

High Prevalence of Stunting in Preschool Children (1-5Years) attending selected Health Centers in a Food Rich Area - Bushenyi District Southwestern Uganda

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Abstract

Background; The prevalence of stunting and helminthiasis among children in Uganda and Sub-Saharan Africa is still high and if Uganda is to achieve the food-related Sustainable Development Goals (SDGs), it must urgently invest in improving nutrition and sanitation . In a food rich area like Bushenyi, chronic under nutrition could be due to several other factors than mere scarcity of food. This study was carried out to determine the prevalence and socio-clinical factors responsible for chronic under nutrition (stunting) among pre-school children aged 1-5 years in selected Health facilities in Bushenyi district.

Methods: A cross-sectional study on prevalence of chronic under nutrition (stunting) and related factors among children 1-5 years. Data was collected using a pre-tested questionnaire and using anthropometric measurements (height/ length), and standard laboratory procedures (stool analysis for eggs of soil transmitted helminthes), then recorded in a data card. Stool samples were collected from 206 children and analyzed for soil transmitted helminthes' eggs using Formol-ether concentration method.

Results: Majority were female (59.7%) aged above two years, with a median age of 2.1 years (IQR= 1.6-2.8). Most children (92.2%) stayed with their parents and resided within Bushenyi municipality (54.9%). Many lived within an extended family (52.4%) and 92.2% had been brought to the health center by their parents who were married (71.8%). children who were likely to be stunted were those who drank unboiled water (aPR=1.21, 95%CI 1.10-1.34) and were exclusively breastfed (aPR=1.35, 95% CI 1.11-1.65). The proportion of children with stunting was 89.3% (95%CI 83.3-92.9).Although most of the children were dewormed twice a year (64.1%), they did not wash their hands after using the toilet and before eating (84.6%). Furthermore, a majority of them (76.2%) rarely wore shoes. Almost all of the caregivers (96.1%) reported that they had never received any form of education on how to feed their children. However, many of the children (74.3%) had or were being exclusively breastfed and half of them (50.5%) drank boiled water. A few of the children (10.7%) were infested with soil transmitted helminthes

Conclusion: The prevalence of chronic malnutrition in Bushenyi district is very high despite the abundance of food. This is due to several factors including parents'/care takers' low knowledge. The study therefore recommends intensive continuous education on proper nutrition of preschool children and its benefits to the communities in Bushenyi District.

Trial registration: Not applicable.

Introduction

Under nutrition is an underlying cause of over half of child deaths and is associated with lower enrollment and poor cognitive functioning among children attending school and subsequently affects the performance, and social wellbeing of children and communities developing countries like Uganda (Lwanga, Kirunda, & Orach, 2012). In 2010, it was estimated that 171 million pre-school aged children were stunted; with 95% of whom lived in developing countries Uganda inclusive (De Onis, Blössner, & Borghi, 2012). A previous community study done in greater Bushenyi district among school children revealed that 46% of the under-five children were stunted which was way above the national prevalence (Kikafunda & Agaba, 2014). Under-nutrition indicators include wasting, stunting and being underweight. Stunting or low height-for-age (HAZ), is a good indicator of

under nutrition and represents a status of chronic nutritional stress in children (Shang et al., 2010). The prevalence of stunting and helminthiasis among children in Uganda and Sub-Saharan Africa is still high and if Uganda is to achieve the food-related Sustainable Development Goals (SDGs), it must urgently invest in improving nutrition and sanitation (Adebisi et al., 2019)

Despite all regions of Uganda having unacceptably high levels of childhood under-nutrition over the years, the distribution has not been even. Western region with Bushenyi inclusive having the highest levels of childhood chronic malnutrition especially stunting, yet this is the region with adequate food production which is sometimes referred to as “the food basket” of the country (Kikafunda & Agaba, 2014). The under nutrition in a such region could be due to other underlying problems like, helminthiasis and other social economic problems like food taboos and beliefs with lack of nutritional knowledge.

This study therefore, aimed at establishing the Prevalence of soil transmitted helminthiasis and stunting among children (1–5 years) attending selected health units in Bushenyi district that is located in south-western Uganda at a distance of about 319 kilometers from Kampala the capital of Uganda. Bushenyi district is part of the greater Bushenyi.

Methods

Study Design

This was a cross sectional study carried out on preschool children attending the outpatient departments of Kampala International University Teaching Hospital, Bushenyi Health center IV, Kyabugimbi Health center IV and Kyamuhunga Health Center IV. A pre tested questionnaire, was used to collect data from the caretakers of the children who fit the inclusion criteria. The children’s weight and height were then taken and with the help of the caretaker a stool sample was collected from the child.

