

# Prevalence and Factors Associated with Iron Deficiency Anemia among School-Age Children in Primary Schools in Burao City, Somaliland, 2020

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## Abstract

**Background:** Anemia is a global public health problem affecting the majority of the population of the world in both developed and developing countries with major consequences on human health as well as social and economic development. It is the world's second leading cause of disability of the whole global disease burden. It affects 1.62 billion (24.8%) of the population, among them, it is affecting 305 million (25.4%) school-age children (SAC). **Objectives:** The main objective of this study was to assess the prevalence and factors associated with anemia among school-age children in primary schools in Burao city, Somaliland, 2020. **Materials & Methods:** A school-based cross-sectional study design was done in four primary schools in Burao, Somaliland. About 285 school-age children in the age group between 6 - 14 years were selected with a respondent rate of 93.4%. Random sampling was used to select schools and systemic random sampling was used to identify children from the selected schools. Socio-demographic data was collected by using a questionnaire & interviews of respondents in addition to anthropometric measurements, hemoglobin measurement, and stool examination. Complete Blood Counting (CBC) was used to determine the mean corpuscular (kor-PUS-kyu-lar) volume (MCV) and hematocrit (HMC) levels to detect hemoglobin status of the children. Data was entered and analyzed using SPSS statistical software for Windows version 21. Anthropometric data was analyzed using ANTHRO Plus. Bivariate logistic regression and multivariable logistic regression were used to identify independent predictors of anemia in school adolescent girls. Statistical significance was set at  $p < 0.05$ . **Results:** A total of 285 school-age children were included in this study. The overall prevalence of anemia was (23.1%) (CI: 18.1%, 28.1%) with the mean and standard deviation

of ( $12.7 \pm 1.59$ ). Out of the anemic children, 20.4% were mild and 2.3% and 0.4% of them were moderate and severe, respectively. Children's from illiterate mothers (AOR = 2.37; 95% CI: 1.14, 4.94. P-value = 0.020), consuming organ meat less than once a week (AOR = 2.19; 95% CI: 1.05, 4.43. P-value = 0.036) and having parasites in stool (AOR = 5.21; 95% CI: 1.10, 24.6. P-value = 0.037) were identified as statistically independent associated factors with prevalence of anemia in school-age children's from Burao, Somaliland. **Conclusion:** Prevalence of anemia in Burao city, Somaliland primary schools was a moderate public health problem in the current study area. Nutrition education, iron folic acid supplementation program, deworming, good hygiene, and sanitation are playing an important role in the prevalence of anemia and we recommend to give them more attention from ministry of education and ministry of health in Somaliland.

### Keywords

Anemia, Associated Factors, School-Age Children, Primary Schools, Burao City

## 1. Introduction

Anemia is a disease in which reduced hematocrit or hemoglobin levels lead to hemoglobin (Hgb), diminished oxygen-carrying capacity that does not optimally meet the metabolic demands of the body, as a result of deficiency of one or more essential nutrients, heavy blood loss, parasitic infections and congenital hemolytic diseases [1]. Anemia is a global public health problem affecting the majority of the population of the world in both developed and developing countries with major consequences on human health as well as social and economic development. It is the world's second leading cause of disability of the whole global disease burden [2] [3]. It is considered as a public health problem when the hemoglobin (Hb) value is below the population-specific Hb threshold.

It can be classified as no, mild, moderate, and severe public health problem when the prevalence is  $\leq 4.9\%$ , 5.0% - 19.9%, 20.0% - 39.9%, and  $\geq 40\%$ , respectively [4]. It affects 1.62 billion (24.8%) of the population, among them it is affecting 305 million (25.4%) school-age children (SAC) [4]. Despite implementation of control programs including iron supplementation, deworming and insecticide-treated bed net distribution, and anemia remains a major global concern in child health, especially in SSA [5]. While it may be difficult to separate the effects of anemia (low hemoglobin (Hb)) from those of its underlying biological mechanisms (e.g., nutritional deficiency, chronic infections, hemoglobinopathies), anemia has been independently associated with overall increased mortality in young children's [6]. Several international studies have examined the role of demographic, social, environmental, and geographic determinants of anemia as significant risk factors for childhood anemia [7] [8]. Blood loss such as that associated with schistosomiasis, hookworm infestation, hemorrhage in

