Determination of risk factors associated with malnutrition among children under the age of five: a case control study at Arthur Davison children's hospital in Ndola, Zambia

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ABSTRACT

Background: Malnutrition is one of the conditions that contribute to high mortality rate among children under the age of five. Although risk factors for malnutrition are well known ,they tend to vary from population to population. The main objective of this study was to establish risk factors associated with malnutrition among children under the age of five presenting at Arthur Davison Children's Hospital in Ndola, Zambia. **Method:** A case-control study was conducted in the protein calorie malnutrition unit and other units at Arthur Davison Children's Hospital in Ndola, Zambia from October 2016 to may 2017.Cases were children who were moderately or severely malnourished with or without oedema with weight for height z-score of less than -2 Standard deviation from the median of WHO reference. Controls were children with z-score of greater than -2 Standard deviation. **Results:** A total of 144 children with 72 cases and 72 controls participated in the study. Independent risk factors which were significantly associated with malnutrition after adjusting for confounders were history of diarrhea (OR=4.20, 95% CI[1.77,9.95], children of fathers who were out of employment (OR= 5.28,95% CI[1.45,19.14]) ,and lack of a balanced diet (OR=0.11,95% CI[0.04,0.28]).**Conclusion:** Diarrhea illnesses, low social-economic status and lack of balanced diet were identified as risk factors significantly associated with malnutrition among children under the age of five presenting at Arthur Davison Children's Hospital, Zambia. As such Mortality rate due to malnutrition may be reduced by coming up with programmes to create more job opportunities, intensive measures to combat diarrhea illnesses such as use of Oral Rehydration Therapy and educating people on how to take a balanced diet.

Key Words: Malnutrition, Risk factor Ndola, Zambia

Introduction

Malnutrition refers to deficiencies, excesses or imbalances in a person's intake of energy and/or nutrients [1]. Some symptoms of malnutrition include anemia, diarrhea, disorientation, night blindness, irritability and anxiety. An individual's nutritional status is influenced by three broad categories of factors: food, care and health [2]. The two types of malnutrition are under nutrition and over nutrition [3]. Malnutrition also called protein calorie malnutrition (PEM) relates to a person's diet when it is lacking in nutrients and does not provide adequate amount of calorie, substance and protein for maintenance and growth [3].

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Over nutrition refers to a person's diet when it is getting far too many nutrients for the body to cope with [3]. The commoner type of malnutrition is under nutrition. Malnutrition can be chronic or acute [4]. Chronic malnutrition causes stunting, while acute malnutrition causes wasting [4]. Severe acute malnutrition is characterized by wasting (marasmus), oedema (as a result of kwashiorkor) or both (marasmic kwashiorkor) and occurs mostly in children [5]. Malnourished children have substantially lower chances of survival than children who are well nourished [2] Risk factors for malnutrition are well known. Hein (2008) reported that mother's level of education and occupation, household size, number of children in the family, weight at birth and duration of exclusive breastfeeding are related to malnutrition [6]. Although risk factors for malnutrition are well known, they tend to vary from population to population .The objectives of the study were to establish risk factors

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associated with malnutrition among children below the age of five years ,the leading factors contributing to malnutrition among children under the age of five presenting at Arthur Davison Children's Hospital in Ndola and to determine measures of preventing malnutrition.

Methodology

Study site: The study was done at Arthur Davison Children's Hospital which is located within the Copperbelt province of Zambia. The area was chosen as it has a high prevalence of malnutrition.

Study design: The study was a case-control study which was looking at the risk factors associated with malnutrition among children under the age of five presenting at Arthur Davison Children's Hospital.

Study population: The study included 72 Cases which were children with moderate to severe malnutrition with or without oedema with z-score of less than -2 Standard deviation and Mid Upper Arm Circumference of less than 11.5cm while controls were any other children below the age of five with z-score of greater than -2 Standard deviation

Sample size: A pilot study was conducted with 30 cases and 30 controls to obtain information to compute the sample size. Lack of parenteral education was used as a risk factor to estimate the sample size where P_1=Case prevalence size = 86.7% and p2=control prevalence size=62.1%, f($\alpha\beta$) was taken as 10.51 at power 90% and significant level at 5% and this gave a minimum sample size of 60.

