

COLLEGE OF MEDICINE AND HEALTH SCIENCE

DEPARTMENT OF NURSING

A RESEARCH PAPER SUBMITTED TO WOLKITE UNIVERSITY, COLLEGE OF MEDICINE AND HEALTH SCIENCE, DEPARTMENT OF NURSING FOR THE PARTIAL FULFILLIMENT OF THE REQUIREMENTS FOR DEGREE OF BACHILOR SCIENCE OF NURSING.

PREVALENCE OF ANEMIA AND ITS ASSOCIATED FACTOR AMONG CHILDREN WHO ARE ON ART AT AGENA HEALTH CENTER, GURAGE ZONE, SNNPR, ETHIOPIA, 2020.

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DECEMBER, 2020

WOLKITE, ETHIOPIA

AKNOWLEDGEMENT

First of all we are deeply grate full to thank for our greatest father god indebtedness for his unlimited help in bringing out this work.Beyond this our advisors Mr.FishaAlebel and Mr. MasinoTessu contributed their knowledge, ideas and time to make this work possible and we would like to take this opportunity to thank for their generous help. in addition to this we would like to thank wolkite university, college of medicine and health science for giving us this precious chance .At the last, but not the least we would like to thank those who helping and guiding us throughout our journey including data collectors

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ABBREVIATION AND ACRONYM

AIDS……AcquiredImmunoDeficiency Syndrome

ART……..Antiretroviral therapy

AHC…….Agena Health Center

CD4……..Cluster of differentiation

EDHS…… Ethiopia demographic health survey

HAART……. Highly active antiretroviral therapy

HAZ……... Height-for-age *Z*-score

HCT…….Hematocrit

HGB……Hemoglobin

HIV …….Human immunodeficiency Vitus

SPSS……..... Statistical package for social science

SNNPR…….South Nation Nationality People Region

UNICEF……United Nations Children Fund or international children's emergency fund

WHO…….World Health Organization

MUAC……Mid-upper arm circumference

WAZ……..Weight-for-age *Z* score

WHZ……. Weight-for-height/length *Z* score.

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ABSTRACT

Background: anemia is a major health problem throughout the world. The magnitude of the problem is higher in developing countries since they are more exposed to various health and socioeconomic problems. Though all age group can develop anemia, due to various factors children and pregnant women are more susceptible one.

Objective: The study aimed to assess the prevalence and associated factor of anemia among children who are on ART atAgena Health Center.

Method:an institutional based retrospective cross-sectional study wasconducted by using structured questionnaire to gather from 291 randomly selected card.

Result: A total of 73 (17.6%) patients among 291 HIV-infected children were found to be anemic (Hg<11g/dl).Out of 291 the total study populations 171 (58.8%) was male and about 220(75.6%) were age between 7-12years, 185(87%) of them live in rural and about 180(62%) CD4 count of study population were greater than 500,most of were found in II WHO stage 101(34.7%), 160 (55%) HIV status of caregiver were positive, 79(38.9%) had been using the treatment combination of (TDF+3TC+NVP) respectively.

Conclusion and Recommendation: In conclusion the factors associated with Anemia in HIV infected children were multifactorial in nature. Efforts to correct Anemia in HIV infected children should include use of HAART and treatment of infections like TB.

KEY WORDS;Anemia,Agena Health Center

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1. INTRODUCTION

1.1 Background

Anemia refers to a condition in which the hemoglobin content of the blood is lower than normal for person's age gender and environment, resulting in the oxygen carrying capacity of blood being reduced[1]. It is also a condition that develops when our blood lacks enough healthy red blood cells (RBC) both in quality and quantity or hemoglobin in circulation to carry adequate oxygen to tissue [1, 2].Anemia is also classified as mild degree (Hgb 10.0–10.9 g/dl), moderate (Hgb 7.0–9.9 g/dl), severe (Hgb 4.0–7.0 g/dl), and very severe Hgb less than 4.0 g/dl and clinical grading of anemia are: conjuctival pallor or mucus membrane pallor is mild, obvious skin pallor; moderate and palmar crease pallor is severe anemia [1].

Hematological complications have been documented to be the second most common cause of morbidity and mortality among HIV positive children [3].Indeed, anemia is a common and serious complication of both HIV infection and its treatment. That is, anemia is recognized as a major hematologic complication and has a significant impact on children's survival, treatment outcomes and quality of life[4].

According to WHO definitions, anemia is defined as hemoglobin level less than 11 g/dl for children <5 years old, <11.5 g/dl for children 5–11.9 years old and <12 g/dl for children 12–14.9 years old after altitude adjustment [5].

Undeniably, anemia is the most important clinical problem seen in people living with HIV/AIDS [6];its severity increases as CD4 count declines [7] and with progression of the disease HIV/AIDS to advanced stage [8]and it is associated with an increased risk of death in both children and adult patients[9].

Anemia is one of the global public health problems that affect more than one third of the world population. It has been strongly associated with poor growth and development, limited psychomotor development, and poor long-term performance in cognitive, social, and emotional functioning in children. It is also associated with impaired mental, physical, and language development and poor coordination, scholastic achievement, and immune function [10].