childbirth, and trauma, can also result in both iron deficiency and anemia. Lastly, as with vitamin A deficiency, inhibition of the normal metabolism of iron can result in anemia [9]. Despite the high prevalence and adverse health consequences reported internationally, there have been limited national representative findings on the prevalence and factors contributing to the development of anemia in SC, particularly in the study area. Anemia has been shown to contribute to mortality; a recent meta-analysis of nearly 12,000 children from six African countries aged 28 days to 12 years indicates that for each 1 g/dL increase in Hb, the risk of death falls by 24% [10]. Therefore, the present study was carried out as the first study and aimed to determine the prevalence of Iron Deficiency Anemia and its associated risk factors among a sample of primary school students in Burao city, Somaliland. To identify the relationship between anemia and BMI of school-age children in primary schools in Burao city, Somaliland, 2020 and identify intestinal parasitic infections related.

## 2. Materials & Methods

A school-based cross-sectional study design was done in four primary schools in Burao city, Somaliland. About 285 school-age children in the age group between 6 - 14 years were selected with a respondent rate of 93.4%.

The sample size (305) was calculated using a single population proportion formula by considering a 23.6% prevalence of anemia among SC from study done in Filtu Town, Somali region, Southeast Ethiopia, 5% margin of error, 95% confidence interval, and 10% non-response rate [11].

Two public primary schools and two private primary schools were randomly selected and sampling was proportionally allocated to the selected schools and finally, systematic random sampling was employed to select study subjects using student registration book as a sampling frame. Only children that had informed consent from their parents/caregivers were included in the study.

Socio-demographic data was collected by using a questionnaire & interview of respondents. Complete Blood Counting (CBC) was used to determine the hemoglobin status of the children. Students (senior lab students) collected the blood and brought it to the University of Burao laboratory to analysis them where CBC machine is available. Anemia was defined as Hb < 11.5 g/dl for SC aged 6 - 11 years, and Hb < 12 g/dl for children aged 12 - 14 years. These verities of anemia were categorized as mild (Hb between 10 and 11.4 g/dl for 6 to 11 years, and between 10 and 11.9 g/dl for 12 to 14 years), moderate (Hb between 7 and 9.9 g/dl), and severe (Hb < 7 g/dl) for 6 to 14 years of age SC based on the adjusted Hb concentration recommended by the WHO scheme [4]. Stool examination was also done for each participant in the present study, fresh stool sample was collected following the standard operating procedures (SOPs) in clean and labeled leak-proof stool cups. The stool specimen was transported in screw-capped cups in 10% formalin to the laboratory. Intestinal helminth was detected microscopically by direct saline wet mount preparation and formalin-ether concentration method within 2 - 8 hours after collection at the Univer-

sity of Burao, Biomedical and Laboratory Sciences Laboratory. Data was entered and analyzed using SPSS statistical software for Windows version 21. Anthropometric data was analyzed using ANTHROP Plus.

Bivariate logistic regression and multivariable logistic regression were used to identify independent predictors of anemia in school adolescent girls. Statistical significance was set at  $p < 0.05$ .

