Survival Status among People Living with HIV/AIDS on Highly Active Anti Retroviral Therapy at Federal Police Referral Hospital, Ethiopia, Retrospective Cohort study.

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Declaration

I, the undersigned, declare that this thesis is my original work, has never been presented in this or any other university, and that all resources and materials used in here, have been duly acknowledge.

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Abbreviation and Acronym

µl	Nanolite
3TC	Lamivudine
ABC	Abacabir
AHR	Adjusted Hazard Ratio
AIDS	Acquired Immune Deficiency syndrome
ALT	Alanine Transaminase
ANC	Anti Natal Care
ART	Antiretroviral Therapy
AZT	Azidothymidine
BMI	Body Mass Index
BP	Bacterial Pneumonia
CM	Cryptococcal Meningitis
CNS	Central Nervous System
CPT	Cotrimoxazole prophylaxis
CT	CNS Toxoplasmosis
d4T	Stavudine
DC/DA	Diarrhea chronic/Acute
ddI	Didanosine
dl	Deciliter
EDHS	Ethiopia Demographic Health Survey

EFV	Efavirenz
EPTB	Extra pulmonary Tuberculosis
ETB	Ethiopia birr
HAART	Highly Active Antiretroviral Therapy
Hgb	Hemoglobin
HIV	Human Immune Deficiency Virus
HR	Hazard Ratio
ID	Identification number
IDU	Intravenous Drug Use
INH	Isonicotinic acid Hydrazide (Isoniazid)
Kg	Kilogram
LPV/r	Ritonavir – boosted lopinavir
MARPs	Most at Risk populations
ml	Milliliter
NA	Not applicable
NVP	Nevirapine
OIs	Opportunistic infections
PCP	Pneumocystis Pneumonic
PGL	Persistent generalized lymphadinopathy
PI	Principal Investigator
PICT	Provider initiated Counseling and Test

PLWHA	People living with HIV/AIDs
PML	Progressive multifocal Leukoencephalopathy
PMTCT	Prevention of Mother to Child Transmission
PTB	Pulmonary tuberculosis
REC	Research and Ethical Committee
RNA	Ribonucleic Acid
SNNPR	South Nations Nationalities People Region
SPSS	Statistical Package for Social science
STD	Sexually Transmitted Disease
TB	Tuberculosis
TDF	Tenofovir
TLC	Total Lymphocyte Count
UNAIDS	The Joint United Nations Program on HIV/AIDS
URTI	Upper respiratory tract
US	United States
VCT	Voluntary Counseling Test
WHO	World Health Organization
1a	d4T + 3TC + NVP
1b	d4T + 3TC + EFV
1c	AZT + 3TC + NVP
1d	AZT + 3TC + EFV

1e	TDF + 3TC + EFV
1f	TDF + 3TC + NVP
1g	Others
2a	ABC + ddI + LPV/r
2b	TDF + 3TC + LPV/r
2c	AZT + 3TC + LPV/r
2d	AZT + ABC + LPV/r
2e	Other

Abstract

Background: HIV/AIDS affects many people globally and its burden was critical. According to the 2005 ANC - based HIV sentinel surveillance the prevalence of HIV at Federal police referral Hospital was 24.8%. The introduction of HAART significantly improved survival and quality of life for many individuals living with the disease. In Ethiopia studies also showed the contribution of HAART for patients. However, still there is lack of information on its outcome among the police community.

Objective: The aim of this study is to assess survival of HIV/AIDS patients on HAART.

Methods: Retrospective cohort study was conducted among HIV patients on HAART from Apr, 2005 to Mar, 2013 at Federal Police Referral Hospital, on a total sample size of 900, selected using systematic random sampling technique. Descriptive statistics to summarize characteristics of the study subjects, Kaplan - Meier survival function to estimate the probability of survival, log - rank test to compare survival in two or more groups and Cox proportional hazard model to determine factors associated with outcome was applied.

Result: The median follow up period was 57 months (IQR, 23 - 89). The overall survival was 88% at 120 months follow up. About 8.3% of patients died and mortality was high (48%) in the first 6 month of follow up. Baseline ART regimen TDF+3TC+EFV (AHR=6.4,95%CI;1.6–25) and TDF+3TC+NVP (AHR=167.6,95% CI; 7.9 – 3525), Not working due to ill health (AHR =2.9,95% CI; 1.2 - 6.9), use of condom rarely (AHR =4.6, 95% CI; 1.6 – 12.7), Ambulatory (AHR =2.8, 95% CI; 1.2 – 6.9), Bed ridden (AHR =11.3,95% CI; 4.6 - 27), PCP (AHR = 3.6,95% CI; 1.4 – 9.2), WHO Treatment stage one (AHR=0.10,95%CI;0.03–0.4), Prophylaxis (AHR=2.6,95% CI:1.1–6.4), Current ART regimen TDF+3TC+EFV (AHR=0.2,95% CI; 0.05–0.76) and TDF+3TC+NVP (AHR =0.09,95% CI; 0.01–0.83), Fair drug adherence (AHR= 3.1,95% CI;1.6 – 6.2) and Recent CD4 cell count (AHR =0.99,95% CI; 0.994– 0.999) were the significant predictors for mortality after initiation of HAART among HIV patients in the adjusted Cox proportional hazard model.

Conclusion: HAART improved survival. However, high mortality was observed in the first six month of follow up. It was associated with Baseline ART regiment, not working due to ill health , use of condom rarely, Ambulatory and bed ridden functional status, PCP after starting ART, current prophylaxis and fair adherence. Highlighting, the need for early and strong HIV testing and counseling to initiate treatment early before they progress to advanced stage.

1. Introduction

1.1 Back ground

By 2013, there were an estimated 35.3 million people living with HIV/AIDS globally. In Sub – Saharan Africa an estimated 25 million people live with HIV/AIDS; of which 1.6 million were newly infected, and 1.2 million deaths were recorded in the region that represents 75% of the global AIDS related death. Signifying that, AIDS is one of the most destructive epidemics in the world (1). In Ethiopia, the prevalence of HIV among general population in 2013 is 1.3% (2). The prevalence is high among most at risk population groups (MARPs) like people in the uniform (3, 4, 5, 6). Due to national security, it is difficult to find the exact prevalence of HIV among Ethiopian police members. But it is possible to estimate how much the problem is from the 2005 ANC-based HIV Sentinel Surveillance, which shows a prevalence of 24.8% (7). This may have impacts on the organization; it takes the lives of many experienced officials and let the organization to incur huge costs for health expenditure, for training and recruitment of new officials to replace the affected and deceased members.

The largest share of morbidity and mortality from HIV/AIDS could be due to lack of accessibility to treatment services (8). Highly active antiretroviral therapy (HAART) has shown to be effective in improving the life of patients with HIV/AIDS. It significantly improves the prognosis of HIV infected persons by reducing viral load, increasing CD4 cell levels, delaying progression to acquired immunodeficiency syndrome (AIDS), prevention of drug resistance, and reducing mortality (9). Also, HAART appears to have been responsible for a significant reduction in the incidence of Opportunistic infections (10). With the introduction of HAART, the overall progression of HIV infection to AIDS and from AIDS to death has slowed (11).

HAART was started in Ethiopia in 2005 with the goal of reducing HIV-related mortality and morbidity, improving quality of life and mitigating impact of the epidemic (12). Currently health facilities including Federal Police referral hospital are providing the service, and 317,443 adults and children receive HAART. Thus the estimated ART coverage reached to 40%, 2014 (13).

1.2 Statement of the problem

Before the initiation of HAART, the burden of HIV/AIDS was critical. Health care services were primarily used by HIV/AIDS patients; hospital beds were almost fully occupied by them and the number of patients seeking medical care for HIV/AIDS related opportunistic infections increased and consumes the already limited health budget. The overall quality of care provided by health institutions were compromised which was manifested by late admission of patients due to shortage of beds and staffs, and staff burnouts (14).

The introduction of HAART significantly improved this condition, and survival and quality of life for many individuals living with the disease recovered (15). Studies examined the effect of HAART in Africa and found that the estimated mortality after initiation of HAART ranged from 5% to 40.7%, and with good adherence of the drug people start to live longer. Researches done in different countries on HIV positive people under care found that, the overall life expectancy since HAART has been considerably increased (16). The life expectancy for people receiving ART now approaches normal life expectancy, including in countries with a high burden of HIV infection(17).Survival is associated with predictors such as baseline viral load, CD4 count, WHO clinical stage, body weight, hemoglobin level, type of ART regiment started, chemoprophylaxis given, gender, risky behaviors and the likes (18,19).

Although studies have been conducted in Ethiopia, to investigate the survival benefit of HAART, the benefit which is not evenly distributed and varies according to different factors still need further study. As a result there have been limited data regarding survival rates among HIV infected uniformed patients on HAART particularly police force peoples. And the independent predictors of survival as well as the interaction of these identifiers in those patients after the introduction of HAART are not also well studied. The police force, which is the back bone of security in Ethiopia, is among the most susceptible subpopulations to sexually transmitted infections like HIV and is categorized as MARPs. Preventive and therapeutic activities including ART service are in place as Part of the intervention for these people. However, there is lack of information on the outcome and associated factors of HAART among the police community. Therefore, the aim of this study was to determine survival and predictors of survival among peoples living with HIV/AIDS after the initiation of HAART at federal police referral hospital.

1.3 Significance of the study

Improvement in survival is considered as a good indicator of the quality of care provided to patients. Hence, studying survival among HIV patients on HAART may benefit patients themselves, health care providers, researchers and even for HIV/AIDS patients who do not start HAART due to fear of side effect of the drug. Also identifying predictors of survival is important.

In the police sector health care is provided in separate level from the public one due to its unique nature (closed and secretive organization). The sector has well organized hospitals which provide the health care service only for the police community. In this sector ART program was started in accordance with the national free ART program in 2005, considering the population as Most-at-risk and most affected group. However, there is limitation of information on the impact of the HAART among this distinctive population.

Given the importance of maintaining healthy personnel in the country's police force, this study is designed to provide a base line data of survival and predictors of survival to program planners, decision makers and HAART implementers at different level, so that it will allow closer follow up of high- risk patients and more targeted interventions will be made that reduces mortality and improve quality of life of patients. It also provide base line information for governmental and non - governmental organizations, who work in collaboration with Federal Police in the area of HIV/AIDS particularly on ART to further strengthen the programs and alleviate the crisis that the diseases creates in the organization. And, since it is a first of its kind in police organization the study will also serve as a base line data for further studies.

2 Literature review

2.1 Over view of HIV/AIDS

According to the UNAIDS 2013 report, around 35.3 million people are currently living with HIV/AIDS worldwide and an estimated 36 million people have died since the first cases were reported in 1981. An estimated 2.3 million individuals were newly infected worldwide in 2012 of which 95 % occur in individuals living in low- and middle -income countries. Even though cases have been reported from all regions of the world, Sub-Saharan Africa is the most affected region, accounting 69 % of all reported cases. The number of AIDS death is 1.6 million in 2012 (1).

In Ethiopia, as in the rest of sub-Saharan African countries, the burden of HIV/AIDS is high. According to FHAPCO, the prevalence of HIV among general population is 1.3% (2). An estimated 800,000 people are currently living with HIV/AIDS (7). Initially the prevalence was high among high risk groups like commercial sex workers, men in uniform and long distance truck drivers (3, 4, 5, 6).

