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Research Article

INFECTIOUS DISEASES IN UNDERNUTRITION AND RISK FACTORS FOR STUNTING AMONG HOSPITALIZED CHILDREN 6MONTH TO 12YEARS IN PAEDIATRIC WARD OF KAMPALA INTERNATIONAL UNIVERSITY TEACHING HOSPITAL

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A B S T R A C T

Background: Undernutrition according to World Health Organisation is defined as the cellular disparity between the supply of nutrients and the bodies need to ensure growth and maintenance of specific functions. Most studies on undernutrition had been public facility based as we were aware of, therefore the was paucity of data with respect to this subject, therefore this study described the infectious disease amongst undernourished children and risk factors for stunting in hospitalized children on the paediatric ward of Kampala International University Teaching Hospital.

Methods: A hospital based cross-sectional descriptive and analytical study was conducted in paediatric ward of Kampala International University Teaching Hospital between January and May 2017. Structured interviews were administered to caregivers of children aged 6 month to 12 years admitted on the ward. Data collected included socio-demographic characteristics, anthropometric measurements and medical conditions that led to hospitalization. Univariate, bivariate and multivariate logistic regression analysis was done to find the risk factors for stunting.

Results: 379 caregiver-children pair were studied. Majority of the children with undernutrition in general had pneumonia 43(29.25%) and malaria 43(29.25%) in equal measures. Diarrheal illness was predominantly diagnosed in those with severe acute undernutrition oedematous 6(28.57%) and pneumonia 6(37.50%) in those with severe acute undernutrition none oedematous. Majority of children with moderate stunting had pneumonia 22(29.33%) and malaria 22(29.33%) in equal measures and predominantly malaria 14(29.79%) in those with severe stunting. Likewise those who resided in semi-permanent houses were 1.63 times more likely to be stunted than those from permanent houses (aOR 1.63, 95%CI 1.03-2.56, p=0.04).

Conclusion: Children with undernutrition hospitalized in the paediatric ward need to be thoroughly evaluated for infectious diseases. Children from semi-permanent houses need to have a more comprehensive nutritional assessment whenever they present to the hospital for care as a measure of preventing stunting.

INTRODUCTION

Background to the Study

Undernutrition is a major developmental concern in Uganda, affecting all regions of the country and most segments of the population. Our country is worryingly hit by undernutrition, were 29% and 4% of our children below five years are chronically and acutely undernourished respectively [1]. Undernutrition has often been denoted as the skeleton in the hospital closet, because oftenly its overlooked, undiagnosed and untreated [2].

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Despite this, the undesirable effects of undernutrition have been widely reported in the studies, and can be separated into two main categories: effects to the patient and effects to the health care facility.

Undernutrition has been shown to cause damage to our cells, physical appearance and also psychologically [3]. This damage is dependent on many factors, including the patient‘s age, gender, type and duration of illness, and current nutritional intake. On our cells, undernutrition impairs the body‘s ability to mount an effective immune response in the face of infection, often making infection harder to detect and treat [4]. It also increases the risk of pressure ulcers, delays wound healing, increases infection risk, decreases nutrient intestinal absorption, alters thermoregulation and compromises kidney function [3].

Physically, undernutrition causes wasting, reduced respiratory and cardiac function, and atrophy of visceral organs [5]. It's also known that an unintentional 15% loss of body weight causes steep reductions in muscle strength and respiratory function, while a 23% loss of body weight is associated with a 70% decrease in physical fitness, 30% decrease in muscle strength and a 30% rise in depression [6]. Psychologically, undernutrition leads to fatigue and apathy, which in turn delays recovery, exacerbates anorexia and increases convalescence time [7].

Undernutrition adds additional stress on health care facilities. As previously stated, undernourished patients often have increased chances of getting infections and pressure ulcers, require more medications, and are dependent on caregivers due to muscle loss and subsequently have longer duration of hospital stay [8]. All these combines indirectly to increase hospital costs associated with treating the patient, secondary to the management of their primary medical reason for admission. No studies had been done in a private clinical setting to describe the infectious diseases in undernutrition, and risk factors for stunting, which this study aimed to find out in our paediatric ward.

METHODS

Study Design, Site and Study Population

A hospital based cross-sectional descriptive and analytical study to describe the infectious diseases in undernutrition and to describe the risk factors for stunting in hospitalized children on pediatric ward of KIUTH a private hospital.KIUTH is located in Ishaka- Bushenyi municipality approximately 319.7km from Kampala, via Mbarara. It is a teaching hospital for Kampala international University, it's a specialized hospital with the following departments: Pediatrics, Internal medicine, Surgery, Obstetrics and Gynecology, and other clinics all headed by professors and some by specialist. Children 6 month to 12 years who were admitted in Pediatric ward KIUTH from January 2017 were consecutively enrolled until when the sample size was attained. The study participants were adult care givers attending to the children.

