Research Article

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Virologic Failure and its Determinant Factors among Children in First Line on Highly Active Anti Retroviral Therapy at Felegehiwot Referral Hospital, Bahir Dar, Northwest, Ethiopia: cross-sectional study

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Abstract

Introduction: *Highly active antiretroviral therapy (HAART) played a critical role in the medical management of HIV infected individuals by restoring the immune function and minimizes HIV related outcomes. But treatment failure minimized these advantages and leads to an increment of morbidity and mortality with poor quality of life in all HIV patients. The aim at this study was to assess the prevalence of HIV-1 treatment failure and its determinants factors among children on first line HAART at Felegehiwot Referral Hospital.*

Methods: *Cross sectional study was conducted on 238 children who had on first line HAART regimen using the inclusion criteria. Data were collected from patients' chart starting from ART commencement (baseline data and other information) and interviewed using structured questionnaire. CD4 T-cells from whole blood and viral load from separated plasma were analyzed according to protocols. The collected data were analyzed using SPSS packages version 20. Descriptive statistics, odds ratio, bi-variate and multiple logistic regression analysis were used to show determinant factors association. Independent associations were considered with $p<0.05$.*

Result: *Among the 238 participants enrolled, 137(57.6%) were females. The mean ages were 8.09 years and the median months on HAART from initiation were 51.93 months. A total of 25 (10.5%) participants were found to have virologic/treatment failure. The mean CD4 T-cells at base line were 342.33 cells/ml and 672.13 cells/ml respectively. Long duration on treatment, sub-optimal drug adherence, conducting faith healing, high medication dosage and ambulatory functional status at baseline were found to be significant predictors of treatment failure and showed positive odds ratio.*

Conclusion: *This study demonstrates high virologic failure and the determinant factors of virologic failures among HAART first line children are still changing. Therefore, evidence-based intervention and early detection of treatment failure must be made to further identify the potential causes and set standardized protective mechanisms of virologic failures.*

Keywords: Virologic Failure, First Line HAART, HIV, Determinant Factors, Children, Ethiopia

Background

Globally an estimated 34 million people were living with human immunodeficiency virus (HIV) as of 2011 and 3.3 million of them were children under 15 years. More than 90 % of these children are live in sub-Saharan Africa [1]. In Ethiopia 710,000 peoples are living with HIV/AIDS by the year 2016. Out of these 60,000 are children and 420,000 peoples living with HIV who are on treatment out of these 21,000 are children [1,2].

Antiretroviral therapy (ART) is accessed in resource poor countries, like Ethiopia [3,4]. It has been attributed to improve the prognosis of HIV infected individuals, reduce morbidity and mortality due to HIV/AIDS and improvement in survival, clinical, immunological

and virological responses are depends on highly active antiretroviral therapy (HAART) quality and good adherence to treatment [5-7].

However, there are different factors that can affect the ability of HAART to suppress viral replication: viral resistance, and inadequate adherence to therapy, the limited access of paediatric regimens, conducting herbal faith healing and require long term therapy with unknown long term side effect, ambulatory/bedridden functional status at initiation and inadequate dosage guideline for specific HAART and age group, the challenges of paediatric ART adherence and the likelihood of HIV drug resistance development raise great public health concern about virologic failure in children [6-13].

Studies in East Africa have shown a high prevalence of immunologic failure ranging from 8% to 38% among clients on first-line HAART and furthermore, the magnitude increases as the time of follow-up increases. The immunological failure rate in Ethiopia a study conducted in Deberemarkos Hospital was found to be high [13-17]. Conversely, the virologic failure rate in Ethiopia conducted in Gondar University Hospital showed that 4.1 and 5.3% was found to be low [18,19]. The timing and accuracy of identifying treatment failure in resource-limited settings are fundamental but challenging [20]. Delayed detection of treatment failure may increase drug toxicity, may lead to the accumulation of drug resistance associated mutations, and may result in increased morbidity and mortality [7].

Therefore, this study assessed the prevalence of HIV/AIDS treatment failure and its determinant factors among Children on first line HAART in Felegehiwot Referral Hospital, Bahir Dar, Northwest Ethiopia.

Materials and Methods

Study Area and Period

This study was conducted at Felegehiwot Referral Hospital in Bahir Dar town, northwest Ethiopia and data collection period was from September to December 2016.

Study design

Hospital based cross sectional study was conducted on Children in first line HAART to assess treatment failure and its determinant factors.

