

# Adequacy of Nutritional Levels at Local Orphanage Homes

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**Abstract:** *The dietary patterns and nutritional adequacy at 3 orphanages in a local town, Gweru in Zimbabwe was determined. Three components of nutritional assessment were used to assess the nutritional status of the children namely anthropometry measures, focussing on weight, height and body mass index (BMI), clinical assessment of the skin, hair, mouth, muscles, blood pressure and fluid retention and dietary assessment of carbohydrate, protein, vitamin A, iron, zinc, calcium and folate intake using a quantitative food frequency questionnaire. Nutritional status indicated that 80, 53.3 and 13.4% of children from Blue hills hostel, Midlands children hope centre and Midlands children's home respectively had low weight for their age. Average servings per day from all the three orphanages did not meet recommendations of MyPyramid and "5 A Day" for combined fruit and vegetables. Results revealed that from the three orphanages no food variety was provided from all the five food groups as the most frequently consumed foods were sadza and beans as the common source of protein.*

**Keywords:** anthropometric, clinical assessment, malnutrition, nutrition, orphanage

## 1. Introduction

One of the most telling and troubling consequences of HIV/AIDS epidemic is the overwhelming number of orphans. Currently more than thirteen million children under the age of fifteen have lost one or both parents to HIV/AIDS in Sub-Saharan Africa [1]. In 1999, the Government of Zimbabwe adopted the Zimbabwean National Orphan Care Policy, which set forth its response to the orphan crisis [2]. Despite government policy and sustained advocacy by international child welfare organizations, residential care facilities have continued to proliferate in Zimbabwe with the number of orphans estimated at more than 1.6 million for children under fifteen years [3].

According to Lucas cited in Sadik [4] (2010) nutritional inadequacy has a serious negative impact on the growth and development of children. Children both under parental care and non-parental care need adequate nutrient intake to meet their nutritional needs. In Zimbabwe, 12 000 children die every year due to malnutrition [5]. The most prevalent forms of malnutrition in younger children in Zimbabwe is Kwashiorkor which is a form of childhood protein energy malnutrition characterized by oedema, irritability, anorexia, ulcerating dermatoses, and enlarged liver with fatty infiltrates [6]. The insufficient protein consumption, but with sufficient calorie intake, distinguishes it from marasmus. Generally the disease can be treated by adding protein to the diet. However, malnutrition in all its forms regardless of child's age can have a long term impact on a child's physical and mental development [7], and in severe cases may lead to death. Therefore, proper nutrition during childhood help prevent nutrition related diseases and the risk of chronic diseases later in adulthood [6], [8], [9].

The main objective of this study is to determine dietary patterns and nutritional adequacy at orphanages in Gweru

thus provide the nutritional status of children. The majority of the children's homes in Zimbabwe are institution type which house orphaned and vulnerable children (OVC) in dormitories [5]. Promoting children's health and nutrition in homes is therefore a priority and requires attention by all. This study plays an important role in highlighting ways to prevent nutrition and health related diseases in children.

## 2. Method

### 2.1 Sampling

Forty five children, comprising 31 boys and 14 girls aged between six and eighteen years and eight orphanage personnel were randomly selected. The study was conducted at three orphanages namely Midlands children's home (1), Blue hills hostel (2) and Midlands children hope Centre (3) in Gweru urban.

### 2.2 Assessment

Quantitative food frequency questionnaire in form of food log sheets and interviews were used to assess nutritional status of the children. The children's anthropometric data in form of weight, height and blood pressure was measured. Clinical assessment of the skin, hair, mouth, muscles and fluid retention was done on children.

## 3. Results and Discussion

### 3.1 Demographic data

Table 1 shows the demographic data of children in the three orphanages. The age of the children varied between six and eighteen years. Orphanage 1 had 27% males (M) and 33% females (F) within the age group range 6-11 years. The age group 12-18 years comprised 20% males and 20% females.

Orphanage 2 indicates 13.3 and 20% males and females respectively between 6-11 years. The age group 12-18 years comprised of 40% males and 26.6% females. Orphanage 3 was a facility for males only with 13.3 and 86.7% children in the 6-11 and 12-18 years categories respectively.