Study Procedure

All the children who were admitted on the ward were assessed for eligibility after the primary reason for admission had been taken care of and any urgent resuscitation (if required) had been done. The purpose of the study explained to the caregiver, who was then requested to sign a written informed consent statement or used a thumb print for those who couldn't write in order to participate in the study. The caregiver-children pair who met the inclusion criteria were interviewed. Data including the caregiver and child's demographics were collected, Anthropometric measurements taken included, weight, height, and length. Age, was obtained from the child's health card and birth certificates, and care givers recall if they had neither of the two. The anthropometric measurements were then converted into indicators of weight for height or length, height or length for age and body mass index for age for those above five years. These were then read on the WHO z-score charts for boys and girls then the undernutritional status of the child classified as either moderate or severe.

Data Management

Data from pre-coded and completed questionnaires were entered using statistical computer package software Microsoft excel 2016, it was cleaned, checked for errors, corrected and was then exported to STATA version 14, for analysis and summarized in frequency tables. To describe the risk factors for stunting, we preformed bivariate followed by multivariate binary logistic regression analysis. Factors with a p-value less than 0.2 on bivariate binary logistic regressionanalysis were subjected to multivariate binary logistic regression. Factors with p-value of less than 0.05 were considered to be statistically significant.

RESULTS

Table 1 Infectious diseases in children hospitalized with undernutrition (January to May 2017)

Infectious diseases	Frequency	Percentage
Pneumonia	43	29.25
Malaria	43	29.25
Other conditions	30	20.41
Diarrheal illness	26	17.69
Human immuno-deficiency virus	3	2.04
Typhoid fever	1	0.68
Meningitis	1	0.68

Infectious diseases in children with undernutrition is shown in Table 1. Children with undernutrition were diagnosed with, pneumonia 43(29.25%), malaria 43(29.25%), others conditions 30(20.41%) which includes diseases like, otitis media, cellulitis, urinary tract infection and anaemia. Diarrhea 26(17.69%). Human immunodeficiency virus, typhoid fever and meningitis, 3(2.04%), 1(0.68%) and 1(0.68%) respectively.

Table 2 Infectious diseases in children hospitalized with acute undernutrition (January to May 2017)

Infectious diseases	Acute undernutrition		
	Moderate Acute Undernutrition	Severe Acute Undernutrition	
		Oedematous	None oedematous
Pneumonia	4(19.05%)	2(16.67%)	6(37.50%)
Malaria	6(28.57%)	2(16.67%)	2(12.50%)
Others	6(28.57%)	4(33.33%)	6(37.50%)
Diarrheal illness	3(14.29%)	4(33.33%)	1(6.25%)
HIV/AIDS	1(4.76%)	0(0.0%)	1(6.25%)
Typhoid fever	1(4.76%)	0(0.0%)	0(0.0%)

Infectious diseases in acute undernutrition is shown in Table 2. Majority 6(28.57%) of children with moderate acute undernutrition had malaria, diarrhoea 4(33.33%) in oedematous undernutrition, and pneumonia 6(37.50%) majority in none oedematous undernutrition.

Table 3 Infectious diseases in children hospitalized with stunting (January to May 2017)

	Stunting	
Infectious diseases	Moderate stunting	Severe stunting
Pneumonia	22(29.33%)	12(25.53%)
Malaria	22(29.33%)	14(29.79%)
Others	16(21.33%)	9(19.15%)
Diarrheal illness	13(17.33%)	10(21.28%)
HIV/AIDS	1(1.33%)	2(4.26%)
Typhoid fever	1(1.33%)	0(0.0%)

Infectious diseases in children with stunting is shown in Table 3. Majority was pneumonia and malaria 22(29.33%) in

moderate stunting and malaria 14(29.79%) in children with severe stunting followed by pneumonia 12(25.53%).

