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PREVALENCE OF NUTRITIONAL ANAEMIA AND ASSOCIATED RISK FACTORS AMONG CHILDREN ATTENDING RUHENGERI REFERRAL HOSPITAL

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ABSTRACT

Nutritional anaemia is a severe public health problem affecting more than half of children under five years of age in low, middle and high-income countries. This study aimed to determine the prevalence and factors associated with nutritional anaemia among children attending Ruhengeri Referral Hospital. The study was carried out from October to December 2021. One hundred and ten children were eligible based on inclusion criteria. Cross-sectional study was used to achieve the objectives. To obtain the information regarding risk factors associated to nutritional anemia, written questionnaires in native language were distributed to caregivers. Middle Upper Arm Circumference (MUAC) was used to assess the nutritional status of children. Blood samples were collected into EDTA tubes and sent to laboratory department for analysis. Data were analyzed using Statistical package for the social sciences (SPSS). Among 110 children who participated in the study, the majority were females over males with 51.8% and 48.2% respectively. Study findings revealed that the prevalence of nutritional anemia was 14.5% for Iron deficiency anemia, 5.5% for megaloblastic anemia and 80% for anemia of other causes. Thus, the overall prevalence of nutritional anemia was 20%. Age-group 6-16 months was the most predominant with a proportion of 35.5%. This study demonstrates that the most prevalent nutritional anemia is Iron deficiency anemia. The most risk factors associated with

nutritional anemia were age-range between 6 months to 27 months, parents' knowledge on nutritional anemia, separated parents, types of meal that a child is given and the source of meal that a child is given were significantly associated with nutritional anemia due to the p value less than 0.05; because, from the information provided by the caregivers, children are given meals mainly composed of energy giving foods without the body building foods or the protective foods. Poor families with children aged 6-59 months need continuous support that will assist them to improve nutritional status of their children.

KEYWORDS: Haemoglobin, Malnutrition, Nutritional anaemia.

1. INTRODUCTION

In Rwanda, malnutrition among the poor children imposes greater burden in rural areas and 38% of young children are affected. Particularly rural children are more vulnerable to malnutrition because they receive foods having low nutritional values. Also, in early childhood due to lack of appropriate care they suffer from recurrent infections and multiple diseases either causing delayed development or fatal effect (De & Chattopadhyay, 2019). The demographic and socio-economic factors influence the nutritional status and neuro-development of the vulnerable children (Mandre, 2020).

Anaemia during childhood period is strongly associated with poor health and physical development, mild and moderate mental retardation, and poor motor development and control leading to reduced academic achievement and work capacity thereby reducing earning potential and damaging national economic growth in the future (Nshimyiryo *et al*., 2019). Since the end of civil war and genocide in 1994, the Government of Rwanda (GOR) has embarked on rebuilding the country and improving the quality of life for its people. Rwanda's long-term development goals are defined in "Vision 2020," a strategy that seeks to transform the country from a low-income, agriculture-based economy to a knowledge based, service-oriented economy with middle-income country status by 2020 (Ansoms & Cioffo, 2016). These goals build on remarkable development successes over the last decade that include high growth, rapid poverty reduction, and reduced inequality. Between 2001 and 2015, real GDP growth averaged about 8 percent per annum. Strong economic growth has been accompanied by substantial improvements in living standards, with a two-thirds drop in child mortality and near universal primary school enrolment (Dollar, 2015).

Anaemia is defined as a decrease in the amount of red blood cell (RBC) volume or

haemoglobin concentration below the range of values occurring in healthy persons. During the stages of accelerated growth between 1 and 5, and 10 to 13 years, all children have mild anemia. In children under five, anaemia is present when haemoglobin is below 11.0g/dl (Aspuru *et al*., 2011). The most common types of anaemia are: iron deficiency anaemia, thalassaemia, aplastic anaemia, haemolytic anaemia, sickle cell anaemia, pernicious anaemia, fanconi anaemia, megaloblastic anaemia, and hypochromic anaemia (Lanzkowsky, 2016). Nutritional anaemia refers to a reduced red blood cell count due to a poor diet which is deficient in iron, folic acid, and /or vitamin B12. It is common among infants and children, from 0-59 months of age. Effects of anaemia in many fields of studies done in many countries like Indian, Somalia and Ethiopia and in some of the East African countries has been associated with delayed psychomotor development and impaired cognitive performance in school children which leads to poor performance in language skills, motor skills, and coordination corresponding with a low intelligent Quotient (IQ) score in this group of children (Nkeshimana *et al.,* 2018). The presence of nutritional anaemia in children is a serious health problem because it negatively impacts mental development and future social performance in children. Children suffering from iron deficiency anaemia during their first 2 years of life have slow cognitive development and poor school performance in later years. Iron deficiency anaemia has also been associated with a diminished ability to fight infections by impairing cell-mediated immunity resulting in greater rates of morbidity due to acute infections and linear growth. The causes of nutritional anaemia are multi-factorial and are interrelated in a complex way the relative importance of each factor for example, folic acid deficiency or vitamin B12 deficiency varies in different communities and it is higher in rural communities than urban communities. Anaemia may be chronic example secondary to iron deficiency, or it may be acute, owing to a sickle cell crisis or infection. The situation is complicated further because anaemia in childhood can result not only from events in childhood but also from maternal iron deficiency and anaemia, which are associated with impaired foetal development, iron deficient and anaemic babies (Bresnahan & Tanumihardjo, 2014).