**Table 1:** Age distribution of children in orphanages

Age (years)	Orphanage					
	1		2		3	
	M	F	M	F	M	F
6-11	4	5	2	3	2	0
12-18	3	3	6	4	13	0
Total	7	8	8	7	15	0

**3.2 Anthropometry measures**

**3.2.1 Weight for age distribution**

Table 2 shows the Z score distribution of weight for age in the orphanages. Orphanage 1 indicates that 80% of the orphans had a normal weight while 13.3% were underweight. Only one female (6.7%) was overweight. An equal number of males (40%) and females (40%) were underweight in orphanage 2. Only 20% of the orphans were normal weight. No orphan was overweight for age in orphanage 2. Orphanage 3 had 46.6% of the children with normal weight for age while 53.3% were underweight. No child was overweight.

Orphanage 2 (Blue hills hostel) had the highest children (80%) with underweight for age. This could be explained by the fact that the government funded Blue hills hostel operates on strained budget and had challenges in meeting nutritional needs for orphans. The other two orphanages are private owned and received most of their basic food provisions from more reliable and financially stable non-governmental organizations.

**Table 2:** Z score distribution of weight for age in orphanages

Z Score	Orphanage					
	1		2		3	
	M	F	M	F	M	F
$z \leq -2$ (Underweight)	1	1	6	6	8	0
$z > -2, z < +2$ (Normal weight)	6	6	2	1	7	0
$z \geq +2$ (Over weight)	0	1	0	0	0	0
Total	7	8	7	7	15	0

**3.2.2 Stature for age**

The Z score stature for age distribution for orphans is shown in Table 3. All (93.3%) except for one short for age female had normal height for age in orphanage 1. In orphanage 2, 66.6% orphans had a normal height for age while more females (20%) had stunted height for age than males (6.7%). None of the females had above normal height while 6.7% males had height above normal. A total of 86.6% of the children had a normal height for age in orphanage 3 while 13.3% had stunted height for age. None of the children had stunted height above normal.

The results of this study revealed that stature for age distribution reflected normal values of 93%, 86.6% and

66.6% for Midlands children’s home, Midlands children hope centre and Blue hills hostel respectively.

Guthrie [10] pointed out that short stature is primarily due to chronic deficiency of energy, protein and micronutrients (iodine, zinc, calcium or vitamin D). In girls, short stature for age would expose them to obstetric risk such as difficult and obstructed labours and deliveries and risk of foetal growth retardation later in adulthood [11]. Darwin and Lisah [12] argued that catch up growth to some degree may be possible throughout childhood and early adolescence, but may not be complete. Therefore, stunting carries serious physical, cognitive and economic consequences.

**Table 3:** Z score stature for age distribution of orphans

Z Score	Orphanage					
	1		2		3	
	M	F	M	F	M	F
$z \leq -2$ (Short)	0	1	1	3	2	0
$z > -2, z < +2$ (Normal height)	7	7	6	4	13	0
$z \geq +2$ (Tall)	0	0	1	0	0	0
Total	7	8	8	7	15	0

**3.3 Z score distribution of BMI**

The Z score distribution of BMI for age of orphans is shown in Table 4. The BMI was calculated from the weight and height of orphans. A total of 73.3% of orphans had normal BMI in Orphanage 1. More males had a normal BMI than females (33%). A total of 20% of the children were underweight. Despite low fat diet in orphanage 1, 6.7% of the children were overweight. This could be hereditary [13]. Wardlaw *et al* [14] argue that if sound nutrition and exercise habits are developed early and are followed throughout life, obesity can be avoided despite a genetic predisposition. According to Peckenpaugh [15] overweight and obesity may expose children to lifelong health problems (heart disease, hypertension and diabetes) in adult years. Emphasis is to encourage changing in energy by adopting healthy, low fat foods such as whole grains, fruits, vegetables, lean meat and reduced fat dairy products [16].

Orphanage 2 had 26.6% males and 13.3% females with normal BMI for age while 26.6% of the males and 33.3% of the females were severely wasted. None of the children were at risk of overweight. No orphan was overweight in orphanage 3. Less number of males (40%) had normal BMI compared to severely wasted males (60%).