2.2 HIV in Most- At -Risk Population

Due to different reasons like socio-demographic characteristics, awareness, behavioral and other factors, the distribution of HIV varies among peoples in different population groups. ~~–~~Most-at-risk and/ or highly vulnerable populations to HIV (MARPs) is defined as a group within a community with an elevated risk of HIV, often because group members engage in some form of high- risk behavior.” uniformed services, sex workers, sero-discordant couples, long-distance truckers, mobile workers, In-school youth, inmates (prisoners), refugees, MSM (men who have sex with men), regular or non paying clients of sex workers with whom condom use is low, young girls engaged in transactional and cross- generational sex, people with disabilities and cross border populations are among most-at-risk populations (4,5,6). It is difficult to find the prevalence of HIV in each group in our country due to luck of their population size. But it is found to be high compared to the general population in some groups (4). The percentage of sex workers living with HIV is 23.8% and the prevalence of HIV among truck drivers was 4.9% (13). And the 2005 ANC- based HIV sentinel surveillance shows HIV prevalence of 24.8% at federal police referral Hospital(7).

2.3 Uniformed service personnel and HIV/AIDS

People in the military are among the most susceptible subpopulations to sexually transmitted infections like HIV. During peace time the rate of HIV is typically two to five times higher than the civilian population and it can be many times higher during war time (20). It has been difficult to find the exact prevalence of HIV among uniformed groups in different countries due to either they do not exist - due to the low frequency of testing and the poor systematic data collection among military services or governments do not make them public for the sake of national security. According to few African countries that release prevalence figures, it is higher than the national average (21), and also AIDS has been the leading cause of death in uniformed people in some African countries (22). In Ethiopia, the 2005 ANC-based HIV Sentinel Surveillance at federal police Hospital shows 24.8% prevalence rate (7).

Uniformed service personnel are believed to be at increased risk of HIV due to (23):

i. Being young sexually active people with relatively low level of maturity
ii. Are posted far away from their home for a prolonged period of time making them less subject to traditional social controls
iii. the military culture and the training given that encourages aggression, courage and willingness in risk taking
iv. High occupational stress periods interspersed with long periods of boredom which create a need to relax by using alcohol and drugs that together with peer pressure may facilitate craving for casual or commercial sex
v. Having more disposable income than the local community that endow with the financial means to purchase sex
vi. The nature of work that lets frequent interaction with sex workers, and
vii. Chance of infection through wounds or contaminated blood during conflict and vulnerability to sexual violence and exploitation by their superior particularly among female soldiers.

2.4 Impact of HIV/AIDS in uniformed personnel

The extent of HIV/AIDS crisis is clear (23).

i. As increasing numbers of people with HIV/AIDS are falling ill, it reduces the number of individuals who would qualify to serve
ii. There will be increased absence from work and worker attrition
iii. A rapid staff turnover undermines the professional capacity of the police service
iv. Morale and Productivity will decline because of time off and the deteriorating health
v. The average age and experience level will fall, with negative implication for institutional memory and unity
vi. The cost is high, as most police officers have relatively high skill levels and are expensive to replace. Good investigation and detection techniques are difficult to teach in a class room overnight and are usually gained through practical experience in the field, such skills can take years to replace
vii. Rapid skills depletion as a result of the disease places additional strains on the shrinking number of experienced offices and detectives. It also creates shortage of mentors for new functional personnel. In the absence of strengthened prevention, treatment and care efforts, it is expected that the impact will continue to rise.

2.5 Highly Active Antiretroviral Therapy

Highly active antiretroviral therapy (HAART), which has been shown to be effective in improving the life of patients with HIV/AIDS, was introduced in 1996 (16). It significantly improves the prognosis of HIV infected persons by reducing viral load to undeletable levels (<50 copies/ml) thereby slowing the spread of HIV, by increasing CD4+ cell count levels (50 to 100 cells/ml in the first year of therapy), delaying progression to AIDS, prevention of drug resistance, and reducing mortality (9). HAART appears to have been responsible for a significant reduction in the incidence of opportunistic infections including AIDS-related malignancies (10). With the introduction of HAART, the overall progression of HIV infection to AIDS and from AIDS to death has slowed (11).

According to UNAIDS 2013 report, a total of 10.6 million people living with HIV were receiving antiretroviral therapy. Out of these 9.7 million people were from low and middle income countries. This represents 34% of the 28.6 million people eligible in 2013. From 1995 to 2012 HAART prevents 6.6 million AIDS-related deaths including 5.5 million deaths in low and middle income countries (1). In these countries the estimated mortality after initiation of HAART was ranged from 5% to 40.7%. Researchers in Canada, Western Europe and the US on HIV positive people under care found that, the overall life expectancy since HAART has been considerably increased (16).

Mortality among patients on HAART is associated with high baseline levels of viral RNA, WHO stage III or IV at the beginning of treatment, low body weight, severe anemia, low CD4 cell count, type of ART treatment, cotrimoxazole prophylaxis, gender, resource-poor setting, poor adherence to HAART, co-morbid illness, and substance use (18,19). Among the predictors of HIV disease progression while on HAART, the CD4 cell level is the most important (11).

2.6 **Survival among PLWHA on HAART**

According to ketema K. and Eshetu W. survival among PLWHA was 88.3%. In this study mortality occurred in the first 12 month of follow up (24). Abdo Bedru showed Mortality to be 33.6% (55.6% died within the first 3 month), the rest 66.4% were active up to the end of last censored date in a 48 month follow up period (25). Andinet W. and Miguel S. revealed mortality of 10.5% after initiation of HAART in a 2 - year period follow up, and all deaths occurred in the first year. In this study, the median survival time for event was 13.4 weeks, indicating that the majority of deaths occurred before the 4^{th} month of treatment (8). A study at Debre Markos hospital by Tadele A. et al showed that the overall survival of patients on HAART was 57% at 72 months of follow up (26). In a study done in Camerool by Isidore S. et al, mortality rate over a study period was 20.2/100 person-years and survival probability at 5 years follow up was 47% (27). A study in Nepal by Laxim B. et al Showed that, the survival probability of patients at 5 years was 82.9%. The total mortality was 6.3/100 person - years at risk (28). DO DUY C.et al in north-eastern Vietnam estimated overall mortality rate of 7.4/100 person-years, including 60 (9%) deaths. The majority (73%) occurred within 6 months and the probability of surviving after 3, 6, 9, 12, and 15 months was 95%, 93%, 92%, 91%, and 90%, respectively (29).

2.7 Predictors of survival

Survival among patients on HAART depends on many predictors such as baseline levels of viral load, advanced baseline clinical WHO stage, body weight, hemoglobin level, baseline CD4 cell count, type of ART treatment, and so on. According to ketema K. and Eshetu W. Employment status, functional status, WHO clinical staging, OIs, TB co-infection, and CD4 cell count were significant predictors of mortality on multivariate analysis (24). In a study by Abdu Bedru educational status, marital status, unemployment, oral Candidiasis, past CNS toxoplasmosis, past TB co-infection, weight loss, functional status, WHO staging, CD4+ cell count, TB co-infection at base line, Anemia, lymphopenia(TLC<600), ART regimens and poor ART adherence were associated with survival in bivariate analysis. In multivariate analysis, poor ART adherence, Advanced WHO staging, being unemployed, moderate anemia, and Low CD4 count were found to be associated (25).

According to a study by Andinet W. et al, Baseline variables of clinical stage, hemoglobin, and CPT initiation were associated with progression to death in the univariate analysis. In the multivariable analysis, hemoglobin ≤10g/dl, clinical stage IV, and non-CPT initiation at or before the start of the treatment, were significant predictors of mortality (8). Tadele A. et al found advanced WHO stage, mild anemia and moderate to severe anemia, poor adherence, CD4 50-99 cells/µl, CD4<50 cells/µl and not taking cotrimoxazole prophylaxis as Significant predictors of mortality among adult HIV patients using HAART (26). A study by Gezahegn Abose shows, factors such as single marital status, poor ART adherence, positive past TB test, Male gender, age >40yrs and WHO clinical stage III Were confirmed as significant independent predictors of death after controlling for other factors in Cox proportional hazard adjusted model (30). DO DUY C.et al also shows that history of intravenous drug use (IDU), male sex, age > 35 y, CD4 count < 100/ µl, viral load > 100,000 copies/ml, and haemoglobin level <100 g/l were predictors on univariate analysis. In Cox proportional hazard model, age > 35 years, body mass index (BMI) < 18 kg/m 2 , clinical stage of 3 and 4, CD4 count < 100/ µ l, haemoglobin level < 100 g/l, and viral load >100,000 copies/ml were found to be significant predictors of mortality (29).

As it is evidenced in the above mentioned studies HAART improves survival time of patients. All except one verify survival time above 50%. The highest survival time (90%) was recorded in a randomized controlled trial study to assess the effect of peer support on treatment failure and drug resistance conducted in north-eastern Vietnam and the least (47%) was registered in retrospective cohort study conducted in Cameron. Also the study findings from different part of Ethiopia indicate promising effect of HAART.

Majority of these studies found that socio demographic variables, Baseline clinical and laboratory variables, and treatment related variables were predictors of survival but they do not show the impact of social and risky behavior related variables such as disclosure, addiction, supportive care and condom use very well. In addition, some studies in Ethiopia exclude study participants who are loss to follow up from their study. As far as the study participant is alive up to the last date of follow up the time contributed showed be included in the calculation.

Majority of the studies were conducted on the general population except the one conducted at Armed forces general teaching hospital, Ethiopia, which shows 88.3% survival time. There is no study to show whether there is similar trend in the police force.

Conceptual frame work

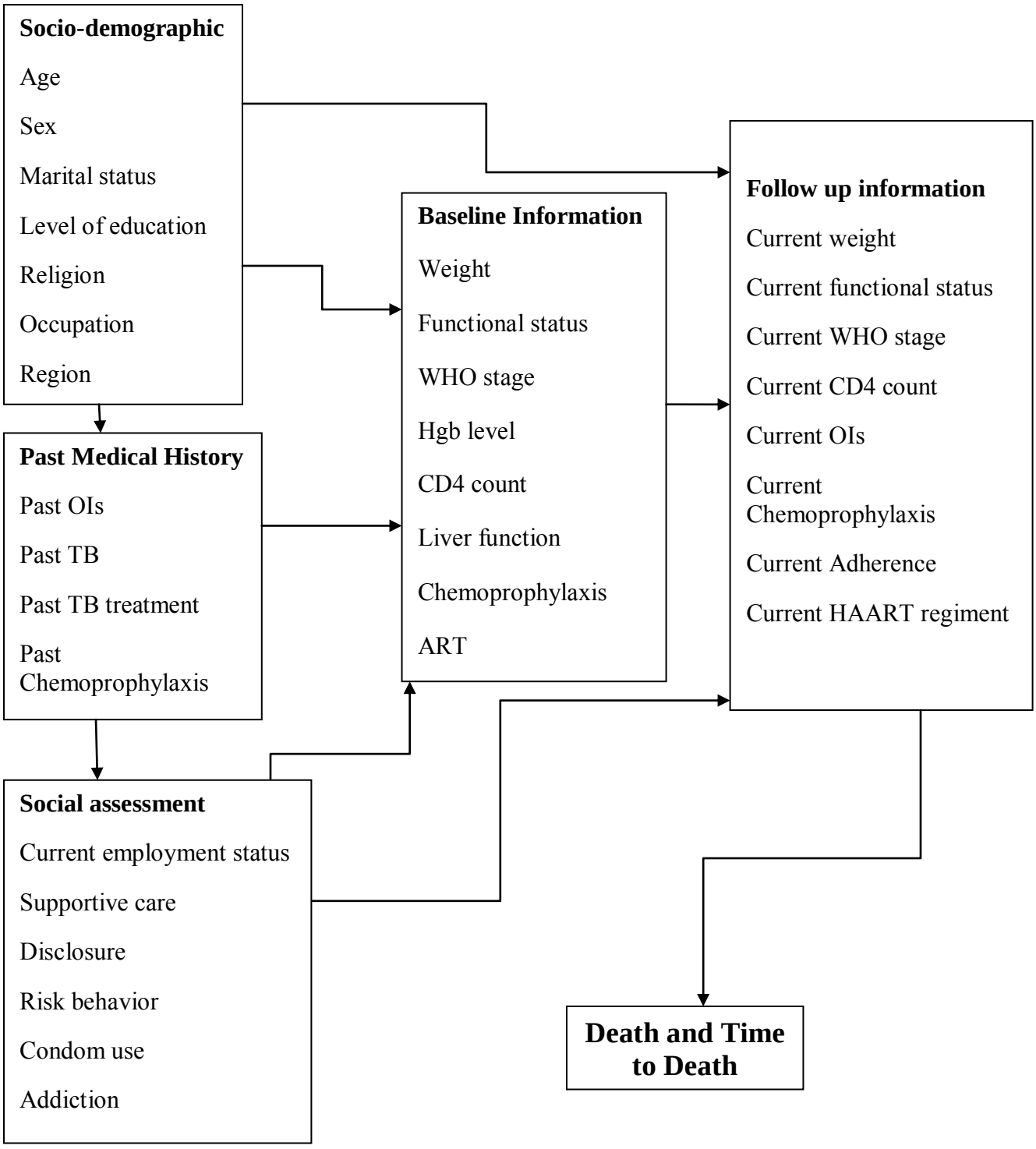

Figure 1: Conceptual frame work on survival and associated factors among PLWHA on HAART in federal police referral Hospital

3. Objective

3.1 General objective

- To assess survival among people living with HIV/AIDS on Highly Active Anti Retroviral Therapy at Federal Police Referral Hospital, Addis Ababa, Ethiopia, from Apr, 2005 to Mar, 2013.

