Anemia Incidence and Contributing Factors Among Under Five Hospitalized Children at Kampala International University Teaching Hospital, Bushenyi District, Western Uganda

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ABSTRACT

The World Health Organization estimates that globally, 1.62 billion people are anemic, with the highest prevalence of anemia (47.4%) among preschool-aged children. A study was conducted at Kampala International University Teaching Hospital (KIU TH) Bushenyi district in western Uganda to assess the prevalence and factors associated with anemia among children under five years. The study found that 44% of children had an 11 g/dl Hb level or less, with 54.0% being housewives and 22.7% being civil servants. The majority of children with low HB levels were of MUAC between 12.5-13.5 cm. The study also found that male gender, milk consumption, and a history of chronic diseases were associated with increased anemia. Child factors included malaria infection, male gender, feeding on cow milk before age 6 months, and a history of chronic diseases. Exclusive breastfeeding was not associated with increased anemia. The study highlights the importance of addressing anemia in children under five years.

Keywords: Anaemia, Exclusive breastfeeding, Chronic diseases, Caretakers, Children Under Five Years.

INTRODUCTION

Anaemia in children is an important health problem in almost all the developing countries of the world with an estimated prevalence of 43%. However, due to the insidious nature of its presentation, mild-to-moderate degrees of anaemia frequently remain undetected and untreated by healthcare workers [1, 2]. Severe anaemia is among the causes of admission and mortality in the pediatric wards. Although mild and moderate anaemia are associated with long-term and debilitating side effects, little attention is given to this condition [3, 4]. It is estimated that nearly 50% of all cases of anaemia are due to iron deficiency, whereas other causes of anaemia are multifactorial [5-7]. Anaemia resulting from iron deficiency adversely affects cognitive and motor development, causes fatigue and low productivity and when it occurs in pregnancy, may be associated with low birth weight and increased risk of maternal and perinatal mortality [8, 9]. Other causes of anaemia include other micronutrient deficiencies (e.g. folate, riboflavin, vitamins A and B) [10, 11], acute and chronic infections (e.g. malaria, cancer, tuberculosis and HIV) [12-15], and inherited or acquired disorders that affect haemoglobin synthesis, RBC production or RBC survival [16]. Symptoms result from impaired tissue oxygen delivery and may include weakness, fatigue, difficulty concentrating, or poor work productivity [3]. Children may have issues with mental development [1]. Anaemia and malaria are key health problems in pediatric populations in sub-Saharan Africa [17]. Malaria causes anemia through hemolysis and increased splenic clearance of RBCs and cytokine-induced dyserythropoeisis. A single episode of malaria or repeated episodes due to reinfection or failure to adequately clear parasitaemia may result in life-threatening anaemia and if

untreated, death [18]. Children younger than age 5 years still have the highest prevalence of, and the most severe, anaemia and had rising prevalence in contrast to the overall trend and findings from other reports. Around 60% of African children below five years of age have anaemia, in sub-Saharan Africa, the prevalence of anaemia among preschool children ranges from 42% in Swaziland to 91% in Burkina Faso [19].

World Health Organization has estimated that globally 1.62 billion people are anemic, with the highest prevalence of anemia (47.4%) among preschool-aged children [20]. In East Africa, the prevalence of anaemia under five years in children is 55% [21]. The UDHS showed that in Uganda half of children aged 6-59 months 53% suffered from some degree of anaemia: 24% were mildly anaemic, 27% moderately anemic, and 2% were severely anaemic. The prevalence of anaemia shows an overall decrease with age from a high of 78% among children aged 9-11 months to a low of 39% among children aged 48-59 months. The different sub regional prevalence of anemia among children under 5 years living in Uganda is; South Central 52.0%, North Central 55.1%, Kampala 50.9%, Busoga 63.4%, Bukedi 47.8%, Bugisu 47.6%, Teso 58.9%, Karamoja 67.7%, Lango 61.0%, Acholi 70.8%, West Nile 56.4%, Bunyoro 55.3%, Kigezi 31.5%, Ankole 30.6%, Islands 57.9 %, Mountains 40.3%, Greater Kampala 49.4%, and Tooro 45.0% [22]. The cohort of children in peri-urban areas in western Uganda were found to have frequent episodes of malnutrition over the past five years especially stunting with a prevalence of 41.6% of the children [23], an indication of potentially high micronutrient deficiencies and anemia. Estimating the prevalence of anemia and especially understanding its determinants is critical in designing effective anemia interventions. This study determined the prevalence and factors associated with anemia among children under five years admitted at KIU TH Bushenyi western Uganda.

