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Prevalence Of Anemia Among Teenage Pregnant Girls Attending Antenatal Clinic In Two Health Facilities In Bungoma District, Western Kenya.

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Abstract
Severe anemia is an important cause of maternal morbidity and mortality among teenage pregnant girls who are susceptible because of their rapid growth and associated high iron requirements. Teenage girls often enter pregnancy with less adequate stores of nutrients and are thus unable to withstand the demands imposed by pregnancy. The aim of the study was to determine the prevalence of anemia and associated factors among teenage pregnant girls. The study was conducted at Maternal Child Health Clinic of Bungoma district hospital and Bumula Health Centre. This was a cross section study. Teenage pregnant girls attending ANC were recruited. Food frequency questionnaires were used to assess the dietary intake and factors associated with anemia. Blood sample and stool were used to determine the hemoglobin levels and presence of intestinal worms. The prevalence of anemia was 61% (Hemoglobin < 110 g/L). 20.5% had severe anemia, (hemoglobin < 60 g/L), 31.2% had moderate anemia (hemoglobin < or = 90 g/L), and 48.3% had mild anemia. Iron intake was significantly associated with perceived food shortage (OR: 2.548; 95% CI: 1.632 – 3.980). Hookworm affected calcium intake (OR: 3.074; 95% CI: 1.089 – 8.698) and malaria parasites affected folate intake (OR: 0.355; 95% CI: 0.226 – 0.557). Those with hookworm were 3 times more likely to have inadequate calcium intake as compared to those without. Anemia was high in the study population. Parasitic infestation and food intake were associated with anemia. De-worming with correction of anemia should be encouraged.
Keywords: Anemia, teenage girls, pregnancy, nutrient intake, iron

1. Introduction

The world's adolescent population (age 10–19 years) is estimated to stand at more than 1 billion, yet adolescents remain a largely neglected, difficult-to-measure, and hard-to-reach population in which the needs of adolescent girls, in particular, are often ignored (Brabin*et al*, 2000). This area of adolescent health has been difficult to study, and there are many unknown factors and consequences for iron deficiency during adolescence in terms of standards, measurement indicators and health consequences.

Adolescence is a time of intense physical, psychosocial, and cognitive development. Increased nutritional needs at this juncture relate to the fact that adolescents gain up to 50% of their adult weight, more than 20% of their adult height, and 50% of their adult skeletal mass during this period. The iron needs are high in adolescent girls because of the increased requirements for expansion of blood volume associated with the adolescent growth spurt and the onset of menstruation (Dallman, 1992). When pregnancy is interposed during this time, problems of iron balance are compounded

Anemia is a major public health problem through out the world and afflicts an estimated two billion people worldwide, mostly due to iron deficiency. It primarily affects women. The prevalence of anemia is disproportionately high in developing countries, due to poverty, inadequate diet, certain diseases, pregnancy and lactation, and poor access to health services. Teenage pregnant girls are particularly susceptible because of their rapid growth and associated high iron requirements (WHO, 1991).

Teenage girls often enter pregnancy with less than adequate stores of nutrients and are thus unable to withstand the demands imposed by pregnancy (Sergeant and Schulken, 1994).It is also suggested that there could be

competition for nutrients between the young growing mother and the fetus (Scholl *et al,* 1994). Failure to meet this nutrient requirement could result in poor pregnancy outcome for both mothers and their babies. These negative outcomes include maternal mortality, low birth weight, neural tube defects, and spontaneous abortions, conditions highly associated with teenage pregnancy (Scholl and Hedger, 1994).

Hookworm infection is among the major causes of anaemia in poor communities, but its importance in causing maternal anaemia is poorly understood, and this has hampered effective lobbying for the inclusion of anthelmintic treatment in maternal health packages.

2. Materials and methods: The cross sectional study was carried out in Bungoma South District, Western Kenya in two health facilities namely; Bungoma District Hospital and Bumula Health Centre between October and December, 2008. The participants were 384 teenage pregnant girls attending antenatal clinic (ANC) at the two health facilities.