**Table 4:** Z score distribution of BMI for age in orphanages

Z Score	Orphanage					
	1		2		3	
	M	F	M	F	M	F
$z \leq -2$ (Low BMI)	1	2	4	5	9	0
$z > -2, z < +2$ (Normal BMI)	6	5	4	2	6	0
$z \geq +2$ (Over-weight)	0	1	0	0	0	0
Total	7	8	8	7	15	0

### 3.4 Clinical assessment

According to Gibney *et al* [11], clinical assessment of nutritional status attempts to identify the initial nutritional state as well as the interplay of the factors influencing the progression or regression of nutritional abnormalities. Physical assessment of the children’s skin, hair, mouth, muscles and fluid retention was conducted to determine signs of good and/or poor nutritional status.

The study revealed that all the children from two orphanages (Midlands children’s home and Midlands children’s hope centre) had smooth moist skin while children from Blue hills hostel had almost three quarters of the children (73.3%) having smooth moist hair. The remaining children (26.6%) had pale scaly skin suggestive of vitamin A deficiency. According to Smolin and Grosvenor [13], vitamin A is essential for maintenance of epithelial tissue that contains cells which produce mucus for lubrication. This type of tissue covers external body surfaces including the skin and lines internal cavities and tubes. When vitamin A is deficient, epithelial surface become hard and dry, a process called keratinization [13]. Guthrie [10] concurs asserting that, dry rough skin may be an early sign of vitamin A deficiency causing a condition known as folliculosis in which small bumps form near the base of the hair follicles later become hardened or keratinized.

Most (89%) of the children (n=45) from all the three orphanages had firm lustrous hair while 11% had dry brittle hair and dry scalp an indication of possible protein deficiency. Proteins perform a structural function as they are part of the cell membrane, the cytoplasm, and the organelles [14]. According to Peckenpaugh [15] hair is largely composed of proteins and when the diet is deficient in protein, the hair becomes thin, brittle and is easily pulled out by its roots.

According to Gibney *et al* [11] strength testing of muscles is done to evaluate for generalized and localized muscle weakness. Results of this study indicated that most (82%) the children (n=45) had well developed muscles. The remaining (18%) showed severely wasted muscles a possible indication of chronic malnutrition. The research study showed that 93% of all the children (n=45) had good coloured lips and no sores in and around the mouth while 7% had dry lips with angular lesions (cheilosis). According to Peckenpaugh [15] angular cheilosis may be caused by vitamin B complex deficiency, vitamin C deficiency as well as vitamin A toxicity. Assessing blood pressure during childhood is essential due to the relationship of elevated blood pressure levels with heart disease, stroke and other medical problems. The blood pressure of all the children from all the three orphanages was normal.

### 3.5 Dietary assessment

Fig. 1 shows daily uptake of selected nutrients in the orphanages for the age group 6-11 years. Overallly the orphanages provide proteins, carbohydrates, vitamin A, iron,

zinc, calcium and folate intake below daily recommendations (RDA) [17]. Orphanage 2 (Blue hills hostel) had the least intake of protein (15.42 g), carbohydrate (48.19 g), vitamin A (77.73 mg), iron (2.55 mg) and folate (83.12 mg) except calcium intake which is more than twice (159.88 mg) as much as orphanage 3 intake (60.29 mg).

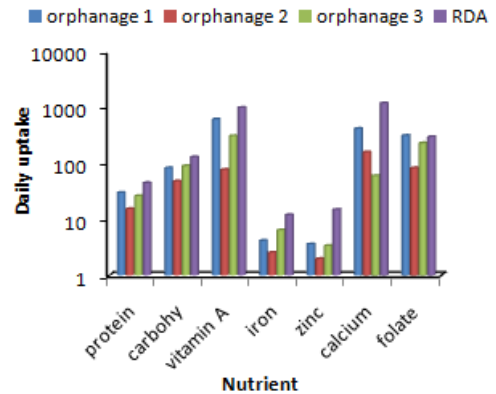


Figure 1: Intake of selected nutrients by 6-11 years age group in orphanages

Daily uptake of selected nutrients in the orphanages for the age group 12-18 years is shown in Fig. 2. All the orphanages did not meet the recommended intake for protein, carbohydrate, vitamin A, zinc, iron, calcium and folate. However, orphanage 1 (Midlands children’s home) had the highest intake of protein, vitamin A, calcium and folate. Orphanage 2 (Blue hills hostel) had the least intake of all the selected nutrients.