1.2. Statement of the problem

Globally about 1.62 billion peoples are estimated to be anemic. The highest prevalence of anemia was in south Asia and Africa. Approximately 50% of children and women in less developing countries affected due to many factors like nutrition deficiencies, infections like malaria, hookworm, schistosomiasis, and other chronic infections [11].

Anemia is among the most common hematologic abnormalities in patients with HIV and has been associated with increasing disease progression to AIDS, high mortality and poor clinical outcomes. In HIV positive patients, the pathogenesis of anemia during human immunodeficiency virus, is multi-factorial and includes the effect of opportunistic infections, nutritional deficiencies, the anemia of chronic disease, impaired erythropoietin production, endogenous release of inhibitory cytokines, mycobacterium ovum complex infection, human parvovirus B19 infections, HIV infection of hematopoietic progenitor cells, HIV infection of other bone marrow stromal cells and drug side effect [12]. Considerable emphasis is placed on reducing the prevalence of Anemia in children, for a large body of evidence indicates that poor iron status negatively affects cognitive, motor and social development during this period of rapid growth and development. Anemia has been shown to have significant adverse effects on children that include decreases in responsiveness and activity as well as increases in body tension and fatigue. There is also a well-known association between Anemia and delayed neurodevelopment in infants and children[13]. The risk of anemia is high during infancy and childhood, for only about 50% of the iron requirement of a normal six month old can be obtained from breast milk, by this age the stores received at birth are likely to have been used to support normal functions and growth even in children born at term of well-nourished mothers. If the mother is anemic and/or the child is of low birth weight, the stores use up much earlier. Continued breastfeeding alone will supply only half of the infant's iron needs, whereas the other half approximately 4 mg/day must come from complementary foods or an iron containing supplement in order to avoid iron deficiency. Where well-fortified infant cereals are available and affordable, they provide the required iron, as does iron fortified infant formula [14]. Chronic iron deficiency in infancy has a long term effect on late childhood, for it is dependent on the socioeconomic characteristics which has a long term consequence in childhood. Since the prevalence has been high, that needs special

attention to over-come the problem by designing program in prevention and treatment of anemia. The current issue in prevention and treatment of anemia would be increasing the use of iron rich foods, targeted fortification of foods for children, and the use of iron supplements [15]. Pathogenesis of micronutrient deficiency is much more complex during human immune deficiency virus (HIV) infection. Insufficient dietary intake, mal-absorption, diarrhea, and impaired storage and altered metabolism of micronutrients can contribute to the development of micronutrient deficiency. Micronutrient deficiency may contribute to the pathogenesis of HIV/AIDS infection through increased oxidative stress and compromised immunity [16]. In a study done by the International Epidemiologic Databases to Evaluate AIDS (IeDEA) collaboration in 6 regions, it was found that at HAART initiation, anemia was found in 15% of patients in Asia- Pacific, 14% of patients in Caribbean, Central and South America, 21% of Southern Africa patients, 45% of Western Africa patients, 36% of Central Africa patients and 29% of Eastern Africa patients[17].While in study carried out in Ethiopia the prevalence of anemia was 16.2% among children having follow-up at the ART clinic of the University of Gondar Hospital, 23.1% in Jimma University Specialized Hospital[18].

Ethiopia is ranked as one of the countries with the highest HIV burden worldwide, with about 1.1 million people living with HIV and about 14,405 new HIV infections being reported in 2016 [19].

Anemia is a common manifestation of pediatric HIV infection, and is a significant negative predictor of survival(6).The etiology of anemia in HIV-infected patients is multifactorial in nature, with opportunistic infections, nutritional deficiencies(iron, folic acid, and vitamin B12), sickle cell disease,, certain medications (including antibiotics and antiretroviral agents), HIV/AIDS itself, and parasitic infections, as well as the presence of a chronic infection, which may decrease erythropoiesis. Some of the factors associated with anemia in HIV/ AIDS patients in Ethiopia are a low CD4 count, WHO clinical stage III and IV, opportunistic infections(OIs), and a low BMI [20,21].

In Ethiopia, as many as six in ten under-five children are anemic [22]. As per EDHS 2016, overall, more than half of the children 6–59 months (56%) suffered from some degree of anemia, ART related anemia in pediatrics age group ranged from 18.9 to 30%[23]..Despite causing such

high levels of burden, the public health community does not pay anemia the attention it deserves. The government of Ethiopia has been working to reduce childhood anemia. Accordingly, it endorsed the national nutrition program and bimanual school deworming, developed micronutrient deficiency prevention and control guideline, and implemented micronutrient fortification. But studies from different corners of the country have shown that childhood anemia is still a major public health problem in this country [22].

Most of the studies on the HIV-anemia interplay were done in developed countries and mainly included adults' prevalence of anemia and its associated factor among HIV/AIDs. But the prevalence of anemia among children on HAART have not been very well addressed in resource poor settings like Ethiopia, Therefore, the main aim of this study was to assess the prevalence and its associated factors of anemia among HIV-positive children on HAART attending Agena Health Center of Gurage Zone, SNNPR, Ethiopia, 2020.

1.3 literature review

1.3.1 Prevalence of anemia

Anemia is a global health problem affecting both developing and developed countries with major adverse effects on human health as well as social and economic development. Anemia is mainly a result of nutritional iron deficiency, malaria, hook warm infection that has got wide range of infection on the health condition of children [24].