METHODOLOGY

Study Design
The study employed a descriptive cross-sectional design. This study design was selected because it shall assist in easy access of the required data for the study which will enable a quicker determination of the prevalence and severity of anemia among children under five years admitted at KIU TH.

Area of Study
The study was conducted in KIU TH located in Bushenyi District, a district bordered by Rubirizi District to the northwest, Buhweju District to the northeast, Sheema District to the east, Mitooma District to the south and Rukungiri District to the west. The District is made of one (1) County (Igara), twelve (12) sub counties of Bushenyi District, Bitooma, Ibaare, Bushenyi E, Bushenyi C, Kyabugimbi, Bushenyi A, Kyeizooba, and Ruhumuro, together with Central Division, Nyakabirizi Division and Ishaka Division., 1 Municipal Council, 4 Town Boards, 3 Wards, 64 parishes and 565 villages.

Study Population
The study targeted all children aged 6 to 59 months admitted at KIU TH pediatric ward.

Inclusion criteria
All children aged 6-59 months who are admitted at KIU TH pediatric ward with anemia.

Exclusion criteria
Active haemorrhage.
History of blood transfusion within two months to prior admission.
History of surgery within previous two months.

Sample Size Determination
Sample size was calculated using Kish and Leslie formula

$$n = \frac{z^2 pq}{d^2}$$

Where z = Z score for 95% confidence interval, which is 1.96
p = estimated prevalence (70% or 0.7)
d = margin of error set at (0.09)
q=1-p (30% or 0.3)
n = estimated minimum sample size required

$$\frac{1.96^2 \times 0.7 \times 0.3}{0.09^2}$$

$$\frac{38416 \times 0.21}{0.0081}$$

100 children below 5 years

Sampling Procedure

The study was carried out among children under five-year age admitted at KIU TH, a total of 100 children was considered and using a random sampling where all those who came within the time of the study was considered for an interview and caregivers or any elder participating in the study was considered to provide relevant information on behalf of the children.

Data Collection Methods and Tools

All children aged 6 to 59 months admitted at KIU TH pediatric ward with anemia were approached for parental consent and was assessed for eligibility. Data of eligible participants was obtained by interviewing parents/guardians, extracting from patient's files then transferred to specific designed questionnaire.

Data Analysis and Presentation

Data obtained was entered and analyzed using computer programs Epi Info version 3.5.3 and SPSS version 20 statistical software. The results are summarized in tables, graphs and pie charts. To identify factors associated with the outcome variable (anemia), the 95% confidence interval was determined and factors with p-value of less than 0.05 were considered significant.

Data Quality Control

Questionnaire were pretested in a different study area so as to ensure validity and reliability of the data collected. The collected data was reviewed and checked for completeness.

Ethical Considerations

An introductory letter was acquired from the faculty of clinical medicine and dentistry of Kampala International University western campus and permission to conduct the study was sought from the Administration of KIU TH. Full and complete information were provided to the respondents about the aim, purpose and the course of the study. Respondents were aware that a signed consent form is non-binding and they can withdraw from the research at any time should they choose to do so. The principle of equity was strongly be adhered to; no favoritism of any kind was exercised as all participants were treated the same way regardless of age, sex, religious affiliation or any other attributes. Confidentiality was observed strictly by all participants as the study issues are so private and bear cultural ramifications should such information leak. To ensure confidentiality, the names of participants were not included on the questionnaires and interviews were conducted in private rooms. All data generated were handled carefully and kept in a safe place by designated people.

RESULTS
Table 1: Child's Socio-demographic Characteristics

Variables	Frequency (n=)	Percentage (%)
Child's age		
0-12	17	17.0
13-24	55	55.0
25-36	25	25.0
37-59	3	3.0
Sex		
Male	52	52.0
Female	48	48.0
Breastfeeding		
Exclusive for 6 months	64	64.0
Not exclusive for 6 months	36	36.0

N=Frequency   %=Percentage

According to the study findings, majority,55(55.0%), 52(52.0%), and 64(64.0%) of the children were 13-24 months of age, Males by gender and breastfed for Exclusive for 6 months respectively.