2.1 Inclusion and exclusion criteria: Pregnant teenage girls were enrolled into the study if they were aged 13 – 19 years, attending their first antenatal visit and willing to give a written informed consent to participate in the study. Teenage girls were excluded in the study if they had any physical disability, mental retardation, were unwilling to participate or incapable of providing a written informed consent. Although the age of maturity in Kenya is 18 years, pregnant teenagers below this age we considered emancipated minors and hence no parental consents were sought

2.2 Data collection procedures:Dietary intake was assessed by means of a standardized interviewer administered Food Frequency Questionnaire. The questionnaire was also used to determine the factors associated with anemia in pregnant teenage girls. Blood samples to test for malaria parasites were collected. Leishman and fields stained peripheral blood smears obtained aseptically by means of finger pricks with sterile lancets were used to investigate the presence of malaria parasites. Stool samples were collected and subjected to both Direct and Ritchet's concentration method for stool microscopy assessing for hookworm. For the direct method a normal saline was mixed with the stool and examined under power 10 or 40. The testing was for ova mainly Hookworm (interferes with iron) and fish tapeworm (interferes with folate)

2.3 Data analysis: The data was cleaned, coded, entered and analyzed using SPSS version 12.0. A nutrient calculator (Sehmi, 1994) was used to analyze nutrient intake. Frequency tables and means were generated for categorical variables and continuous variables respectively. Chi square test of association was used to determine the association between anemia in adolescent pregnant girls as the outcome of interest and independent categorical variables. Multivariate logistic regression was used to determine the factors associated with anemia. All p-values less than 0.05 were considered statistically significant

The study was reviewed and approved by Institutional Research and Ethics Committee (IREC) of Moi University before the research commenced. Permission to carry the research was also obtained from Bungoma District Hospital administration that also covers Bumula Health Centre. The participants' rights were upheld throughout the study, which included the rights to withdraw from the study at any stage of interview. Confidentiality of the information gathered was ensured. No names were used at any point. The participants were assured that no information was to be used for any other purpose other than the research.

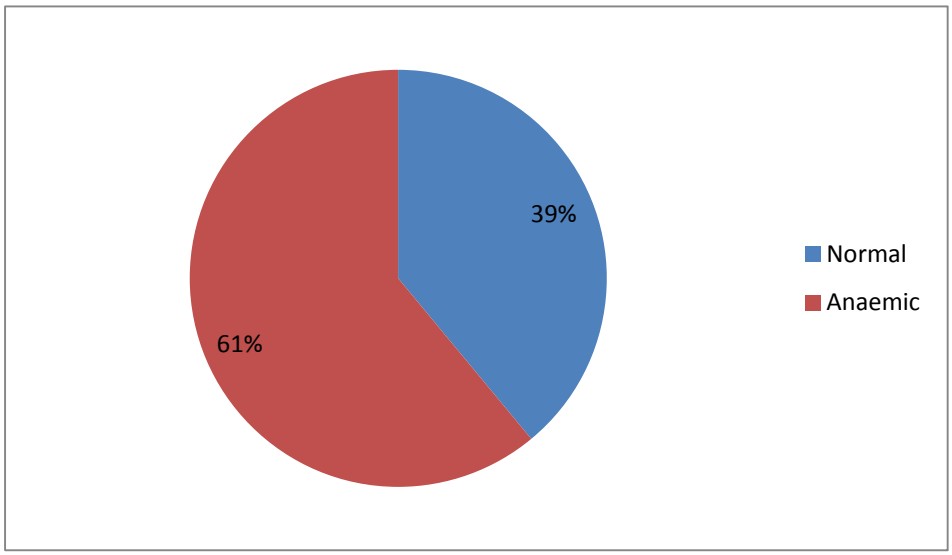
3. Results: We report data from 384 pregnant teenage women attending antenatal care in the two facilities in Western Kenya

Table 1: Socio-economic Characteristics of the participants (N = 384)

Variable	N (%)
Age (mean)	17.7(sd 1.3)
Marital status Single Married	 117 (30.5%) 267 (69.5%)
Level of education None Primary Secondary Tertiary	 9 (2.3)% 255 (66.4%) 111(28.9%) 9 (2.3%)
1st pregnancy Yes No	 285 (74.2) 99 (25.8)
Diet restrictions Medical Religion Cultural	 1 (0.3%) 76 (19.8%) 306 (79.9%)
Most restricted foods Eggs Chicken Others	 145 (38%) 228 (59.7%) 9 (2.4%)
Food shortage Yes No	 248(64.6%) 136(36.4%)
Monthly income <100 500-2000 3000-5000 6000-10,000	 253(65.9%) 84(21.9%) 43(11.2%) 4(1%)
Food source Garden Buying	 187(48.7%) 197(51.3%)

Table 1 indicates majority of the participants had attained primary level of education (64.4%) and they had restrictions not to eat some foods especially protein

Figure 1: Prevalence of Anemia among the study participants (n = 384)



Pregnant adolescents with anemia were 61%.