Study population

All children living with HIV/AIDS who took first line HAART for at least six months were included in the study with the following inclusion criteria:

Inclusion and Exclusion criteria

Inclusion criteria

All children living with HIV/AIDS who were enrolled in first line HAART and who attended the clinic for routine visits, and followed the treatment for at least six months during the study period were included.

Exclusion criteria

Children on second line HAART treatment

Sampling technique and Sample Size

Systematic random sampling technique was used to select 138 participants from HAART follow up. The sample size is calculated using Single population proportion by considering the following assumptions; n=z2p (1-p)/w2, n = required minimum sample size from single population= 138, W= estimated error =0.05; P = population proportion in problem (estimated prevalence) = 9.9%, Z α/2= 1.96 standard normal value at 95% level of confidence, so, n=138 participants included in this study.

Socio-demographic and determinant factors

Data were collected from patients' card starting from HAART commencement (baseline data and other information) and interviewed using structured questionnaires. The questionnaire was translated from English to Amharic language and finally back to English.

Specimen Collection and laboratory investigation

Blood collection: Five millimeters venous blood with EDTA tube were collected for determining viral load and CD4 counts parameters based on standard procedure. Two experienced data collectors (one laboratory technician and one nurse) were involved in data collection and laboratory analysis of the samples.

Determination of CD4 counts

To determine CD4+ T cells and CD4%, fifty micro litters of fresh whole blood was added to single reagent tube and processed according to the protocol set by Becton Dickinson Biosciences (BD, San Jose, California, USA). Results of CD4 counts were found from baseline (HAART initiation) to peak value (any time but peak CD4 value after HAART initiation before started declines) at registration book and current (at time of collection) result was done from fresh whole blood as the protocol specified above.

Determination of Viral Load

The whole blood containing EDTA anticoagulant was allowed to settle for 15 to 30 minutes and, then centrifuged at 3000-4000 rpm for 5 min and the plasma was separated from the cell within 6 hours and stored at -20°C if the analysis was delayed. To determine viral copy/ml with a lower detection limit of 40 copies/ml, six hundred micro liter plasma was added to reagent tube and processed according to the procedure using a quantitative real time HIV-1 assay (by m2000sp and m2000rt Abbott, USA).

Data Quality

The validity of the questionnaires was assured by proper designing and also pre-testing the questionnaire in 5% of respondents other than those involved in actual study. Before commencing the actual data collection, training was given to the data collectors. Questionnaires were reviewed and checked by the supervisors and principal investigators. The necessary feedback was offered to data collectors in the next morning.

Data Processing and Analysis

Variables of the study

Dependent variable: Treatment failure/ virologic failure.

Independent variables: Patient treatment adherence, Socio-demographic variables (age, sex and educational status), WHO clinical stages, CD4 count (baseline, current), HAART regimen, Change/substitute of treatment, Detection of tuberculosis during the course of therapy were assessed. Moreover, HAART service delivery, distance from home to the clinic, trust in health care (private consultancy) providers, pill burden concerns and using faith healing

Data analysis

The data were cleaned, checked for completeness and entered in to EPI info version 3.5.1 and compiled and analyzed using SPSS packages version 20. Descriptive statistics, odds ratio (both crude odds ratio and adjusted odds ratio) were used in the analysis. Percentage, means, medians, standard deviations and ranges were used to describe findings. The data were also analyzed using univariate and multivariate logistic regression and to determine the effect of various factors on virologic failure.

The cumulative prevalence of first-line ART failure was ascertained from the proportion of participants with viral load ≥1000 copies/ml at one point for virologic failure. Similarly, immunologic and clinical treatment failures were defined according to WHO (WHO, 2013); CD4+ T cell count below the baseline or persistent CD4+ T-cell levels below 100 cells/mm3 for immunologic failure. Logistic regression analysis was done to determine the extent to which the risk factors are associated with HAART treatment failure. All socio demographic and clinical characteristics (variables) were subjected to uni-variate analysis for calculating Crude Odds Ratio (COR). To identify the independent explanatory variable (s) of the dependent variable, factors with $p< 0.25$ at univariate analysis were selected and included in multivariate analysis (Lutalo et al., 2016). The model was then built by dropping the most insignificant factor one at a time in step-wise manner and the factor (s) that appeared in the final model with $p<0.05$ was taken to be the factor (s) that independently associated with treatment failure.

