number of income sources (χ^2=236.306; p=0.000), total income per month of ECD child household (χ^2=5298.708; p=0.000), years of schooling of the household head (χ^2=1619.948; p=0.000), as well as distance from the ECD school from home (χ^2=693.927; p=0.000) as shown in Table 3. More educated parents and those of higher socio- economic status may cause parents' willingness to be more involved in the education of their children. Such children may also have enhanced regard for learning and also stronger work orientation than children of parents with slightly lower socio-economic status who are less educated (Bettelheim, 1987). Onzima (2010) concurs that parents' education level is a key determinant of a student's academic performance in school.

Table 3: Relationship between the ECD child's academic performance and selected demographic, geographic location and socio-economic variables

Factor	Pearson Chi-square Value	Significance (p value)
Location	125.986	0.000**
ECD Grade	126.161	0.000**
Relationship with child	218.823	1.000
Marital status of HHD HD	264.991	0.470
Gender of child	86.552	0.191
OVC/Disability of child	55.806	0.960
Age of child	2969.840	0.000**
Age of HHD Hd	2615.745	0.327
Gender of HHD Hd	89.070	1.000
No. of chronically ill in HHD	169.226	0.161
HHD size	672.487	0.035**
MUAC	3057.446	1.000
Diet composition	1419.489	0.000**
Total value of assets owned	9991.764	0.030**
Residence ownership status	152.527	0.473
Years of schooling by HHD HD	1619.948	0.000**
Distance from school	693.927	0.009**
Total No.of income sources	236.306	0.000**
Total income per month	5298.708	0.000**
Total no. of assets owned	692.248	0.405

3.7 Policy implication and recommendations

School feeding programmes (SFP) should be done in mainly rural schools without ceasing to guard against deteriorating nutrition amongst the 'at risk' children and also maintain the good nutrition status that exist. SFP should give special treatment to under five children as the younger ones may not be familiar with feeding themselves outside their homes because of young age. SFP programmes should not just have cereals like

what is happening in most Zimbabwean rural schools. A diversified diet should be promoted and designed by trained nutritionist with input from the children and guardians not the current top down approach currently being used in Zimbabwe. The diet should take into full consideration the infants' preferences and location as opposed to the current 'one size fits all approach.' Nutrition sensitive living should be advocated for in every home through advocacy, training and promotion of own food production. The promotion of home gardens could assist in boosting the nutritional status of infants in Zimbabwe. To reduce distance travelled to school by ECD children, especially in rural areas it is key that ECD centres be established at village or cluster level. Parents on the other hand should be encouraged to have under five children attend schools that are near their homes to reduce their time of travel and also increase their time on playing to sharpen psychomotor and cognitive development. Marriage counselling services should be increased in both rural and urban areas to reduce divorces and keep marriages intact so that the nutrition status of young children is not negatively impacted. Microfinancing of households and formation of ISALs should encouraged by NGOs and Government so as to enable households to engage in income generating projects which increase household incomes and purchasing power.

4. Conclusion

Although there were no cases of severe and moderate acute malnutrition amongst the interviewed infants, the existing high number of well-nourished children should never be allowed to deteriorate and those in the risk range should be monitored and provided with adequate food through programmes such as school feeding schemes and health education to household heads. There was a significant relationship between nutrition status of infants aged between 4 and 5 years and location of the school, ECD grade of the child, marital status of the household head, relationship between the household head and the ECD child, diet score, total value of assets owned by ECD child's household, residence ownership status of ECD child household and years of schooling of the parent or guardian. Academic performance of ECD children had a significant relationship with location of the school, age of the ECD child, ECD grade of the child, ECD child household's size, diet score, value of assets owned, income sources, total income, years of schooling of the household head and distance of the ECD school from home. There is clear evidence that the study assists all those who are involved with children under-five like relevant government line ministries, parents, guardians, teachers and the communities to understand the importance of nutrition and other factors on academic performance of the under-five ECD children.

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