

## Factors Influencing Malnutrition among Under Five Children at Kitwe Teaching Hospital, Zambia

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**Abstract:** The nutritional status of under-five children in the country is one of the indicators of the countries health status as well as its economic status. Malnutrition is capable of affecting the physical growth, mortality, morbidity, cognitive development, reproduction, and physical work capacity. It is one of the underlying factors in many diseases affecting children today. This study aimed at identifying and determining the factors influencing malnutrition among the under five children admitted at Kitwe Teaching Hospital. An unmatched case control study was conducted. A total of 236 children were recruited in this study with 79 being malnourished and the rest not malnourished. Data collection was done using structured questionnaires. Following placement of the data in regression models, the factors that were found to be significantly associated with child malnutrition were child's birth weight (Adjusted OR= 30.83, 95% CI 3.43-277.43), the number of meals per day (Adjusted OR= 379.54, 95% CI 32.50-4433.25) and the mother's knowledge of the causes and prevention of malnutrition (Adjusted OR= 549.61, 95% CI 47.27-6490.71). The findings of this study showed that malnutrition in children that are admitted at Kitwe Teaching Hospital was dependent on a number of factors. Some of these factors were birth weight of the child, number of meals given to a child in a day and the parent's knowledge about malnutrition. Therefore, intensifying health education and antenatal care could contribute in the reduction of malnutrition cases in under-five children.

**Keywords:** Malnutrition, Demographic factors, Social economic factors, Health related factors, Under-five children, Kitwe Teaching Hospital.

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### Introduction

Malnutrition is one of the leading causes of morbidity and mortality in children under the age of five in developing countries and is said to be responsible for about 45% of all child deaths (WHO, 2006). In Zambia, the setting for the current study, chronic malnutrition or stunting affects 45 per cent of children under five. This remains the most common nutritional disorder, being slightly above the sub-Saharan Africa average of 42 per cent (CSO, 2009) and the eighth highest rate in the world (UNICEF, 2013).

The World Health Organization defines malnutrition generally as both under nutrition and over nutrition, but in this study the term is used to refer solely to a deficiency of nutrition. A well-nourished child is one whose weight and height measurements compare very well with the standard normal distribution of heights and weights of healthy children of the same age and sex (Salah *et al.*, 2006). Many factors can cause malnutrition, most of which relate to poor diet or severe and repeated infections, particularly in underprivileged populations. Inadequate diet and disease, in turn, are closely linked to the general standard of living, the environmental conditions, and whether a population is able to meet its basic needs such as housing, food and health care (WHO Guide on Malnutrition, 2002).

Being one of the tertiary hospitals with a high admission number in Copperbelt Province of Zambia, Kitwe Teaching Hospital is also known for its cases of malnutrition in children. According to the Kitwe Teaching Hospital-Hospital Information Management System (2016), the hospital had a total number of 242 malnutrition cases with 79 deaths recorded in 2016. Because of the serious complications of malnutrition in this country, this study focused on determining the factors influencing malnutrition among the under five children at Kitwe Teaching Hospital. This is a very important study as it will improve on the knowledge people have about the causes of malnutrition and could also influence the formulation of appropriate policies that will aim at addressing the factors of malnutrition. The relevant interventions could then be formulated with the aim of reducing the incidence of malnutrition in the District and the Country at large.

## Methodology

### Study Site

The study was conducted from Kitwe Teaching Hospital, located in the Kitwe District of the Copperbelt Province of Zambia. Kitwe teaching Hospital is the second biggest hospital in the Copperbelt Province of Zambia. Located in the Centre of the Copperbelt Province, this hospital receives a number of referral cases from surrounding districts of the Copperbelt Province, the North-western Province as well as Luapula Province of Zambia. The hospital has a total number of 630 bed spaces.

### Study population

The study was conducted on parents of children admitted for malnutrition and those of children admitted for other conditions not related to malnutrition. The cases were the parents of the malnourished children while the controls were the parents of the nourished children admitted for other conditions.