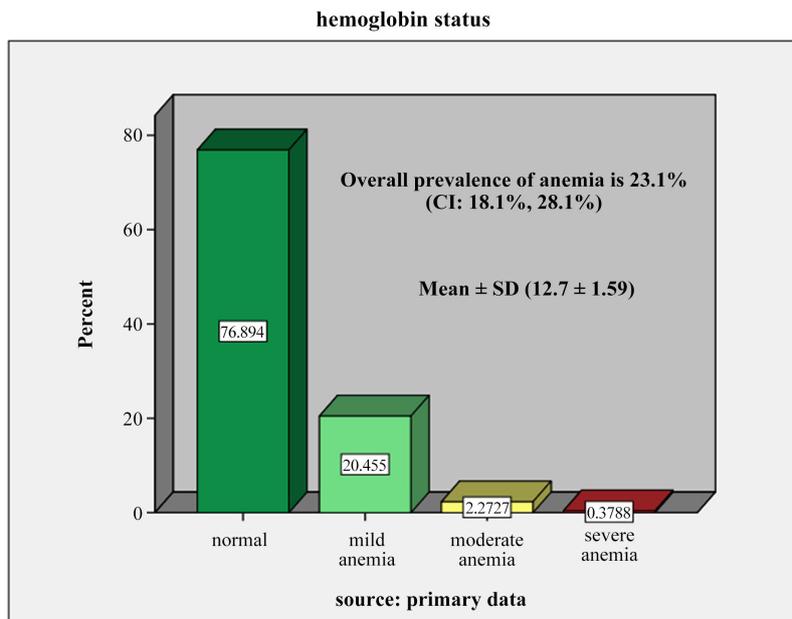
### 3. Results

Hemoglobin level of the school-age children was tested and overall prevalence of anemia is 23.1% (CI: 18.1%, 28.1%) with the mean and standard deviation of  $12.7 \pm 1.59$ . Out of the anemic children, 20.4% were mild and 2.3% and 0.4% were moderate and severe, respectively. While, approximately (77%) were normal children (Figure 1).

#### Socio-demographic characteristics of the respondents

About 285 of children aged between 6 and 14 years participated in this study with 93.4% of response rate, these children were obtained from four primary schools (two public and two private schools). According to the age of the children, 187 (65.8%) of them were the age group between 6 - 11 years and 97 (34.2%) were the age group between 12 - 14 years (mean  $\pm$  SD =  $10.6 \pm 1.95$ ). majority of the participants 180 (63.2%) were females and 105 (36.8%) were males.

About 188 (66.4%) of the children were studying in grades between 1 up to 4 and 95 (33.6%) were studying between 5 - 8 classes. Majority of the households, 234 (83%) consist of more than six people and only 48 (17.0%) consist of family members less than or equal to six (Table 1).



**Figure 1.** Showing the percentage of prevalence of anemia based on the hemoglobin status of school-age children among public schools in Burao, Somaliland, 2020 (n = 285).

**Table 1.** Distribution of socio-demographic characteristics of school-age children in public schools in Burao, Somaliland, 2020 (n = 285).

Variable	Categories	Frequency	Percentage %
Age	6 - 11 years	187	65.8
	12 - 14 years	97	34.2
	Total	284	100.0
Mean $\pm$ SD 10.6 $\pm$ 1.95			
Gender	Male	105	36.8
	Female	180	63.2
	Total	285	100.0
Class of studying	1 - 4	188	66.4
	5 - 8	95	33.6
	Total	283	100.0
Family size	$\leq 6$	48	17.0
	$> 6$	234	83.0
	Total	282	100.0
Mean $\pm$ SD 9.2 $\pm$ 2.8			
Educational status of the father	Illiterate	38	13.6
	Only Quran college	14	5.0
	Read and write only	101	36.1
	Primary level	34	12.1
	Secondary level	43	15.4
	College and above	50	17.9
	Total	280	100.0
Educational status of the mother	Illiterate	88	31.9
	Only Quran college	36	13.0
	Read and write only	77	27.9
	Primary level	35	12.7
	Secondary level	31	11.2
	College and above	9	3.3
	Total	276	100.0
Occupational status of the mother	Housewife	200	72.5
	Merchant	36	13.0
	Private/company employee	22	8.0
	Government employee	7	2.5
	Other	11	4.0
Total	276	100.0	

**Continued**

Occupational status of the father	Government employee	54	19.4
	Merchant	26	9.3
	Private/company employee	74	26.5
	Daily laborer	41	14.7
	Unemployed	41	14.7
	Other	43	15.4
	Total	279	100.0
Name of the enrolled school	SH. Ibrahim school	97	34.0
	Al-Mustaqbal school	86	30.2
	21-November school	49	17.2
	Candlelight school	53	18.6
	Total	285	100.0
Both parents are alive	Yes	273	96.1
	No	11	3.9
	Total	284	100.0

About 38 (13.6%) of educational status of children's fathers were illiterate and 101 (36.1%) can read and write only, where 34 (12.1%), 43 (15.4%), and 50 (17.9%) had the educational status of primary level, secondary level and college and above level, respectively.