Study Area

Bushenyi district is located in the western region, about 323 km from the capital city Kampala, Uganda. The district is made up of 11 sub-counties, 76 Parishes and a total of 585 villages with an estimated total population of 235,617 people as per the National population and housing census of 2014. Agriculture is the commonest economic activity providing employment for 86.7% of the population. The four health units selected for the study serve the rural and semi urban populations of the greater Bushenyi district.

Study Population

The study participants were 206 preschool children aged 1–5 years old who attended the selected health centers in Bushenyi District from the 20th March to 30th of July 2019.

Sampling Technique And Sample Size Calculation

The sample size was determined using the single population formula. It was calculated by using a previous prevalence of 17.4% (Zemene et al., 2018) with a margin of error of 0.05 and a confidence level of 95%. In line with it, 220 children was the minimum sample size. The children attending the health units on the 20th March to 30th of July 2019 were consecutively recruited into the study. However, only 206 children fitted the inclusion criteria.

Respondents were caretakers of children aged between 1 and 5 years of age and had brought them to the health unit. Children excluded from the study were those whose caretaker refused to give ethical consent, were too sick or were unable to give stool samples and those who had been dewormed 2–3 months prior to the date of the study.

Socio-clinical Data Collection

An interview based structured questionnaire was used to collect socio-clinical data. The questionnaire was initially developed in English and translated to Runyankole, the local language, and then retranslated back to English for analysis to ensure the consistency. A pre-test was administered on caretakers of 10 preschool aged children attending the pediatric clinic of Kampala International University, Teaching Hospital and relevant amendments were made. Written informed consent was obtained from each caregiver before the interview was conducted.

Assessment For Stunting

The height and weight of each child that fulfilled the inclusion criteria, were taken, recorded and interpreted using WHO Z-scores (WHO, 2009). For children aged above two years, the child stood on a pre-calibrated weighing scale with his/her back against the weighing scale board, his/her heels, buttocks, shoulders and head touching a flat upright head piece. The child was instructed to place their feet, knees and ankles together. The head piece was brought down onto the upper most point on the head and the height was read to the nearest 0.1 cm at the examiner's eye level. For those children below 2 years length was taken using an infantometer. The child would lie on it and a length read and recorded to the nearest 0.1 cm (Kikafunda & Agaba, 2014). The weight of the children was read to the nearest 0.1 g.

Stool Sample Collection And Processing

The caregiver was provided with a stool container with a tight cover labeled with the child's study number. He/she was provided with gloves for his/ her safety while collecting a sample of the child's stool (using the applicator provided in a specimen container, estimate 20 g). The child and caregiver used a side room near the laboratory to collect the stool sample, after which soap and clean water was provided to their wash hands.

In the laboratory, a gram of the stool sample was emulsified in 8mls of 10% formol water in a screw cap bottle and shaken well to mix. The emulsion was then sieved and the suspension transferred into a glass tube where added 3mls of diethyl ether were added. These were then mixed and centrifuged at 750 revolutions for a minute. Using a stick any fecal debris layer was made loose and decanted to remain with the sediment at the

bottom. The sediment was transferred onto a microscopic slide and a cover slip applied. It was then mounted to a light microscope using the 10x objective and 40x objective to examine for soil transmitted helminthes' eggs (Garcia et al., 2018). When found, the eggs were confirmed using an atlas and further by a laboratory technologist.

Statistical analysis

Data from pre-coded and completed questionnaires was entered into Microsoft excel, cleaned and analyzed using Statistical Analysis Software (STATA 12.0). The prevalence of children with stunting was calculated and presented as percentages. Information on socio-demographic and clinical factors was descriptively presented as frequencies (percentages). A logistic regression with adjusted Prevalence Ratio was performed to test the association between the socio-demographic and clinical factors and stunting at both bivariate and multivariate levels of analysis. A 95% Confidence Interval was used to assess the strength of association. A P value of $P \leq 0.05$ was accepted as statistically significant.

Ethical Considerations

Ethical approval was obtained from the Institutional Research Ethics Committees (IREC-Mbarara University Science and Technology (approval number 20/10–16). At all respective health units, a verbal approval by the health unit's leaders was obtained on presentation of an IREC approval document. A written informed consent was obtained from each caregiver/child before the interview was conducted. The questionnaires were administered after attending to the primary reasons in order not to interfere with the patients care. The principal investigator participated in the children's general medical care at out-patient department at the time of data collection. The interviews were carried out in a side room to ensure confidentiality. Names were not written on the questionnaires and only research numbers were used. No individual-based data was reported. After the interview the researcher replied to any concerns the caregiver had. The completed questionnaires were kept under lock and key and only accessed by the principal investigator. Those children found with soil transmitted helminthiasis were treated and those that were stunted a nutritional education was given to their caregivers.