A research result from New Delhi among HIV+ children taking ART mild anemia was present in 15(31.3%) of total 36 anemic children, and 16(33.3%) were having moderate anemia. Severe anemia was present in 5(10.4%) of cases.Socioeconomic and wasting or low BMI as well as dietary intakewere not found to be significantly associated with the development of anemia.But,malnutrition is definitely a major risk factor for the development of anemia and of severe grade in the children with HIV infection[25].Another cross-sectional study conducted among 300 HIV infected children visiting the pediatric outpatient clinics of Al-Fayoum University Hospital in Egypt, it was found that 64% of studied children had Anemia (20% mild, 41.7% moderate and 2.3% severe).The risk factors associated with it are found that children from rural areas, those from low social class and those of low maternal educational level had a higher risk for Anemia than other children[26].

A results from ART Clinic of Minilik II Hospital Addis Ababa, Ethiopia: Of the 230 study subjects 121 (52.6%) were anemic before ART. However, the prevalence of anemia after ART (37.4%) was significantly decreased. The prevalence of anemia was higher in females than in males at base line (70.25% vs. 29.75%), and after ART treatment (69.23% vs. 30.77%).Significant association was observed between Hb and CD4+ T cell count after ART .There was a decline in the prevalence of anemia and increment of mean CD4+ T cell count among HIV infected patients after ART[27].A cross sectional study in WolaitaZone,south Ethiopia on 256 children age between 6 month to 12 years age suggest that the prevalence of anemia was found to be 38.8%.[28]. Another case-control study was conducted on 350HIV-infected children on HAART attending Hospitals of North Wollo Zone, A total of 350 HIVpositive children (117 cases and 234 controls) On multivariate analysis, variables which havestasticallysignificant association with anemia were as follows: had amebiasis (AOR = 7.29,1.22–43.56), had history of opportunistic infections (AOR = 9.63, 1.94–47.85), had malaria

infection (malaria) [29].From the cross sectional study among HIV infected children who received HAART at Zewditu Memorial Hospital in Addis Ababa, Ethiopia ART clinic. The prevalence of anemia was 22.2%where 21 (52.5%), 17 (42.5%), and 2 (5.0%) patients had mild,moderate, and severe anemia. There was a significant increase in severity and prevalence of anemia in those with CD4+ T cell counts below 350[30].Another retospective study in northwest Ethiopia, Gonder University Hospital, The overall prevalence of anemia was 138 (35%). Female HAART naive HIV positive patients had significantly higher prevalence of anemia than males (62% Vs 38%). The prevalence of anemia at different CD4 level was; 6 (4%) with CD4 count greater than 500 cells/μL, 18 (13%) with a CD4 count of 350–500 cells/μL, 37 (27%) with a CD4 count of 200–349 cells/μL, 44 (32%) with a CD4 count of 100–199 cells/μL, 14 (10%)with a CD4 count of 50–99 and 19 (14%) with CD4 count of less than 50 cells/μL[31].

1.3.2conceptual framework

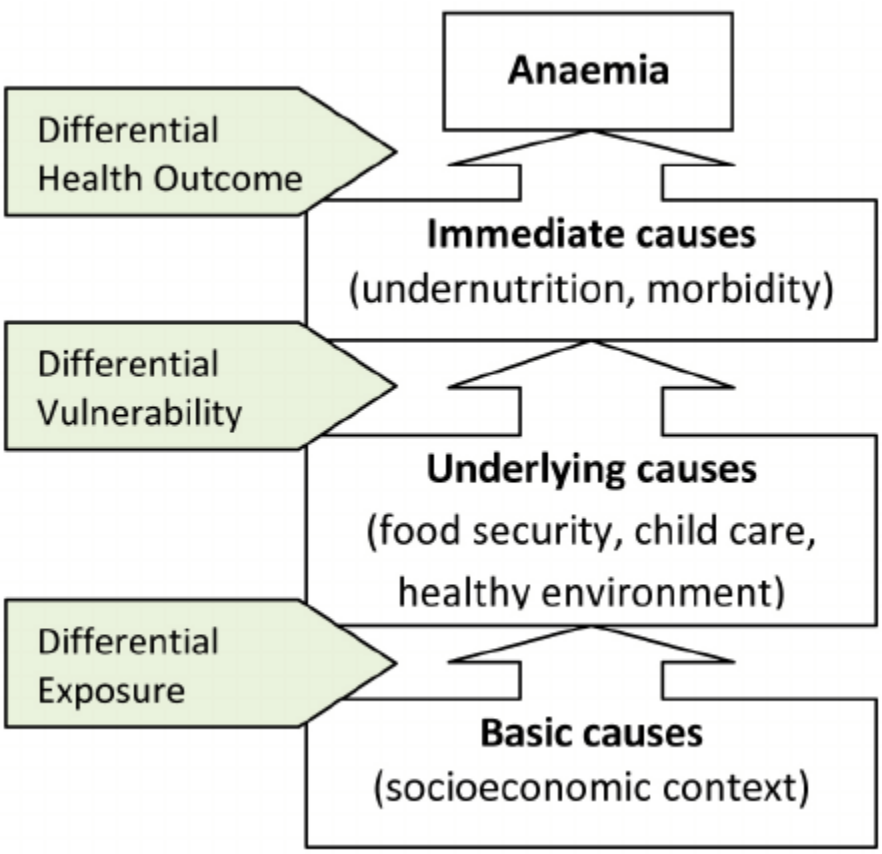


Figure 1:Conceptual framework for the prevalence and associated factor of Anemia among HIV positive children visiting Agena Health Center,GurageZone,Ethiopia(adapted from ngnie-teta et al)