According to educational status of children's mothers, about 88 (31.9%) were illiterate and 77 (22.9%) can only read and write while only 9 (3.3%) reached college and above (**Table 1**).

Majority of children's mothers, 200 (72.5%), were housewife and about 41 (14.7%) of children's fathers were unemployed and 54 (19.4%), 74 (26.5%) and 41 (14.7%) were government employees, private/company employee and daily laborer, respectively.

Majority of the respondent, 97 (34.0%) were from SH. Ibrahim School and 86 (30.2%), 49 (17.2%) and 53 (18.6%) of the children were from Al-Mustaqbal, 21-November and Candlelight schools, respectively. About 273 (96.1%) of the children's both parents were alive where the rest, 11 (3.9%), lost at least one of the parents (**Table 1**).

To determine the associated socio-demographics factors of anemia, bivariate logistic regression was done and based on that analysis, the year of studying (grade) and education of children's mothers were associated with anemia with the P value less than 0.25. Children in class year (grade) between 1 - 4 were more likely to be anemic (COR = 2.12; 95% CI: 1.09, 4.12) and children from illiterate mothers were more likely to be anemic (COR = 3.30; 95% CI: 1.80, 6.05) (**Table**

2). Using mosquito nets and current stool examination were also associated with anemia with P-value less than 0.25. Children who used mosquito nets were associated with anemia (COR = 1.51; P-value 0.167; 95% CI: 0.84, 2.71). Children who had parasites in their stool were more likely to be anemic (COR = 4.22; 95% CI: 1.08, 16.38) (Table 2).

Using mosquito nets and current stool examination were also associated with anemia with P-value less than 0.25. Children who didn't use mosquito nets were associated with malaria infection and subsequently with anemia disease (COR = 0.167; 95% CI: 0.84, 2.71). Children who had parasites in their stool were more likely to be anemic (COR = 4.22; 95% CI: 1.08, 16.38) (Table 3).

**Table 2.** Distribution of bivariate logistic regression about socio-demographic factors of school-age children with and without anemia in public schools in Burao, Somaliland, 2020 (n = 285).

Variable	Categories	Hemoglobin status		Crude Odds Ratio 95% CI	P-value
		Anemic Cases	Normal Cases		
Age of the child	6 - 11 years	38 (14.4%)	132 (50.2%)	0.87 (0.48, 1.58)	0.662
	12 - 14 years	23 (8.7%)	70 (26.6%)	1	
Sex of the child	Male	23 (8.7%)	70 (26.5%)	1.15 (0.63, 2.08)	0.644
	Female	38 (14.4%)	133 (50.4%)	1	
Class of studying	1 - 4	47 (17.9%)	123 (46.9%)	2.12 (1.09, 4.12)	0.025*
	5 - 8	14 (5.3%)	78 (29.8%)	1	
Name of the school	Sheikh Ibrahim	25 (9.5%)	72 (27.3%)	0.76 (0.35, 1.67)	0.508
	Mustaqbal	12 (4.5%)	74 (28.0%)	0.35 (0.14, 0.36)	
	21-November	10 (3.8%)	26 (9.8%)	0.85 (0.32, 2.23)	
	Candlelight	14 (5.3%)	31 (11.7%)	1	
Family size	≤6	14 (5.3%)	34 (13.0%)	1.46 (0.72, 2.95)	0.288
	>6	47 (17.9%)	167 (63.7%)	1	
Education of the father	Illiterate	7 (2.7%)	28 (10.8%)	0.80 (0.33, 1.95)	0.634
	Literate	53 (20.5%)	171 (66%)	1	
Education of the mother	Illiterate	30 (11.7%)	47 (18.4%)	3.30 (1.80, 6.05)	0.001*
	Literate	29 (11.3%)	150 (58.6%)	1	
Occupation of the mother	Housewife	44 (17.2%)	141 (55.1%)	1.16 (0.60, 2.26)	0.652
	Employed	15 (5.9%)	56 (21.9%)	1	
Occupation of the mother	Unemployed	9 (3.4%)	29 (11.0%)	1.03 (0.46, 2.33)	0.927
	Employed	52 (19.7%)	174 (65.9%)	1	

NOTE: \*reminds the significance of the variable (P-value < 0.25).