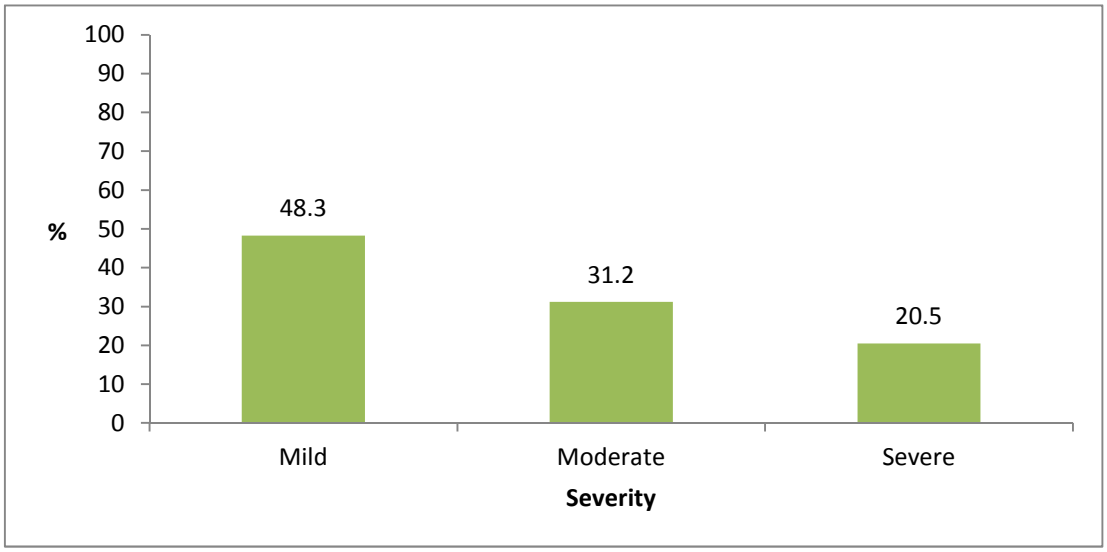


Figure 2: Severity of Anaemia (n= 384)

From Figure 2, of the pregnant adolescents who were anaemic, 20.5% were severely anaemic, 31.2% moderate while 48.3% were mildly anaemic.

Table 2: Association between Demographic factors and Adequacy of Iron Intake

Characteristics	**Iron (mg)**		
	Adequate	**Inadequate**	**p-value**
Median age(mean)	17.7(1.3)	17.7(1.2)	**0.804**
Education level			**0.486**
None	4	5	
Primary	81	174	
Secondary	35	76	
Tertiary	1	8	
Marital status			**0.472**
Single	35	82	
Married	86	181	
Income			**0.092**
Kshs>100	34	97	
Kshs<100	87	166	
First pregnancy			**0.145**
Yes	84	201	
No	37	62	
Food shortage			
Yes	60	188	**<0.001**
No	61	75	
Diet restrictions			**0.375**
Medical	0	1	
Religious	22	45	
Cultural	93	213	
Vegetarian	5	4	

From Table 2, iron intake was significantly associated food shortage (p=0.001). Simple logistic regression indicated that those who do not experience food shortage were less likely to have inadequate intake of 1ron (OR: 95%CI: 0.39:0.25-0.63)

Table 3 Association between Demographic Factors and Adequacy of folate intake of the participants

Characteristics	**Folate(µg)**		
	adequate	**Inadequate**	**p-value**
Age(mean)	17.7	17.6	**0.318**
Education level None Primary Secondary Tertiary	 111 41 3 6	 144 70 6 3	**0.268**
Marital status Single Married	44 117	73 150	**0.593**
Income Kshs>100 Kshs<100	 49 112	 82 141	**0.196**
First pregnancy Yes No	 124 37	 161 62	**0.344**
Food shortage Yes No	 85 76	 163 60	**<0.001**
Diet restrictions Medical Religious Cultural Vegetarian	 0 28 129 3	 1 39 177 6	**0.801**

Table 4: Association between malaria and Nutrient Intake**.**

Nutrient	**Malaria**		
	Yes	**No**	**p-value**
Iron Inadequate Adequate	 86 47	 177 73	**0.220**
Protein Inadequate Adequate	 90 43	 190 60	**0.083**
Energy Inadequate Adequate	 107 26	 181 69	**0.106**
Calcium Inadequate Adequate	 128 5	 240 10	**1.000**
Vitamin C Inadequate Adequate	 80 53	 137 113	**0.331**
Folate Inadequate Adequate	 95 38	 117 133	**<0.001**

From Table 4, folate was significantly associated with presence of malaria ($p<0.001$).

Table 5: Association between Hookworm and Nutrient Intake.

