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Factors associated with Anaemia management among children under five in Kisumu county hospital, Kenya

Fredrick Oluoch[1*], Daniel Mokaya[2], Daniel Sagwe[3]
[1-3] Department of Public Health, College of Health Sciences, Jomo Kenyatta University of agriculture and technology, Kenya

Abstract
Background: High Prevalence of anemia and its consequences for children's health and especially for their growth and development, have made anemia an important public health problem. Given the difficulty in implementing effective measures for controlling anemia, World Health Organization (WHO) is implementing new strategies for the integrated management of the sick child in the primary care setting, which includes algorithms based on clinical signs detected by trained professional health care workers. We aimed to assess the healthcare-seeking behavior among caregivers of sick children who had severe anemia and are ten years and below in western Kenya.
Methods: Data from a descriptive cross-sectional study design was used. Systematic random sampling was used to obtain the study subjects. The researcher collected data on factors associated with anemia management in Kisumu county hospitals by use of a structured questionnaire and clinician desk review charts. Association of factors was measured using a Chi-Square test of association. The odds ratio was also used for likelihood tests.
Results: Results revealed that Anemia factors, Number of children <5 years of age, and type of food were major determinants for anemia management. Children who eat non-rich iron foods were less likely to practice good anemia management as compared to those who eat iron-rich food.
Conclusions: Anemia management in Kisumu County Hospital is satisfactory. However, there is a need to conduct further studies on home and hospital management outcomes to ensure effective and efficient anemia management.

Keywords: childhood anemia, Kisumu, Kenya

Introduction

Pediatric anemia refers to a hemoglobin or hematocrit level lower than the age-adjusted reference range for healthy children. Physiologically, anemia is a condition in which reduced hematocrit or hemoglobin levels lead to diminished oxygen-carrying capacity that does not optimally meet the metabolic demands of the body. The global anemia prevalence stands at 43% and anemia prevalence in Africa was 64.6%, (WHO, 2008) [20] which is almost four times higher than the prevalence in Europe (16.4%), and over 60 percentage points higher than in North America (3.4%).

Ghana has children anemia prevalence of 78.4% (GDHS, 2016) [5] and Prevalence reduces with age. Anemia is defined as a low level of hemoglobin in the blood, as evidenced by a reduced Quality or quantity of red blood cells (Cavasini, Ribeiro, Kawamoto, & Ferreira, 2000) [4]. The basic physiology of anemia is the lack of sufficient circulating hemoglobin to deliver oxygen to tissues. Community-based estimates of anemia prevalence (blood hemoglobin concentration (Hb) <11 g/dl) in children under five in settings where malaria is endemic range between 49% and 76% (Cavasini *et al*., 2000) [4]. It has serious negative consequences, including increased mortality in children, decreased capacity to learn, impaired physical development and decreased productivity in all individuals. Its devastating effects on health, physical and mental productivity affect quality of life and translate into significant economic losses for individuals and nations with high anemia prevalence. Anemia is one of the world's most widespread health problems. The most up to date global estimate of childhood anemia indicate that, 293.1 million children age less than five years are anemic worldwide, and 28.5% of those are located in Sub Saharan Africa (WHO, 2006) [19]. Childhood anemia is considered a severe public health problem in Sub Saharan Africa, reaching 67% prevalence, or 83.5 million children in the region (WHO, 2006) [19]. Anemia in Children is of particular interest since it impairs their mental, physical and social development; it causes negative behavioral and cognitive effects resulting in poor school performance and reduced work capacity in later years (Villalpando, Shamah-Levy, Ramírez-Silva, Mejía-Rodríguez, & Rivera, 2003) [17].

Causes of anemia are multi-factorial. Its direct causes can be broadly categorized as poor, insufficient, or abnormal red blood cell production; excessive red blood cell destruction; and excessive red blood cell loss. Contributing causes include poor nutrition related to dietary intake leading to deficiency in iron plus deficiencies in folate, vitamins B and B12, and certain trace elements involved with red blood cell production, dietary quality, sanitation, and health behaviors; adverse environmental conditions; lack of access to health services; and poverty. The relative importance of these causes vary by region with the highest Prevalence in Africa and Asia (Stoltzfus, 2001) [16], For instance 80 % of children in Benin were noted to be anemic as captured in results of a study conducted by (McLean, Cogswell, Egli, Wojdyla, & De Benoist, 2009) [9], which makes anemia a threat to development in our time. Iron deficiency causes 50 percent of all anemia worldwide and in turn, is largely due to an inadequate dietary intake of bio-available iron, increased