Ethical consideration

Institutional Ethical clearance was obtained from Bahir Dar University Ethics Review Committee. Each respondent and their guardians were informed about the objective of the study and findings of the study used for improving health of those attending HAART clinic. Written assent were obtained from guardians and each study participant. Involvement in the study was endorsed only after written assent was obtained. Any person who was not willing to participate in the study was not forced to participate. They also informed that all data obtained from study participant kept confidential by using codes instead of any personal identifiers.

Results

Socio-demographic characteristics

A total of 238 study participants were enrolled in this study. The mean age of the study participant was 8.09 years (sd+3.7) and 83(34.9%),79(33.2%) and 76(31.9%) fall in age categories of 6 to 10 years ,11 to 15 years and 1 to 5 years respectively . More than half of the study participants, 137(57.6%) were females. Among the study participants, 218 (91.6%) were from urban setting and 98(41.2%) live far apart greater than 10 kilometer from the clinic. Regarding the educational level of children, 56(23.5%) did not in school, 154(64.7%) in primary school and 28(11.8%) were in their high school (Table 1).

Table 1: Socio-demographic characteristics (N=238)

Variables	Category	Number	Percent (%)
Age	1-5	76	31.9
	6-10	83	34.9
	11-15	79	33.2
	Total	238	100
Sex	Male	137	57.6
	Female	101	42.4
	Total	238	100
Residence	Urban	218	91.6
	Rural	20	8.4
Educational status	Not in school	56	23.5
	1-4	122	51.3
	5-8	32	13.4
	9-10	28	11.8
Distance from home to clinic	≤10 km	140	58.8
	>10 km	98	41.2

Baseline clinical and immunologic characteristics

The mean CD4 count at ART initiation was 342.3 cells/ µl (range 2–1321 cells/ µl) and half of the CD4 118 (49.6%) falls on between 101-350 cells/ul. Majority of study participants, 159(66.8%) had suffered an AIDS defining illness (clinical status) i.e. WHO stages 3 and 4 conditions at the time of ART initiation. The proportion of children who commenced HAART after developing signs or symptoms suggestive of mild immunosuppression (WHO stage 2) and with no sign and symptom (WHO stage 1) was 79(33.2%)(Table 2). TB infection is the most dominant opportunistic disease in HIV/AIDS. Out of 238 study participants, TB infection was confirmed in 79(33.2%) starting from HAART initiation (table 2).

Types of ARV first line regimen during initiation

During treatment initiation, different types of first line (initial regimen) HAART drugs were used as choice of treatment for children living with HIV/AIDS. Having this point, d4T based regimen contained NNRTIs of both NVP (d4T/3TC/NVP) and EFV (d4T/3TC/EFV) were 78(32.8%) and 18(7.6%) respectively. Similarly, the AZT based regimen was highest into AZT/3TC/NVP and AZT/3TC/EFV 110(46.2%). On the other hand TDF based regimens consisted of TDF/3TC/EFV and TDF/3TC/NVP were 22(9.2%) and 10(4.2%) respectively (table 2).

Regarding treatment regimen substitution, only 99(43.0%) study participants received a substitution while they were on first line regimen (Table 2). Out of the total substitutions, AZT based substitution was 69(69.7%) followed by TDF 15(15.2%) and D4T 15(15.1%) respectively.

During study time, out of 238 children, 153(64.3%) were following AZT based regimen while 77(32.2%) were following TDF based regimen. The rest 8 (3.4%) were following D4T based regimen were considered as current regimen. About 79(33.2%) of the children in first line regimen had had TB infection throughout the HAART treatment course (table 2).

Table 2: Baseline clinical and immunologic characteristic (N= 238)

Variables	Category	Frequency (%)
Baseline first line HAART regimen	D4T/3TC/NVP	78(32.8%)
	D4T/3TC/EFV	18(7.6%)
	AZT/3TC/NVP	73(30.7%)
	AZT/3TC/EFV	37(15.5%)
	TDF/3TC/NVP	22(9.2%)
	TDF/3TC/EFV	10(4.2%)
	Total	238(100%)
First line HAART in use	D4T/3TC/NVP	3 (1.3%)
	D4T/3TC/EFV	5 (2.1%)
	AZT/3TC/NVP	88 (37.0%)
	AZT/3TC/EFV	65(27.3%)
	TDF/3TC/NVP	34(14.3%)
	TDF/3TC/EFV	43(18.0%)
	Total	238(100%)
Baseline CD4 results	≤ 100	43(18.11%)
	101-350	118(49.6%)
	351-500	28(11.8%)
	≥501	49(20.5%)
	Total	238(100)
Baseline WHO stages	I – II	79(33.2%)
	III- IV	159(66.8%)
Baseline patient functional status	Ambulatory	54(22.7%)
	Working	184(77.3%)
TB history	Yes	79(33.2%)
	No	159(66.8%)
Drug substitution/ change	Yes	99(43%)
	No	139(67%)