3.2 Specific objectives

- To estimate survival time among HIV/AIDS patients on HAART
- To compare survival time between groups of a variable among HIV/AIDS patients on HAART
- To assess predictors of survival among HIV/AIDS patients on HAART

4. Methods

4.1. Study design and period

Retrospective cohort study was conducted in Federal Police Referral hospital from February to March 2015.

4.2. Study Area

Federal police health service is governed under Federal police commission and structured as directorate. The directorate had two hospitals; Federal police referral hospital found in Addis Ababa and Harar police hospital found in Harare region, and 14 clinics. It provides health serves for all police members and their families all over the country. This study uses Federal police referral Hospital since the majority of police members and their families are served there.

Federal Police Referral Hospital is one of the Referral hospitals found in Addis Ababa. It has 213 beds. The hospital provides different clinical services for only police members and their families from different part of the country. It provides general outpatient and inpatient services, including medical, surgical, pediatric and obstetric emergency care. It also provides care and treatment for HIV/AIDS patients including ART, voluntary counseling test (VCT), provider initiative counseling and testing (PICT), cotrimoxazole (CPT) and Isoniazid (INH) prophylaxis, and care and treatment of TB patients. The ART program of the hospital was started in April, 2005 when the free ART program started in Ethiopia in March, 2005. Patients eligible for ART based on WHO recommendation criteria are enrolled. A total of 3,812 patients have been enrolled since April, 2005. Two thousand nine hundred thirty eight patients ever started and 1,909 adult patients are currently on HAART. Patients are routinely followed every two weeks at the beginning of HAART initiation, then every month and then every three month for clinical assessment and HAART dispensing. The hospital uses different standard forms developed by FMOH to monitor patient's condition on treatment. The hospital was the only hospital to provide HAART service to police members in Ethiopia initially. Later the service extends to Harar police hospital to serve members around the region. As a result adequate sample with optimal follow up period and a good data handling system is in place.

4.3. Study Population

4.3.1 Source population

All adult police members and their families living with HIV /AIDS and started antiretroviral therapy in federal police referral Hospital were the source population.

4.3.2 Study population

All selected participants (police members and their families) aged 15 and above living with HIV/AIDS and started antiretroviral therapy in federal police referral Hospital between Apr, 2005 and Mar, 2013 were the study population based on the record review.

Exclusion Criteria

- Patients with incomplete baseline and follow up information
- Patients who had no follow-up visits for at least one month
- Patients transferred from other health facilities
- Female patients started HAART for PMTCT purpose

4.3.3. Sample size

The sample size is calculated using

$$n = \frac{\left[Z_{\alpha}\sqrt{(1+1/m)\bar{p}(1-\bar{p})} + Z_{\beta}\sqrt{p_0(1-p_0)/m + p_1(1-p_1)}\right]^2}{(p_0 - p_1)^2}$$

Where $\bar{p} = \frac{p_1 + m\,p_0}{m+1}$

Where; Po = proportion of death among nonexposed.

P1 = proportion of death among exposed

α = level of significance, Zα/2 = 1.96 at 95%CI

Power = 80% = 1-β, Zβ = 0.842

n = the minimum required sample size in each group

Calculation of the sample size is based on the two population proportion formula assuming type I error of 5%, power of 80% and allocating ratio (m) of one exposed (CD4<100 cells/µl) to two non exposed (CD4>100 cells/µl). To determine sample size the most significant predictors of mortality among adults on HAART from different literatures have been considered (11, 25, and 31). The sample size required is calculated taking the predictor which gives the maximum sample size among the significant predictors. Accordingly, CD4+ cell count gave a maximum sample size and a

10% contingency was added and the final sample size is 600 for n0 (nonexposed) and 300 for n1 (exposed) resulting total sample size of 900.

4.3.4. Sampling procedure

First, study participants were grouped as those with base line CD4 cell count <100 cell/µl and those with base line CD4 cell count >100 cell/µl. Then systematic random sampling technique was applied using a sampling frame of ART register. Every 3rd patient was selected after the first sample is selected using lottery method. For participants who do not fulfill the inclusion criteria the next person was taken as a study participant.

4.4. Data collection

4.4.1. Data collection Tools and procedure

The data was collected by using checklist, developed based on ART intake and follow up forms or registers in use in ART clinic, which have been adopted by the Federal Ministry of Health (FMoH). The registers include the Pre ART register where all confirmed HIV-positive clients who visit ART site for the first time were registered, the ART register (a register compiled at the date of ART initiation), and the follow-up form; a form completed for all patients at each visit, and on which information regarding progressive weight change, clinical stage, drug side effect, adherence, newly diagnosed OI, and laboratory test results is documented. Data was also collected by reviewing lab request and death summary together with a call made by case managers or drug adherence supporters. The most recent laboratory results before HAART initiation used as a base line values. Data was collected by two nurses who were trained for comprehensive HIV care after a one day intensive training was given. The overall activity was supervised by the principal investigator of the study.

4.4.2 Variables

Dependent variable: Death and the Time to death were the main outcome variables.

Independent variable: include

- Socio-demographic characteristics such as age, sex, marital status, level of education, religion, region (address), and occupation.

- Past medical and treatment information such as past OIs, past TB and past chemoprophylaxis
- Base line clinical and laboratory information such as weight, functional status, WHO clinical staging, Hgb level, CD4count, liver function, chemoprophylaxis and base line HAART regimen. .
- Follow up information such as current weight, current functional status, current WHO staging, current OIs, current chemoprophylaxis, current adherence, current CD4 count and drug regiment

4.4.3 Operational definition

Censored: Individuals on HAART, who reach the end of the study, lost to follow-up, transfer out, or drop out.

Competing cause of death: death from other causes not related to HIV/AIDS, like car accident.

Death: death from HIV/AIDS related causes

Functional Status:

- **Ambulatory functional status:** unable to perform usual work of living but able to carry out self care activities
- **Bed ridden functional status**: not able to perform activities of daily living
- **Working functional status**: able to perform usual work in or out of the house, harvest and go to workplace.

Adherence:

- **Good Adherence**: if the percentage of missed dose is between >95 %(< 2 doses of 30 doses or <3 dose of 60 dose) as documented by ART physician.
- **Fair Adherence:** if the percentage of missed dose is between 85-94 % (3-5 doses of 30 doses or 3-9 doses of 60 doses) as documented by ART physician
- **Poor Adherence:** if the percentage of missed dose is between <85 % (> 6 doses of 30 doses or >9 dose of 60 dose) as documented by ART physician

HAART: It is the use of three or more anti-retroviral drugs for the treatment of HIV infection.

Loss to follow up (loss and drop out): patient discontinued ART for at least one month as recorded by ART physician

Transferred-in: a patient who start HAART in another health facility and has been transferred to federal police referral hospital to continue his/her treatment

Transferred-out: a patient who start HAART at federal police referral hospital and has been transferred to other health facilities that deliver ART for different reasons

Unformed: People who work in the military.

4.5. Data Quality management

Data quality was controlled by designing proper data collection tools, pre testing, and through continues supervision. Pre-testing was under taken before the actual data collection period in five percent of patients in the same facility but outside the study period. Accordingly modification was made.

The data was supervised for completeness, consistency and accuracy every day. Every incomplete questionnaire has been sent back to the corresponding data collector for check up. The data was entered and cleaned by trained data clerk and principal investigator respectively before analysis.

4.6. Data processing and Analysis

Data was entered to Epi-Info 7 for windows and analyzed using SPSS version 21.0 for windows. The data was cleaned and edited before analysis. We described the patient cohort characteristics in terms of mean/median value for continuous data and percentage for categorical data.

The main outcome variables were death and the time of its occurrence. Death from all causes was considered as event of interest. Survival time was calculated in months using the time interval between the date of ART initiation and the date of event (death) or date of censoring until last date of follow up. Date of censoring includes date of last clinic visit for patients who came to the clinic within the last 3 months prior to data collection period, date of transfer out for Transferred out patients and date of last clinic visit for lost to follow ups. For those who died at home, last date of clinic visit was taken as date of death. The maximum survival time was censored at 119 months.

Baseline Demographic, clinical, laboratory and social characteristics were used as independent variables in the analysis. Cox proportional hazard assumption was assessed by Schoenfeld residuals and some variables violate the assumption, as a result graphical method was used to check the

assumption, and further stratification was considered for violating variables. Kaplan-Meier survival function was applied to estimate the probability of survival of patients after HAART initiation and Log-rank test was used to compare the KM curves for two or more categories of patients on HAART.

Cox proportional hazard model was used to determine the relationship between independent variables and outcome variable (death). First Bivariate Cox-regression analysis was applied to estimate the unadjusted Hazard Ratios (HRs). Every independent variable was tested against dependent variable and variables significant at $P<0.05$ in bivariate analysis was taken to the Cox regression model. Then multivariate Cox-regression analysis was performed to estimate the adjusted hazard ratios. Hazard ratio with 95% confidence interval was used to measure the association between dependent and independent variables.

4.7. Ethical consideration

Ethical clearance was obtained from Research and ethical committee (REC) of school of public health, Addis Ababa University and Letter of co-operation from school of public health was taken to communicate Federal Police Referral Hospital Officials. Data was collected from medical record using only patient's unique ID number by data collectors from ART department and raw data will not be given to third party, hence confidentiality will be kept.

5. Results

A total of 900 study participants, who initiated HAART between April, 2005 and end of March, 2013 were included for this study. Socio demographic, past history of illness, base line clinical and laboratory information's, social and risk behaviour, and follow up information of HIV patients who started HAART were assessed.

5.1 Socio demographic Characteristic

The mean age at the time of HAART initiation was 35.8 years (±SD 8.18). As it is shown in Table 1 which describe the socio demographic characteristic of study participants, 382 (42.4%) were within the age group of 25 – 34 and 59 % were males, and 28 and 44 patients found to be dead at the end of the study period, respectively. Out of 370 females who participated in the study 36 (9.7%) were pregnant who initiated HAART for reasons other than PMTCT. Six hundred thirty five (70.6%) were married and 559(62.5 %) attended secondary school. Seven hundred forty one (82.3%) follow orthodox religion and 660 (73.7%) were employed. Fifty five percent were from Addis Abeba followed by 25.4 % from Oromia.