### Study Design

This was an unmatched case control study. The data was collected by interviewing parents of children aged 12-59 months admitted at KTH Pediatric wards.

### Sample size

For this study the sample size was ascertained using the 'Stalcalc' function of Epi Info Version 7.1.5. A confidence level of 90% and Power of 80% were used. The ratio of controls to cases was set at 2 whilst the percentage of controls exposed was set at 40% due to fact that population of controls was only be picked from paediatrics patients admitted to KTH for other conditions which are not related to malnutrition and not from outside. The least extreme Odds Ratio to be detected was set at 2.0 and the percentage of cases with exposure therefore showed 57.1%. Using the Kelsey's formulae, a sample size of 236 children were 79 are the cases and 157 are the controls was found.

### Study period

This study was done within a period of one year.

### Sampling method

The selection of participants in this study was done on the first come first serve basis.

Inclusion and Exclusion criteria

The inclusion criterions were;

- All parents of Children between the ages of 12-59 months admitted at KTH.
- Parents willing to give consent.

The exclusion criteria were;

- Parents with children below the age of 12months.
- Parents with children above the age of 59 months.
- Parents not willing to give consent.

### Data tools

In this study, a questionnaire was used to collect data. The questionnaire contained questions aimed at gathering adequate information in line with the specific objectives of this project. Some of these questions were, parent or guardian's details, child's details, knowledge about malnutrition, feeding habits and illnesses and social-economic status.

### Permission

Permission to conduct the study was gotten from the Senior Medical Superintendent of KTH. The Head of the Paediatrics Department was fully informed about this study.

### Enrolment

The objectives of the study were fully explained to the parents and a consent form was to be signed for them to be enrolled in this study. The malnourished cases as well as the controls were then be identified with the help of the in patients hospital register. Lastly, a questionnaire was administered to the parents of the healthy and those of the malnourished children.

### Data Management

The collected data was carefully coded, entered and analysed. All inconsistencies in the data were also checked. In addition, any missing data was to be documented. This data was then analysed using the SPSS version 22.

### Ethical consideration

The ethical clearance was obtained from the Tropical Disease Research Centre (TDRC) Ndola Teaching Hospital and Kitwe Teaching Hospital research ethics committee. Any participant in this study first had to agree by signing the consent form. The reason for this study was well explained to them and those who did not show interest in taking part in this study were allowed not to do so. Those who were willing but did not give consent were also not allowed to take part. The data that was collected for this study was confidential and anonymous. All the ethical issues such as plagiarism, misconduct, informed consent and falsification were strictly observed.

### Results

A total of 236 children were recruited in this study with 79 being malnourished and the rest not malnourished.

### Characteristics of participants

Of the 236 children, 41.1% (97) were females. The ages ranged from 7-49 months. The mean age was 21.8 months (SD±9.724).

