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Incidence and Factors associated with Anemia in children aged Six months to five years presenting at Fort Portal Regional Referral Hospital, Western Uganda

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ABSTRACT

This study determined the incidence and factors associated with anemia in children 6 months to five years presenting at Fort Portal Regional Referral Hospital (FRRH), Western Uganda. This was a hospital-based cross-sectional descriptive-analytical study determining the incidence and factors associated with anemia in children aged 6 months to five years at FRRH. Data collected using the questionnaire was coded and entered into Microsoft Excel version 2010 and then exported to STATA version 14.2. Data analysis and presentation were carried out based on the specific objectives of this study. According to the study findings, most of the respondents (50%) introduced other feeds to their babies at less than six months whereas (16.7%) introduced other feeds to their babies at 6 months. The study concluded that most respondents only sometimes ensured that their family ate a balanced diet every day as the majority said 1 meal was eaten per day, most fed their children after 6 hours which was inadequate and all contributed to the increased risk of anemia among children aged six months to five years. The study recommended that the Ministry of Health should improve and reenergize its campaigns and programs for the prevention of malnutrition in children less than 5 years old in an effort to improve mothers' knowledge about the prevention of malnutrition. Health workers should endeavor to offer sensitization and training of mothers on nutrition education.

Keywords: Anemia, Malnutrition, Balanced diet, Exclusive breastfeeding, Nutrition education.

INTRODUCTION

Anemia in children under 5 years of age is defined as a hemoglobin (HB) level < 11g/dl. Anemia has been man's continual companion since ancient times [1, 2]. The biological causes of pediatric severe anemia have been widely documented since ancient times as being complex and multifactorial; involving socio-demographic and economic factors, malaria, micronutrient deficiency, viral agents, and sickle cell anemia [3, 4]. Anemia as a cause of intra-visceral organ injury has been recognized and spoken of since historical times [5]. There's limited research on the beliefs and knowledge for pediatric anemia management and prevention as many think it is caused by evil spirits in Uganda which may be an obstacle to seeking timely health care for pediatric severe anemia [6]. Africa is the region with the highest prevalence of anemia in preschool children, followed by the Southeast Asia region and the Eastern Mediterranean region [7, 8]. Anemia is a global public health concern affecting a significant percentage of the world's population. Despite recent data that reveals a lower global prevalence of anemia in 2018 when compared with 2006, nearly one-third of the world's population was estimated to be anemic among children under 5 years of age. The severity of anemia is classified as severe, moderate, and mild forms of anemia. With the cut-offs of hemoglobin (HB) levels for each being 10.0-10.9gdl for mild, 7.0-9.9g/dl for moderate, and < 7.0g/dl for severe anemia [9, 10]. Severe anemia is a common health problem among children accounting for 10-29% of all pediatric admissions and about 8-17% of hospital deaths in sub-Saharan Africa [6]. In Uganda, 11% of children under five years are anemic [6]. According to the 2006 demographic health survey, the prevalence of anemia among children under 5 years in

Uganda was 72%. The 2009 Uganda malaria indicator survey was conducted in late 2009 and revealed that over 60% of children less than 5 years of age were anemic [11]. The role of anemia in cognitive impairment and educational attainment is also well recognized affecting the child up to adulthood. Other possible causes of anemia could be parasitic infections, genetic conditions, and disease factors like jaundice, splenomegaly, and hemoglobinuria [12, 13]. Severe anemia remains a major cause of morbidity and mortality among children in sub-Saharan Africa. 60% of African children less than 5 years old have anemia, 42% in Swaziland and 91% in Burkina Faso in sub-Saharan are anemic. Prevalence of anemia among children under five in Uganda was reported at 51.1% in 2016 according to the World Bank collection of development indicators in November 2020. Even though this value is less compared to the previous years of 2014 (53.3%), 2012 (57.8%), 2010 (61.2%), 2008 (64.6%), and 2006 (67.3%); this value is however still high and therefore need for intervention [6]. No study has been done in the Fort Portal regional referral hospital that is looking at the incidence and factors associated with anemia in children below the age of 5 years. Hence a need to analyze these problems. This study, therefore, determined the incidence and factors associated with anemia in children 6 months to five years presenting at Fort Portal Regional Referral Hospital, Western Uganda.

METHODOLOGY

Study Design

This was a hospital-based cross-sectional descriptive-analytical study determining the incidence and factors associated with anemia in children aged 6 months to five years at FRRH.