Table 1: Baseline Socio-demographic characteristics of the study subjects at Federal police Referral Hospital, Addis Ababa, Mar, 2015 (n = 900).

Socio-demographic Characteristic	Total	Death (n=75)
	Frequency (%)	Frequency (%)
Age group		
15 -24	50(5.6%)	-
25 -34	382(42.4%)	28(37.3%)
35 -44	351(39.0%)	38(50.7%)
45 –54	85(9.4%)	9(12.0%)
>55	32(3.6%)	-
Sex		
Male	530(58.9%)	44(58.7%)
Female	370(41.1%)	31(41.3%)
Pregnancy (n=370)		
Pregnant	36 (9.7%)	2 (6.5%)
Not pregnant	334 (90.3%)	29 (93.5)
Marital status		
Never Married	126(14.0%)	11(14.7%)
Married	635(70.6%)	52(69.3%)
Separated	17(1.9%)	4(5.3%)
Divorced	41(4.6%)	2(2.7%)
Widowed	80(8.9%)	6(8.0%)
level of education		
No education	31(3.5%)	2(2.7%)
Primary	212(23.7%)	17(22.7%)
Secondary	559(62.5%)	49(65.3%)
Tertiary	92(10.3%)	7(9.3%)
Religion		
Muslim	65(7.2%)	8(10.7%)
Orthodox	741(82.3%)	60(80.0%)
Protestant	88(9.8%)	7(9.3%)
Others [1]	6(0.7%)	-
Occupation		
Employed	660(73.7%)	61(81.3%)
Unemployed	211(23.5%)	13(17.3%)
Others[2]	24(2.7%)	1(1.3%)
Region		
Addis Ababa	494(54.9%)	42(56.0%)
Oromia	229(25.4%)	18(24.0%)
Amhara	100(11.1%)	10(13.3%)
SNNPR	42(4.7%)	2(2.7%)
Others [3]	35 (3.8%)	3 (4.0%)

[1] include catholic and those who has no religion; [2] include merchant, Farmer and Retired

[3] include Afar, Gambela, Tigray, Somali, Harar, Dire Dawa and Benshangul Gumuz

5.2 History of Past Illness

History of past illness at the time of HAART initiation was assessed and 629 (69.9 %) participants were affected by one or more opportunistic illness, of which 61 patients found to be dead at the end of the study. Two hundred seventy two (30%) had history of Tuberculosis treatment in the past and only 123 (45%) completed their treatment. Thirty Four (4%) patients took chemoprophylaxis before starting HAART. (Table 2)

Table 2: Past History of Illnesses among study participants at Federal police Referral Hospital, Ethiopia, Addis Ababa, Mar, 2015 (n = 900).

Past History of Illness	Total	Death (n=75)
	Frequency (%)	Frequency (%)
past history of opportunistic illness		
Yes	629(69.9%)	61(81.3%)
No	271(30.1%)	14(18.7%)
past Tuberculosis Treatment		
Yes	272(30.0%)	23(31%)
No	628(70.0%)	52(69%)
past chemoprophylaxis		
Yes	34(4.0%)	1(1.3%)
No	866(96.0%)	74(98.7%)

As it is described in table 3 the leading opportunistic illnesses that affect patients in the past were Tuberculosis (46.6%) followed by Candidiasis (40%), pneumonia (28.3%) and fever (26.9%). About 26 from tuberculosis patients, 32 from Candidiasis patients, 18 from pneumonia and 17 from fever patients were dead at the end of the study. There were no patients affected by cryptosporidiosis, cytomegalovirus infection and PML.

Table 3: List of opportunistic illnesses that affect study participants in the past at Federal police Referral Hospital, Addis Ababa, Mar, 2015 (n= 629).

Opportunistic illnesses	Total	Death (n=61)
	Frequency (%)	Frequency (%)
Candidiasis	254 (40.0%)	32 (52.0%)
Cryptococcal meningitis	27 (4.3%)	7 (11.0%)
Encephalopathy	12 (1.9%)	3 (4.9%)
salmonella septicemia	9 (1.4%)	1 (1.6%)
wasting syndrome	118 (18.8%)	15 (25.0%)
Diss,atypical mycosis	15 (2.4%)	3 (4.9%)
Diarrhea	154 (24.5%)	17 (27.9%)
Fever	169 (26.9%)	17 (27.9%)
pneumonia	178 (28.3%)	18 (29.5%)
Herpes simplex	56 (8.9%)	10 (16.0%)
Kaposi's sarcoma	3 (0.48%)	1 (1.6%)
Toxoplasmosis	24 (3.8%)	2 (3.3%)
Recurrent URTI[1]	137 (21.8%)	10 (16.0%)
mucocutaneous	70 (11.0%)	9 (14.8%)
Tuberculosis	293 (46.6%)	26 (42.6%)
PCP[2]	32 (5.0%)	5 (8.0%)
PML[3]	1 (0.16%)	1 (1.6%)
PGL[4]	32 (5.0%)	4 (6.6%)
other	23 (3.7%)	3 (4.9%)

[1]URTI – upper respiratory tract infection [2]PCP –Pneumocystis Pneumonic
[3]PML – Progressive Multifocal Leukoencephalopathy [4]PGL – persistent Generalized Lymphadinopathy

5.3 Base line clinical and Laboratory characteristic

Assessment of Clinical and laboratory parameters at the time of HAART initiation shows mean weight of 55.57 Kg (±SD 10.34) with about 829 (92.2%) being above 40Kg. Five hundred twenty one (58%) had working functional status and 358 (40%) were at WHO stage IV. Six hundred eighty four (76%) had normal hemoglobin result (11 – 15gm/dl). The mean CD4 count was 137.37 (± SD 79.28) and 571(63.4 %) patients were grouped under CD4 cell count of 51 – 200 cells/µl, of which 45 found to be dead at the end of the study period. Liver function test at time of HAART initiation using ALT was done for 83 % of patients. The mean ALT result was 31.54 lu/ml (± SD 31.26) and about 609 (68%) had normal result (0 – 50 Iu/ml). Chemoprophylaxis was given for 750 (83%) of patients at baseline, of them 65 were dead. At baseline ART regimen 1a (d4T+3Tc+NVP) was prescribed for about 31.2% followed by 1e (TDF+3TC+EFV) for 26.4 % of the patients. (Table 4)

Table 4: Base line Clinical and Laboratory characteristic of the study participants at Federal police Referral Hospital, Addis Ababa, Mar, 2015 (n = 900).

Base line Clinical and Laboratory characteristic	Total	Death (n=75)
	Frequency (%)	Frequency (%)
Weight category		
Wt ≤40 kg	70 (8.0%)	14 (18.7%)
Wt > 40 kg	829 (92.0%)	61 (81.3%)
Functional status		
Working	521 (58.0%)	29 (39.0%)
Ambulatory	209 (23.0%)	22 (29.0%)
Bed ridden	169 (19.0%)	24 (32.0%)
WHO clinical stage		
Stage I	88 (10.0%)	4 (5.0%)
Stage II	142 (16.0%)	9 (12.0%)
Stage III	312 (34.0%)	27 (36.0%)
Stage IV	358 (40.0%)	35 (47.0%)
Hemoglobin category		
Normal	684 (76.0%)	58 (77.0%)
Ab normal	216 (24.0%)	17 (23.0%)
CD4 category		
< 50	153 (17.0%)	17 (22.7%)
51 – 200	571 (63.4%)	45 (60.0%)
201 – 350	168 (18.7%)	12 (16.0%)
> 350	8 (0.9%)	1 (1.3%)
Liver function test result category		
Normal	609 (68.0%)	48 (64.0%)
Abnormal	291 (32.0%)	27 (36.0%)
Chemoprophylaxis		
Yes	750 (83.0%)	65 (87.0%)
No	150 (17.0%)	10 (13.0%)
ART regiment		
1a (d4T + 3TC + NVP)	281 (31.2%)	24 (32.0%)
1b (d4T + 3TC + EFV)	147 (16.3%)	22 (29.3%)
1c (AZT + 3TC + NVP)	85 (9.4%)	2 (2.7%)
1d (AZT + 3TC + EFV)	144 (16.0%)	10 (13.3%)
1e (TDF + 3TC + EFV)	238 (26.4%)	16 (21.3%)
1f (TDF + 3TC + NVP)	5 (0.6%)	1 (1.3%)

5.4 Social conditions and Risky Behaviour among study population

About 633 (70.8%) of study participants were full time workers at the time of HAART initiation (47 patients found to be dead at the end of the study period). One hundred sixty five (18.4%) patients have got supportive care from their religious care giver. Seventy percent of patients

disclose their sero status either to family, relative or friend. About 270 (46.5%) had history of sexual contact with regular sexual partner. From those who have casual sexual contact 46.1% has more than one sexual partner in the last three months and 32 % had never used condom. Twenty nine percent were addicted. (Table 5)

Table 5: Social Condition and Risk Behaviour of the study participants at Federal police Referral Hospital, Addis Ababa, Mar 2015 (n = 900).

Social Condition and Risk Behaviour	Total	Death (n=75)
	Frequency (%)	Frequency (%)
Employment status		
Working Full Time	633 (70.8%)	47 (62.7%)
Work part time	12 (1.3%)	1 (1.3%)
Not Working due to ill health	84 (9.4%)	16 (21.3%)
Unemployed[1]	161 (18.0%)	10 (13.3%)
Other	4 (0.4%)	1 (1.3%)
Supportive care		
Religious	165 (18.4%)	14 (18.9%)
Community	43 (4.8%)	5 (6.8%)
Both	11 (1.2%)	1 (1.4%)
None	679 (75.6%)	54 (73.%)
Disclosure		
Yes	628 (70.2%)	47 (62.7%)
No	267 (29.8%)	28 (37.3%)
Sexual practice		
Regular partner	217 (46.6%)	20 (54.1%)
Casual partner	200 (42.8%)	15 (40.5%)
Both	50 (10.7%)	2 (5.4%)
Number of casual partner		
1 casual partner	134 (53.8%)	12 (70.6%)
2 casual partner	52 (20.9%)	1 (5.9%)
3 casual partner	13 (5.2%)	-
>3 casual partner	50 (20.1%)	4 (23.5%)
Condom use		
Not Applicable[2]	433 (48.1%)	38 (50.7%)
Never	288 (32.0%)	19 (25.3%)
Rarely	38 (4.2%)	9 (12.0%)
Sometimes	73 (8.0%)	3 (4.0%)
Mostly	28 (3.1%)	3 (4.0%)
Always	39 (4.3%)	3 (4.0%)
Addiction		
Yes	262 (29.1%)	23 (30.7%)
No	638 (70.9%)	52 (69.3%)

[1]unemployed include wife's of police members [2]Not applicable includes Married patients

From those who are addicted 37% were addicted to tobacco, 84% to alcohol, 37% to soft drugs like khat, shisha and pills and 17% addicted to hard drugs like cocaine, morphine, IV drugs, etc at the time of HAART initiation.

5.5 Follow up History

Patient conditions at the last date of follow up were assessed. About 886 (98.4%) had weight greater than 40 Kg (67 found to be dead at the end of study period), 784 (87%) had working functional status and 73% were on treatment stage one based on the WHO staging criteria. About 277 (30.8%) had opportunistic illness after starting HAART. Six hundred twenty two (69%) of the patients were given chemoprophylaxis during their follow up time. Drug adherence was good for 89.7% patients at last date of follow up. The mean CD4 cell count within six month before last date of follow up was 364.79 (± SD 228.54) and about 49.2% were categorized under CD4 cell count more than 350. About 65% of the study subjects were on treatment at the end of the study period followed by 17% transferred out. (Table 6)

Table 6: Current Clinical and Laboratory condition of the study participant at Federal police Referral Hospital, Addis Ababa, Mar, 2015 (n = 900).