iron requirements during rapid growth periods (such as pregnancy and infancy), and increased blood loss due to hookworm or schistosome infestation. Supplementing dietary iron with iron tablets, syrups, drops, or elixirs, and fortifying processed foods and condiments with iron are the best defense against this cause of anemia. Where fortification has been evaluated in specific populations, it has improved iron status and reduced anemia prevalence. In most developing countries, however, food industries are not well developed. Where they are developed, most people cannot afford to buy fortified foods. Supplementing dietary iron can meet the iron needs of vulnerable groups who do not consume fortified foods (WHO/UNICEF/MI, 1999) [22]. Certainly, children admitted to hospital with severe anemia (Hb<8 g/dl) are more likely to die than children admitted without anemia. Anemia is one of the largest killers of children admitted to hospital in sub-Saharan Africa (Haque, 2013). Prevalence of anemia among children under-fives in Kenya was 46.30 (WHO, 2011) [21]. Its highest value over the past 21 years was 78.00 in 1990, while its lowest value was 46.30 in 2011.Prevalence of anemia, children under age 5, is the percentage of children under age 5 whose hemoglobin level is less than 110 grams per liter at sea level.

The World Health Organization (WHO) is implementing new strategies for the integrated management of the sick child in the primary care setting, which includes algorithms based on clinical signs detected by trained professional health care workers (WHO, 1995) [21]. As part of this algorithm Palmer pallor is used to evaluate the presence of severe anemia in absence of routine hemoglobin (Hb) measurements (Specht, Weber, Heitmeyer, & Schöch, 1997) [15]. The initial focus of the WHO has been on the use of the algorithm by health care workers in health facilities. However, early recognition of moderate to severe anemia by the primary caregiver is essential to ensure that these children are brought to the formal health care system. Early diagnosis and appropriate treatment are essential to reduce morbidity and mortality related to malaria in children (Armstrong *et al*., 2002) [2]. The choice of treatment has been found to be influenced by accessibility, disease type and severity, patient's gender and parents' educational level (Masud Ahmed, 2001; Miguel, Manderson, & Lansang, 1998; Müller, Traoré, Becher, & Kouyaté, 2003) [1, 10, 11]. Attitude towards providers is also an important factor (McCombie, 1996) [8]. Patients are more likely to start with self-treatment at home as this allows them to minimize expenditure (Aly Théra *et al*., 2000; Nyamongo, 2002) [1, 13]. Naturally, caregivers play a pivotal role in the provision and care for childhood diseases. Since most children cannot fend for themselves, time of intervention and quality of care received, depend on the actions of the caregiver and ultimately determines the outcome of a disease. The use of health care options has a direct influence on the outcome of SMA. Older children do rarely get SMA, but with the possibility of shifting ages of severe malaria attack, older children may start to present with this disease. As such, it will be critical to have an early recognition of moderate to severe anemia by the primary caregiver to ensure that these children are brought to the formal health care system. As such, the current study assessed the health care seeking behavior among caregivers of sick children who had severe anemia and are 10 years and below in western Kenya.

Methodology

Study setting and source of data

The study was carried out in Kisumu County Hospital. This area is malaria endemic zone with high anemia prevalence. The main economic activity is varied as it's located at the town Centre with cosmopolitan population but with diverse economic activities from the rural neighboring populations.

This was descriptive cross-sectional study design. This study design was used since this study is non-experimental and it enables collection of accurate information within a short time at a minimal cost.

Study variables

a. Dependent variables

Anemia management among children under five in Kisumu County Hospital

b. Independent variables

Socio-demography factors, economic status,

Study Population and sample

The targeted population for the study was caregivers with anemic children under the age of five years old, while the accessible population was derived from caregivers with children under five years old at Kisumu county hospital pediatric ward. Children with caregivers who are not mentally stable were excluded from the study.

Inclusion and Exclusion Criteria

Inclusion criteria; Children below five years diagnosed with anaemia, and resident of Kisumu County for the last 2 months.

Exclusion criteria; Kisumu county non-resident children and children meeting criteria but their caregivers have not given consent to participate.

Sampling Criteria

The study employed systematic sampling to identify and interview the mothers/caregivers of children less than five years.

Systematic sampling method was used in selecting caregivers of anemic children under five years old at Kisumu county hospitals pediatrics ward whereby every third anemic child was selected until the required sample size was achieved.

The researcher collected data on factors associated with anemia management in Kisumu county hospitals by use of a structured questionnaire. Information on anemia management was collected by reviewing the clinician desk review charts to ascertain the management levels. The study used questionnaire since it is a reliable instrument for data collection that can be distributed to many people within a very short period of time at minimal costs.

Data Analysis plan

Data collected by use of questionnaires were checked for accuracy and completeness before they are entered into a computer.

Analysis of this data was done by use of Statistical Package for Social Sciences Version 20. Missing and invalid responses were excluded from final data analysis.

Descriptive statistics i.e. mean and frequencies were used to Analyze the sample and the variables of the study. Associations were done by use of Chi-Square. Data analyzed were presented by use of tables, graphs as well as

discussion of findings.

Results

Characteristics of the study participants

Children between 0-12 months accounted for the highest percentage (30.9%) followed by children between 13-24 months (28.4%), and the least were children between 49-60 months (9.2%) of the total number of children. Male children were the highest participants (51.8%) in comparison to the female (48.2%).