1.4 significance of study

Anemia is an independent predictor of clinical prognosis in HIV and anemia is associated with increased morbidity and mortality in children infected with HIV. The factors associated with anemia in HIV infected children have not been well characterized in sub Saharan Africa. However there is still a gap in knowledge of the proportion of HIV infected children with anemia and the associated factors in HIV infected children aged between 6 months to 12 years, hence the need for this study. The results of this study would provide information on the prevalence of anemia and its associated factors in HIV infected children in Agena Health Center which can be used to effectively address anemia in HIV infected children.

Many studies have examined these at-risk age group children; there is a scarcity of data on anemia in children living with HIV, but the response towards anemia are increasing at an alarming rate and associating with the diseases prognosis and outcome. Putting this in to consideration this study may have its own contribution in identifying anemia and associated factors. In addition to this; this research washelp full in providing evidence to create screening test for Anemia for every child who come to HIV care and treatment center, and considering supplementation for those deficient patients and to decrease the consequence which come relating with it. Moreover, we hopes that, this study may help for other researches as a spring board to work more on it and to conduct further studies.

2. OBJECTIVES

2.1 General objective

To assess the prevalence of anemia and its associated factor among children who were on ART atAgena Health Center, SNNPR, Ethiopia, 2020.

2.2 Specific objectives

- To determine the prevalence of anemia among children who are on ART atAgena Health Center,SNNPR, South Ethiopia,December 1st,to December 31, 2020.
- To identify factors associated with anemia among children who are on ART atAgena Health Center, SNNPR, South Ethiopia, December 1st, to December 31, 2020.

3. METHODS

3.1 study area and period

The study wasconductedinAgena health center (AHC), located in Agena town; from December, 1/2020– 30/ 2020, Ezhaworeda, Gurage zone, SNNPR regional state, Ethiopia. Agena is the only urban kebele found in Ezhaworeda, Gurage zone, and SNNPR regional state of Ethiopia. Agena is located on the road to butajira and is 198 km from Addis Ababa (south west), 42 km from wolkite (east) and 23.17 km from the University of Wolkite found in gubre. The woreda is bordered in the north with Muhoraklil, in the south with Chehaworeda, in the east with Gumerworeda and Silte zone and in the west with Aboshege.In the town there is 1 governmental health center and there are 3 private clinics, 3 private drug stores and 1 Red crossservice.According to Agena health office chart view,Agena Health Center has 20 diploma Nurses,2 bachilorscienceNurses and 1general physician.

According to Agena town municipality office, Agena town has a total population of 4017 peoples of these 1968 (49%) are males and 2048 (51%) are females.

3.2 study design

An institutionalbased retrospective cross-sectional study wasused.

3.3 source of populations

The study population consists of medical records of children enrolled for ART from January1st,2015 toDecember 31, 2020 in Agena health center and whose chart is available during data collection time.

3.4 Study population

All 6 month up to 12 years children who are on ARTAgena Health Center during the study period. Children aged between 6 months to 12 years. The lower limit of 6 months was chosen because during infancy, physiological anemia occurs in the neonatal period and early infancy with the lowest level at about 2-3 months but by 6 months the hemoglobin has risen to normal values. The upper limit of 12 years is because this is the age limit for admission of children on the pediatrics wards.

3.5 Inclusion and exclusion criteria

3.5.1 Inclusion criteria.

Children aged 6 months to 12 years admitted on the Agena Health Center including those whose card were on available.

Confirmed HIV infection.

3.5.2 Exclusion criteria

Children whose sociodemographic data were incomplete

3.6 sample size determination

Sample size(n) is determined using the formula for a single population proportion for cross sectional study with the prevalence of anemia 22.2% from the previous studies[30].withassumption of 95% confidence interval and 5%marginal error(d) and constant standard distribution(Z)value 1.96 calculated by formula;

$$n_i = \frac{Z^2 p(1-p)}{d^2} = \frac{1.96*1.96*0.222*0.778}{0.0025}$$

Therefore, n=265 then after adding 10 % contingency rate the final sample size is 291.

3.7 sampling procedure

A simple random sampling methodwasused among children who were on ART at Agena Health Center during the time of data collection was taken until the sample size is achieved.

3.8 variables

3.8.1 Dependent variables

Anemia

3.8.2 Independent variable

(1) **Sociodemographic variables**

(a) Residence

(b) Religion

(c) Occupation of mother/care giver

(d) Family size

(e) Household wealth index status

(f) Educational level of the mother

(g) Educational level of the father

(h) Age

(i) Sex

(2) **Disease-related**

(a) Cd4 count/percentage

(b) WHO stage

(c) Opportunistic infection

(d) Intestinal parasite

(3**) Drug-related**

(a) HAART status (new . . . known.)