Prevalence Clinical, Immunologic and Virologic failures

Clinical failure

WHO stages I (no AIDS case) and II (mild AIDS case) were the most dominant clinical presentations 210 (88.2%) participants. Twenty eight (11.8%) of participants were at stage III (table 3).

Immunologic failure

Quantitative restoration of CD4+ T cells is one of the principal evidences for immune recovery during HAART course. Out of 238 study participants, 36 (15.9%) encountered immunologic failure. Over time analysis of immunologic failure has shown that 36(41.7%) study participants encountered immunological failure within 6-36 months while 7(19.4%) and 14 (38.8%) of them encountered within 37-60 months and greater than 60 months, respectively. Immunologic failure was independently associated with virologic failure (p-value < 0.05) (table 3).

Virologic failure

During the study period, out of 238 study participants in first line HAART regimen, prevalence of virologic failure (≥1000 RNA copies per ml) was found to be 25(10.7%); 17 (68.0%) females and 8(32.0%) males. Since the start of HAART, out of the total study participants, 10(40%) of them encountered virological failure within 6-36 months followed by 5(20%) of them within 37-60 months and 10(40%) greater than months (table 3).

Treatment failure

In detecting treatment failure in HAART, clinical, immunologic and virologic failures are important but virologic failure is the golden standard according to WHO 2013 and we presented the associations of the determinant factors with virologic failures. Generally, the prevalence of treatment failures were 25(10.5%), 36(15.1%), and 28(11.8%) encountered virologic failure, immunologic failure, and clinical failure respectively. The mean of months on HAART from commencement was 51.93 months with standard deviation of 26.o8. Moreover, the backbone of treatments which showed virologic/ treatment failure of AZT/3CT/NVP and AZT/3CT/EFV was 17(68%) and TDF/3CT/NVP and TDF/3CT/EFV was 8(32%) (Table 3).

Table 3: Treatment failure after initiation of HAART in HIV/ AIDS patients (N=238)

Variable	Categories	Frequency (%)
Clinical failure (WHO stages)	Yes	28(11.8%)
	No	210(88.2%)
Immunologic failure	Yes	36(15.1%)
	No	202(84.9&)
Virological failure	Yes	25(10.5%)
	No	213(89.5%)
Treatment failed regimen backbone	AZT/3TC	17(68%)
	TDF/3TC	8(32%)
Duration on treatment (months)	6-36	100(42.0%)
	37-60	60(25.2%)
	>60 months	78(32.8%)

Determinant factors of HIV/AIDS treatment failure among Children on first line HAART

In bivariate logistic regression age, CD4 value baseline, TB history ,drug substitutions ,duration of treatment, immunologic failure, functional status, medication dosage, consultation privacy, conducting faith heal, drug adherence to HAART were significantly associated with treatment failure of the participants, while in multivariate logistic regression long duration on treatment, functional status, medication dosage, consultation privacy, conducting faith heal, drug adherence to HAART were the factors which was significantly associated with virological failure to wards treatment failure. However, there were no statistical significance associations (p> 0.05) between educational statuses, distance from home to clinic, regimen substitutes, gender, age with treatment failure (table 4&5). In this study, long duration (months) on treatment was independent predictor to treatment failure. Long duration on treatment (>60 months) was strong risk factor for treatment failure as the patients with long time on first line HAART treatment (adjusted odds ratio= 15.634, 95% CI: 6.053-30.232)) were 15.6 times more likely to have treatment failure when compared to patients with short duration on treatment (6-36 months) (table 5).

Adherence was defined as optimal and sub-optimal (based on pill count and self-report at each visit) when it was ≥ 95% and < 95% respectively. Sub-optimal drug adherence (< 95%) was

independently associated risk factor for treatment failure as patients with sub-optimal adherence (adjusted odds ratio=8.143, 95% CI: (2.561-17.358)) were greater than 8 times more likely high risk of treatment failure when compared to optimal adherence (≥95%) patients. Similarly when compared to the patients who conducted faith healing (adjusted odds ratio=9.001, 95% CI: 3.089-20-564) and these patients who did not conduct *faith healing/ holy water* were 9 times more risky to develop and associated with higher risk of treatment failure. Religious beliefs and practice the well-known 'holy water' leads to patient poor adherence from HAART care. Majority of patients who conduct healing holy water sessions are persuading patients to discontinue HAART treatment because they think as they are healed (table 5).