Results

Prevalence of stunting

The proportion of children with stunting was 89.3% (95%CI 83.3–92.9) as shown in Fig. 1 below.

Demographic characteristics of the children enrolled in the study.

The demographic characteristics of children enrolled in the study are summarized in Table 1. Children attending the selected health centers in the period of 25th to 30th of July 2019 were mainly female (59.7%) aged above two years, with a median age of 2.1 years (IQR = 1.6–2.8). Most children (92.2%) stayed with their parents and resided within Bushenyi municipality (54.9%). Many of the children lived within an extended family (52.4%) and 92.2% had been brought to the health center by their parents who were married (71.8%).

Table 1
Socio-demographic and clinical factors of children aged 1–5 years attending the selected health units in Bushenyi district.

Characteristic	Summary measure	Confidence Intervals 95%
Age of children		
Less than 2 years	86 (41.7%)	21.5–78.7
More than 2 years	120 (58.3%)	51.4–64.9
Residence		
Within municipality	113 (54.9)	48.0-61.6
Outside municipality	93(45.1)	38.4–52.0
Gender		
Male	83(40.3)	33.8–47.1
Female	123(59.7)	52.9–66.3
Family		
Extended	108(52.4)	45.6–59.2
Nuclear	98(47.60)	40.8–54.4
School going		
No	162(78.6)	72.7–83.8
Yes	44(21.40)	16.2–27.4
Caregiver		
Parent	190(92.2)	88.0-95.3
Guardian	16(7.80)	46.7–12.0
Marital status of caregiver		
Single	55(26.70)	21.7–32.2
Married	148(71.80)	66.2–77.0
Others	3(1.50)	0.40–37.2

Prevalence Of Clinical Factors Associated With Malnutrition

Although most of the children were dewormed twice a year (64.1%), they did not wash their hands after using the toilet and before eating (84.6%). Furthermore, a majority of them (76.2%) rarely wore shoes. Almost all of the caregivers (96.1%) reported that they had never received any form of education on how to feed their children. However, many of the children (74.3%) had or were being exclusively breastfed and half of them

(50.5%) drank boiled water. A few of the children (10.7%) were infested with soil transmitted helminthes. These factors are summarized in Table 2.

Table 2
Clinical factors associated with malnutrition in children aged 1–5 years attending the selected health units in Bushenyi district.

Characteristic	Summary measure	95% CI
Nutritional education of caregiver	Number (%)	
No	198 (96.1)	92.8–98.2
Yes	8 (3.9)	1.8–7.2
Deworming of child		
Once a year	74(35.90)	29.6–42.7
Twice a year	132(64.10)	57.4–70.4
Washing hands after toilet & before eating		
No	28(13.4)	9.4–18.8
Yes	178(84.6)	81.2–90.1
Wearing shoes always		
No	157(76.2)	70.0-81.7
Yes	49(23.8)	18.2–30.0
Presence of helminthes eggs in stool		
Yes	22 (10.7%)	7.0-15.5
No	184 (89.3%)	84.5–93.0
Drinking boiled water		
Yes	104 (50.5%)	43.7–57.3
No	102 (49.5%)	42.7–56.3
Exclusive breastfeeding		
Yes	153 (74.3%)	67.4–80.1
No	44 (21.4%)	16.2–27.4
Don't know	9 (4.3%)	2.2–7.9

Bivariate analysis of the socio-demographic and clinical factors associated with chronic undernutrition (stunting) among children aged 1–5 years attending selected health units in Bushenyi district.

Selected socio-demographic and clinical factors associated with stunting among participants enrolled in the study as shown in Table 3. Children aged above two years and lived in an extended family setting were less

likely to be stunted. On the other hand, children likely to be stunted were those who drank unboiled water (aPR = 1.21, 95%CI 1.10–1.34) and were exclusively breastfed (aPR = 1.35, 95% CI 1.11–1.65).

Table 3

Bivariate analysis of major socio-demographic and clinical factors associated with stunting among children attending selected health units in Bushenyi district.