(b) HAART regimen

3.9 Operational definition

Anemia – a reduction of the red blood cell (RBC) volume or hemoglobin concentration below the range of values occurring in healthy persons(<11gm/dl) (30)

Mildanemia – hemoglobin value between 10gm/dl and 11gm/dl

Moderateanemia – hemoglobin value between 7gm/dl and 10gm/dl

Severeanemia – hemoglobin value less then 4gm/dl

Malnutrition **–**The biochemical and/or physical consequences of long-term inadequate intake. (32)

Marasmus - emaciation with a body weight less than 60% of the median (50th percentile) for age or less than 70% of the ideal weight for height and depleted body fat stores

Kwashiorkor **–**hypo-albuminemic , edematous malnutrition and presents with pitting edema that starts in the lower extremities and ascends with increasing severity.

Marsmic-kwash- when both marasmus and kwashiorkor occur simultaneously.

Severe acute malnutrition-weight for height less than 70%, MUAC<11cm (6months -5 years) or bilateral pitting edema

Wasting syndrome-a total weight loss>10% within one month

3.10 Data collection

Data wascollected from December 1-30, 2020. A structured questioner wasused to collect information about socio- demographic characteristics, drug related, disease and nutritional status.

The questionnaire is developed in English, translated into the local language (Amharic) and back translated in to English for consistency. The questioner waspre-tested in 5 % of the total samples of study participants inwolkite health center before data collection. Any error and comments during pre-test wascorrected in to the final version of the questionnaire. Data was collected bytrained nurses and supervised by the investigator to maintain consistency in information gathering. Chart review wasdone to identify hemoglobin concentrations(Hgb), blood history of malaria.

3.11 Data quality

To ensure data quality, since the target group had been children living with HIV special care and training wasgiven for the data collectors for one day. Before collecting the data, the questionnaire waspretested in similar groups with the study population in Wolkite health center to familiarize the data collectors with the data collection tools. Any error found during the process of pre-testing wascorrected in the final version of the questionnaire. The principal investigator (one of us) wasmade frequent checks on the data collection process to ensure the completeness and consistency of the information gathered

3.12 data analysis

Data wasentered, coded and analyzed by using SPSS software version 24.0Descriptive statistics wascarried out to illustrate the percentage and frequencies of study variables.

3.13 Ethical consideration

Formal letter of ethical clearance for permission wasobtained from the wolkite university college of medicine and health science department of nursing and research committee to conduct study. Further permission wasobtained from AHC.The confidentiality will keep during data collection by data collector.

*3.*14 Dissemination of results

The result of this study would be submitted to wolkite university department of nursing and AHC to be used as reference for the future researchers.

4.RESULT

4.1. Socio-Demographic Characteristics of the Study Participants

A total of 291 patient's card was reviewed.The study showed that about 93(43.5%) caregiver completed secondary school and above. Out of 291 the total study populations 171 (58.8%) was male and about 220(75.6%) were age between 7-12years, 185(87%) of them live in rural. More than fifty percent 157(52%) of the study participants' family were earned<1000 ETB per month. Majority 160 (54.9%) of family size were less than three. Marital status of the parents/care givers of the study participants, 237(81.4%) of them were married. most of care giver 202(69.4%) was mother, about 107(36.8%) caregiver were housewife, about 180(62%) CD4 count of most patient were greater than 500,most of them has II WHO stage 101(34.7%) and about 160 (55%) HIVstatus of caregiver were positiverespectively(Table 1).

Table1. Socio- demographic characteristics of the study participants (n=291) among HIV^{+} children visiting ART center atAgena Health Center, SNNPR,GurageZone,Ethiopia 2020.

Variables	**Frequency**	**Percent**
Child age		
6months-6 year	71	24.4
7-12 year	220	75.6
Child sex		
Male	171	58.8
Female	120	41.2
Respondents relation with child		
Mother	202	69.4
Father	18	6.2
Stepparents	19	6.5
Sibling	52	17.9

Table1. Socio- demographic characteristics of the study participants (n=291) among HIV^{+} children visiting ART center atAgena Health Center, SNNPR,GurageZone,Ethiopia 2020.

Variables	**Frequency**	**Percent**
Care giver education		
Unable to read and write	74	25.9
Able to read and write	93	43.5
Primary education	56	10.2
Secondary education and above	68	20.4
Care giver Occupation		
Not employee	63	21.6
House wife	107	36.8
Governmental employee	27	9.3
Employee in private center	94	32.3
Marital status		
Single	27	9.3
Married	337	81.4
Windowed	81.4	9.3