Similarly, the caregivers mostly, 71(71.0%), 59(59.0%), 41(41.0%) and 52(52.0%) were ≤ 4 members by number in family, away from Ishaka-Bushenyi Municipality, acquired Secondary education level and Secondary by occupation respectively.

Table 2: Caretakers Soci0-demographic Characteristics

Variables	Frequency (n=)	Percentage (%)
Family size		
≤ 4 members	71	71.0
≥5 members	29	29.0
Residence of the care giver		
Within Ishaka-Bushenyi Municipality	41	41.0
Away from Ishaka-Bushenyi Municipality	59	59.0
Education level of care giver		
Primary	33	33.0
Secondary	41	41.0
Tertiary	26	26.0
Occupation of the care giver		
Secondary	52	52.0
Peasant	11	11.0
Self-employed	18	18.0
Civil servants	19	19.0

N=Frequency   %=Percentage

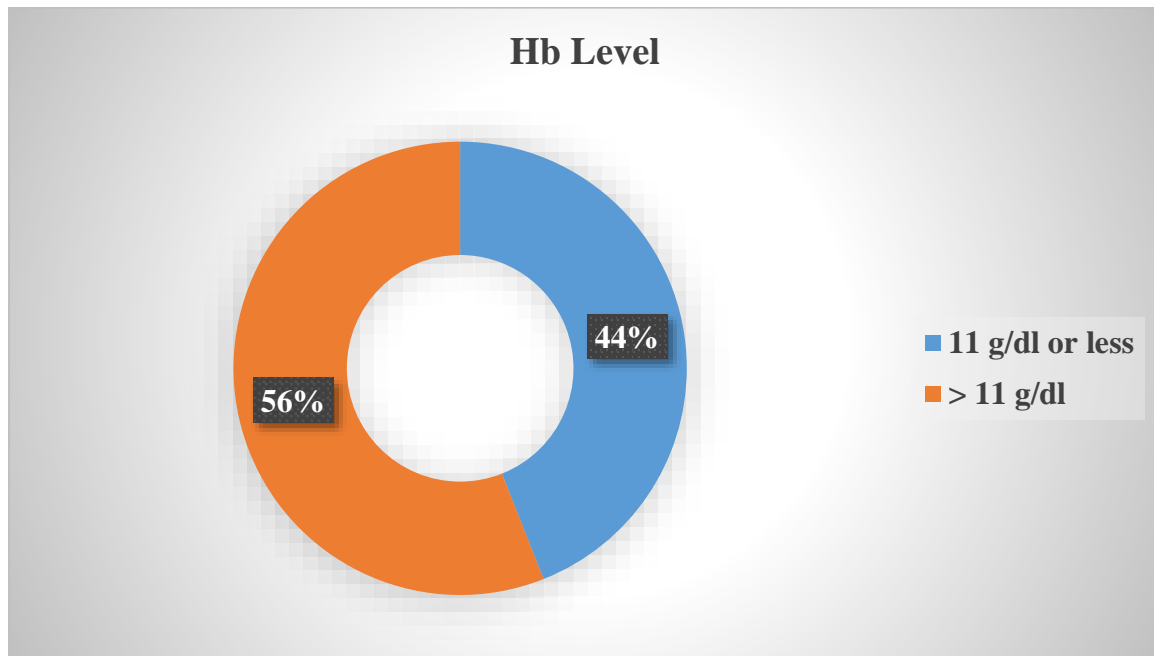### The prevalence of anemia among children under five years admitted at KIU TH

Figure 1: Distributions of Hb Levels of the Children in the Study

According to the study findings, majority were >11 g/dl whereas 44% had 11 g/dl or less Hb level.