Current* Clinical and Laboratory condition	Total	Death (n=75)
	Frequency (%)	Frequency (%)
Weight category		
<40 kg	14 (1.6%)	8 (10.7%)
40 kg and above	886 (98.4%)	67 (89.3%)
Functional status		
Working	784 (87.1%)	26 (34.7%)
Ambulatory	74 (8.2%)	19 (25.3%)
Bedridden	42 (4.7%)	30 (40.0%)
WHO staging		
Stage I	22 (2.4%)	5 (6.7%)
Stage II	32 (3.6%)	6 (8.0%)
Stage III	60 (6.7%)	19 (25.3%)
Stage IV	119 (13.2%)	33 (44.0%)
Treatment stage 1	659 (73.2%)	11 (14.7%)
Treatment stage 2	1 (0.1%)	-
Treatment stage 3	6 (0.7%)	1 (1.3%)
Treatment stage 4	1 (0.1%)	-
OIs after ART		
Yes	277 (30.8%)	36 (48.0%)
No	623 (69.2%)	39 (52.0%)
Chemoprophylaxis		
Yes	622 (69.0%)	61 (81.0%)
No	278 (31.0%)	14 (19.0%)
Adherence status		
Good	806 (89.7%)	43 (57.3%)
Fair	71 (7.9%)	27 (36.0%)
poor	22 (2.4%)	5 (6.7%)
Recent CD4 category		
<50	47 (5.2%)	18 (24.0%)
51 - 200	207 (23.0%)	31 (41.3%)
201 - 350	203 (22.6%)	17 (22.7%)
>351	443 (49.2%)	9 (12.0%)
Outcome of the patient		
On treatment	587 (65.2%)	
Transfer out	155 (17.2%)	
Drop	83 (9.2%)	
Dead	75 (8.3%)	75 (100%)

*current refers last date of follow up

The most common opportunistic illnesses after starting ART were Pulmonary Tuberculosis (30% patients), extra pulmonary Tuberculosis (17% patients) and Pneumocystis pneumonic (17% patients). (Table 7)

Table 7: List of opportunistic illnesses that occur among study participants after starting HAART at Federal police Referral Hospital, Addis Ababa Mar, 2015 (n = 277).

Opportunistic illnesses After starting HAART	Total	Death (n=36)
	Frequency (%)	Frequency (%)
Zoster	24 (9.0%)	3 (8.0%)
Thrush	18 (6.0%)	4 (11.0%)
Pulmonary Tuberculosis (PTB)	82 (30.0%)	13 (36.0%)
Extra pulmonary tuberculosis (EPTB)	46 (17.0%)	3 (8.0%)
Acute / Chronic Diarrhea (DA/DC)	27 (10.0%)	1 (3.0%)
Pneumocystis Pneumonic (PCP)	47 (17.0%)	10 (28.0%)
Bacterial Pneumonia (BP)	17 (6.0%)	2 (6.0%)
Cryptococcal Meningitis (CM)	9 (3.0%)	2 (6.0%)
CNS toxoplasmosis (CT)	20 (7.0%)	3 (8.0%)
Ulcer	3 (1.0%)	1 (3.0%)
other	44 (16.0%)	6 (17.0%)

Among the reviewed participants 866(96%) were on first line ART regiment (Of which 69 patients found to be dead) with 1e (TDF+3TC+EFV) being the most prescribed regiment.

Table 8: Current ART regimen prescribed for patients at Federal police Referral Hospital, Addis Ababa, Mar, 2015(n = 900).

Current ART regimen		Total	Death (n=75)
		Frequency (%)	Frequency (%)
First line	1a (d4T + 3TC + NVP)	54 (6.2%)	12 (17.4%)
	1b (d4T + 3TC + EFV)	73 (8.4%)	19 (27.5%)
	1c (AZT + 3TC + NVP)	127 (14.7%)	5 (7.2%)
	1d (AZT + 3TC + EFV)	138 (15.9%)	10 (14.5%)
	1e (TDF + 3TC + EFV)	434 (50.1%)	21 (30.4%)
	1f (TDF + 3TC + NVP)	36 (4.2%)	2 (2.9%)
	1g (Others)	4 (0.5%)	-
Second line	2b (TDF + 3TC + LPV/r)	16 (47.0%)	4 (66.7%)
	2c (AZT + 3TC + LPV/r)	16 (47.0%)	2 (33.3%)
	2e (Other)	2 (6.0%)	-

5.2 Survival Analysis

The total person month of follow up was 51,008 with incidence density of 51/1000 person months. The mean survival time of patients on HAART was 56.68 (±SD 37.16) months. Study participants were followed for a median of 57 months (IQR, 23 - 89), ranging 1- 119 months. About 75 (8.3%) study participants died during the study period, out of these 48% (36) died within the first 6 months. The remaining study participants were censored for different reasons: 155(17.2%) transferred out to other facilities, 83 (9.2%) dropped and 587 (65.2 %) were alive at the end of study period. The estimated mortality was 4%, 2%, 0%, 2%, and 0% at 6, 12, 24,108 and 120 months respectively.

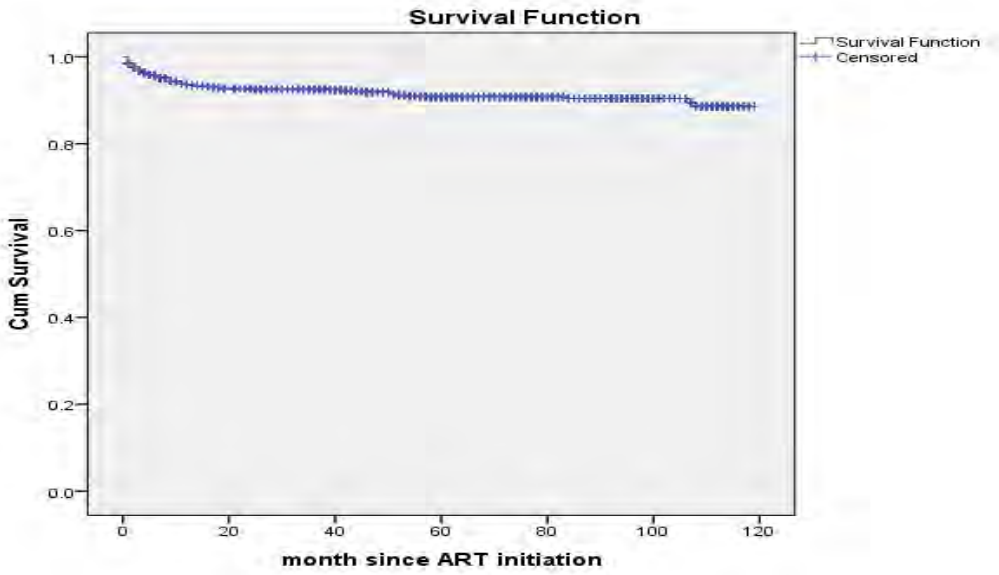

Figure 2: Overall survival of the study population on HAART at Federal police Referral Hospital, Addis Ababa, Mar, 2015

The survival probability of patients on HAART was 96%, 94% & 93% at 6, 12 & 24months respectively and the overall survival of patients on HAART was 88% at 120 months of follow up. On a log rank test the overall survival of male patients on HAART was slight higher than survival of female patients, but not significant (Figure 3). And the Result of comparison of survival time among groups of selected variables had been annexed (Annex II).

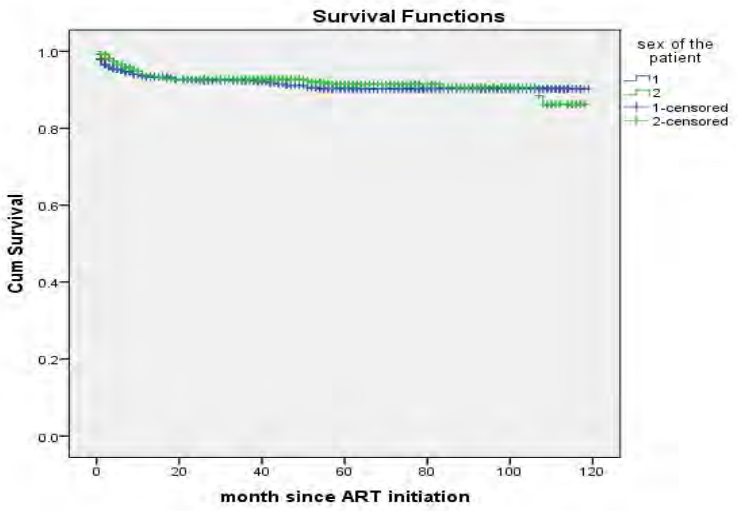

Figure 3: survival curves of the study population on HAART according to sex category (1 refers male and 2 refers Female) at the time of HAART initiation in Federal Police Referral Hospital, Addis Ababa, Mar, 2015

In Bivariate analysis socio demographic variables such as age, sex, marital status, level of education, religion, occupation and region were found to be not significantly associated the outcome variable. Whereas, the bivariate analysis of opportunistic illness in the past indicates significant association between past history of Candidiasis (HR=1.8, 95% CI; 1.1 – 2.9) and past history of Cryptococcal meningitis (HR =3.9, 95% CI; 1.7 – 8.4) with the outcome variable death. (Table 9)

Table 9: Bivariate analysis between opportunistic illnesses in the past and death among study population at Federal Police Referral Hospital, Addis Ababa, Mar,2015 (n=900).

Opportunistic illnesses in the past	Censored	Dead	Crude HR (95% CI)	P value
Past History of Candidiasis				
Yes	222	32	1.8 (1.1- 2.9)	0.013*
No	603	43	1	
Past History of Cryptococcal meningitis				
Yes	20	7	3.9 (1.7 - 8.4)	0.001*
No	805	68	1	
Past History of Encephalopathy				
Yes	9	3	3.4 (1.0 – 10.8)	0.038*
No	816	72	1	
Past History of Herpes simplex				
Yes	46	10	2.4 (1.2 – 4.7)	0.010*
No	779	65	1	
Past History of PML				
Yes	1	1	33.9 (4.5 – 255)	0.001*
No	825	74	1	

*P value <0.05

Bivariate analysis of baseline clinical and laboratory characteristics was done. As a result, weight >40kg (HR=0.4, 95%CI; 0.2-0.7) Bed ridden functional status (HR =2.9, 95% CI; 1.7–5.2) and being put on 1b (d4T + 3TC + EFV) drug regimen (HR =2.1 (1.20 – 3.80) were found to be significantly associated with the outcome Variable. (Table 10)

Table 10: Bivariate analysis between base line clinical and laboratory characteristics and death among study population at Federal Police Referral Hospital, Addis Ababa, Mar,2015 (n=900).

Base line clinical and laboratory characteristics	Censored	Dead	Crude HR (95% CI)	P value
Weight category				
Wt ≤40kg	56	14	1	
Wt >40kg	768	61	0.4 (0.20 – 0.70)	0.001*
Functional status				
Working	492	29	1	<0.001*
Ambulatory	187	22	2.1 (1.20– 3.70)	0.008*
Bed ridden	145	24	2.9 (1.70 – 5.20)	<0.001*
ART regimen				
1a (d4T + 3TC + NVP)	257	24	1	0.016*
1b (d4T + 3TC + EFV)	125	22	2.1 (1.20 – 3.80)	0.012*
1c (AZT + 3TC + NVP)	83	2	0.3 (0.07 – 1.30)	0.109
1d (AZT + 3TC + EFV)	134	10	0.9 (0.45 – 1.90)	0.873
1e (TDF + 3TC + EFV)	222	16	0.98 (0.50 – 1.90)	0.959
1f (TDF + 3TC + NVP)	4	1	3.7 (0.50 – 27.20)	0.205

*p value <0.05

Not working due to ill health (HR =2.9, 95% CI; 1.6 –5.2), use of condom rarely (HR =3.5, 95% CI; 1.7–7.2), consumption of soft drugs (HR =2.1, 95%CI; 1.1 – 3.7) were significantly associated variables on bivariate analysis of social condition and risky behaviour. (Table 11)

Table 11: Bivariate analysis between Social condition and Risky Behaviour and death among study population at Federal Police Referral Hospital, Addis Ababa, Mar,2015 (n=900).