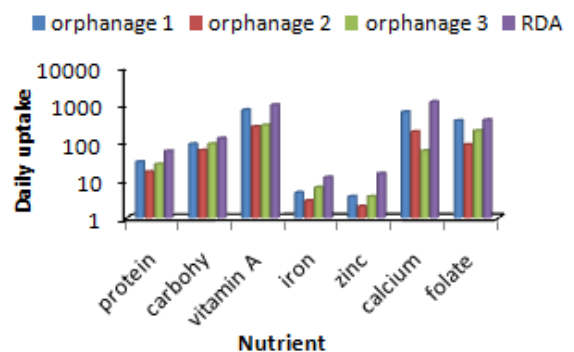


Figure 2: Intake of selected nutrients by orphans in 12-18 years age group

### 3.6 Daily Food Servings at Orphanages

A diet consisting of recommended servings of grain, vegetable, fruit, meat and dairy promotes growth and development in children and also decreases the risk for developing chronic diseases later in life [4]. Food daily servings at the orphanages are shown in Fig. 3. Children between 6-18 years from all the three orphanages consumed less than the recommended servings per day of grains, vegetables, fruits, meat and dairy as compared to the recommendations of the MyPyramid 2005 [18]. Midlands children’s home and Midlands children hope centre had the same average servings per day for grain (3.6) and vegetable (1.4) while Blue hills hostel had lower servings of 3.5 and

1.2 for grain and vegetable respectively. Fruit servings were low with average servings of 1.5, 1.4 and 0.7 for Midlands children hope centre, Midlands children's home and Blue hills hostel respectively. All the three orphanages had also low meat servings per day with Blue hills hostel having the least serving of 0.7 followed by Midlands children's home (1.1) and Midlands children hope centre (1.2). Dairy was only provided at Midlands children's home with extremely low serving of 0.2 per day. MyPyramid 2005 recommends minimal daily servings of 5-10 (grains), 2-3.5 (vegetables), 1.5-2.5 (fruits), 3 (dairy) and 5-7 (meat) for age group 6-18 years. Lack of dairy serving could possibly affect children's protein, calcium and riboflavin intake which are essential for growth and tissue, muscle and bone development. Results also revealed that recommendations of "5 A Day" for combined fruit and vegetables were not met by the three orphanages [19]. Fruit and vegetable intake consisting of five servings per day has shown to have a decrease in risk for developing cancer and cardiovascular disease [15]. The American Heart Association also support the recommendation for the consumption of five servings of fruits and vegetables daily [14].

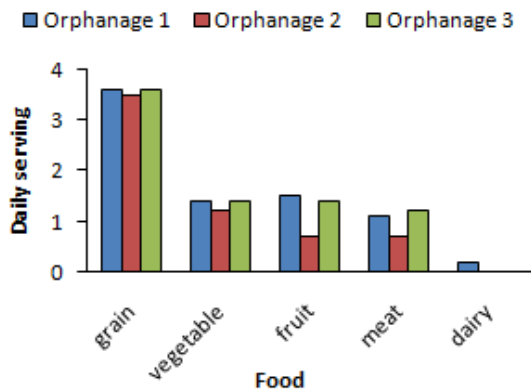


Figure 3: Food daily servings at 3 orphanages

### 3.7 Orphanage personnel information

The staff at these orphanages cited several major challenges encountered in running orphanages. All the orphanages had insufficient funding to meet nutritional needs with government sponsored Blue hills hostel being affected most. Funding limited food quantities provided to children impacting negatively on nutrient intake. There was no specific menu on all orphanages due to lack of food provisions resulting from financial constraints.

80% of the care givers (cooks) had no catering or nutrition qualification. Inadequate training affects meal planning, preparation and service. One of the orphanages (Midlands children hope centre) had only one untrained care giver to look after 27 children.

There were no standardized food preparation methods on orphanages. Knowledge in food preparation and service was not well implemented in all the three orphanages due to lack of regular staff development programs. Staff training programs were conducted only once a year.

All the orphanages had inadequate and obsolete kitchen equipment. Limited cooking and serving equipment affected food portion sizes. The quality of food was possibly affected by the outdated kitchen equipment such as stoves and refrigerators.

Sadik [4] also found similar challenges in their studies in orphanages in Tamale, Ghana and Uganda respectively. This could possibly be common challenges faced by orphanages in developing nations.