**Table 3.** Distribution of bivariate logistic regression about history of parasites, prevention of malaria, and source of water of school-age children with and without anemia in public schools in Burao city, Somaliland, 2020 (n = 285).

Variable	Categories	Haemoglobin status		Crude Odds Ratio 95% CI	P-value
		Anemic	Normal		
Infected with malaria in the last three months	Yes	15 (5.7%)	42 (16.1%)	1.22 (0.62, 2.40)	0.553
	No	46 (16.8%)	158 (60.5%)	1	
Diagnosed with intestinal parasite in the last three months	Yes	9 (3.4%)	37 (14.1%)	0.77 (0.34, 1.70)	0.522
	No	52 (19.8%)	165 (62.7%)	1	
Use mosquito nets	No	38 (14.4%)	106 (40.2%)	1.51 (0.84, 2.71)	0.167*
	Yes	23 (8.7%)	97 (36.7%)	1	
Use of insect sides	Yes	28 (10.6%)	109 (41.4%)	0.72 (0.40, 1.28)	0.270
	No	33 (12.5%)	93 (35.4%)	1	
Source of water	Pipe	49 (18.9%)	160 (61.8%)	0.97 (0.47, 2.00)	0.934
	Water tanker truck	12 (4.6%)	38 (14.7%)	1	
Current stool examination	Parasite seen in stool	8 (3.8%)	3 (1.4%)	4.22 (1.08, 16.38)	0.037*
	No parasite seen in stool	43 (20.7%)	154 (74.0%)	1	

NOTE: \*reminds the significance of the variable (P-value < 0.25).

BMI for age Z score, average use of organ meat, and average use of flesh meat were associated with anemia using bivariate logistic regression P-value less than 0.25. Children with low MBI for age (wasting) were associated with anemia (COR = 0.58; 95%: 0.26, 1.28) and children that consume organ meat more than once a week were at high risk of anemia (COR = 1.87; 95% CI: 1.04, 3.37). Children who consume organ meat less than once a week were at high risk of anemia (COR = 1.87; 95% CI: 1.04, 3.37), similarly, children who consume flesh meat less than once a week were also at high risk of anemia (COR = 2.03; 95% CI: (1.10, 3.76) (**Table 4**).

Seven independent variables were significant on bivariate binary logistic regression with a p-value of <0.25 and all were entered into the multivariate logistic regression model to identify independently associated factors with anemia after controlling confounding factors with p-value < 0.05. Accordingly, education of children's mother, average use of organ, meat, and stool examination were identified as statistically independent associated factors of anemia. Children from illiterate mothers were 2.37 times more likely to be anemic than children whose mothers were literate (AOR = 2.37; 95% CI: 1.14, 4.94). Children who consume organ meat less than once a week are 2.16 more likely to be anemic compared to those who consume organ meat at least once or more in a week (AOR = 2.19; 95% CI: 1.05, 4.43). Children who had parasites in their stool were 5.21 times more risk to be anemic (AOR = 5.21; 95% CI: 1.10, 24.62) (**Table 5**).

**Table 4.** Distribution of bivariate logistic regression about nutrition-related factors of school-age children with and without anemia in public schools in Burao city, Somaliland, 2020 (n = 285).