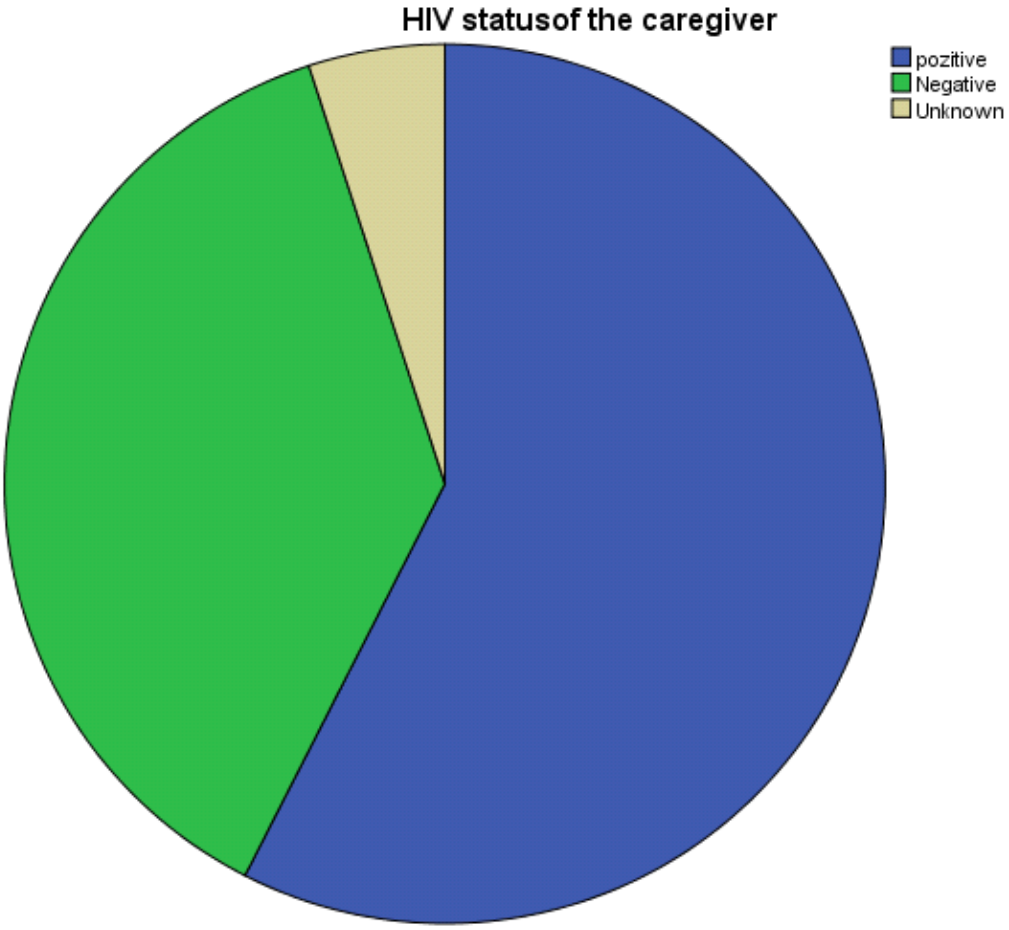


Figure 2 HIV status of caregiver among HIV^{+} children visiting ART center at Agena Health Cente,Gurage Zone,SNNPR,Ethiopia,2020