The socioeconomic factors associated with anemia among children under five years admitted at KIU TH.
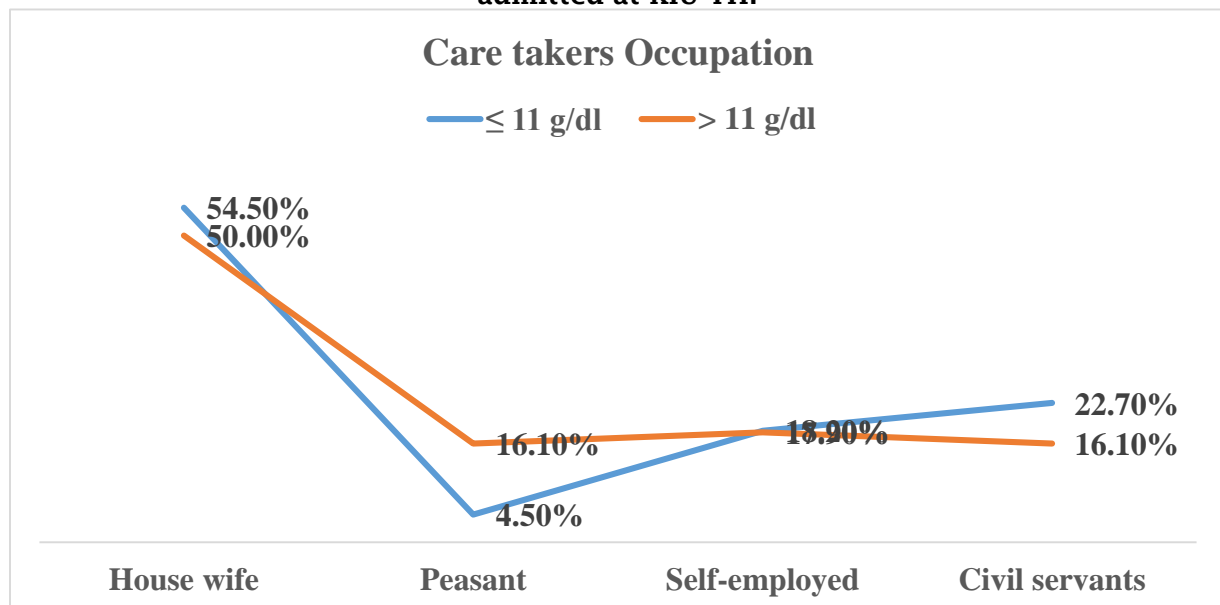

Figure 2: Caretakers Occupation relationship with Children's HB Levels

According to the study findings, majority 54.50% of the children with Hb ≤ 11 g/dl were housewives as well as the 22.7% who were Civil servants. See Figure 2 Similarly, higher numbers of low Hb Levels (≤ 11 g/dl) were found among family size of ≤ 4

members 32(72.7%) and those who reside away from Ishaka-Bushenyi Municipality 27(61.4%) but this was statistically insignificant.

Table 3: The socioeconomic factors associated with anemia among children under five years admitted at KIU TH

Variable	Hb Level		TOTAL N (%)	P-Value	OR [95% C.I]
	≤ 11 g/dl	> 11 g/dl			
Family size					
≤ 4 members	32(72.7%)	39(69.6%)	71(71.0%)	0.736	1.16(0.49-2.79)
≥ 5 members	12(27.3%)	17(30.4%)	29(29.0%)	Ref	1
Residence of the care giver					
Within Ishaka-Bushenyi Municipality	17(38.6%)	24(42.9%)	41(41.0%)	0.670	0.84(0.38-1.88)
Away from Ishaka-Bushenyi Municipality	27(61.4%)	32(57.1%)	59(59.0%)	Ref	1

*Statistically Significant, P-Value=<0.05   OR=Odds Ratios   Ref=Reference category

The child factors associated with anemia among children under five years admitted at KIU TH.