Nutrient	Presence of H/worm		
	Yes	No	P-value
Iron			
Inadequate	185	78	**<0.001**
Adequate	30	90	
Protein			
Inadequate	79	201	**1.000**
Adequate	29	74	
Energy			
Inadequate	80	208	**0.793**
Adequate	28	67	
Calcium			
Inadequate	100	268	**0.039**
Adequate	8	7	
Vitamin C			
Inadequate	54	163	**0.109**
Adequate	54	112	
Folate			
Inadequate	63	159	**1.000**
Adequate	45	116	

Iron and calcium were significantly associated with presence of hookworm as shown in Table 5 (p= 0.001 and p=0.039)

4. Discussion

In the study population, 61% of the respondents had anemia. 20.5% had severe anemia, 31.2% had moderate anemia and 48.3% had mild anemia. Iron deficiency anemia and megaloblasticanemia were the most common type of anemia found in the pregnant adolescents. This was in accord with a study that demonstrated Iron deficiency anemia was prevalent among pregnant minorities. This study showed depleted iron stores for adolescents during the 2nd and 3rd trimesters respectively (Loral *et al*, 2005). Other studies indicated that Iron absorption increased during pregnancy. Although the majority of women were still unable to meet their iron needs without supplementation especially during the 2rd and 3rdtrimesters of pregnancy. The situation with adolescent would have worsened since iron was required for their normal development since they were still growing (Allen,1997).

Anemia was significantly associated with presence of hookworms, with almost half of those who had anemia having also presence of hookworm shown in stool examination. This study was similar with a study that showed that there was a significant relation between anemia with hookworm infestation. In this study anemia was 58.9% of the women and almost half of them had helminthic infestation (Binary and Lubna, 2000). Other findings have shown that anemia is common in developing countries because of poor nutrition and high prevalence of parasitic infestation. Prevalence of anemia among pregnant women in developing countries averages 56% (WHO, 1992). Another study in Niger found a significant correlation between anemia and schistosomahaematobium proving that helminthic infestations are a cause of significant morbidity directly related to anemia (Prual*et al*, 1992).

There was insignificant association between anemia and malaria in this study. Though a study carried out by Shah and Gupta indicated a prevalence of anemia in adolescent girls in Dharan was 68%(Prual et al, 1992) Association of anemia with malaria and hookworm infestations have been seen earlier in various studies across the globe (Shah and Gupta, 2002; Runthy*et al*, 2000;Hawdon and Hotez, 1999; Brooker*etal*, 2008). Folate intake was significantly associated with malaria parasites these findings agrees with Hawdon and Hotez studies on developing countries.

In a study carried out in Nepal, the role of hookworm as a cause of anemia was consistent with the findings of the present study. There was a negative relationship between hookworm burden and plasma ferritin level in the study. Among Nepal pregnant women, 32% of moderate to severe anemia and 29% or iron deficiency anemia was attributable to hookworm infection (Verhoeff*et al*, 1998).

As folate deficiency may generate anemia (Green and Miller, 2005), or even foetal neural tube defects the low consumptions of folate could expose the study population to high risk during pregnancy. Iron deficiency –induced anemia has adverse effects for the mother including tiredness, reduced physical and mental

performance, and reduced immune function. For the fetus causes, prematurity, low weight at birth and infection Scholl et al, 2000.This deficiency could be more severe if iron bioavailability is taken into account. Even worse in this case where the consumption of Vitamin C, and enhancer of non-hemic iron absorption (Binary and Lubna, 2000) was insufficient in this population. The reason could be the phytate rich foods inhibiting iron absorption (Dreyfuss*et al*, 2000) are staple in this population.

Anaemia affects large numbers of adolescent pregnant girls in this study population and increases their risk of dying during pregnancy and delivering low birth weight babies, who in turn are at increased risk of dying. Human hookworm infection has long been recognized among the major causes of anaemia in the community, but understanding of the benefits of the management of hookworm infection in pregnancy has lagged behind the other major causes of maternal anaemia. Low coverage of anthelmintic treatment in maternal health programmes in many countries has been the result.

5. Conclusion

The prevalence of anemia was high in the study population (61%). Parasitic infections and food shortage were some of the factors that were associated with anemia.

6. Recommendations

Government should seek ways of reducing unwanted pregnancy (because pregnancy itself contributes to anemia). Increasing the iron content of food through dietary intake, Increasing the iron content of food through fortification, Increasing iron intake through supplementation. Robust de-worming programs to be introduced.

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8. Conflict of interest

I have no conflict of interests; this was my thesis for the MPH program

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