2. MATERIALS AND METHODS

2.1 Study area

This study was carried out at Ruhengeri referral hospital in pediatric and laboratory department, located in Northern Province, Musanze District, Muhoza sector and Ruhengeri cell. It is built in front of the Rwanda National Academy of Police and by the road of Kigali

to Rubavu, at 93 km from Kigali city, 56 km from Rubavu. The hospital receives referred patients from 16 Heath centers of Musanze district and others from neighboring health centers of Burera, Gakenke Nyabihu and patients from Gisenyi and Shyira hospital (in 26km).

2.2 Study design

This was a cross-sectional study and was conducted in a period of three months from October to December 2021.

2.3 Study population

This study included all children aged 6-59 months with caretakers attending Ruhengeri Referral Hospital who fulfilled inclusion criteria during the study period.

2.4 Inclusion and exclusion criteria

Children were eligible if they were at least in the age group of 6 months t 59 months with hemoglobin level less than 11 gm/dl. Children were excluded if they were in the age group below 6 months and above 59 months with hemoglobin level above 11 g/dl.

2.5 Data collection

Upon obtaining consent, written questionnaires in native language were distributed to caregivers to obtain the information regarding risk factors associated to nutritional anemia. Participants were informed of the general purpose and benefits of the study. Middle Upper Arm Circumference (MUAC) was used to assess the nutritional status of children.

2.6 Sample collection and processing

Up to 4 ml of venous blood was collected into EDTA and dry test tubes. After maintenance of sysmex and abbott 1000i architect machines, the serial number of patients was put created, the patient's examination tests were ticked and saved, and samples were examined. Full blood count and serum ferritin levels were expressed.

2.7 Ethical consideration

A recommendation letter of data collection was obtained from INES-Ruhengeri and this study was approved by the hospital research committee prior to being done and presented in department of biomedical laboratory sciences from INES-Ruhengeri.

2.8 Statistical analysis

Statistical package for the social sciences (SPSS) for windows version 24 software was used to analyze data in order to determine the frequency and statistical significance of records. Data were presented in terms of frequency, tables and percentages.

3. RESULTS AND DISCUSSION

3.1 Socio-demographic and clinical characteristics of study participants

Nutritional deficiency results in anaemia, reduced physical endurance, impaired immune response, difficulty in temperature regulation, changes in energy metabolism, leading to stress and anxiety, headache, fatigue, lethargy, dyspnoea, palpitations and decreased in cognitive performance (Osazuwa & Ayo, 2010). The table 1 presents frequencies and percentages of distribution of 110 children participants according to age and gender. According to age, the results show that the majority of the study participants (35%) were in the age between 6-16 months old. Based on gender characteristics, females were high (51.8%) compared to males (48.2%). The finding of this study was both similar and contrary with those of Sungnoon *et al*., (2016), where according to age most cases were between 4-20 months and based on the gender the males were high (56.1%) compared to female (43.9%).

Table 1: Age-gender distribution among participants.

Variables		Frequency	%
Age of patients (in months)	[6-16]	39	35.5%
	[17-27]	23	20.9%
	[28-38]	18	16.4%
	[39-49]	20	18.2%
	[50-60]	10	9.1%
Gender of patients	Male	53	48.2%
	Female	57	51.8%

3.2 Nutritional status of the children

Nutritional status refers to the condition of the body as influenced by diet, levels of nutrients in the body and the ability of those levels to maintain normal metabolic integrity (Rampersaud *et al*., 2015). Malnutrition places children at increased risk of morbidity and mortality and it is also shown to contribute to impaired mental development (Aboubakar *et al*., 2017). Middle upper arm circumference (MUAC) was used in order to achieve research objectives (Severe acute malnutrition). As depicted in the table 2, the prevalence of malnutrition was estimated to be 5.5%. According to information obtained from the caregivers, a good number of children are given food missing out on vital protein intake

(from Crops).

The majority of these meals were mainly composed of energy giving foods without the body building foods or the protective foods. Similarity was also seen in the study conducted by Carlos *et al*., (2018) which aimed to evaluate the nutritional status and the prevalence of iron deficiency anemia in children attending public day care centers in the city of Guaxupé (MG), Brazil and the results showed that prevalence of total iron deficiency anemia in the age span from 6 to 36 months was of 16.1% thus malnutrition was not considered to be a problem due to its low prevalence; however, an important prevalence of iron deficiency was observed.