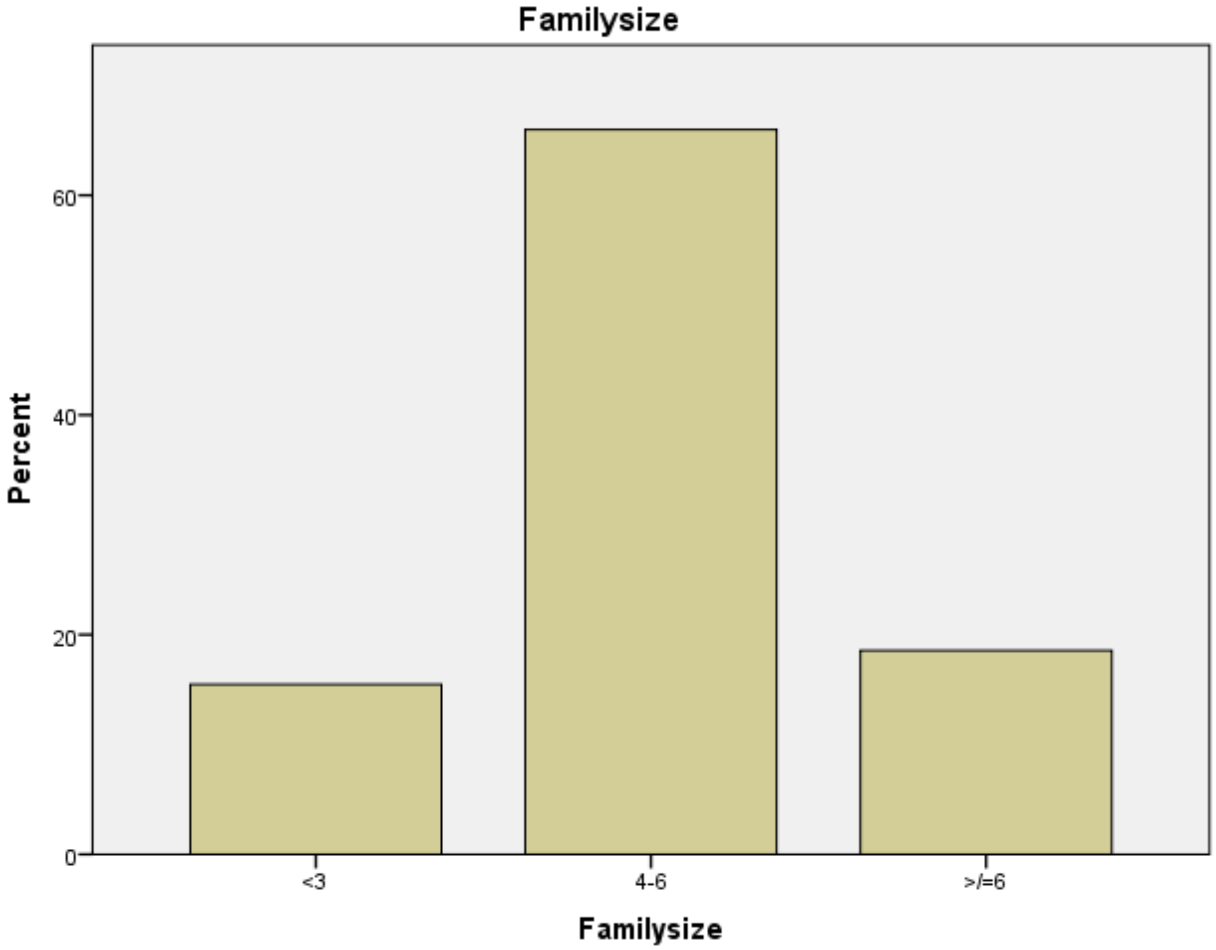


Figure 3; family size of study population(n=291) among HIV^{+} children visiting ART center at Agena Health Cente,Gurage Zone,SNNPR,Ethiopia,2020

Table 2; WHO clinical stage of study population among HIV^{+} children visiting ART center at Agena Health Cente,Gurage Zone,SNNPR,Ethiopia,2020

Variables(WHO stage)	Frequency	Percent
I	*91*	*31.2*
II	*101*	*34.7*
III	*49*	*16.8*
IV	*50*	*17.3*

4.2 Opportunistic Infections and Other Illness of the Study Population

From a total of (n=291) children 42(14.5%) were diagnose and on treatment for tuberculosis during the study period, 50((17.1%) of the children had wasting syndrome, 57(19.6%) oral ulcer, 47(16.2%) acute/chronic diarrhea, 50(17.1%) pneumocystis carrini (Table3).

Opportunistic infections	**Frequency**	**Percentage**
Acute/chronic diarrhea	47	16.2
Tuberculosis	42	14.5
Oral thrush	45	15.5
Oral ulcer	57	19.6
Pneumocystis carrini	50	17.1
Wasting syndrome	50	17.1

4.3. Laboratory and Treatment Regimen Results

A total of 291 children were tested for CD4+ cells count. The median CD4+ cell counts was 672cells/µl, the range were between 132cells/µl-2335cells/µl.
Substantial number of children 59 (20.4%) were on (AZT, 3TC, NVP) ART treatment combination, while 57(18.5%) on (AZT, 3TC, EFZ), 79(38.9%) (TDF+3TC+NVP) and41(4.9%)(ABC, 3TC, EFZ). The overall anemia among the study population 73 (17.6%) were anemic based on their hemoglobin value (Table4).

Table4. ImmunologicandTreatment regimens, among HIV^{+} children (n=291) at Agena Health Center,Gurage Zone, Ethiopia, 2020.

Variables	Frequency	Percent
$CD4^{+}$ count	180	62
<500cells/μl	111	38
Treatment regimen		
(AZT,3TC,NVP)	59	20.4
(TDF+3TC+NVP)	79	38.9
(AZT,3TC,EFZ)	57	18.5
(ABC,3TC,EFZ)	41	4.9
Other	55	17.5
Anemia status		
Anemic	73	17.6
Non-anemic	218	82.4

*Lamivudine(3TC),Abacavir(ABC),Stavudine(d4T),Zidovudine(ZDV/AZT),Nevirapine(NVP),Efavirenz(EFZ).

5.Discussion

A total of 291 children included in the study. The age range of the study participants was 6month-12years old children. All children were on different ART treatment combinations with the majority taking treatment (AZT, 3TC, NVP) combination. The median CD4+ cell counts was indicating that most of them were within the normal range, but the maximum value was out of the normal range which based on WHO guideline this might be as a result of unidentified hematological problems.

Similar study among school age children in southwest Ethiopia, the Overall, prevalence of anemia was 43.7% and [18].which was two times double with the current study.Some of them were suffered from opportunistic infections. Anemia was prevalent among HIV+ children. Opportunistic infections, sociodemographic data, nutritional status and dietary diversity were not predictor of anemia. The determinants of anemia in this study were age, and treatment regimen.

Literatures from different countries have found anemia as the most common hematological abnormality in HIV infected children. In this study 73(17.6%), were having anemia. These findings were similar to the prevalence of severity of the anemia observed in other studies. Socio demographic variables, wasting or low BMI as well as dietary intake were not statistically significant, which was consistent with study finding of [25].

Prevalence of anemia from this study lower than the study from pediatric outpatient clinics of AlFayoum university hospital in Egypt. This might be resulted from basic socio demographic, cultural, health and dietary habit difference, it was found that 64% of studied children had Anemia[26].