Variables: The dependent variables of this study were gender- specific anthropometric z-score of weight for height. A child was classified as either undernourished or well- nourished. The study considered three main domains affecting child nutrition. Child related factors: Age, history of chronic illnesses, time of weaning and history of diarrhea; Social-economic factors: Parenteral Education, Father's work status, monthly salary of father and intake of a balanced diet; and Caregiver practices: childbirth weight, worm infection child spacing and age of mother .

Ethical consideration: Permission to conduct this study was obtained from The Ndola Central Hospital Tropical Disease Research Centre (TDRC) Ethical Review Committee, the Copperbelt University School of Medicine and NCH. Written Consent was obtained from the senior medical superintendent at Arthur Davison Children's Hospital as well as from the participants (mothers).

Data Entry and Analysis: Data was entered using Microsoft excel. Thereafter, the data was exported to SPSS version 16.0 for analysis using descriptive statistics and logistic regression. The Chi square test was used to determine associations between selected risk factors and malnutrition. Independent factors associated with malnutrition were determined using multivariate logistic. A result yielding a p-value of less than 5% was considered statistically significant. Adjusted odds ratios (AOR) with 95% confidence intervals were calculated

Results

A total of 144 respondents (72 cases and 72 controls) under the age of five years participated in the study. Table 1 shows child related factors associated with malnutrition: age, gender, history of chronic illness, time of weaning and history of diarrhea. All the factors except gender were significantly associated with malnutrition.

Table 2 shows social-economic factors associated with malnutrition: father's work status, monthly salary of father and Mother's work status; and they were all significantly associated with malnutrition.

Table 3 shows Caregiver practices related factors associated with malnutrition: age of mother, Childbirth weight, history of worm infection and practice of child spacing and they were all significantly associated with malnutrition.

Table 4 shows factors independently associated with malnutrition. In Model 1, child spacing was not significantly associated with malnutrition. Model 2 shows that history of worm infestation was not significantly associated with malnutrition. Model 3 shows factors that were independently associated with malnutrition. Children who had a history of diarrhea were 4.20 (95% CI [1.77, 10.00]) times more likely to have malnutrition compared to children who did not have the history. Compared to children who had fathers out of employment, children whose fathers were in employment were 5.28 (95% CI [1.45, 19.14]) times more likely to have malnutrition. Children who ate a balanced diet were 99% (AOR=0.11, 95% CI [0.04, 0.28]) less likely to have malnutrition.

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Table 1: Child related factors associated with malnutrition

Factors	Cases[n%]	Controls[n%]	P-values
Age(months)			<0.001
0-5	3(4.2)	11(15.3)	
6-11	15(20.8)	7(19.7)	
12-23	30(41.7)	12(16.7)	
24-35	19(26.4)	17(23.6)	
36-47	3(4.2)	8(11.1)	
48-59	2(2.8)	28(36.1)	
Gender			0.863
Male	45(62.5)	46(63.9)	
Female	27(37.5)	26(36.1)	
History of chronic illnesses*			<0.001
Yes	42(59.2)	13(18.1)	
No	29(40.8)	59(81.9)	
Time of weaning			0.043
<6 months	15(22.1)	6(9.2)	
≥6months	53(77.9)	59(90.8)	
History of diarrhea			<0.001
yes	61(84.7)	25(34.7)	
No	11(15.3)	47(65.3)	
*Epilepsy, Diabetes mellitus, Asthma			

Table 2: Social economic factors associated with malnutrition

Factor	Cases[n%]	Control[n%]	P-value
Father's work status			<0.001
Does not work	22(32.4)	5(7.6)	
Working*	46(67.6)	61(92)	
Monthly salary of father			<0.001
<k1000	27(42.9)	7(10.9)	
≥k1000	36(57.1)	58(90.6)	
Mother's work status			0.003
Housewife	64(91.4)	52(72.2)	
Working*	6(8.6)	20(27.8)	
Intake of a balanced diet			<0.001
Yes	18(25.0)	68(94.4)	
No	54(75.0)	4(5.6)	

*Formal, private or self-employment

Table 3: Caregiver practices associated with malnutrition

Factors	Cases[n%]	Controls[n%]	P-value
Age of mother			0.003
<20 years	18(25.4)	5(7.0)	
≥20 years	53(74.6)	66(93.0)	
Childbirth weight			0.003
<24 months	21(29.6)	7(9.7)	
≥24months	50(70.4)	65(90.0)	
History of worm infection			<0.001
Yes	48(67.6)	17(23.9)	
No	23(32.4)	54(76.1)	
Practice of Child spacing			<0.001
<24months	44(62.0)	66(93.0)	
≥24 months	27(38.0)	5(7.0)	