Study Population

The participants were children aged 6 months to five years presenting at Fort Portal Regional Referral Hospital with anemia.

Inclusion Criteria.

- ✓ Children with anemia aged 6 months to five years
- ✓ Patients whose mothers consent to inclusion in the study

Exclusion Criteria.

- ✓ Anemic patients below six months of age and above five years old.
- ✓ Children who fit the inclusion criteria but whose mother/caregiver has not given informed consent.

Sample Size

The sample size was determined using Kish and Leslie, 1965 formula.

$$N = \frac{Z^2 PQ}{D^2}$$

Where N= Desired sample size

Z= Standard normal deviation was taken as 1.96 at a confidence level of 95%

P= Proportion of target proportion estimated to have similar characteristics will be obtained.

If there is no estimated percentage, 50% or 0.5 (constant) will be considered.

Therefore, P=0.5

Therefore, Q= is standardized 1.0- P= 0.5

D= Acceptable error was 0.05 or 5%

In this case, the 95% confidence level had 5% errors. Therefore, 0.05 was the level of significance

$$N = \frac{1.96^2 x 0.5 x 0.5}{0.05^2}$$

$$N = 384$$

Sampling Technique and Sampling Procedure

A consecutive recruitment was used, in which every patient who qualifies in the inclusion criteria is enrolled into the study until the desired sample size is achieved.

Data Collection Procedures

A structured questionnaire was used to gather information on socio-demographic variables (gender, age, level of education, etc.). Marital status, history of anemia, history of feeding patterns (nutritional status), disease patterns associated with anemia like gastrointestinal infestations, hemoglobinopathies, parasitic infections like malaria, inherited or acquired conditions like HIV, sickle cell, glucose 6 phosphate deficiency, preterm and post-term child history, maternal parity and history of maternal anemia and socio-economic status of caregivers of the child. Adherence to the child's treatment was assessed. Anthropometric measurements including weight and height/length for age were measured by trained staff (research assistants). The patient was leveled as being anemic on the physician's and according to the hemoglobin level on the child's file or if the patient was once on anemia treatment. The weight was recorded in kilograms to the nearest 0.1 kg using a weighing scale, and the height or length in meters to the nearest 0.05m. Anemia was categorized as mild(10-10.9g/DL), moderate (7.0-9.9g/DL), and severe (<7.0g/DL).

Pretest

The test questions were first given to a few caregivers of patients in KIU-TH to assess the acceptability of data collection tools (questionnaires) to the participants and necessary adjustments were made to ensure adequate data quality. The purpose was to get the true picture of what happened when the questions or questionnaires were used.

Data Analysis

Data collected using the questionnaire was coded and entered into Microsoft Excel version 2010 and then exported to STATA version 14.2. Data analysis and presentation were carried out based on the specific objectives of this study. A descriptive analysis looking at frequencies and percentages and presented using a bar graph was used for analyzing the incidence of anemia factors associated with anemia using bar graphs and pie charts.

RESULTS

Socio-demographics of the respondents

Table 1: Socio-demographics of the respondents

Age (caretakers)	**Frequency**	**Percentage**
34-38	93	22.9
39-43	88	24.2
44-48	54	14.1
49-53	50	13.0
54-55	50	13.0
56 and above	35	92.1
Total	**384**	**100**
Marital status		
Single	0	0
Married	265	69
Divorced	119	31
Total	**384**	**100**
Religion		
Catholic	120	31.25
Protestant	140	36.4
Islam	60	15.6
Other Religion	64	16.6
Total	**384**	**100**
Level of education		
Primary level	215	55.9
Secondary level	100	26
Tertiary institution	69	17.9
Total	334	100

Most of the participants were between the ages of 34-38 (24.2 %) while a few were 69 and above (13%). This implied that the majority of participants were old enough to give valid findings. Most of the participants were married (69%) unlike 31% of participants were single. The findings implied that participants who involved in the study were married. Most of the respondents were protestants (36.4%) followed by Catholics (31.2%), Muslims (15.6%) and other religions with 16.6% For the case of education level, most of the respondents had attained primary level (55.9%), Secondary level (26%), Tertiary institution (17.9%) and none of the respondents had not attained education.