Majority (81.0%) with low HB Levels (≤ 11 g/dl) were of MUAC between 12.5-13.5 cm. According to the study findings, majority 25(56.8%) with low HB Levels (≤ 11 g/dl) had a positive BS for MPS (malaria) with P-Value=<0.001*, OR=7.90(3.03-20.56). Male gender 29(65.9%), P-value=0.014* OR=2.77(1.22-6.29); similarly, 41(97.6%) took milk, P-Value=0.007*;   OR=11.08(1.35-90.77). However, majority 25(73.5%) had no history of chronic diseases but History of chronic diseases had a P-value=0.006* OR=7.56(1.51-37.83). Also, Exclusive for 6 months,   23(52.3%)   P-Value=0.030* OR=0.40(0.17-.93).
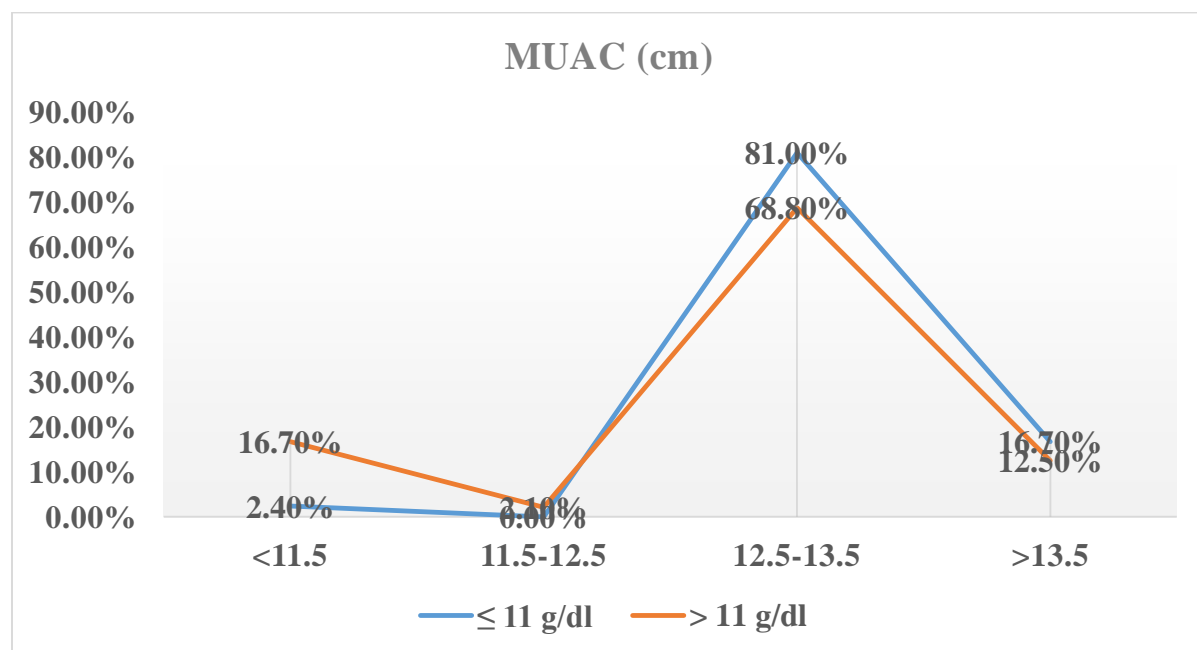

Figure 3: Distribution HB level with MUAC of the Children

Table 4: The child factors associated with anemia among children under five years admitted at KIU TH

Variable	Hb Level		TOTAL N (%)	P-Value	OR [95% C.I]
	≤ 11 g/dl	> 11 g/dl			
BS for MPS					
Positive	25(56.8%)	8(14.3%)	33(33.0%)	<0.001*	7.90(3.03-20.56)
Negative	19(43.2%)	48(85.7%)	67(67.0%	Ref	1
Sex					
Male	29(65.9%)	23(41.1%)	52(52.0%)	0.014*	2.77(1.22-6.29)
Female	15(34.1%)	33(58.9%)	48(48.0%)	Ref	1
Breastfeeding					
Exclusive for 6 months	23(52.3%)	41(73.2%)	64(64.0%)	0.030*	0.40(0.17-.93)
Not exclusive for 6 months	21(47.7%)	15(26.8%)	36(36.0%)	Ref	1
Milk					
Yes	41(97.6%)	37(78.7%)	78(87.6%)	0.007*	11.08(1.35-90.77)
No	1(2.4%)	10(21.3%)	11(12.4%)	Ref	1
History of chronic diseases					
Yes	9(26.5%)	2(4.5%)	11(14.1%)	0.006*	7.56(1.51-37.83)
No	25(73.5%)	42(95.5%)	67(85.9%)	Ref	1

*Statistically Significant, P-Value=<0.05   OR=Odds Ratios   Ref=Reference category

DISCUSSION

The prevalence of anemia among children under five years admitted at KIU TH.