Similarly high pill burden/medication dosage (≥ 3 tablets a day) was high risk to develop treatment failure when compared to patients who took one or two tablet daily. High pill burden/medication dose was associated risk factor for developing treatment failure as the patients were used high medication dose (Adjusted odds ratio=6.293,95% CI:1.396-20.375) were more than 6 times more risky when compared to the patients who used low medication dose (one or two a day) (table 5).

Ambulatory functional status at baseline was found significant risk factor to treatment failure. Ambulatory functional status at baseline was high risk to develop treatment failure, as the children with ambulatory functional status (adjusted odds ratio = 7.124, 95% CI: 3.897-16.766) were 7 times more likely to have treatment failure when compared to the patients who had working functional status. Moreover, privacy issue during consultation and counseling of HIV treatment was shown independent risk factor to treatment failure. Not feeling privacy during consultation and counseling was high risk to increase treatment failure as the patients who did not feel privacy during consultation and counseling (adjusted odds ratio= 4.151, 95% CI: 2.376-12.562) were 4 times more likely to have treatment failure than the patients who had felt privacy during consultation and counseling on treatment failure (table 4).

Table 4: Multiple logistic regression analysis of socio demographic

Variables	Categories	All (n=238)	VF (n=25)	Crude Odds Ratio (COR, 95% CI)	P-value	Adjusted Odds Ratio AOR(95% CI)	P-value
Gender	Female	137	17	1	1	1	1
	Male	101	8	1.647 (0.681-3.982)	0.268	0.160(0.017-1.534)	0.112
Age category	1-5	77	11	1.062 (0.431-2.616)	0.974	0.654 (0.052-7.767)	0.999
	6-10	78	11	4.344(1.162-16.237)	0.039	0.692(0.043-11.082)	0.795
	11-15	75	3	1	1	1	1
consultation privacy	Yes	227	20	1	1	1	1
	No	11	5	8.625 (2.416-30.788)	0.001	4.151 (2.376-12.562)	0.028*

Table 5: Multiple logistic regression analysis of clinical factors of virologic failure

Variables	Categories	All (n=238)	VF (n=25)	Crude Odds Ratio (COR, 95% CI)	P-value	Adjusted Odds Ratio AOR(95% CI)	P-value
CD4 baseline value	≤ 100	43	8	0.984 (0.343-2.827)	0.977	2.401 (0.519-20.218)	0.474
	101-350	118	5	5.085 (1.608-16.078)	0.006*	2.194 (0.915-8.124)	0.066
	351-500	28	3	1.875 (0.463-7.595)	0.378	9.2629 (0.567-18.409)	0.093
	>500	49	9	1	1	1	1
Duration on treatment	6-36 months	100	5	1	1	1	1
	37-60 months	60	3	3.284 (1.060-10.173)	0.039	4.769 (0.287-9.207)	0.275
	>60 months	78	8	8.914 (2.008-39.561)	0.004	15.634 (6.053-30.232)	0.002*
Faith heal Medicine	Yes	49	16	9.697 (3.954-23.780)	0.000	9.001 (3.089-20.564)	0.001*
	No	189	9	1	1	1	1
Drug adherence	<95	33	15	16.250 (6.382-41.373)	0.000	8.143 (2.561-17.358)	0.000*
	≥95	205	10	1	1	1	1

ARV regimen Substitutes	Yes	99	18	4.190 (1.677-10.471)	0.002	4.354 (0.930-20.390)	0.062
	No	139	7	1	1	1	1
	1-2	185	12	1	1	1	1
	3-4	53	13	4.685 (1.989-11.035)	0.001	6.293 (1.396-20.375)	0.017*
TB History	Yes	79	15	3.492 (1.490-8.188))	0.004*	2.342 (0.818-6.712)	0.083
	No	159	10	1	1	1	1