Most of the caregivers were between 25-29 years (39.2%) followed by 20-24 years (31.5%), and the least number of caregivers were aged between 45-49 years (1.1%). Close to half of the caregivers had primary education (47.0%) followed by secondary education (35.7%) and the least percentage of caregivers attained a tertiary level of education (17.3%).

In terms of occupation, the highest number of caregivers had personal businesses (55.2%), (10.6%) were farmers and those with other occupations were (18. 6%). Majority of caregivers were Christians (95.5%) whereas (2.8%) of the caregivers followed the African traditional culture, the least number of caregivers practiced Islam (1.7%).

(88.3%) of the participants were not affected by maternal health status while (11.7%) were affected by maternal health status. The highest number of children suffered moderate anemia (42.9%) while mild anemia least affected the children (24.5%). Majority of the children did not suffer from malnutrition (20.9%)

A high number of children were fed with Iron rich food (57.1%) while those fed with non-iron rich food were (37.3%), and the least number of children were fed with other types of food (5.6%). Iron deficiency was found to be the highest cause of anemia (42.9%) followed by malaria (32.6%) and sickle cell disease was at (17.8%) and the least cause was others (3.1%).

Most children were between 2-5years (53.5%) while (46.5%) were1and below years. The highest number of children were dewormed on a 3month frequency (32.3%) followed closely by 6month frequency (30.9%) the least frequency of deworming was yearly (9.5%) whereas others accounted for (27.3%). (Table 2).

Anemia Prevalence by Age group and Sex in children Under 5.

According to the study findings, 111(30.9%) of the caregiver's kids were between age category 0-12 months and of these 24(21.6%) of the kids suffered mild anemia, 62(55.9%) of the kids suffered of moderate anemia and 25(22.5%) of the kids suffered of severe anemia. However, 102(28.4%) of the kids were in age category between 13-24 months and of these 25(24.5%) of the kids suffered of mild anemia, 40(39.2%) of the kids suffered of moderate anemia and 37(36.3) of the kid suffered of severe anemia as provided below.

On sex, 186(51.8%) of the kids were male and of these 47(35.3%) of the kids suffered of mild anemia, 75(40.3%) of the kids suffered of moderate anemia and 64(34.4%) suffered of severe anemia.

Female kids were 173(48.2%) of and of these 41(23.7%) of the kids suffered of moderate anemia and 53(30.6%) of the kids severed of severe anemia. (Table 3)

The Figure 1 below reveals that 29% of the participants practice good anemia management while 71% of the participants practice poor anemia management.

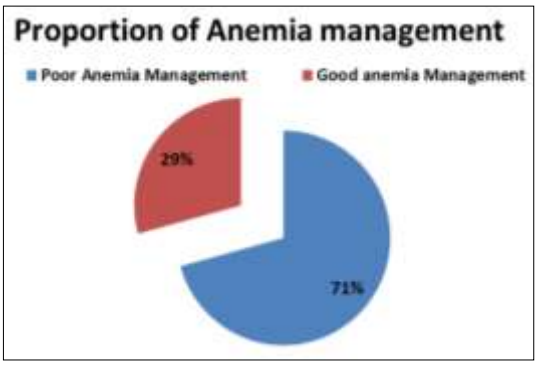

Fig 1: Prevalence of anemia management in Kisumu County Hospital, Kenya

Socio-Demographic factors influencing Anemia Management in Kisumu County Hospital

According to the study findings, children who eat non-rich iron foods and practice good anemia management were 23.1% compared to 35.1% children who eat iron rich food and practice good anemia management. (cPR= 0.7; 95%CI, 0.46-0.95; p-value=0.023).

The study further illustrates that children who had other anemia factors and practice good anemia management were 54.6% compared to 28.6% children suffering from iron deficiency and practicing good anemia managent. (cPR=1.9;95%CI;1.05-3.46; p-value=0.033). In addition, those who suffered from sickle cell disease and had good anemia management was 9.4% compared to 28.6% children suffering from iron deficiency. (cPR=0.3;95%CI,0.15-0.73; p-value=0.007).

Table 1

Variable	Overall N (%)	Poor Anemia management n (%)	Proper Anemia Management n (%)	cPR (95%CI)	P-value
Age of Caregiver	Mean±SD (27.04±5.09)				
15-19	11(3.1)	10(90.9)	1(9.1)	ref	
20-24	113(31.5)	83(73.4)	30(26.6)	2.9(0.44-19.46)	0.268
25-29	141(39.3)	87(61.7)	54(38.3)	4.2(0.64-27.69)	0.134
30-34	69(19.1)	56(81.2)	13(18.8)	2.1(0.29-14.34)	0.460
35-39	16(4.5)	12(75.0)	4(25.0)	2.8(0.35-21.48)	0.335
40-44	5(1.4)	3(60.0)	2(40.0)	4.4(0.51-38.08)	0.178
45-49	4(1.1)	3(75.0)	1(25.0)	2.8(0.21-34.46)	0.433
Occupation					
Formal employment	56(15.6)	40(71.4)	16(28.6)	ref	
Farming	38(10.6)	27(71.1)	11(28.9)	1.0(0.53-1.94)	0.968