The prevalence of anemia among children under five years admitted at KIU-TH stands at 44%. This complements a study by Soares Magalhães and Clements in which it was found that the prevalence is estimated to be above 40% among this group [24]. However, its lower than that in a study by Dos Santos et al. [25] conducted in Recife, Brazil concluded that there was a 56.6% prevalence of anemia under five-year-old children. Similarly, a study done in Namutumba district, Uganda indicated that, 58.8% of the children had anemia (haemoglobin level below 11 g/dl) [26].

The socioeconomic factors associated with anemia among children under five years admitted at KIU TH.

According to the study findings, majority of the children with anemia were those raised by housewives. This is consistent with a cross-sectional survey by conducted in rural settings from Bata District, Equatorial Guinea in which it was concluded that belonging to the poorest wealth family were positively associated with anemia as well as those who were Civil servants [27-34]. Similarly, higher numbers of anemic children were found among family size of ≤ 4 members. This complements cross sectional study conducted in North-western Uganda shown that household size was associated with anaemia [35-40]. Also, UBOS [22] revealed that number of household members was associated with anemia. Those who reside away from Ishaka-Bushenyi Municipality though statistically insignificant, they were associated with higher level of anemia compared to their counterparts. This complements a study conducted in Namutumba district, residents of Magada 54.0% and Namutumba 51.6% (urban areas) were less likely to be anemic than rural area in Bulange 79.0% [28-34]. As well, Osorio et al. [29] revealed that prevalence in the metropolitan region of Recife was 39.6%, 35.9% in the urban interior and in the

rural interior had the highest prevalence, 51.4%.

The child factors associated with anemia among children under five years admitted at KIU TH.

Significant influence was found among majority with malaria had 7.90(3.03-20.56) odds to developing anemia. This coincides with a study in which it was concluded that malaria was associated with a 1.5 times risk of anemia though not statistically significant in the multivariate analysis [28]. As well Uganda Malaria Indicator Survey revealed that over 60% of children less than 5 years of age were anemic and that over half of children tested positive for malaria via a rapid diagnostic test [30]. In this study, having a history of chronic diseases had 7.56(1.51-37.83) odds to development of anemia. This complements a study conducted in Kuwaiti shown that a moderately/severely stunted child was 2.3 times prone to be anemic than a normal child, a moderately/severely overweight child was less likely to be anemic and a child who was given cereals as a weaning food was 3.5 times of becoming anemic than a child given meat and egg as a weaning food [31]. Similarly, Male gender was 2.77(1.22-6.29) times more likely to be anemic. Those who took milk instead of exclusive breast feeding were 11.08(1.35-90.77) times likely to be anemic. This is in agreement with conducted study in Eastern Cuba that showed that lack of breastfeeding was found to be associated with anemia [32]. A study in Sri Lanka shown at multivariate logistic regression that duration of exclusive breastfeeding was associated with anemia (r2 = 0.060, p = .002) [33]. However, exclusive breastfeeding for 6 months, significantly reduced the odds to development of anemia by 0.40(0.17-.93). This further agrees with a study in Sri Lanka that revealed that the duration of exclusive breastfeeding was associated with anemia (r2 = 0.060, p = .002) [33].

CONCLUSION

The prevalence of anemia among children under five years admitted at KIU-TH stands at 44%. Socio-economically, caretakers who were housewives living away from Ishaka-Bushenyi Municipality and to some extent the family size increased anemia. Child factors included malaria infection, Male gender, feeding on cow milk before age 6 months and history of chronic diseases whereas exclusives breastfeeding offers protection against anemia.

Recommendation

The government and all other stakeholders should encourage public participation in developmental programs and sensitizations about preventive measures of anemia creating awareness about healthy feeding, infection prevention as well as attending public lectures/sensitizations about provision of balanced diet especially exclusive breastfeeding to children, this would help to improve the knowledge of care takers of children in Bushenyi, Western Uganda and the whole country at large. Encouraging caretakers/mothers especially the housewives to ensure that the children sleep under a mosquito net and/or clean the surrounding. This would reduce the incidence of malaria as they contribute to anemia among under-fives since its one of the malaria complications. Care takers should be encouraged to only add milk, tea, porridge after six months of exclusive breast feeding which is highly recommended to reduce the possibility of infections among other condition which could expose the children to anemia.

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