Parameter	Variable	Frequency of stunting			P value	Adjusted prevalence ratio		Relative risk	Confidence Interval 95%
		Absent	Present	Total		Value	95% CI		
Sex	Male	10	73	83		1.00		0.975	0.88–1.08
	Female	12	111	123	0.61	1.03	0.93–1.13		
Age	≤ 2	4	82	86		1.00		1.12	1.02–1.24
	> 2	18	102	120	0.011	0.89	0.82–0.97		
Family setting	Nuclear	7	101	108		1.00		1.10	1.00-1.22
	Extended	15	83	95	0.047	0.91	0.82-1.00		
Water drank	Boiled	20	84	104		1.00		0.824	0.75–0.91
	Not boiled	2	100	102	0.001	1.21	1.10–1.34		
Exclusive breastfeed	No	13	31	44		1.00		0.738	0.61–0.90
	Yes	7	146	153	0.002	1.35	1.11–1.65		
Wear shoes always	No	9	40	49		1.00		0.890	0.75-1.00
	Yes	13	144	157	0.11	1.12	0.98–1.29		
Helminth egg in stool	No	21	163	184		1.00		0.928	0.84–1.03
	Yes	1	21	22	0.16	1.08	0.97–1.20		

Discussion

The 89.3% prevalence of stunting found in this study, is high compared to the national and regional prevalence of 33% and 46% respectively (Health, 2015). This may be due to the different study sites community versus health units. In health units children are likely to have co-morbid conditions that may be hindering their growth. Chronic malnutrition itself could lower the immunity that exposes the child to succumb to other morbidities. However, this high prevalence is comparable to that Kabatereine *et al.*, (2001) found in Bushenyi district, among school children, that showed a high prevalence of chronic under nutrition of 90%. This may suggest that there has been no improvement in nutritional status in the region. Kikafunda *et al.*, (2014) reported a prevalence of 46% among under-fives of western Uganda; a relatively low prevalence compared to ours but higher than the national prevalence. She found that poor education levels of the caregivers and poor child feeding practices were major contributory factors to the high community incidence.

This study showed that children who lived in an extended family setting were 9% less likely to be stunted. This could be explained by the attention given to the child by different house hold members. However, Kikafunda *et al.*, (2014) reported that children staying with a large number of family members were likely to be stunted probably due to the competition for resources. Pre-preparation of drinking water by boiling to makes it safe and is associated with hygiene and health seeking character. This is consistent with the finding that children who drank boiled water were less likely to be stunted. Access to safe water has been used as a proxy for good health conditions in a community (Smith & Haddad, 2000). Therefore, these results are in agreement with expected trends (WHO, 2012).

A cross-sectional study done among Malawian infants (below 6 months), (Kuchenbecker et al., 2015), showed that exclusive breastfeeding had a prevented stunting. However, this study shows that exclusively breastfed children were likely to be stunted. This may be due to different age groups as most of the children in this study were aged above 2 years. Children aged above six months need to be supplemented with food to satisfy their nutritional needs adequate for their proper growth and development.

Conclusion(S)

The prevalence of chronically under-nourished pre-school children aged 1–5 years attending health centers in Bushenyi district is very high. There is significant relationship between children aged less than two years, staying in a nuclear family setting, drinking unboiled water, soil transmitted helminthiasis and stunting among children aged 1–5 years.

Recommendation(S)

Stakeholders are to encourage continuation of mass deworming and hygienic practices, to reduce further the prevalence of soil transmitted helminthiasis among children.

All health workers are to educate caregiver about children's nutritional needs and prevention of soil transmitted helminthiasis and proper sanitation measures irrespective of their nutrition status.

The control of soil transmitted helminthiasis should be undertaken among stunted children in Bushenyi district.

Further research involving the whole community and using advanced methods should be done to get more accurate prevalence and intensity of soil transmitted helminthes.

Declarations

The **ethical approval and consent to participate** has been included in the manuscript

Consent to Publish

Not applicable

Data Availability

All data has been included in the manuscript

Competing Interests

The authors declare no competing interests

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Authors' contribution

DM and HIN conceptualization and design of the study, DM, HIN, HKW, EDE, data collection, DM, HIN, HKW, EDE, data analysis, DM, HIN, HKW, Draft manuscript, DM, HIN, HKW, EDE, PV, ST, NA, Review the manuscript before submission, DM, HIN, HKW, EDE, manuscript approval.

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Authors' information

Not applicable

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Figures

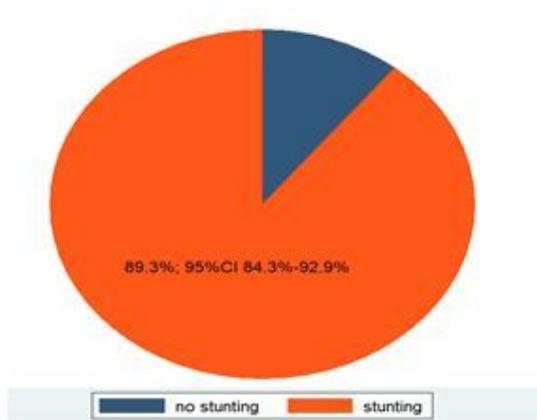


Figure 1

The prevalence of chronic under-nutrition among children aged 1-5 years attending selected health units in Bushenyi district.