Analysis of study objectives

The incidence of anemia among children age 6months to five years of age attending the pediatric unit in FRRH

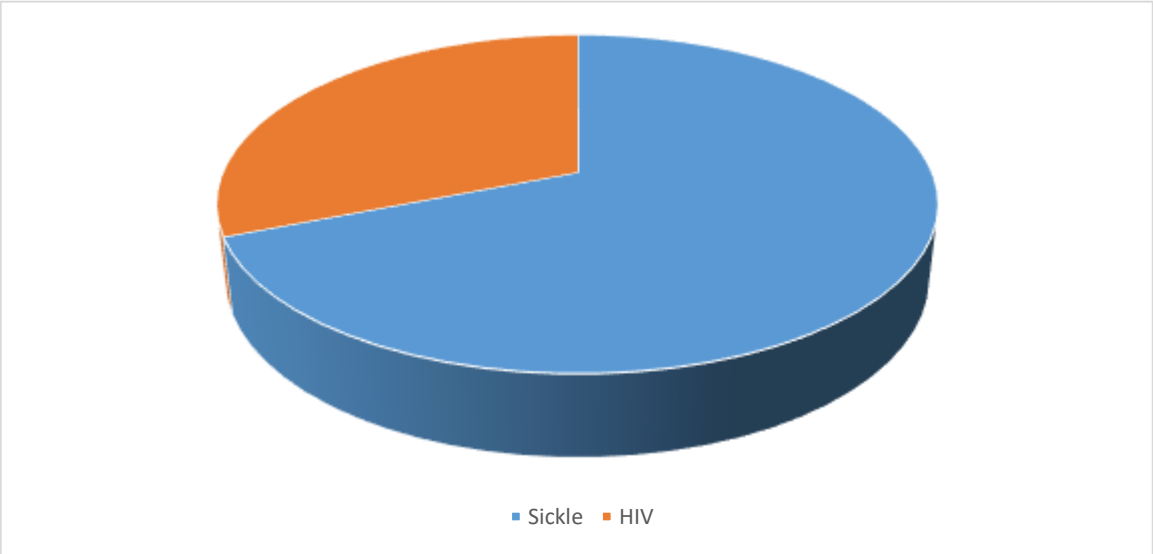

Figure 1: Whether the child has any of these medical conditions

Most 69% of participants revealed that their children suffered from sickle cells, unlike 31% who had HIV/AIDS.

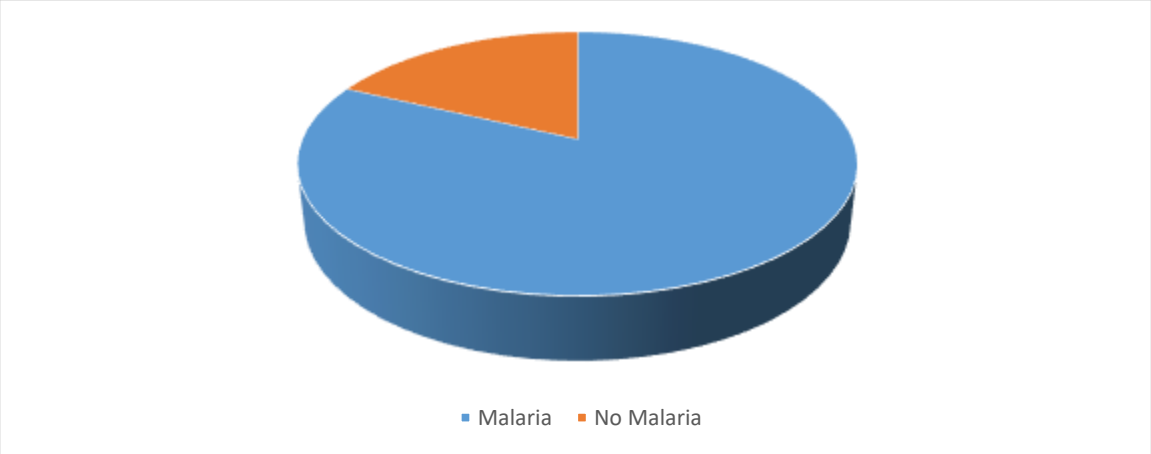

Figure 2. The disease partner of the child in the past 2years.
Most of children 82% had malaria unlike 18% did not have