Social condition and Risky Behaviour	Censored	Dead	Crude HR (95% CI)	P value
Employment				
Working Full Time	586	47	1	0.003*
Work part time	11	1	1.2 (0.16 – 8.50)	0.874
Not Working due to ill health	68	16	2.9 (1.60 – 5.20)	<0.001*
Unemployed	151	10	0.8 (0.40 – 1.60)	0.532
Other	3	1	4.2 (0.60 -30.90)	0.156
Condom use				
Not Applicable	395	38	1	0.014*
Never	269	19	0.8 (0.50 – 1.40)	0.443
Rarely	29	9	3.5 (1.70 – 7.20)	0.001*
Sometimes	70	3	0.5 (0.20 – 1.60)	0.252
Mostly	25	3	1.3 (0.40 – 4.20)	0.667
Always	36	3	0.9 (0.30 – 2.90)	0.844
Soft Drugs				
Yes	83	13	2.1(1.10 – 3.70)	0.019*
No	742	62	1	

*p value <0.05

On bivariate analysis of current clinical and laboratory condition variables such as weight > 40 kg (HR = 0.1, 95% CI; 0.1 -0.2), Bed ridden functional status (HR =51, 95% CI; 29 - 90), PCP after initiating HAART (HR =2.9, 95% CI; 1.5–5.6) were significantly associated variables with the outcome variable. (Table 12)

Table 12: Bivariate analysis between current clinical and Laboratory condition and death among study population at Federal Police Referral Hospital, Addis Ababa, Mar,2015 (n=900).

Current clinical and Laboratory condition	Censored	Dead	Crude HR (95% CI)	P value
weight category				
<40 kg	6	8	1	
40 kg and above	819	67	0.1(0.10 – 0.20)	<0.001*
Functional status				
Working	758	26	1	<0.001*
Ambulatory	55	19	19.6 (10.50 – 36.40)	<0.001*
Bedridden	12	30	51.4 (29.40 – 90.00)	<0.001*
WHO clinical staging				
Stage I	17	5	1	<0.001*
Stage II	26	6	1.1 (0.30 – 3.60)	0.91
Stage III	41	19	2.9 (1.10 – 8.10)	0.04*
Stage IV	86	33	2 (0.80 – 5.40)	0.16
Treatment stage 1	648	11	0.03 (0.01 – 0.90)	<0.001*
Treatment stage 2	1	-	-	0.98
Treatment stage 3	5	1	0.3 (0.03 – 2.30)	0.23
Treatment stage 4	1	-	0.00 (0.00 - 1.40)	0.97
OIs after ART PTB				
Yes	69	13	1.9 (1.10 – 3.60)	0.02*
No	756	62	1	
OIs after ART PCP				
Yes	37	10	2.9 (1.50 – 5.60)	0.002*
No	788	65	1	
chemoprophylaxis				
Yes	561	61	2.2 (1.20 – 3.90)	0.009*
No	264	14	1	
ART 1st Line regiment				
1a (d4T + 3TC + NVP)	42	12	1	<0.001*
1b (d4T + 3TC + EFV)	54	19	1.3 (0.60– 2.70)	0.44
1c (AZT + 3TC + NVP)	122	5	0.1 (0.03 – 0.30)	<0.001*
1d (AZT + 3TC + EFV)	128	10	0.2 (0.10 – 0.50)	<0.001*
1e (TDF + 3TC + EFV)	413	21	0.13 (0.10 – 0.30)	<0.001*
1f (TDF + 3TC + NVP)	34	2	0.1 (0.03 – 0.50)	0.006*
1g (Others)	4	-	0.0 (0.00 – 7.40)	0.96
Adherence				
Good	763	43	1	<0.001*
Fair	44	27	16.1 (9.60 – 26.70)	<0.001*
Poor	17	5	5.4 (2.10 – 13.50)	<0.001*
RecentCD4count	825	75	0.99 (0.98 – 0.99)	<0.001*

*p value <0.05

In multivariate Cox regression analysis model, baseline ART regiment, employment status, condom use, current functional status, current WHO staging, PCP after starting HAART, current prophylaxis, current 1st line ART regimen, current adherence and recent CD4 count were found to be significantly associated with outcome variable.

The estimated AHR for patients who put on 1e (TDF+3TC+EFV) and 1f (TDF+3TC+NVP) drug regimen at baseline in relation to those who put on 1a (d4T + 3TC + NVP) drug regimen was (AHR=6.39, 95% CI; 1.6 – 25) and (AHR=167.6, 95% CI; 7.9–3525) respectively. It means that patients prescribed with 1e drug regimen had about 6.39 and patients prescribed with 1f drug regimen had about 167.5 times higher mortality then patients prescribed with 1a.

The estimated AHR for patients not working due to ill health was (AHR=2.9, 95% CI; 1.2-6.9). This implies that those patients were more likely to die than working patients. Also the estimated AHR for patients who use condom rarely was (AHR=4.6, 95% CI; 1.6–12.7) showing that mortality is higher for these group of patients.

The estimated AHRs for current Ambulatory and Bed ridden patients were (AHR=2.8, 95% CI; 1.2 – 6.9) and (AHR=11.3, 95% CI; 4.6 - 27) respectively. The implication is that ambulatory and bed ridden patients were at higher risks of death than patients who were actively working.

The estimated AHR for current WHO Treatment stage one was (AHR=0.10, 95% CI; 0.03–0.4). This means that, the risk of death for patients in treatment stage one was 89.7% lower than for patients in stage I. The study also showed that, patients who suffered from PCP after starting ART had (AHR 3.6, 95% CI; 1.4 – 9.2).

The estimated AHR for patients who were on prophylaxis during the follow up period was (AHR=2.6, 95% CI; 1.1 – 6.4), indicating risk of dying than those who were not on prophylaxis. The estimated AHRs and CIs for patients who were taking 1e (TDF+3TC+EFV) and 1f (TDF+3TC+NVP) drug regimens at the last date of follow up, respectively were (AHR=0.2, 95% CI; 0.05 – 0.76) and (AHR= 0.09, 95% CI; 0.01 – 0.83). The interpretation is that, patients

in regimen 1e and 1f were 79.9% and 91.4% at lower risk of dying than those taking 1a(d4T + 3TC + NVP), respectively.

The estimated AHR for patients with fair drug adherence was (AHR=3.1, 95% CI; 1.6 – 6.2) and the estimated AHR for a 1 cells/µl increase in recent CD4 cell count was (AHR=0.99, 95% CI; 0.994 – 0.999) indicating the risk for patients whose CD4 cell count was higher by 1 cells/µl were 1% lower than for patients in the next lower value. (Table 13)

Table 13: Multivariate Cox-regression analysis of the death outcome among the Study population in Federal Police Referral Hospital, Addis Ababa, Mar, 2015 (n =900)

Variables	Censored	Dead	AHR (95% CI:)	P value
Base Line ART regimen				
1a (d4T + 3TC + NVP)	257	24	1	
1e (TDF + 3TC + EFV)	222	16	6.4 (1.60 – 25.00)	0.008
1f (TDF + 3TC + NVP)	4	1	167.6 (7.90 – 3525.00)	0.001
Employment				
working full time	586	47	1	
Not working due to ill health	68	16	2.9 (1.20 – 6.90)	0.014
Condom use				
Not applicable	395	38	1	
Rarely	29	9	4.6 (1.60 – 12.70)	0.004
Current functional status				
Working (784)	758	26	1	
Ambulatory (74)	55	19	2.8 (1.20– 6.90)	0.022
Bed Ridden (42)	12	30	11.3 (4.60 – 27.00)	<0.001
Current WHO clinical staging				
stage I	17	5	1	
Treatment stage I	648	11	0.10 (0.03 – 0.40)	0.001
OIs after ART PCP				
Yes	37	10	3.6 (1.40 – 9.20)	0.008
No	788	65	1	
Current prophylaxis				
Yes	561	61	2.6 (1.10 – 6.40)	0.030
No	264	14	1	
Current ART 1st Line regiment				
1a (d4T + 3TC + NVP)	42	12	1	
1e (TDF + 3TC + EFV)	413	21	0.2 (0.05 – 0.76)	0.019
1f (TDF + 3TC + NVP)	34	2	0.09 (0.01 – 0.83)	0.034
Current adherence				
Good	763	43	1	
Fair	44	27	3.1 (1.60 - 6.20)	0.010
RecentCD4count	825	75	0.99 (0.994 – 0.999)	0.013

6. Discussion

This study was conducted with the aim of assessing survival among people living with HIV/AIDS on Highly Active Anti Retroviral Therapy. The overall probability of survival of patients on HAART in this study was 88% at 120 months of follow up. It was higher compared to a study done at Debre Markos Hospital, where survival is 57% at 72 month, Zewditu found in AA (66.4% at 48 month), Cameron (47% at 60 month) and Nepal (82. 9% at 60 months of follow up) (25, 26, 27). The difference may be due to quality of care given to patients. It may also be due to difference in study period, study area and study population. The overall survival rate was similar with a study done at Army force general teaching hospital found in Addis Ababa where it was 88.3% justifying similar back ground of uniformed people(24).

In this group 8.3% of patients were died and it was high (4%) in the first 6 month of follow up. The overall mortality rate was lower compared to other studies in Ethiopia such as, Debre Markos (22.9%), Zewditu (Addis Ababa) (33.6%), and other developing countries such as Cameroon (28.5%) and Ukraine (17.5%) (10, 25, 26, 27). This difference may be due to the strong care and support provided particularly to admitted patients. But the finding is almost similar with studies done in Oromia (10.3%), Axum (8.8%), Nepal (11.7%) and Vietnam (9%) (8, 28, 29, 31), and it was higher compared to a study done in Canada (5%) which may result from difference in quality of care (16).

The high mortality in the first few months of therapy was similar to other studies in different countries (8, 24, 25, 26, 27, 28, 29, 31), and this may be due to immune reconstitution syndrome associated with the initiation of HAART (immunological restoration may unmask a latent opportunistic event) since most of the patients (78% and 74%) had advanced disease as evidenced by a baseline of CD4 <200 cells/μL and advanced WHO stage (stage III and IV) respectively. Also Limited availability and access to HIV testing and counseling (HTC) and ART services in most areas since the police organization has limited number of health institutions that provide HIV care and support, and stigma and discrimination might have played a role in delaying diagnosis and/or treatment that contribute to high mortality. The high mortality in the first few months indicates the need to initiate HAART early, which would require early

diagnosis of the disease. This could be addressed by increasing the number of health facilities that provide HIV care and support within vicinity of police members, in addition to strong health education and mobilization.

Similar with a study (8) there was no significant difference in survival rate between sex groups in our study, however, other studies (16, 25, 27, 28, 31) showed difference in survival rate that might be due to difference in adherence, risk behaviour and financial accessibility, and earlier health seeking behavior of women. Also there is no difference in survival by age group in this study. Survival was significantly different between the groups with and without past history of OIs ($p<0.05$) in our study. Patients with past history of Candidiasis, past history of Cryptococcal meningitis, past history of encephalopathy and past history of herpes simplex had low survival compared to their counterpart groups. In line with our study, a history of oral Candidiasis presents a high mortality rate (25). This could be due to patients with past history of OIs particularly AIDS defining illnesses like Cryptococcal meningitis, Candidiasis and encephalitis might present with low CD4 cell count during initiation of HAART.