Personal Business	198(55.2)	135(68.2)	63(31.8)	1.1(0.70-1.77)	0.648
Other	67(18.6)	52(77.6)	15(22.4)	0.8(0.43-1.44)	0.433
Education Level					
Primary	169(47.0)	123(72.8)	46(27.2)	ref	
Secondary	128(35.7)	89(69.5)	39(30.5)	0.3(0.65-1.34)	0.543
Tertiary	62(17.3)	42(67.7)	20(32.3)	0.1(0.69-1.69)	0.457
Religion					
African traditional	10(2.8)	6(60.0)	4(40.0)	ref	
Christianity	343(95.5)	244(71.1)	99(28.9)	0.7(0.33-1.57)	0.411
Islam	6(1.7)	4(66.7)	2(33.3)	0.8(0.21-3.26)	0.793
Malnutrition Status					
Yes	75(20.9)	54(72.0)	21(28.0)	0.9(0.63-1.41)	0.791
No	284(79.1)	200(70.4)	84(29.6)	ref	
Anemia Factors					
Iron deficiency	154(42.9)	110(71.4)	44(28.6)	ref	
Sickle cell disease	64(17.8)	58(90.6)	6(9.4)	0.3(0.15-0.73)	0.007
Parasitic infections	13(3.6)	10(76.9)	3(23.8)	0.8(0.29-2.25)	0.683
Malaria	117(32.6)	71(60.7)	46(39.3)	1.4(0.98-1.92)	0.063
Others	11(3.1)	5(45.4)	6(54.6)	1.9(1.05-3.46)	0.033
Number of children <5 years					
<1	167(46.5)	134(80.2)	33(19.8)	ref	
2-5	192(53.5)	120(62.5)	72(37.5)	1.9(1.33-2.71)	<0.0001
Type of food					
Iron rich	205(57.1)	133(64.9)	72(35.1)	ref	
Non-Iron rich	134(37.3)	103(76.9)	31(23.1)	0.7(0.46-0.95)	0.023
Other	20(5.6)	18(90.0)	2(10.0)	0.3(0.08-1.08)	0.064

Statistically significant if p-value <0.05, cPR; Crude Prevalence rates, ref; Reference category

Socio-Economic factors influencing Anemia Management in Kisumu County Hospital

Comparing to 24.3% participants who relied on farming and practiced good anemia management, those who had good anemia management and relied on donations as source of income were 0% (cPR=0.1, 95%CI; 0.0--; p-value<0.0001).

Participants who earn 11000-30000,31000-50000 and 51000-100000 per month and practiced good anemia management were 24.8%, 0% and 0.0% respectively compared to 42.1% earning <1000 and practicing good anemia management. (cPR=0.6;95%CI,0.41-0.83; p-value=0.003), (cPR=0.6;95%CI,0.37-0.95; p-value=0.028) and (cPR=0.0;95%CI,0.0--; p-value<0.0001).

Participants who valued food as a key expenditure and had good anemia management were 35.4% compared to 11.5% who valued education and had good anemia management. (cPR=3.1;95%CI;1.05-9.02; p-value=0.041). Those who valued health and practiced good anemia management were 0% compared to 11.5% who valued education and had good anemia management. (cPR=0.0;95%CI,0.0--; p-value<0.0001).

Participants practicing good anemia management and families' savings ranging between 1100-3000 Ksh and 3100-5000Ksh were found to be 23.9% and 23.1% respectively compared to 39.7% participants whose families savings were <1000 and had good anemia management (cPR=0.6; 95%CI, 1.33-2.70; p-value= 0.011) and (cPR=0.0; 95%CI, 0.0--; p-value<0.0001).

And families who loose around 1100-3000 Ksh and 3100-5000 Ksh during anemia case and practice good anemia management were 45.8% and 45.2% respectively compared to 24.1 those who had good anemia management and lost <1000 during anemia case. (cPR=1.9;95%CI,1.33-2.70; p-value<0.0001), (cPR=1.9;95%CI,1.19-2.92; p-value=0.006).