Variable	Categories	Haemoglobin status		Crude Odds Ratio 95% CI	P-value
		Anaemic	Normal		
Height for age Z score	Stunted growth	6(2.3%)	15(5.7%)	1.35 (0.50, 3.65)	0.551
	Normal growth	55 (55%)	186 (71.0%)	1	
BMI for age Z score	Wasted	9 (3.5%)	45 (17.4%)	0.58 (0.26, 1.28)	0.184*
	Normal	52 (20.1%)	153 (59.1%)	1	
Average use of fruits	Less than once a week	25 (9.6%)	81 (31.2%)	1.13 (0.62, 2.04)	0.682
	More than or once a week	33 (12.7%)	121 (46.5%)	1	
Average use of organ meat	Less than once a week	35 (13.5%)	85 (32.8%)	1.87 (1.04, 3.37)	0.035*
	More than or once a week	25 (9.7%)	114 (44.0%)	1	
Average use of flesh meat	Less than once a week	23 (8.8%)	48 (18.5%)	2.03 (1.10, 3.76)*	0.024*
	More than or once a week	36 (13.8%)	153 (58.8%)	1	
Average use of flesh meat	Less than once a week	33 (13.0%)	104 (40.9%)	1.23 (0.67, 2.23)*	0.496
	More than or once a week	24 (9.4%)	93 (36.6%)	1	
Average use of milk and milk products	Less than once a week	24 (9.2%)	74 (28.4%)	1.10 (0.61,1.98)	0.741
	More than or once a week	37 (14.2%)	126 (48.3%)	1	

NOTE: \*reminds the significance of the variable (P-value < 0.25).

**Table 5.** Multivariable logistic regression analysis showing factors associated with anemia among school-aged children in public schools in Burao, Somaliland, 2020 (n = 285).

Variable	Categories	Haemoglobin status		Adjusted Odds Ratio 95% CI	P-value
		Anaemic	Normal		
Class of studying	1 - 4	47 (17.9%)	123 (46.9%)	1.61 (0.71, 3.67)	0.252
	5 - 8	14 (5.3%)	78 (29.8%)	1	
Education of the mother	Illiterate	30 (11.7%)	47 (18.4%)	2.37 (1.14, 4.94)	0.020*
	Literate	29 (11.3%)	150 (58.6%)	1	
BMI for age Z score	Wasted	9 (3.5%)	45 (17.4%)	0.58 (0.22, 1.50)	0.267
	Normal	52 (20.1%)	153 (59.1%)	1	
average use of organ meat	Less than once a week	35 (13.5%)	85 (32.8%)	2.16 (1.05, 4.43)	0.036*
	More than or once a week	25 (9.7%)	114 (44.0%)	1	
average use of flesh meat	Less than once a week	23 (8.8%)	48 (18.5%)	1.97 (0.92, 4.22)	0.079
	More than or once a week	36 (13.8%)	153 (58.8%)	1	
Use mosquito nets	No	38 (14.4%)	106 (40.2%)	1.49 (0.71, 3.15)	0.288
	Yes	23 (8.7%)	97 (36.7%)	1	
Current stool examination	Parasite seen in stool	8 (3.8%)	3 (1.4%)	5.21 (1.10, 24.62)	0.037*
	No parasite seen in stool	43 (20.7%)	154 (74.0%)	1	

NOTE: \*reminds the significance of the variable (P-value < 0.05).

## 4. Discussion

The main objective of this study was to assess the prevalence and factors associated with anemia among school-age children in primary schools in Burao. According to WHO cut point, anemia is considered as a public health problem when the prevalence is more than 5%. However, the magnitude of the problem is defined as mild, moderate, and severe when the prevalence is 5.0% - 19.9%, 20.0% - 39.9%, and  $\geq 40\%$ , respectively [4], respectively. Accordingly, 23.1% prevalence of anemia in SC means that the problem is a moderate public health problem in the study area. This indicated that a considerable number of children in the community were suffering from anemia. Anemia is negatively correlated with educational outcomes & levels in parents and schools children's, leading to poor learning outcomes, such as loss of concentration in class, impaired academic achievement, and discontinuation of education in addition to other major contributing factors in the prevalence of anemia such as malnutrition, infected by parasites. So that emphasis should be given to reduce the prevalence of anemia in children.