Discussion

In this study, an attempt has been made to assess the prevalence and factors associated with treatment failure. Virologic failure is a golden standard for detecting treatment failure in HAART [21]. Prevalence of virologic failure was 10.5% (25/238) among the study participants. There is a possibility of improving the suppression rate near to 100% by providing an efficient early HAART service such as letting patients to commence ARV early and ensuring adherence of patients to treatment. Near similar report which conducted in Uganda and Nepal demonstrated the prevalence of treatment failure 9.9% which is comparable to the result of the present study. Compared to other studies, this study revealed a lower prevalence of treatment failure than the one reported (23.2%) from Cameron and also from costal Kenya (24%) [22-25]. The probable reason for lower failure in the present study might be that the great majority 218(91.6%) of participants being urban dwellers which gives them an advantage over the rural dwellers in getting information from a number of media and easily accessible to health facilities. It is also possible that the existence of nearby ART clinic which is at a distance of 10 km, on average, might give the chance the urban dwellers to frequently visit the clinic for further information. The present study, however, showed higher treatment failure rate compared with 4.1 and 5.3% which was reported from Gondar and from Jima respectively [18,19]. The higher prevalence in the present study might be because of poor adherence and long duration on treatment that could possibly increase treatment failure.

Using multivariate logistic regression long duration on HAART treatment, functional status at baseline, high medication dosage, not consultation privacy, conducting faith heal, suboptimal drug adherence to HAART were the factors which was significantly associated ($p < 0.05$) with virologic failure. However, there were no statistical significance associations ($p > 0.05$) between educational statuses, distance from home to clinic, regimen substitutes, gender, age, TB infection, WHO stage at baseline, CD4 T cells at baseline and first line regimen type with virologic treatment failure (table 4&5).

Long duration on treatment to be one of determinant factors for treatment failure may increase drug resistance and adaptation of drugs finally got virologic failure; similar study conducted in Cameron showed and this particular factor, long duration on treatment, for example, for above 60 months among patients in Gondar, Ethiopia, was found to be an independent predictor for an increased risk of HIV treatment failure [17,26]. Before children commence HAART, it is essential that they should be adequately prepared for this life-long drug therapy with good adherence. In this study suboptimal treatment adherence is significantly associated ($p<0.05$) with virologic failure. A similar study in South Africa has shown that incomplete adherence as one of the risk factors for virologic failure and in Kenya other report has shown that unsatisfactory adherence to have strong correlation with virologic failure [25,27]. In Gondar, Ethiopia, poor adherence during follow up has been shown to be associated with treatment failure [17].

This study indicated that faith heal, mostly known by community as "Holy Water" was found to be associated to increase the risk of treatment failure as of not adhered to treatment. This study is lined with a study conducted, in Debrebirhan, Ethiopia, the very existence of high prevalence of holy water, has been implicated as hindrance (not taking medicines as a spiritual fear to holy water) to HAART, therefore, this can increase the development of drug resistance and finally increase treatment failure [28]. On the contrary another meta-analysis conducted in Ethiopia have indicated an evidence of positive outcomes of faith healing involving holy water and spiritual aspects that mentally benefit people living with HIV/AIDS and in other part of Africa there are different reports which shows significant association using different herbal/faith healing and adherence to therapy in HIV patients [11,29]. Ambulatory functional status at baseline is associated risk factor to treatment failure and this is in line with study done in Addis Ababa, Ethiopia [30]. This indicates delayed diagnosis and treatment of HIV before any disease development due to HIV/AIDS.

In the present study, high medication dosage currently taken by patients is showed high risk factory to virologic failure this is because high pill burden can affect adherence and intervention of drug with decreasing viral suppression. Similar study reported as high medication dosage is significantly associated with virologic failure Children who were not consulted and counseled privately has positive odds ratio comparing to these feeling consulted and counseled in separate and private room with experience health works so giving advice and counseling correctly to caregiver and giving hope to children may increase in sticking their meditational adherence [31,32].

Conclusion

The present study reported still high prevalence of virologic failure and needs attention. Viral load testing is best in early detection of treatment failure and should be used in a routine ART laboratory. Furthermore, the present study showed that long duration on treatment, sub-optimal adherence, ambulatory baseline functional status, high medication dosage, not privacy consultation and counseling, and conducting faith heal were determinant factors of virologic failure.

Authors' contribution

Author BG participated in the conception, design of the study, coordinated the data collection data analysis, and prepared the

manuscript for publication. Authors YG, EN and DN involved in study design, proposal preparation, data analysis and manuscript preparation. Author GK determined the CD4 and plasma HIV viral load data.

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