Table 2: Socio-Economic factors influencing Anemia Management in Kisumu County Hospital

Variable	Overall N (%)	Poor Anemia management n (%)	Good Anemia Management n (%)	cPR((95%CI)	P-value
Source of Income					
Farming	37(10.3)	28(75.7)	9(24.3)	ref	
Salary	75(20.9)	58(77.3)	17(22.7)	0.9(0.46-1.89)	0.845
Business	239(66.6)	162(67.8)	77(32.2)	1.3(0.73-2.41)	0.357
Donations	4(1.1)	4(100.0)	0(0.0)	0.1(0.0---)	<0.0001
Others	4(1.1)	2(50.0)	2(50.0)	2.1(0.66-6.39)	0.213
Monthly Earning of family					
<10000	114(31.8)	66(57.9)	48(42.1)	ref	
11000-30000	161(44.9)	121(75.2)	40(24.8)	0.6(0.41-0.83)	0.003
31000-50000	68(18.9)	51(75.0)	17(25.0)	0.6(0.37-0.95)	0.028
51000-100000	16(4.5)	16(100.0)	0(0.0)	0.0(0.0---)	<0.0001
Key expenditure areas					
Education	26(7.3)	23(88.5)	3(11.5)	ref	
Food	288(80.2)	186(64.6)	102(35.4)	3.1(1.05-9.02)	0.041
Health	45(12.5)	45(100.0)	0(0.0)	0.0(0.0---)	<0.0001
Family save per month					
<1000	126(35.1)	76(60.3)	50(39.7)	ref	

1100-3000	117(32.6)	89(76.1)	28(23.9)	0.6(0.041-0.89)	0.011
3100-5000	65(18.1)	50(76.9)	15(23.1)	0.6(0.36-0.95)	0.031
5100-10000	36(10.0)	28(77.8)	8(22.2)	0.6(0.29-1.07)	0.080
>10000	15(4.2)	11(73.3)	4(26.7)	0.7(0.28-1.60)	0.369
Family lost during Anemia case					
<1000	257(71.6)	195(75.9)	62(24.1)	ref	
1100-3000	59(16.4)	32(54.2)	27(45.8)	1.9(1.33-2.70)	<0.0001
3100-5000	31(8.6)	17(54.8)	14(45.2)	1.9(1.19-2.92)	0.006
5100-10000	10(2.8)	8(80.0)	2(20.0)	0.8(0.24-2.992)	0.771
>10000	2(0.6)	2(100.0)	0(0.0)	NA	NA

Statistically significant if p-value <0.05, cPR; Crude Prevalence rates, ref; Reference category

The caregivers' opinion on anemia signs and symptoms in Kisumu County Hospital.

Figure 2 below revealed that out of (359) participants, 287 (79.94%) of the participants thought that anemia is being caused by paleness and 23 (6.41%) argued that anemia is being caused by tiredness while 17 (4.74%) of the caregivers argued that anemia is being caused by other things apart from the ones listed. 13 (3.62%) of the participants thought that anemia is being caused whenever a child vomits and only 7 (1.95%) of the caregivers thought that anemia is caused by coughing.

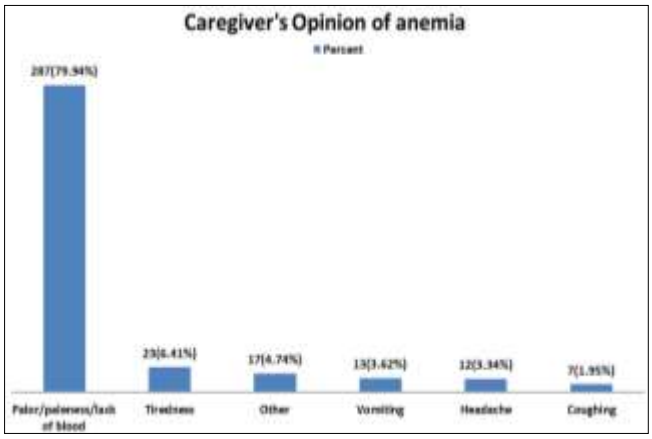

Figure 2: Caregiver's opinion of Anemia in Kisumu County Hospital, Kenya

Sources of Anaemia information in Kisumu County Hospital, Kenya

Figure 3 below revealed that majority 98(60.12%) of the respondents obtained their information of anemia signs/symptoms and it's response from health care providers, 58(35.58%) of the participants obtain their information from friends, 4(2.45%) of the respondents obtained their information from television and 1(0.61%) of the participants obtained their information from the Radio.

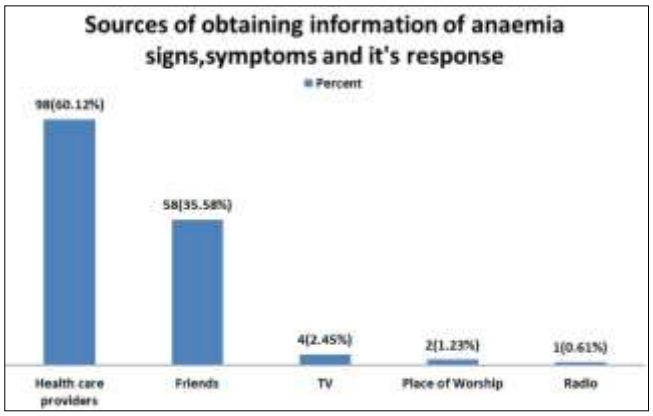

Fig 3: *Sources of information of anemia signs and symptoms in Kisumu County Hospital, Kenya*

Caregivers' factors influencing Anemia Management in Kisumu County Hospital

Participants who pray only as a method of preventing anemia and practice good anemia management too were 0% compared to 14.4% participants who go to the hospital and practice good anemia management. (cPR=0.0; 95%CI, 0.0---; p-value<0.0001)

The findings also shows that participants who go to witch doctor, go to religious leaders and practice good anemia management were 0.0% and 0.0% respectively compared to 26.8% participants who go to the chemistry to buy drugs at the same time practicing good anemia management. (cPR=0.0; 95%CI, 0.0---; p-value<0.0001), (cPR=0.0; 95%CI, 0.1---; p-value<0.0001).