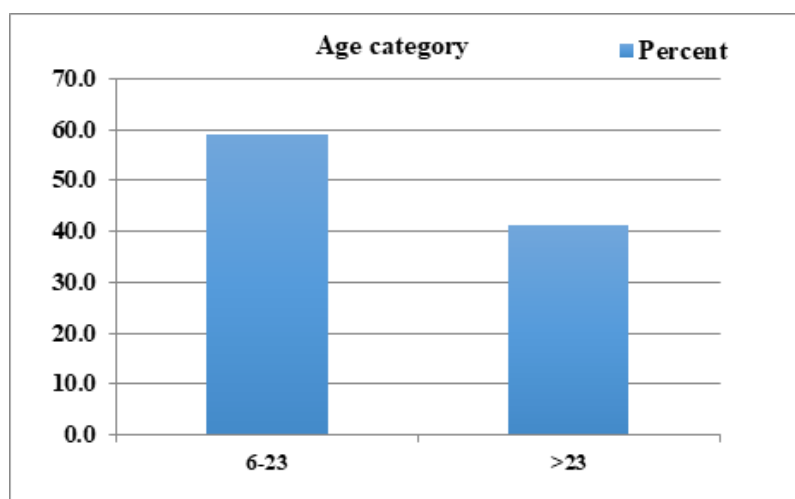


Figure 1. Distribution of the ages of participants

### Association of demographic factors with malnutrition

Several demographic characteristics were analysed using bivariate analysis at 95% confidence interval. The results are summarised in table 1. The age category of 6-23 months had the highest number of malnourished children with a percentage of 70.9%. There were more malnourished males as compared to females. However, this result was not statistically significant because p value was found to be p=0.210.

Table 1. Bivariate analysis of demographic factors at 95% confidence interval (n=236)

Factors	Malnourished f (%) (n=236)	Not malnourished f (%) (n=236)	P value (0.05)
<b>Age Category</b>			
6-23	56(70.9%)	83(52.9%)	0.008*
>23	23(29.1%)	74(47.1%)	
<b>Sex</b>			0.210
Male	51(64.6%)	88(56.1%)	
Female	28(35.4%)	69(43.9%)	

### Association of health related factors with malnutrition

The results are shown in the table 2. About 40.5% of the malnourished children showed their mother were poorly attending antenatal. However, 95.5% percent of children who were not malnourished had mothers with history of a good antenatal attendance. 38.0% of the malnourished children were from mothers who were HIV positive. Most of the malnourished children (94.9%) were delivered from health institutions, though the relationship was not significant cause of a 0.650 p-value. The analysis also showed that 63.3% of the malnourished children were underweight at birth. Immunisation was not up to date in 24.1% of the malnourished children.

**Table 2. Bivariate analysis of health related factors at 95% confidence interval (n=236)**

Factors	Malnourished f (%) (n=236)	Not malnourished f (%) (n=236)	P value (0.05)
<b>ANC attendance</b>			
Good	47(59.5%)	150(95.5%)	<0.001*
Poor	32(40.5%)	7(4.5%)	
<b>HIV status</b>			
Positive	30(38.0%)	13(8.3%)	<0.001*
negative	49(62.0%)	144(91.7%)	
<b>Place of delivery</b>			
Institutional	76(96.2%)	149(94.9%)	0.650
Non institutional	3(3.8%)	8(5.1%)	
<b>Birth weight</b>			
Normal	29(36.7%)	139(88.5%)	<0.001*
Underweight	50(63.3%)	18(11.5%)	
<b>Immunisation</b>			
Up to date	60(75.9%)	150(95.5%)	<0.001*
Not up to date	19(24.1%)	7(4.5%)	

**Association of social and economic factors with malnutrition**

Results are shown in the table below. Majority (73.4%) of the malnourished children came from low class areas. A greater percentage (77.2%) of malnourished children received small meals per day. 16.5% of the malnourished children were poorly breastfed. Only 1.3% of the malnourished children were living with guardians. However this result was not significant cause of a 0.710 p-value. 63.3% percent of the malnourished children had mothers with 15-25 age range though the results were also not statistically significant cause of a 0.431 p-value.

Most of the malnourished children mothers only went up to primary level in terms of education. The result was not statistically significant because p was equal to 0.63. 79.7% of the mothers of malnourished children had no knowledge of the causes and prevention of malnutrition. Majority (83.5%) of mothers with malnourished children were married but a p of 0.825 made this result statistically insignificant. It also turned out that 88.6% of the malnourished children had a family monthly income of less than K500. 19% of the malnourished children came from large household size.