In this study patients with baseline weight of <40 kg were at high risk of death compared to those who has >40kg. Similar finding was observed in a study done in Axum and Nepal (28, 31). Lower bodyweight is an indicator of advanced disease (low CD4 and advanced clinical stage) and risk factor of opportunistic infections like TB. Malnutrition, poor immunity, and poor living standards, which are associated with low bodyweight, could also be responsible for the increased risk of mortality. In other studies (27) body mass index (BMI) was found to be the significant predictor of mortality. In our study we excluded it because only weight not height of the patient has been recorded at base line. As a result we couldn't calculate BMI for each patient so that weight was used as proxy measure of BMI of patients.

Patients with baseline bed ridden functional status were at high risk of death compared to those with ambulatory and working functional status ($p<0.05$). This finding was supported by a study done in Nepal (28). Bedridden functional status at HAART initiation reflects the worst health condition of patients. Therefore, the effects of these conditions of patients on mortality indicate

that patients died mostly because of their late initiation of HAART when they had the worst health conditions.

Our study showed no difference in survival by baseline CD4 cell counts, baseline WHO clinical staging and baseline Haemoglobin level. However, survival differences based on baseline CD4 have been revealed in other studies. For instance a study done in Debre Markos hospital showed increased risk of mortality among those whose baseline CD4 cell count was low. Also a study in Axum indicated patients with baseline CD4 cell count < 50 had higher risk of mortality than those with >200. Mortality was higher for patients who began HAART with a severe immune-depression (CD4 <50 cell / ml) in Cameron study (26, 27, 31). Different literatures revealed patients are more prone to develop OIs like tuberculosis and other AIDS defining illnesses when their CD4 cell is low that increases the chance of death.

Unlike to the current study, statistically significant difference in survival time was observed among WHO clinical stages in many other studies (8, 26, 27, 28), where Patients with advanced clinical diseases (WHO stage III or IV) had higher mortality compared to patients with WHO stage I or II. Similarly, survival rate was different among groups with abnormal and normal haemoglobin levels at baseline in many other studies (8, 25, 26, 31). This lack of survival benefits associated with baseline CD4 cells count, baseline WHO clinical staging and baseline Haemoglobin level in our study might be explained by the fact that the majority of patients (78.2%, 74.4% and 76%) had a CD4 <200 cells/μL, advanced WHO clinical stage (III and IV) and normal Haemoglobin level (11 – 15 gm/dl) respectively, which could have made the comparison with counter groups statistically unstable.

In this study, patients who are addicted to soft drugs like khat, shisha and pills were at high risk of death on bivariate analysis. The possible explanation for this difference might be those patients are prone to poor drug adherence and drug toxicity. Patients with history of OIs like PTB and PCP after starting HAART were at high risk of death compared to those who has no history ($p<0.05$) in this study. The development of OIs after initiating HAART may be due to undiagnosed treatment failure. And the reason why needs to be explored.

According to the national treatment guidelines, CPT has to be started for all patients who are eligible for HAART, unless clinical contraindications exist. Being put on chemoprophylaxis at baseline was found to improve survival rate among patients on HAART in different studies where patients starting on CPT had a significantly lower risk of death (8, 26). Lack of survival benefit associated with use of baseline chemoprophylaxis in this study might indicate that physicians were dispensing mainly for high risk patients or due to other reasons that needs to be identified. Whereas patients with current prophylaxis (being on CPT at the end of the study period and on INH and Fluconazol prophylaxis during follow up period) were at high risk of death compared to those who were not ($p<0.006$). it might be due to these patients are more likely to develop OIs as a result of lowered immunity or due to some other reason that requires further study.

Medication adherence is the critical determinant of survival. Non - adherence to HAART leads to virologic, immunologic and clinical failure; it leads to failure to suppress viral replication, thus increasing the likelihood of developing drug-resistant viral strains. It also leads to prevent further viral destruction of the cellular immune system with consequent reduction in the level of CD4+ cells and development of opportunistic infections (18). Studies showed that the risk of death is highest in non adhered patients compared to adhered (25, 26, 30). The same finding is observed in our study that the risk of death in poorly adhered patients is higher than adhered patients.

The impact of HAART regimens on survival of HIV positive peoples could only be positive. According to our study being put on 1e (TDF+3TC+EFV) and 1f (TDF+3TC+NVP) drug regimen at baseline were found to be a cause of high mortality. The reason of this finding might be immune reconstitution syndrome but needs further study. Whereas patients who are taking 1e (TDF+3TC+EFV) and 1f (TDF+3TC+NVP) drug regimen at last date of follow up were found to have lower risk of mortality.

Employment status of not working due to ill health was also found to have impact on survival. This could be due to the ill health as a result of advanced disease and lowered immunity from the virus.

It is known that use of condom during sexual intercourse protects HIV positive patients from acquiring new infection by new HIV strain or other STIs that affect immunity of the person. Use of condom rarely found to increase mortality in this study. According to a study (24) reduced ability to perform activities of daily living led to shorter survival. This reduced ability may arise from worst disease condition of the patient. The study showed that ambulatory and bedridden patients were at higher risk of death than active patients. In agreement with this, our study showed higher risk of death among ambulatory and bedridden patients.

WHO clinical stage has direct association with health status of HIV patients (8, 24, 25, 26, 30). Our study showed that treatment stage one (at last date of follow up) was found to have lower risk of death, which indicates the effectiveness of HAART. The study also showed that, patients who suffered from PCP after starting HAART had increased risk of dying. The finding was in agreement with a study (24). And the reason may be due to undiagnosed treatment failure.

It is to be expected that prophylaxis during the follow up period would have an impact on health status and survival condition of the patient on HAART. Research findings (8, 26) showed that patients who were not on CPT had an increased risk of death. To the contrary our research finding indicates an increased risk of death among those who were taking prophylaxis during the follow up period. This may be due to those patients (who are taking prophylaxis) are in advanced disease condition or lowered immunity so that the prophylaxis is needed.

Three studies (25, 26, 30) showed that HAART adherence is a critical determinant of survival. In agreement with their finding, our study showed that patients with fair drug adherence had higher risk of mortality. This might be due to drug resistance. CD4 cell count have an impact on health status and therefore on mortality of patients on HAART. Different studies (24, 25, 26, 29) point out that low CD4 is a determinant factor for mortality. An increase in CD4 cell count during the follow up period indicates successes of treatment as a result lower mortality. This study arrived at the same conclusion.

7. Strength and Limitation

Strength

- Being a cohort design by itself
- The follow-up time was long enough to estimate survival and it determinants.
- The study used large sample size

Limitation

- Use of secondary data which might have incomplete data.
- Selection bias during data collection is possibly introduced since patients with incomplete records were excluded
- Mortality might be overestimated since the real cause of death is not investigated so that all deaths were considered as HIV/AIDS related. To the opposite it might be underestimated due to the lost to follow up patients that probably include more patients dying at home without being reported.
- Body mass index (BMI) which is a significant predictor of mortality in many other studies could not be calculated in our study. And it is because of the difficulty to find registered base line height. Similarly socio-demographic variables, hemoglobin level and CD4 cell count during the follow up period have faced data incompleteness.

8. Conclusion and Recommendation

8.1 Conclusion

- In conclusion, we found a high overall probability of survival among patients on HAART at Federal Police Referral Hospital.
- Most of the deaths occurred during the first six months of treatment.
- Baseline ART regimen (1e (TDF+3TC+EFV) and 1f (TDF+3TC+NVP)), Not working due to ill health employment status, use of condom rarely, current ambulatory functional status , current bed ridden functional status, PCP after initiating ART, Current WHO Treatment stage one, Prophylaxis during the follow up period, Current ART regimen (1e (TDF+3TC+EFV) and 1f (TDF+3TC+NVP)) , Fair drug adherence and Recent CD4 cell count were predictors of mortality.
- Factors such as age, sex, baseline CD4 cell counts, baseline WHO clinical staging and baseline Haemoglobin level are not associated with mortality.

8.2 Recommendations

- Patients should be encouraged to come forward for early HIV testing and counseling, and to initiate early treatment before they progress to advanced stages.
- Strategies should be designed to decentralize ART service to make the service accessible within vicinity of police members.
- Researches need to be conducted to identify the real cause of death.
- A research also need to be conducted to identify the cause of baseline 1e (TDF+3TC+EFV) and 1f (TDF+3TC+NVP) regimens, and provision of chemoprophylaxis during the follow up period being cause of increased mortality in our study.
- The ART intake forms should be documented properly, if possible implementing HMIS is recommended.

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Annexes

Annex I: Questioner

This Questioner is designed to assess survival and its predictors among HIV patients after the initiation of HAART in ART unit of Federal Police Referral hospital, Addis Ababa, Ethiopia.

Date of review ___/___/___

Name and signature of reviewer_____

Name and signature of the supervisor_____

Date_____

Result:

a) Completed ---------- b) Incomplete ----------c) excluded----------

Action taken for the incomplete and excluded data_____

(Please use additional blank paper if the space is not enough)

Questionnaire ID_____

Part I: socio demographic characteristics

No	Variables	Categories	Skip to	code
101	ART unique ID number	_____		
102	Age (in years)	_____		
103	Sex	1. Male 2. Female	If, 1 go to 105	
104	pregnancy	1. Yes 2. No		
105	Marital status	1. Never married 2. Married 3. Separated 4. Divorced 5. Widowed		
106	Level of Education	1. No education 3. secondary 2. Primary 4. Tertiary		
107	Religion	1. Muslim 2. Orthodox 3. Protestant 4. Catholic 5. Others (specify)_____		
108	Occupational status	1. Governmental employee 2. Non-governmental employee 3. Farmer 6. Merchant 4. Day laborer 7. Driver 5. Unemployed 8. Others (specify) _____		
109	Region/patient address	1. Afar 2. Gambela 3. Oromia 4. SNNPR 5. Tigray 6. Amhara 7. Somali 8. Harar 9.Diredawa 10. BenshangulGumuz 11.Addis Ababa		

Part II: past medical/ treatment history

No	Variable	Categories	Skip to	code
201	Past opportunistic illness	1. No 2. Candidiasis 3. Cryptococcal meningitis 4. Cryptosporidiosis 5. Cytomegalovirus 6. Encephalopathy 7. Salmonella septicemia 8. Wasting syndrome 9. Diss. Atypical mycobacteriosis 10. Diarrhea * 11. Fever** 12. Mycosis 13. Pneumonia*** 14.Herpes simplex* 15. Kaposi sarcoma 16. Toxoplasmosis 17. Recurrent URTI 18.Minor mucocutaneous mani 19. PTB 20. PCP 21.PML 22. PGL 23. Other (specify) _____		
202	Past TB treatment	1. Yes 2. No		
203	If 202 is yes, was treatment completed?	1. Yes 2. No		
204	Past chemoprophylaxis	1. Yes 2. No	If, no go to 301	

* For >1 month ** For >1 month; unexplained *** Recurrent

Part III: Baseline clinical and laboratory information

No	Variable	Category	Skip to	code
301	Base line weight (Kg)	____		
302	Base line functional status	1. Working 2. Ambulatory 3. Bedridden		
303	Base line WHO clinical stage of HIV	1. Stage I 3. Stage III 2. Stage II 4. Stage IV		
304	Base line Hgb level	_____		
305	Base line CD4 count	_____		
306	Base line liver function test (ALT)	1. Yes 2. No		
307	if 306 is yes, result	_____		
308	Prophylaxis at base line	1. Yes 2. No		
309	Baseline ART regiment	`		