Participants who had ever participated in anemia management and had good anemia management were 12.5% compared to 32.3% participants who had never participated in anemia management yet practiced good anemia management. (cPR=0.4; 95%CI, 0.19-0.79; p-value=0.009). On the other hands, participants who had wished to get involved in anemia management and practiced good anemia management were 52.6% compared to 13.2% who had not wished to get involved in anemia management yet practiced good anemia management. (cPR=3.9; 95%CI, 2.70-5.86; p-value<0.0001).

Table 3: Caregiver's factors influencing Anemia Management in Kisumu County Hospital

Variable	Overall N (%)	Poor Anemia management n (%)	Good Anemia Management n (%)	cPR((95%CI)	P-value
Causes of Anemia					
Iron deficiency	144(40.6)	98(68.1)	46(31.9)	ref	
Sickle cell disease	77(21.7)	67(87.0)	10(13.0)	0.4(0.21-0.76)	0.005
Parasitic infections	19(5.4)	17(89.5)	2(10.5)	0.3(0.09-1.25)	0.103
Malaria	104(29.2)	61(58.7)	43(41.3)	1.3(0.93-1.80)	0.127
Others	11(3.1)	11(100.0)	0(0.0)	0.0(0.0---)	<0.0001
Prevention of Anemia					

Prayer only	1(0.3)	1(100.0)	0(0.0)	0.0(0.0---)	<0.0001
Good eating habits	237(66.0)	160(67.5)	77(32.5)	2.3(0.79-6.59)	0.131
Consulting a witch doctor	12(3.3)	11(91.7)	1(8.3)	0.6(0.07-5.02)	0.624
Observing hygiene	42(11.7)	37(88.1)	5(11.9)	0.8(0.22-3.16)	0.789

Other factors

Table 4

No idea	**46(12.8)**	**27(58.7)**	**19(41.3)**	**2.9(0.96-8.72)**	**0.060**
Going to hospital	21(5.9)	18(85.7)	3(14.3)	ref	
Do when child is suspected to be Anemic					
Go to A witch doctor	5(1.4)	5(100.0)	0(0.0)	0.0(0.0---)	<0.0001
Go to hospital	281(78.3)	195(69.4)	86(30.6)	1.1(0.75-1.74)	0.535
Go to a religious leader	2(0.6)	2(100.0)	0(0.0)	0.1(0.0---)	<0.0001
Buy drugs as a nearby shop/chemist	71(19.7)	52(73.2)	19(26.8)	ref	
Ever participated in anemia management					
Yes	56(15.6)	49(87.5)	7(12.5)	0.4(0.19-0.79)	0.009
No	303(84.4)	205(67.7)	98(32.3)	ref	
Wish to be involved in anemia management					
Yes	133(39.5)	63(47.4)	70(52.6)	3.9(2.70-5.86)	<0.0001
No	204(60.5)	177(86.8)	27(13.2)	ref	

Statistically significant if p-value <0.05, cPR; Crude Prevalence rates, ref; Reference category

Health facilities factors influencing anemia management in Kisumu County Hospital.

According to the study results, participants who delay in admission from the health facility and had good anemia management 20.1% compared to 86.7% who practiced good anemia management and had no delay in admission while at the facility. (cPR=9.9; 95%CI, 5.89-16.74; P-value<0.0001). Participants who had good anemia management and had their test done in time were 88.2% compared to 100.0% those who had good anemia management and were not tested in time. (cPR=1.98; 95%CI, 1.98-4.48; p-value<0.0001).

The study further revealed that participants who could afford anemia drugs yet practiced good anemia management were 1.6% compared to 4.8% individuals who practiced good anemia management and could not afford anemia drugs. (cPR=1.9; 95%CI, 1.05-3.57; p-value=0.032).

Those who were satisfied by the services offered at health facility and practiced good anemia management were 89.0% compared to 100.0% who were not satisfied by the services offered at the health facility yet practiced good anemia management. (cPR=2.9;95%CI,1.93-4.61; p-value<0.0001.