**Table 3. Bivariate analysis of social and economic factors at 95% confidence interval (n=236)**

Factors	Malnourished f (%) (n=236)	Not malnourished f (%) (n=236)	P value (0.05)
<b>Address</b>			
Low class	58(73.4%)	5(3.2%)	<0.001*
Middle class	21(26.6%)	135(86.0%)	
High class	0(0%)	17(10.8%)	
<b>Meals per day</b>			
Adequate	18(22.8%)	155(98.7%)	<0.001*
Small	61(77.2%)	2(1.3%)	
<b>Breastfeeding practice</b>			
Breast fed	66(83.5%)	153(97.5%)	<0.001*
Not breast fed	13(16.5%)	4(2.5%)	

<b>Parents identity</b>			
Mother	78(98.7%)	154(98.1%)	<i>0.710</i>
Guardian	1(1.3%)	3(1.9%)	
<b>Mothers age</b>			
15-25	50(63.3%)	91(58.0%)	<i>0.431</i>
>25	29(36.7%)	66(42.0%)	
<b>Mothers level of education</b>			
None	0(0%)	4(2.5%)	<i>&lt;0.001*</i>
Primary	52(65.8%)	39(24.8%)	
Secondary	26(32.9%)	100(63.7%)	
Tertiary	1(1.3%)	14(8.9%)	
<b>Mothers knowledge on malnutrition</b>			
Knowledgeable	16(20.3%)	155(98.7%)	<i>&lt;0.001*</i>
Not knowledgeable	63(79.7%)	2(1.3%)	
<b>Marital status</b>			
Single	11(13.9%)	13(8.3%)	<i>0.407</i>
Married	66(83.5%)	139(88.5%)	
Separation	2(2.5%)	5(3.2%)	
<b>Total monthly income</b>			
<K500	70(88.6%)	9(5.7%)	<i>&lt;0.001*</i>
K500-1000	9(11.4%)	51(32.5%)	
>K1000	0(0%)	97(61.8%)	
<b>Household size</b>			
Adequate	64(81.0%)	145(92.4%)	<i>0.010*</i>
Large	15(19.0%)	12(7.6%)	

### Multiple logistic regressions of the significant factors

All the factors found to be significant in bivariate analysis (with  $p < 0.05$ ) were analysed using the multivariate logistics regression then a backward step by step elimination method was used to manually eliminate factors with insignificant p-values.

Only three factors remained significant after this analysis. These were child's birth weight, the number of meals per day and the mother's knowledge of the causes and prevention of malnutrition.

Children who were underweight at birth were 30.83 times more likely to develop malnutrition as compared to those who were of normal weight at birth. Those who had small number of meals in a day were 379.54 times more likely to develop malnutrition as compared to those who used to receive adequate meals. Lastly, children of mothers who had no knowledge of what malnutrition was were 549.61 times more likely to develop malnutrition as compared to those of mothers who were knowledgeable. The table 4 gives a summary of the results.

**Table 4. Multivariate logistic regressions of statistically significant factors (n=236)**

Factors	Adjusted OR	Confidence interval	p-value
<b>Birth weight</b>			
Normal weight	1		
Underweight	30.83	3.43-277.43	0.002*
<b>Number of meals per day</b>			
Adequate	1		
Small	379.54	32.50-4433.25	<0.001*
<b>Mother/guardians knowledge about malnutrition</b>			
Knowledgeable	1		
Not knowledgeable	549.61	47.27-6490.71	<0.001*

### Discussion

Following the placement of data in logistic regression, the factors that were significantly associated with malnutrition were child's low birth weight, number of meals per day and parents knowledge of the causes and prevention of malnutrition.

Children who were underweight at birth were 30.83 times more likely to develop malnutrition as compared to those who were of normal weight at birth. A similar study by Rayhan and Khan (2006) on the factors causing malnutrition among under-five children in Bangladesh revealed that the prevalence of wasting and underweight were remarkably high among low birth weight children. This could be due to the fact that children born with a low birth weight might from the time of their birth lack certain nutrients that are essential for their future normal growth and development. Muthayy (2009) study on maternal nutrition and low birth weight reported that maternal lack of nutrients such as vitamin B12; folate and essential fatty acids were associated with low birth weight. In such a case, underweight children may lack such nutrients.