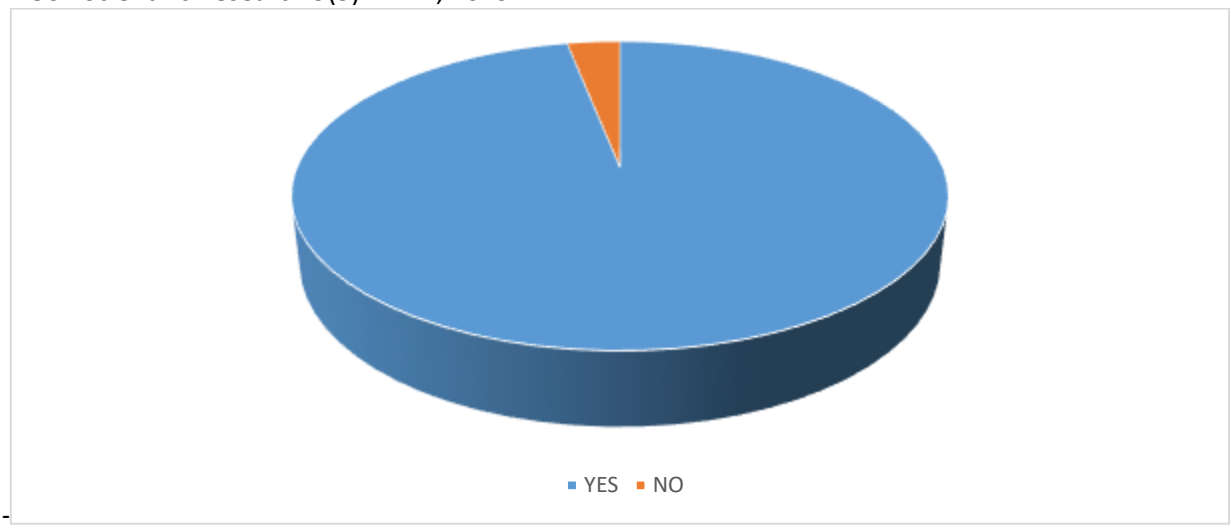

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Figure 3: If the mother had any medical-related condition /complication while pregnant

All participants agreed that the mother had some medical-related condition /complication while pregnant. In an interview with some of the respondents, they revealed that they were affected by sickle cell anemia. Sickle cell is an inherited disease caused by a defect in a gene. A person will be born with sickle cell disease only if two genes are inherited—one from the mother and one from the father. A person who inherits just one gene is healthy and said to be a "carrier" of the disease. The factors associated with anemia among children aged 6months to five years of age attending the pediatric unit in FRRH

Table 2: Parameter estimation of bivariate binary logistic regression modeling of child undernutrition and anemia

Predictors	Anemia		Undernutrition	
	AOR (95% CI)	P-value	AOR (95% CI)	P-value
Intercept	1.24 (0.70,1.91)	0.089	1.43 (0.22,2.03)	0.203
Place of residence				
Urban	0.751 (0.573,0.984)	0.002	0.663 (0.456,0.965)	0.000
Rural	Ref.		Ref.	
Source of drinking water				
Not improved	Ref		Ref	
Improved	0.681 (0.466,0.996)	0.000	0.581 (0.338,0.998)	0.003
Types of toilet facility				
Not improved	Ref		Ref	

Predictors	Anemia		Undernutrition	
Family size	AOR (95% CI)	P-value	AOR (95% CI)	P-value
1 to 4	Ref		Ref	
5 to 8	1.012 (0.968,1.058)	0.608	1.012 (0.978,1.047)	0.496
More than 8	1.029 (0.938,1.130)	0.545	1.024 (0.953,1.100)	0.516
Male	Ref		Ref	
Female	0.984 (0.938,1.031)	0.489	0.988 (0.953,1.025)	0.529

Predictors	Anemia		Undernutrition	
	AOR (95% CI)	P-value	AOR (95% CI)	P-value
Multiple	1.727 (1.292, 2.310)	0.000	1.278 (1.183,1.380)	0.000
Sex of child				
Male	Ref		Ref	
Female	0.985 (0.955, 1.017)	0.367	0.989 (0.965,1.014)	0.379
Number of antenatal visits during pregnancy				
No visit	Ref		Ref	
1 to 3	1.034 (0.880,1.214)	0.683	1.048 (0.926,1.185)	0.459
More than 3	1.002 (0.853,1.177)	0.980	1.046 (0.924,1.185)	0.479
Place of delivery				
Home	Ref		Ref	
Health facility	0.998 (0.931,1.070)	0.959	0.951 (0.902,1.004)	0.067
Size of children at birth				
Small	Ref		Ref	
Average	0.567 (0.462,0.696)	0.000	0.856 (0.827,0.886)	0.000
Large	0.823 (0.700,0.968)	0.000	0.822 (0.791,0.853)	0.000