Table 5: Health facility factors influencing Anemia Management in Kisumu County Hospital

Variable	Overall N (%)	Poor Anemia management n (%)	Good Anemia Management n (%)	cPR((95%CI)	P-value
Delay in admission					
Yes	254(70.8)	203(79.9)	51(20.1)	9.9(5.89-16.74)	<0.0001
No	105(29.2)	14(13.3)	91(86.7)	ref	

Other factors

Table 6

Test done in time					
Yes	254(70.8)	30(11.8)	224(88.2)	2.9(1.98-4.48	<0.0001
No	105(29.2)	0(0.0)	105(100.0)	ref	
Got all Drugs prescribed					
Yes	254(70.8)	113(44.5)	141(55.5)	1.1(0.74-1.41)	0.906
No	105(29.2)	46(43.8)	59(56.2)		
Affordability of Drugs					
Yes	254(70.8)	250(98.4)	4(1.6)	1.9(1.05-3.57)	0.032
No	105(29.2)	100(95.2)	5(4.8)	ref	
Satisfied with services					
Yes	254(70.8)	28(11.0)	226(89.0)	2.9(1.93-4.61)	<0.0001
No	105(29.2)	0(0.0)	105(100.0)	ref	

Statistically significant if p-value <0.05, cPR; Crude Prevalence rates, ref; Reference category

Multivariate Prevalence ratios of factors influencing Anemia Management

Findings demonstrated that other anemia factors (aPR=2.8; 95%CI, 1.41-6.78; p-value<0.0001), relying on donations as a source of income (aPR=1.7; 95%CI, 3.81-7.92; p-value<0.0001), having food (aPR=3.9; 95%CI, 2.20-6.79; p-value<0.0001) and health (aPR=8.8; 95%CI, 7.07-10.6; p-value<0.0001) as key expenditure areas, going to hospital when a child is suspected to be anemic (aPR=1.6; 95%CI, 1.23-1.87; p-value=0.005), having test done in time (aPR=7.6; 95%CI,6.56-9.34 ; p-value<0.0001), getting all drugs prescribed (aPR=7.9; 95%CI, 1.27-8.98; p-

value=0.003) and affordability of drugs (aPR=6.6; 95%CI, 4.11-11.34; p-value<0.0001) were significantly high likely to practice good anemia management

On the other hand, children eating non-iron rich food (aPR=0.8; 95%CI, 0.67-0.99; p-value=0.044) and other types of food (aPR=0.1; 95%CI, 0.08-1.04; p-value<0.0001), participants earning <10000 a month (aPR=0.3; 95%CI, 0.12-0.68; p-value<0.0001) and those earning 11000-30000 a month (aPR=0.1; 95%CI, 0.01-0.23; p-value<0.0001), family losing 3100-5000 during anemia case (aPR=0.4; 95%CI, 0.17-0.92; p-value=0.032), consulting a witch doctor as a prevention of anemia (aPR=0.3; 95%CI, 0.01-0.41; p-value<0.0001), going to a religious leader when a child is suspected to be anemic (aPR=0.1; 95%CI, 0.02-0.48; p-value=0.032) and being satisfied with services from a health facility (aPR=0.3; 95%CI, 0.13-0.74; p-value=0.008) were significantly less likely to practice good anemia management.

Table 7: Multivariate Prevalence ratios of factors influencing Anemia Management in Kisumu County Hospital

Variable	Overall N (%)	Poor Anemia management n (%)	Good Anemia Management n (%)	aPR((95%CI)	P-value
Anemia Factors					
Others	11(3.1)	5(45.4)	6(54.6)	2.8(1.41-6.78)	<0.0001
Type of food					
Iron rich	205(57.1)	133(64.9)	72(35.1)	ref	
Non-Iron rich	134(37.3)	103(76.9)	31(23.1)	0.8(0.67-0.99)	0.044
Other	20(5.6)	18(90.0)	2(10.0)	0.1(0.08-1.04)	<0.0001
Source of Income					