Table 4: Results of multivariate analysis

	Model 1	Model 2	Model 3
Factor	AOR(95%CI)	AOR(95%CI)	AOR(95%CI)
History of diarrhea			
Yes	3.24(1.23-8.56)	3.27(1.34-7.99)	4.20(1.77-10.00)
No	1	1	1
Father's work status			
Does not work	8.53(1.21-59.95)	5.88(1.39-24.88)	5.28(1.45-19.14)
Working*	1	1	1
Intake of balanced diet			
Yes	0.06(0.16-0.22)	0.01(0.34-0.027)	0.11(0.04-0.28)
No	1	1	1
History of worm Infection			
Yes	3.12(1.12-8.62)	2.24(0.94-5.38)	
No	1	1	
Parenteral education			
Yes	3.24(1.23-8.56)		
No	1		
Child spacing			
<24 months	0.20(0.33-1.14)		
≥24months			

*Formal, private or self-employment.

Discussion

Our study investigated the risk factors for malnutrition also known as protein energy malnutrition in children under the age of five at Arthur Davison Children's Hospital,Zambia. The Study identified diarrheal illnesses, fathers out of employment and lack of a balanced diet as major risk factors for malnutrition. The onset of diarrhea can be attributed to various infections that affect the gastro-intestinal tract such as *E coli, salmonella* and *vibro cholerae*. These infections cause malnutrition in that they lead to malabsorption of nutrients as well as loss of nutrients through diarrhea. Lack of employment among many fathers could be attributed to lack of education and lack of self empowerment. As a result many fathers cannot provide adequately for their families. This predispose children in the families to develop malnutrition.

Despite some families having abundant supply of food at home, many do not know that it is essential to take a balanced diet. As such many children are subjected to an imbalanced intake of food which leads to malnutrition.This was consistent with a similar study done in Bangladesh [7]. Therefore, there is need of coming up with programmes to educate people on how to prevent diarrhea such as proper handling of food and use of Oral Rehydration Salt Therapy, the importance of acquiring employment before considering raising children ,self- empowerment together with creating more job opportunities and sensitization on the importance of taking a balanced diet.

Another similar study in Malaysia observed that lack of food security or lack of a balanced diet was significantly associated with malnutrition [8].In addition ,it observed that mother education, food insecurity, household with low birth weight, increased number of children were more likely to acquire malnutrition than their counterparts[8]. Another similar study done in India showed that having a jobless father was more likely to contribute to malnutrition than having a jobless mother[9].

Despite the programmes that have been set up to alleviate the incidences of diarrhea such as use of Oral Rehydration Salt Therapy, Diarrhea is still a major challenge in Zambia that is contributing to malnutrition. A study which was done in Ethiopia reviewed that acute malnutrition is significantly associated with maternal illiteracy and lack of maternal autonomy [10].However, in our study maternal illiteracy and lack of maternal autonomy were not significantly associated with malnutrition. A Study done in India by Jeyaseelan and lakshman reviewed that acute malnutrition is significantly associated with older age of a child[11]. On the other hand, our study did not review that old age was significantly associated with malnutrition.

Despite other studies describing many other factors which were significantly associated with

malnutrition, this study only reported history of diarrhea , fathers who were out of employment(jobless) and lack of a balanced diet as factors which were significantly associated with malnutrition. History of diarrhea could be explained due to poor handling of food and poor sanitation which is prevalent in Zambian communities especially in the rural areas. High unemployment may be explained as a result of lack of education or increased retirement ages. lack of balanced diet may be explained as a result of poverty and lack of knowledge which is prevalent among Zambian communities.

Study limitation

Biases encountered included Selection bias arising from patients being referred from outside Ndola District which were not representatives of the true population ,Non response bias arising from the low response rate from the cases.

Conclusion

In this study it was observed that fathers who were out of employment (jobless), history of diarrhea and lack of a balanced diet were significantly associated with malnutrition .Therefore, there is need of coming up with programmes to encourage self-employment, intensive measures to control diarrhea such as use of Oral Rehydration Therapy and educating people on how to taking a balanced diet. Some variables such as early weaning, history of chronic illnesses, young age of mother, low income, low child birth weight and worm infection were significantly associated with malnutrition at univariate level.

Acknowledgment

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