Table 4 Bivariate binarylogistic regression analysis of child risk factors for stunting (January to May 2017)

	Stunting				
Variable	**No(n=250)**	**Yes(n=129)**	**cOR**	**95%CI**	**P-value**
Sex.					
Male	131	81	1.00		
Female	119	48	0.65	0.42-1.11	0.05
Age.					
13-36month	95	60	1.00		
≤12month	80	32	1.58	0.96-2.66	0.09
37-60month	54	31	1.43	0.79-2.62	0.24
≥61month	21	6	0.71	0.26-1.93	0.51
Family.					
Both parent	227	105	1.00		
Single parent	13	15	2.49	1.15-5.43	0.02
Relative	10	9	1.95	0.77-4.93	0.16
District.					
Bushenyi	182	89	1.00		
Sheema	4	2	1.02	0.18-5.69	0.98
Rubirizi	23	21	1.87	0.98-3.55	0.06
Buhweju	2	2	2.05	0.28-14.75	0.48
Mitooma	30	14	0.95	0.48-1.88	0.89
Others	9	1	0.23	0.03-1.87	0.16
Relationship.					
Mother	213	103	1.00		
Father	20	10	1.03	0.46-2.28	0.93
Grand parent	11	12	2.25	0.96-5.28	0.06
Other relative	6	4	1.38	0.38-4.97	0.63

cOR= Crude odds ratio. CI= Confidence interval

Table 4 shows bivariate binary logistic regression of child risk factors for stunting. Children who stayed with single parent family were 2.49 times more likely to have stunting than those from both parent family (cOR 2.49, 95%CI 1.15-5.43: p=0.02). Childrens age, gender, relationship to caregiver, district of residence were not found to be significant risk factors for stunting.

Multivariate binary logistic regression analysis of child risk factors for stunting (January to May 2017)

Risk factors found to have a p-value less than 0.20 with occurrence of stunting at bivariate binary logistic regression analysis were considered together in a multivariate analysis. All (5) child variables were considered in multivariate binary logistic regression, these were sex of children, age of children, relationship of children to caregiver district of residence and family setting. Through a stepwise regression with removal of least significant variable in each step, none of the children remained independently significant as a risk factor for stunting.

Table 5 shows bivariate binary logistic regression analysis of caregiver risk factors for stunting in children hospitalized on the paediatric ward of Kampala International University Teaching Hospital. The risk factors that were significantly associated with stunting were; occupational level andhouse of residence. Children whose parents were peasants were 2.01 times more likely to have stunting than those whose parents did business(cOR 2.01, 95%CI 1.04-3.81, p=0.04). Those who resided in semi-permanent houses were 1.81 times more likely to have stunting than those from permanent houses (cOR 1.81, 95%CI 1.18-2.79, p<0.007). Children of caregivers who resided in urban and semi urban settings were less likely to be stunted than those from rural setting, (cOR 0.41, 95%CI 0.23-0.73, p=0.003) and (cOR 0.37, 95%CI 0.61-0.84, p=0.02) respectively. Those whose parents had secondary and tertiary level of formal education were less likely to be stunted than those whose parents had primary level of formal education, (cOR 0.44, 95%CI0.24-0.73, p=0.002) and (cOR 0.37, 95%CI 0.17-0.81, p=0.01) respectively.

Table 5 Bivariate binary logistic regression analysis of caregiver risk factors for stunting in children (January to May 2017)

	Stunting				
Variable	**No(n=250)**	**Yes(n=129)**	**cOR**	**95%CI**	**P-value**
Occupation.					
Business	41	14	1.00		
Peasant	137	94	2.01	1.04-3.81	0.04
Formal	39	8	0.60	0.23-1.58	0.31
Others	33	13	1.15	0.48-2.70	0.75
Education.					
Primary	18	18	1.00		
None	121	81	1.40	0.69-2.83	0.35
Secondary	75	21	0.44	0.24-0.73	0.002
Tertiary	36	9	0.37	0.17-0.81	0.013
Monthly income.					
100000-500000	78	28	1.00		
<100000	67	42	1.74	0.98-3.12	0.06
None	99	59	1.66	0.97-2.84	0.07
Residence.					
Rural	153	103	1.00		
Urban	65	18	0.41	0.23-0.73	0.003
Semi-urban	32	8	0.37	0.16-0.84	0.02
House.					
Permanent	137	52	1.00		
Semi-permanent	113	77	1.81	1.18-2.79	0.007

cOR=Crude odds ratio. CI=Confidence interval.

Table 6 shows multivariate binary logistic regression analysis of caregiver risk factors which was conducted to describe the risk factors independently associated with stunting in hospitalized children on paediatric ward of KIUTH. Factors with p-value less than 0.20 with occurrence of stunting at bivariate binary logistic regression analysis were considered together in a multivariate analysis. Five (5) caregiver variables were considered in multivariate logistic regression, these were occupation, education, residence, house and monthly income, to describe risk factors that were independently associated with stunting in children. Through a stepwise logistic regression with removal of least significant variable in each step, house of residence remained significantly associated stunting in children. Children who resided in semi-permanent houses were 1.63 times more likely to have stunting than those from permanent houses (aOR 1.63, 95%CI 1.03-2.56, p=0.04).