Other factors

Table 8

Donations	**4(1.1)**	**4(100.0)**	**0(0.0)**	**1.7(3.81-7.92)**	**<0.0001**
Others	4(1.1)	2(50.0)	2(50.0)	0.9(0.23-3.23)	0.826
Monthly Earning of family					
<10000	114(31.8)	66(57.9)	48(42.1)	0.3(0.12-0.68)	<0.0001
11000-30000	161(44.9)	121(75.2)	40(24.8)	0.1(0.01-0.23)	<0.0001
31000-50000	68(18.9)	51(75.0)	17(25.0)	ref	
51000-100000	16(4.5)	16(100.0)	0(0.0)	NA	NA
Key expenditure areas					
Education	26(7.3)	23(88.5)	3(11.5)	ref	
Food	288(80.2)	186(64.6)	102(35.4)	3.9(2.20-6.79)	<0.0001
Health	45(12.5)	45(100.0)	0(0.0)	8.8(7.07-10.6)	<0.0001
Family lost during Anemia case					
3100-5000	31(8.6)	17(54.8)	14(45.2)	0.4(0.17-0.92)	0.032
5100-10000	10(2.8)	8(80.0)	2(20.0)	ref	
>10000	2(0.6)	2(100.0)	0(0.0)	NA	NA
Prevention of Anemia					
Consulting a witch doctor	12(3.3)	11(91.7)	1(8.3)	0.3(0.01-0.41)	<0.0001
Do when child is suspected to be Anemic					
Go to A witch doctor	5(1.4)	5(100.0)	0(0.0)	NA	NA
Go to hospital	281(78.3)	195(69.4)	86(30.6)	1.6(1.23-1.87)	0.005
Go to a religious leader	2(0.6)	2(100.0)	0(0.0)	0.1(0.02-0.48)	0.032
Buy drugs as a nearby shop/chemist	71(19.7)	52(73.2)	19(26.8)	ref	
Test done in time					
Yes	254(70.8)	30(11.8)	224(88.2)	7.6(6.56-9.34)	<0.0001
No	105(29.2)	0(0.0)	105(100.0)	ref	
Got all Drugs prescribed					
Yes	254(70.8)	113(44.5)	141(55.5)	7.9(1.27-8.98)	0.003
No	105(29.2)	46(43.8)	59(56.2)	ref	
Affordability of Drugs					
Yes	254(70.8)	250(98.4)	4(1.6)	6.6(4.11-11.34)	<0.0001
No	105(29.2)	100(95.2)	5(4.8)	ref	
Satisfied with services					
Yes	254(70.8)	28(11.0)	226(89.0)	0.3(0.13-0.74)	0.008
No	105(29.2)	0(0.0)	105(100.0)	ref	

Statistically significant if p-value <0.05, cPR; Crude Prevalence rates, ref; Reference category

Discussion

Results showed that 32.6% of the participants suffered severe anemia, 42.9% had moderate anemia and 24.5% mild anemia. Globally, anemia prevalence is 43% and Africa 64.6%. (WHO, 2008) [20] and in Kenya the Prevalence of anemia among children under-fives in Kenya was 46.30% which is the lowest value in 21years. (WHO, 2011) [19].

The study also shows factors related to anemia management amongst under five children in Kisumu county. In Kisumu having test done in time seem to be a significant determinant of anemia management. This is consistent with a study carried out by (Armstrong *et al.*, 2002) [2], the study

found that early diagnosis and appropriate treatment are essential in reducing morbidity and mortality among children.

Families losing money during anaemia case was also found to be a significant determinant of anaemia management, according to *Aly Thera et al* study, patients were more likely to start with self-treatment at home as this allows them to minimize expenditure (Aly Théra *et al*., 2000; Nyamongo, 2002) [1, 13].

In developed countries, poor dietary iron intake is very infrequent however, it is very common in developing countries and the Prevalence of iron deficiency is quite high causing health problems like anemia. (Aspuru, Villa, Bermejo, Herrero, & López, 2011) [3]. In agreement to this study, our study observed that there is association between the type of food and anemia management. Similarly, in Nigeria, malnutrition is one of the leading factors of mortality amongst under five children with anemia. (Muoneke, Ibekwe, Nebe-Agumadu, & Ibe, 2012) [12]. Monica. M. Osirio emphasized on diet as a major determinant of anemia in children. In her study, she demonstrated that consumption and bioavailability of iron are the main determinants of anemia.

In Tanzania, factors associated with anemia among children under five were found to be malaria parasitaemia, parent's unemployment and presence of sickle haemoglobin. (Simbauranga, Kamugisha, Hokororo, Kidenya, & Makani, 2015) [14]. In contrast, our study found no association between sickle cell disease and anemia management.

Conclusion

Anemia causes high economic burden in children under five in Kisumu county, there is need to control the Co-morbidities and genetic factors associated with anemia such as malaria and sickle cell disease as well as improve care giver knowledge on anemia and its management.

Recommendations

- There is need to hire more nutritionist to help in educating and sensitizing the patients on various types of anemia management and prevention strategies. This helps in delivery, quality counseling and high adherence to anemia drugs especially for sickle cell prophylactic drugs.
- There is need to source and stock more anemia drugs especially sickle cell anemia drugs such as hydroxy urea and stock adequate lab reagents and provide more tests for anemia especially electrophoresis, CT scan etc.
- Hire and train more staffs on anemia management especially sickle cell anemia which is on the rise.
- To sensitize, mobilize and encourage more care givers to seek timely health services for their sick children.
- Form more patient support groups and allocate finances for running such support groups with refreshers and locally available food demonstrations for the patients to support good nutrition.
- Educate patients on the need for disclosure especially for sickle cell anemia and its timing, treatment buddy (care giver) and adherence support items like alarm, clock, calendar etc.
- There is need to map, register and provide support for sickle cell anemia patients by the Government especially the county Government.
- There is need to conduct further studies on home and hospital management outcome.
- Measures that reduce the Prevalence of malaria will consequently reduce anemia in young children and the need for blood transfusions associated with the risk of HIV-transmission.

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