The prevalence of anemia was found to be relatively higher than that of research from Per-iurban health center in Nairobi, Kenya findings revealed that the prevalence of Anemia was 7.4%, which was less than this study result. It might be due to basic socio demographical, health and cultural difference in feeding practice but similar in the determinate of anemia among HIV+ children. The percentage of anemia in HIV infected children were similar to what was found in the other studies of similar kind, which was consistent with the prevalence of Kenitra, Northwest of Morocco, the prevalence of anemia was 16.2%. The mean hemoglobin concentration was 12.53 g/dl in boys and 12.52 g/dl in girls, the results suggest that iron deficiency is an important determinant of anemia in this population. There was a significant relationship between education of the mother and anemia in children which was different from the current study but not with the family income which was consistent with this study [33]

A result from Pemba Is-land, overall, 62.3% of children were anemic (hemoglobin <110g/l), and 82.7% of anemia was associated with iron deficiency which were triple of this study but the predictors were the same. The overall prevalence of Anemia was 48.5%, and the prevalence of exhausted iron stores (serum ferritin <12g/L) was 41.3%. There were a difference in the parameters drawn to detect anemia ,the previous method was to detect anemia at the two levels this increase the prevalence, but the current study parameter that we used only gave the number of anemia at the first stage (iron depilation stage) this reduced the prevalence relatively. It was consistent in bivariate analyses iron status was slightly better in children age 7-12 year than in those older. This significant number of under nutrition was not considered totally as protein energy malnutrition, it might be as a result of HIV wasting

syndrome, because from the total study population 11(10.2) of them had been wasting syndrome, since, BMI defines acute wasting. The finding of this study was not consistence with a study in northern Ethiopia; anemia was highly prevalent (42%) and constituted an important nutritional problem in the region. In a subsample of 230 anemic children, 56% had a low red blood cell (RBC) count, and 43% had a serum ferritin of less than 12 mg/l indicating that the anemia was as a result of iron deficiency. This difference was associated with a long term time lapse between the studies [34].

6. Conclusion and Recommendation

To explore anemia among children living with HIV, retrospective cross-sectional study was conducted to examine the prevalence andassociated factors of anemia in a group 6month to 12 year of HIV infected children in ART center..

Treatment with ART prevents anemia among HIV-infected children specifically treatment regimen (TDF, 3TC, EVZ) has a protective effect relative to other combinations.

7. limitation of the study

The limitation of the current study could be the study design as the retrospective cross-sectional study design by its nature limits information about cause and effect relationship in the majority of predictors.

Therefore, continued effective actions aimed at the prevention and controls of Anemia are recommended in this context.

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Appendix I- research questionnaires

PREVALENCE AND FACTORS ASSOCIATED WITH ANEMIA IN HIV INFECTED CHILD ADMITTED AND THOSE WHO ARE OPD AT AGENA HEALTH CENTER

QUESTIONNAIRE

Data Extraction tool (questionnaire)

CodeNo._____

S. N.	PartI:Socio-demographiccharacteristics Child socio-demographiccharacteristics	
101	Dateofinitiation	/ / /DD/MM/YY
102	Age	Months/year
103	Sex	1. Male 2. Female
	Caregiversocio-demographiccharacteristics	
104	Age _____	
105	Sex	Male 2 .Female
106	Educational status	Cannot read and write 2.Can read and write 3.Primary 4. Secondary and above
107	Marital status	Single 2.Married 3. Divorced/Separated
108	Occupation	Not employed 2.Housewife 3. Governmental employee 4.An employee in the private sector
109	Relationship tothechild	1.Mother2. Father3. Stepparents 4. Sibling 5.Others(specify)_____
110	Residence	Urban 2.Rural
111	Familysize	1._____
	PartII:baselineclinicalcharacteristics	
201	WHOclinicalstage	I 2. II 3. III 4. IV
202	CD4+count/percent	1._____/_____%
203	Weightat baseline	1._____kg
204	Height/length atbaseline	1._____Cm
205	History of OI other than TB	1 . Yes2. No
206	If yes sit of TB	1.PTB 2. EPTB

207	HistoryofOI other than TB	1,No2 .CMV 3.PCP 4.Herpessimplex5. Kaposi sarcoma6. Toxoplasmosis 7. Herpes 8. Candidiasis 9. Diarrhea10. Pneumonia 11. Otherspecify-------
Part III: follow-up related characteristics		
301	Initial Regimen	_____
302	WastheRegimenchanged?	Yes 2. No
303	When wasitchanged	1. _____(DD/MM/YY)
104	Newregiment	1._____
305	Reason forregimen change	1. Side effects 2.Treatmentfailure3. TB 4. Stockout5. Others
306	Did thechildhad treatmentfailure	1. Yes 2. No
307	If yeswhen?	1._____
308	Typeof failure	1. Immunologic2,virologic3. Clinical
309	Second-lineregimens	1. _____
310	OI prophylaxis	1. Not given 2.Co-trimoxazole 3. INH 4. Others specify----------
311	Level of Adherence	1. Good 2. Fair 3.Poor
312	Functional statusforage>= 5years	1. Working2. Ambulatory 3.Bedridden
313	Developmentalmilestoneforage<5years	1. Appropriate 2.Delayed3.Regression
314	Viral load	1._____
315	Hemoglobin level at	Baseline---------6months-------12months----------24 months ---------36 months ----------42 months------- last visit
316	The final status of based on	Anemia 1.yes 2.no
317	Hx of missing follow-up	Yes 2. No
318	The final status of the child	If the patient Dead, drop out, transfer out or stop when was it occurs -------/------/-----DD/MM/YY?

Thank you!!!