Table 6 Multivariate binary logistic regression analysis of caregiver risk factors for stunting in children (January to May 2017)

	Stunting				
Variable	**No(n=250)**	**YES(n=129)**	**aOR**	**95%CI**	**P-value**
House.					
Permanent	137	52	1.00		
Semi-permanent	113	77	**1.63**	1.03-2.56	**0.04**

aOR =Adjusted odds ratio. CI= Confidence interval.

DISCUSSION

Infectious Diseases among Hospitalized Children with Undernutrition

Children who were admitted with undernutrition had pneumonia and malaria as the commonest infectious diseases followed closely by diarrheal illness. This was in agreement with a study on clinical spectrum of severe acute undernutrition in children in a hospital in Cameroon, they

found respiratory tract infections were the commonest, followed by malaria,[9].

[10] in Mbarara found the commonest infectious diseases amongst hospitalized acutely undernourished children was Diarrheal illness (41.2%). Other included, Pneumonia (26.8%), Malaria (26.8%), and septic shock (11.3%). The findings are similar to our study in that pneumonia was as equally diagnosed as malaria, this could have been due to the fact that these studies were done in periods were malaria and pneumonia were more prevalent.

[11] carried out a hospital based descriptive study on 104 children with severe acute undernutrition. They found diarrhea as the commonest infectious disease, followed by acute respiratory tract infections. Still this agrees with our study which found diarrhoea as the commonest infectious disease in severe acute undernutrition oedematous, this can be explain in that severe undernutrition leads to a reduction in the intestinal micro-villi, hence reducing on the absorptive surface area leading to diarrheal illness [3].

So generally from the above studies, the commonest infectious disease diagnosed in undernourished children were, pneumonia, diarrhoea and malaria respectively. Children with undernutrition present to health facilities with these infectious diseases because undernutrition has been shown to cause impairment at a cellular, physical and psychological level [3]. On a cellular level, undernutrition impairs the body‘s ability to mount an effective immune response in the face of infection, often making infection harder to detect and treat [4]. All this makes the undernourished child very susceptible to infections.

Risk Factors Independently Associated With Stunting In Hositalized Children

Our study found out that children who resided in semi-permanent houses were more likely to be stunted than their counter parts from permanent houses. This can be explained in that living in permanent house is associated with a high socio-economic class in that they can afford to pay for nutritious foods for their children and afford good medical care for the children if they became unwell, well aware that all these factors can lead to stunting in the long run if not managed early. According to a study by[12],they found that most children in the shantytowns unlike in the non-slum areas resided in non-permanent or single room apartments and this group significantly contributed to the higher percentage of the undernutrition. Other studies in Africa and beyond reporting similar findings have attributed this disparity to differences in the social class in the areas studied which influenced the overall living standard, type of housing, quality of education, affordability of adequate food, and appropriate health services.

CONCLUSIONS

Pneumonia and malaria were the most diagnosed infectious diseases in hospitalized undernourished children on our Paediatric ward. Diarrheal diseases majorly in severe acute undernutrition oedematous and pneumonia in severe acute undernutrition none oedematous.

Residing in semi-permanent house was independently associated with stunting in children. We therefore recommend that in the future, children who have caregivers living in a semi-permanent house will need further nutritional evaluation. We also recommend that emphasis should put to diagnose underlying infectious diseases since most undernourished children don’t manifest cardinal signs of infection like there normal counter parts due to secondary immunosuppression as a result of the undernutrition.

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Availability of data and materials

Important data for this paper are contained in the manuscript. Individual patients’ data are not shared in this work due to ethical reasons.

Authors’ contributions

Richard Justin Odong principal investigator designed the study, carried out data collection all under the supervision of Barnabas R Atwiine. All other authors were fully involved in writing the manuscript and all have approved the final manuscript for submission.

Competing interests

All authors declares that they have no competing interests.

Consent for publication

Not applicable.

Ethics and consent to participate

Approval was sought from the Research and Ethical committee of Kampala International University and Mbarara University of Science and Technology Institutional Review Committee and from the department of pediatrics where the research was carried out. An informed consent and assent form was signed by caregivers before conducting the study. All children were assessed for eligibility and enrolled into the study after the reason for hospitalization was taken care of.

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