## 4. Conclusion

This study has revealed nutritional inadequacy of diets offered in orphanages in Gweru. Factors that influence nutritional adequacy in the three orphanages were also established namely, inadequate funding, inadequate and obsolete kitchen equipment, untrained catering personnel and last but not least, expired and poor quality food donations. There is a large knowledge gap in the nutritional status and requirements of the children in orphanages. Children growing up in orphanages are most vulnerable and disadvantaged members of the society, especially if measures to provide adequate food intakes are not addressed. The study of this nature helps to establish nutritional status of children in orphanages and identifies appropriate nutrition programs to be implemented.

This study recommends adequate training of orphanage personnel, establishment of projects such as, poultry, piggery and nutritional garden that help to compliment food donated. There is need for monitoring the implementation of nutritional policies, standards and guidelines in child care institutions by the responsible boards and surveillance programs to reduce the risk of macro and micronutrient deficiencies in children.

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## References

- [1] UNIADS, Report on the Global AIDS epidemic, New York, 2010.
- [2] G. Powel, T. Chinake, W. Mudzingo, W. Maambira, S. Mukutiri, Children in Residential Care: The Zimbabwe Experience, Ministry of Health and Child Welfare, Harare, 2004.
- [3] UNICEF, First Call for children, New York, 2011.
- [4] A. Sadik, "Orphanage Children in Ghana: are their Dietary Needs Met?" Parkinston Journal of Nutrition, 9, pp. 844-852, 2010.
- [5] UNICEF, Africa's Orphaned and Vulnerable Generations: Children Affected by AIDS, New York, 2012.
- [6] F. Gómez, R.R. Galván, J. Cravioto, "Malnutrition and Kwashiorkor," Acta Paediatrica, 43(s100), pp. 336-357, 1954.

- [7] R.L. Guerrant, R.B. Oriá, S.R. Moore, M.O.B. Oriá, A.A.M. Lima, "Malnutrition as an Enteric Infectious Disease with Long Term Effects on Child Development, Nutrition Reviews," 66(9), pp. 487-505, 2008.
- [8] S.R. William, Nutrition and Diet Therapy, Mosby, London, 2007.
- [9] C. Doak, "Large-scale Interventions and Programmes Addressing Nutrition-Related Chronic Diseases and Obesity: Examples From 14 Countries," Public Health Nutrition, 5(1), pp. 275-277, 2002.
- [10] H.A. Guthrie, Introductory Nutrition (7<sup>th</sup> edition), Mosby College Publishing, Boston, 1992.
- [11] M.J. Gibney, M. Eliah, O. Ljungqvist, J. Dowsett, Clinical Nutrition, Blackwell Publishing Company, USA, 2005.
- [12] D. Darwin, H. Lisah, The Complete Guide to Nutrition in Primary Care, Blackwell Publishing Ltd, USA, 2007.
- [13] L.A. Smolin, M.S. Grosvenor, Nutrition, Science and Applications (3<sup>rd</sup> Edition), Harcourt College Publishers, USA, 2000.
- [14] G.M. Wardlaw, A.M. Smith, Contemporary Nutrition (8<sup>th</sup> Edition), McGraw-Hill, USA, 2011.
- [15] N.J. Peckenpaugh, Nutrition Essentials and Diet Therapy, Saunders, China, 2010.
- [16] M. Nardella, Nutrition Interventions for Children with Special Care Needs, Washington State Department of Health, USA, 2002.
- [17] A.H. Lichtenstein, L.J. Appel, M. Brands, M. Carnethon, "Diet and Lifestyle Recommendations Revision 2006 A Scientific Statement from the American Heart Association Nutrition Committee," Circulation, 114, pp. 82-96, 2006.
- [18] P.M. J. Guenther, Reedy, S.M. Krebs-Smith, "Development of the Healthy Eating Index-2005, Journal of the American Dietetic Association, 108(11)," pp. 1896-1901, 2008.
- [19] A. Naska, V.G.S. Vasdekis, A. Trichopoulou, S. Friel, "Fruit and Vegetable Availability Among Ten European Countries: How Does it Compare with the 'Five-a-day' Recommendation?" British Journal of Nutrition, 84, pp. 549-556, 2000.



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