The prevalence of anemia was similar and comparable to the study done in Filtu town, Somali region in Ethiopia which identified anemia as 23.6%. The reason for close similarity could be due to their living sitting and culture are very alike [11]. Studies done in Cape Verde, China, and two studies from Saudi Arabia [Najran and Riyad] had prevalence of anemia of 23.8%, 24.9%, 22.5% and 22.3%, respectively [12] [13] [14] [15]. These studies were in agreement with the current study. The current study had a higher prevalence of anemia among school-age children compared to studies done in Gonder town in Ethiopia with a prevalence of 15.5% [16], 16.2% in Morocco [17] and a study from Indonesia with a prevalence of 14% [18]. The prevalence of anemia in this study was lower than those of studies done in other African countries, such as Kenya (28.8% - 35.3%) [19], Nigeria (82.6%) [20], Mali (58%) [21], Mozambique (54%) [21], Ghana (41%) [21], Tanzania (57%) [21] Sudan (88.3%) [22] and Egypt (59.3%) [23]. It was also lower than the findings of studies conducted in Asian countries, like Gaza strip, Palestine (35.3%) [24], and western China 34% [25].

The discrepancy may be attributed to the differences in study settings the latter were carried out in rural areas and our study it was in city. In addition, the consumption of mothers & schools children iron-rich foods, for example, red meat, the iron-rich staple food particularly in cows and kamala's meats in Somaliland might have contributed to the low prevalence of anemia in the our study area. In this study we found that children who consume red meat less than once a week are 2.16 more likely to be anemic compared to those who more consume red meat at least once or more in a week. Studies from Riyadh in Saudi Arabia and Turkey also have found that anemia was associated with eating meat [15] [26].

Maternal education was found to be significantly associated with anemia among school-age children. Children whose mothers were illiterate were 2.3

times more likely to be anemic compared to children from literate mothers. The findings of this study are similar to the study done in Gonder town in Ethiopia that identified anemia in school-age children to be significantly associated with lower maternal education [16].

Studies from in Kenitra, Northwest of Morocco, also identified a significant relationship between maternal education and school-age child anemia [17]. Similarly, a study done in Northwest Ethiopia determined that children from illiterate mothers were more likely to be anemic [16]. On the other hand, a similar study was done in Rural China's Elementary Schools that revealed a strong association between paternal education and anemia in this age group [13].

Overall, we discussed that specially maternal educational status plays a major role in child health, nutrition, growth and development. Uneducated mothers may not understand the nutritional requirements of children easily and follow the recommended child feeding practices. In addition, parents lack of education negatively affects the socio-economic status of households which in turn limits food purchasing power. Hence, children's access to heme iron sources, animal products, is limited.

In current study intestinal parasite in stool was significantly associated with anemia in school-age children where children who had parasites in their stool were 5.21 times more risk to be anemic. Similar result was found in the study done in Filtu town, Somali region in Ethiopia [11]. Studies from Arba Minch in Ethiopia, rural Upper Egypt, and Nigeria identified that the parasite in stool was significantly associated with anemia in this age group [20] [23] [27]. We explained that might be due to nutritional competition, RBC destruction and parasite and feeding absorbed food of host, and loss of appetite caused by worms. These parasites also cause impaired nutrient uptake by a direct damage of the intestinal mucosal wall.

## 5. Limitations & Strengths of Study

One of the strengths of this study it was community-based and can provide information about both enrolled SAC. The study also tried to address multifactorial associated with anemia including investigation of the presence of intestinal parasitic infections. While, the first limitation of this study was we didn't differentiate specific causes of anemia, such as TIBC, vit.B12, folate, RBC morphology and measure the level of ferritin was not identified. Second limitation unfortunately there is no local previous studies in same subject in Somaliland republic.

## 6. Conclusion

In this current study, Anemia was found to be a mild public health problem among SC. It was strongly associated with low maternal education levels, malnutrition, dieting habit, parasites infections & monthly income. Hence, focused policies and strategies of government towards school children should be de-

signed to reduce anemia among low income & low education groups. Moreover, health education that enhances the knowledge of women about child feeding practices should be given regularly. On top of that, further studies using a larger sample size and including the assessment of all anemia diagnostics tests and subclinical infections are required to be conducted to identify the cause-effect relationships of anemia with its contributing factors.

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### Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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