Children born with low birth weight might take a longer period of time to reach the normal weight for their age. A study by Rahman *et al.*, (2016) on association of low birth weight with malnutrition in children under-five years in Bangladesh showed that the prevalence of malnutrition was markedly higher in children with low birth weight than those with normal birth weight. It appeared that babies who were underweight at birth tend to remain underweight during their early childhood. Low birth weight is also associated with many diseases which could affect the child's normal growth pattern. Hirano *et al.*, (2016) study on the association between low birth weight and childhood onset chronic kidney disease in Japan showed that birth weight was strongly associated with childhood onset of chronic kidney diseases.

Inadequate dietary intake was another factor associated with malnutrition. The children who had small number of meals in a day were 379.54 times more likely to develop malnutrition as compared to those who used to receive adequate meals. The findings of this study were consistent with those of a case-control study done in Ethiopia by Amsalu and Tigabu (2006) on risk factors for ever acute malnutrition in children under the age of five that showed that child's numbers of meals per day were positively associated with malnutrition. However factors such as knowledge about malnutrition, monthly income and a large family size which were found to be significant in the study were not in ours. Turyashemererwa *et al.*, (2009):

983) report that the number of meals a child takes has an effect on his or her nutritional status, since it is related to nutrient intake. The greater the number of times a child is feed, the higher the chances of meeting the recommended daily nutrient intake. Contrary, the results yielded by a community case-control study conducted by Anoop *et al.*, (2004) on maternal depression and low maternal intelligence as risk factors for malnutrition in children did not reveal a significant association between malnutrition and small number of meals per day. However, this study is consistent with our study findings that low maternal knowledge about malnutrition and low birth weight are significantly associated with malnutrition.

The underweight children were found to be 549.61 times more likely to have parents who do not have knowledge about malnutrition as compared to well-nourished children. A similar study done by Akinpelu (2005) on social cultural predictors of protein energy malnutrition among breast feeding mothers in Osogbo Metropolis, Nigeria showed that parent's knowledge was one of the predictors of protein energy malnutrition.

Amid *et al.*, (2007) study on the factors influencing malnutrition in Congo reports that parents with good nutritional knowledge are likely to take good care of their children. Contrary, Nzala *et al.*, (2011) study on demographic, cultural and environmental factors associated with frequency and severity of malnutrition among Zambian children less than five years of age found that malnutrition was not associated with parent's knowledge but place of residence, vaccination status and the type of toilet used. The lack of knowledge of the recommended infant and child feeding practices by some of the parents could suggest that there are limitations in the quality of health education and promotion activities conducted at child welfare clinics.

Although this research has provided important information on the factors that could influence malnutrition among children, it has not assessed all the important factors that influence malnutrition. This could explain the differences between the findings of this study and those of other studies conducted on the same topic but in different settings. The study relied on participant's self-reported data, which is prone to recall bias and social desirability. A large sample couldn't be obtained due to time constraints. This could explain the wide confidence intervals observed in the variables.

In line with the study findings, it was recommended that a similar study assessing more factors that could be associated with malnutrition in children should be done. This will give a broader view of the factors that are associated with malnutrition in our society. A similar study with a larger sample size of under-five children should also be done to detect the effect of some factors that could not be observed in the current study. Health education should be reinforced in clinics to improve parent's knowledge on the recommended infant and child feeding habits. There is also need for intensifying antenatal education and care as this will help reduce the number of low birth weights in mothers which was found to be a factor associated with malnutrition in this study.

## Conclusion

The findings of this study showed that malnutrition in children that are admitted at Kitwe Teaching Hospital was dependent on a number of factors. Some of these factors were birth weight of the child, number of meals given to a child in a day and the parent's knowledge about malnutrition. It therefore requires a multidisciplinary approach when alleviating as some of the factors are underlying and others comes as the child is growing.

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