The table shows the influence of predictors on the undernutrition and anemia status of under-five children by taking into account the dependency of child undernutrition and child anemia by applying bivariate binary logistic regression analysis. The correlation between child undernutrition and child anemia was calculated using an odds ratio (OR) of 1.729, and this value different from one indicates a significant correlation between child undernutrition and child anemia. Once the correlation between a child's undernutrition and child anemia was checked, the effect of each predictor on the undernutrition and anemia of a child was determined. Therefore, the findings of this paper revealed that the region and current working status of a mother and a child taking vitamin A in the last six months were statistically associated with children's anemia. The type of toilet facility and the mother's BMI were statistically related to childhood undernutrition. Whereas, types of residence, drinking water source, anemia level of the mother, the child if twin, birth size of children, diarrhea, fever, and age of a child are statistically associated with both childhood undernutrition and anemia. The ratio of the number of correct predictions to the number of observations, i.e., the correct classification rate (CCR), is 88.8%, which is very high. This indicates that the estimated model was a good fit for the data.

DISCUSSION

All participants agreed that the mothers had some medical-related condition/ complication while pregnant. This is in relation to a study in Kenya where a population-based cross-sectional study revealed that low iron diet intake, birth-related factors, and malaria were the main causes of anemia. Also, glucose 6 phosphate dehydrogenase deficiency, parasitic infestations (i.e. hookworms and tapeworms), acute and chronic inflammations, inherited or acquired disorders that affect Hb synthesis, red blood cell production or survival, and nutritional deficiencies were other factors associated with anemia in children under five years [14]. According to the study findings minority of the respondents (43%) had a problem with breastfeeding their babies. This is in line with the findings in another study done by Kuziga *et al.* [15] in Uganda which found that cultural activities like attending burial ceremonies and breastfeeding when newlywed led to inadequate breastfeeding of children which led to malnutrition and opened the way for severe conditions like anemia. This could be because of superstitions and beliefs that these mothers had a strong attachment to thus not breastfeeding their babies. According to the findings, vitamin A supplementation has a significant association with childhood anemia. A child who took vitamin A supplements in the six months before the survey is less likely to develop anemia than a child who did not take vitamin A supplements in the six months before the survey. This is most likely due to vitamin A's role in promoting optimal hematologic and linear growth. Furthermore, vitamin A improves both humoral and cell-mediated immunity, lowering the risk of infection-related anemia [16-27]. Supplementing with vitamin A is also beneficial for promoting child growth and reducing the risk of stunting. As a result, it is clear that a vitamin A-deficient child is more likely to suffer from both anemia and stunting. This finding supports the findings of Opoka *et al.* [17] in 2019 in Uganda. Children living in households with insufficient toilet facilities were found to be at a higher risk of malnutrition than children living in households with adequate toilet facilities [18-25]. Insanitary or unsanitary toilet conditions may increase mother-child-environment interactions, increasing exposure to childhood diseases and other opportunistic infections (diarrhea, fever) caused by contaminated foods, drinking water, or poor environmental sanitation [19-27].

CONCLUSION

The study concluded that most respondents only sometimes ensured that their family ate a balanced diet every day as the majority said one meal was eaten per day. Most fed their children after 6 hours which was inadequate and all contributed to the increased risk of anemia among children aged six months to five years. The majority of respondents said there was no cultural attachment to the age at which to stop breastfeeding. However, the overwhelming majority of respondents said there were times their culture forbade them from breastfeeding such as during funerals and if newly married. There is thus a serious need for concerned authorities to offer regular sensitization of mothers of children under 5 years of age and help them be able to translate the high levels of knowledge they possess on anemia and its causes into adequate and protective practices which prevent anemia such as ensuring that children eat a balanced diet every day, they are fully breastfed and food security is ensured in their households.

RECOMMENDATIONS

The Ministry of Health should improve and reenergize its campaigns and programs for the prevention of malnutrition in children less than 5 years old in an effort to improve mothers' knowledge about the prevention of malnutrition. Health workers should endeavor to offer sensitization and training of mothers on nutrition education. Mothers should ensure that their children less than 5 years of age eat a frequent,

nutritious, and balanced diet every day as well as ensure that children eat adequate quantities of food daily as well as adhering to best-recommended practices in ensuring a good nutrition status for their children. Mothers should be encouraged to get involved in more income-generating activities as this helps to ensure that they have the ability to purchase recommended food items as well as ensure food security in their households.

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