Table 2: Nutritional status of children attending Ruhengeri Referral Hospital.

	Frequency	Percent (%)
SAM	6	5.5
Mild	0	0
Normal	104	94.5
Total	110	100

3.3 Prevalence of Nutritional anemia

Anemia is an important comorbidity in under-five children with severe acute malnutrition (SAM). The data on evaluation of SAM are limited. About 95% of anemia prevalence was found among children with SAM and most cases were of nutritional anemia (81.79%). About 54.33% of the children had mild anemia, with 79.75% had iron deficiency as the most common cause, followed by Vitamin B12 and folic acid deficiency (Chellan & Paul, 2017). The purpose of this research was to determine the prevalence and evaluate the factors associated with nutritional among children attending Ruhengeri Referral Hospital. In this representative survey of 110 children aged 6-59 months, 5.5% had megaloblastic anemia, 14.5% had iron deficiency anemia while 80% had anemia of other causes other than Iron deficiency anaemia and megaloblastic anemia. The overall prevalence of nutritional anemia was 20%. However, nutritional anemia has remained a severe public health problem based on the WHO classification. This study suggests that Ruhengeri Referral Hospital has not achieved the national nutritional strategy, which is aimed at reducing the prevalence of childhood nutritional anemia by 30% and 20% in 2015 and 2020, respectively (Gupta, 2014).

Similarly, according to a survey report on micronutrient problems in 10 provinces in 2006, it was found that the prevalence of nutritional anemia in pre-school age children in Indonesia was 26.3% of all under-five children. Based on the results of Basic Health research, the

prevalence of nutritional anemia in under-five children in Indonesia increased in 2013 to 28.1%. In addition, the results of the South East Asian Nutritional Survey in 2011 found that the prevalence of nutritional anemia in Indonesia in children aged 6-48 months was 25% (Iswati & Roshida, 2019).

Table 3: Prevalence of nutritional anemia.

Diagnosis	Frequency	%
Iron Deficiency anemia	16	14.5
Megaloblastic anemia	6	5.5
Anemia of other causes	88	80
Total	110	100

3.4 Nutritional anemia and associated risk factors

The World Health Organization reported that it is impossible to supply enough iron from unmodified plant-based complementary foods to meet the recommended daily intake of iron for under-fives without adding animal products such as liver, fish, beef, and eggs. Apart from other causes of anemia the analysis revealed that, in our population, poor feeding practices especially non-consumption of iron-rich foods (ie, meat, vegetables, and fruits) were significantly associated with the presence of childhood anemia. Food-based animal product were not (0%) consumed by the study subjects (Kejo *et al*., 2018).

Wirth *et al*. (2018) revealed that Childhood is a very crucial period in the life span since these are the influential years in the life of children with major physical, psychological and behavioral changes take place. The nutritional requirements during childhood are relatively high to meet the needs of the growth spurt. Female children are at higher risk of malnutrition since they gain 30% of their growth weight and more than 20% of their growth height between 3 and 5 years. This age group are more susceptible to malnutrition particularly iron deficiency anemia. Under nutrition, in every form, presents significant threat to human health. Today the world faces double burden of under nutrition, especially in developing countries where under nutrition contributes to about one third of all child deaths.

In order to determine child related factors that were associated with nutritional anemia, chi-square test was used. Children related factors such as age-range between 6 months to 27 months, parents' knowledge on nutritional anemia, separated parents, types of meal that a child is given and the source of meal that a child is given were significantly associated with nutritional anemia due to the p value less than 0.05. This concurred with prior findings showing that at the younger age, there is high demand for nutrients to support the rapid body

growth of children, which further increases their need for iron. Complementary foods are started when the children reach 6 months, if nutritionally poor complementary foods were introduced children were more likely to be anemic. Children above 2 years are able to eat more variety of foods, which put them at less risk of being anemic.

4. Conclusion and Recommendations

The outcomes of the study shows that iron deficiency anemia remain the most prevalent type of nutritional anemia in children aged between 6-59 months old. The results showed that the demographic factors such as residence of the participants, parents' knowledge on nutritional anemia, types of meal that a child is given (inadequacy of micronutrients such as iron, folic acid, and vitamin B12, C, and D) and the source of meal that a child is given are the most important factors that influence nutritional deficiencies and leading to the prevalence of nutritional anemia in respondents. Mothers are encouraged for the good eating habit for their children (life style) in order to decrease risk of nutritional anemia. Malnutrition screening as early as possible is also recommended, conducting additional studies and establishing appropriate intervention strategies to improve the nutritional status and increase the intake of food that contains adequate quantities of micronutrients, particularly iron intake is also recommended.

Data availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflict of interest

The authors declare that they have no conflicts of interest.

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