Part IV: Baseline social and Risk Behaviour Assessment

No	Variable	Category	Skip to	Code
401	employment status	1. Working full time 3. Work part-time 2. Not working due to ill health 4. Unemployed 5.Other (specify) _____		
402	Supportive care	1. Religious 2. Community 3. Both 4. None		
403	Sero status Disclosure	1. Yes 2. No		
404	Sexual behavior	1. Yes 2. No		
405	If 406 is yes, was it with	1. Regular partner 2. Casual partner 3. both	If 1, go to 409	
406	If 407 is 2 or 3, number of casual partner in the last 3 month	1.1 2. 2 3. 3 4. >3		
407	Condom use	1. NA 2. Never 3. Rarely 4. sometimes 5. Mostly 6.always 7. no response		
408	Addictions	1. Yes 2. No	If no, skip to 501	
409	If 412 is yes,	1. Tobacco 3. Alcohol 2. Soft Drugs* 4. Hard Drugs **		

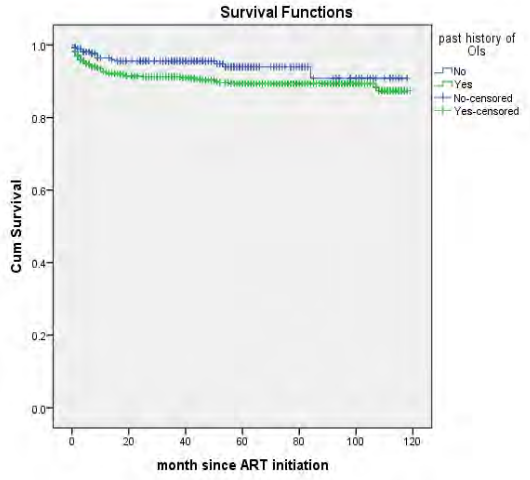
* Soft drugs e.g. khat, shisha, pills etc… **hard drugs e.g. cocane, morphine, Iv drugs, etc…

Part V: Follow up information

No	Variable	Categories	Skip to	Code
501	Date HIV pos confirmed	___/___/___		
502	ART initiation date	___/___/___		
503	Eligibility criteria	1. CD4 cell count 2. WHO stage 3. WHO stage with TLC count 4. Mixed (CD4 & WHO) 5. Mixed (CD4 & TLC count)		
504	Most recent follow up date	___/___/___		
505	Months since ART initiation	____		
506	Current weight	____/kg		
507	Current functional status	1. Working 2. Ambulatory 3.Bed ridden		
508	Current WHO staging	1. Stage I 3. Stage III 5. T1 7. T3 2. Stage II 4. Stage IV 6. T2 8.T4		
509	Opportunistic infection after ART	1. NO 2. Zoster 3. Thrush 4. PTB 5. EPTB 6. DC/DA 7. PCP 8. BP 9. CM 10.CT 11. Ulcer 12. others (specify)_____		
510	Current prophylaxis	1. Yes 2. No		
511	Current ART regiment	1. 1st line 2. 2nd line	If 2, go to 514	
512	If 512 is 1st line,	1. 1a 2.1b 3. 1c 4. 1d 5. 1e 6.1f 7. 1g	Go to 515	
513	If 512 is 2nd line	1. 2a 2. 2b 3. 2c 4. 2d 5. 2e		
514	Current adherence status	1. Good 2. Fair 3. Poor		
515	Recent CD4 count	____		
516	Outcome of the patient	1. On treatment 3. Drop 2. Transfer out 4. Dead		
517	Event	0. Censored 1. Death		

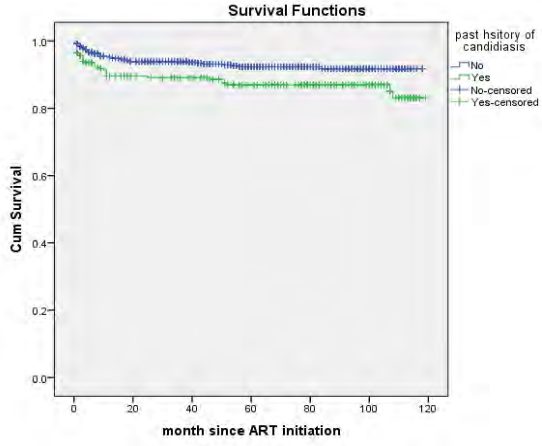
Annex II: Figures from log rank test result

Log rank test was done to compare survival time between groups of variables. The results in the following figures confirm significant difference in survival situation among the categories of past history of OIs, past history of Candidiasis, past history of Cryptococcal meningitis, past history of encephalopathy, past history of herpes simplex, base line weight category, base line functional status, addiction to soft drugs, current weight category, current functional status, history of OIs after ART, history of PTB after ART, history of PCP after ART, current prophylaxis, adherence status and recent CD4 cell count category.



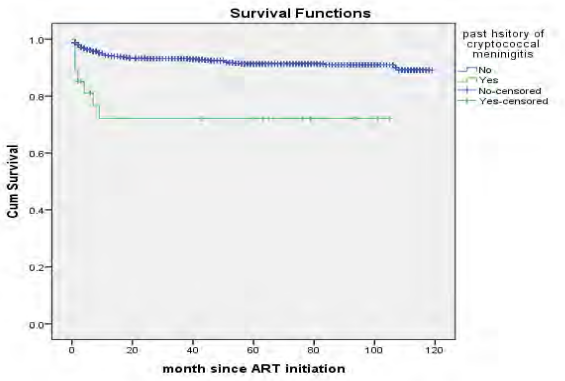
Survival Function by past history of OIs

Patients with past history of OIs were at high risk of death compared to those who has no history of OIs (log rank test, $p<0.04$)



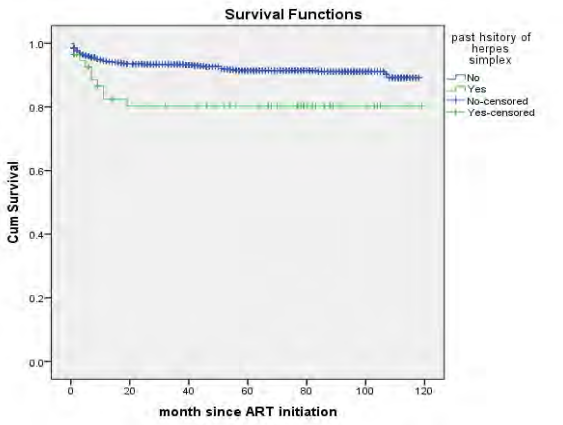
Survival Function by past history of Candidiasis

Patients with past history of Candidiasis were at high risk of death compared to those who has no history (log rank test, $p<0.009$)



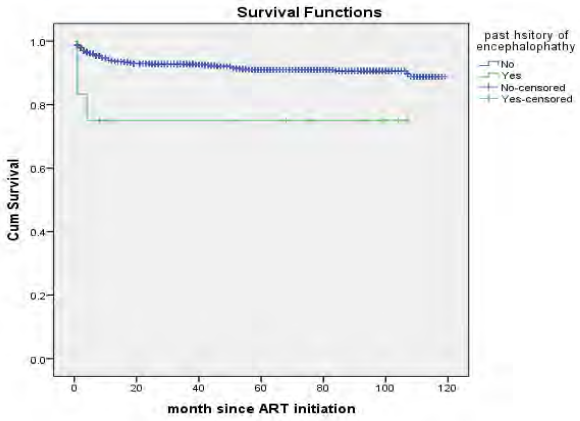
Survival Function by past history of Cryptococcal meningitis

Patients with past history of Cryptococcal meningitis were at high risk of death compared to others (log rank test, p<0.00)



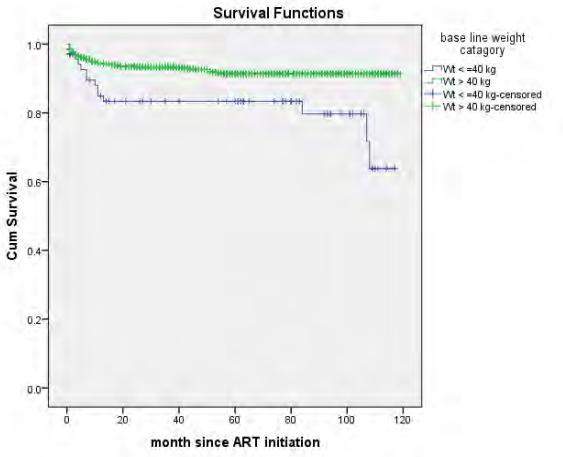
Survival Function by past history of herpes simplex

Patients with past history of herpes simplex were at high risk of death compared to those who has no history (log rank test, p<0.006)



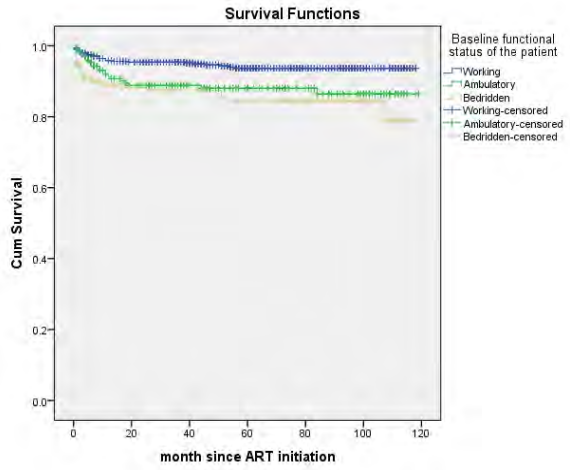
Survival Function by past history of encephalopathy

Patients with past history of encephalopathy were at high risk of death compared to those who has no history (log rank test, p<0.022)



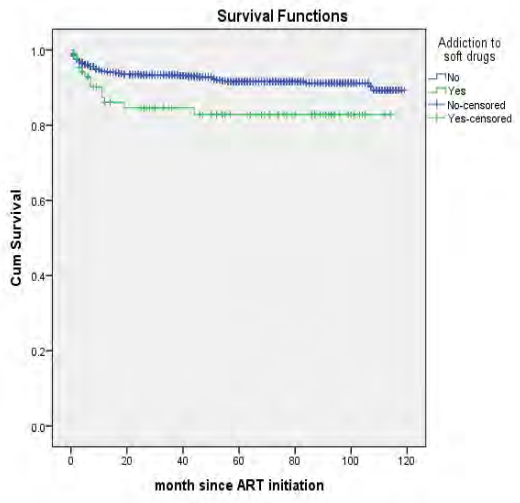
Survival Function by base line weight category

Patients with base line weight of <40 kg were at high risk of death compared to those who has >40kg (log rank test, p<0.00)



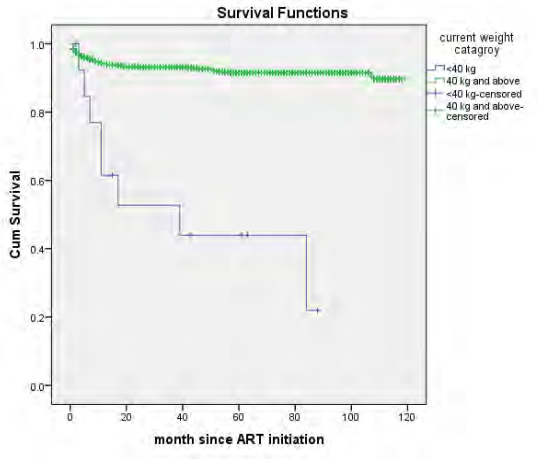
Survival Function by base line functional status

Patients with base line bed ridden functional status were at high risk of death compared to those with ambulatory and working functional status (log rank test, p<0.00)



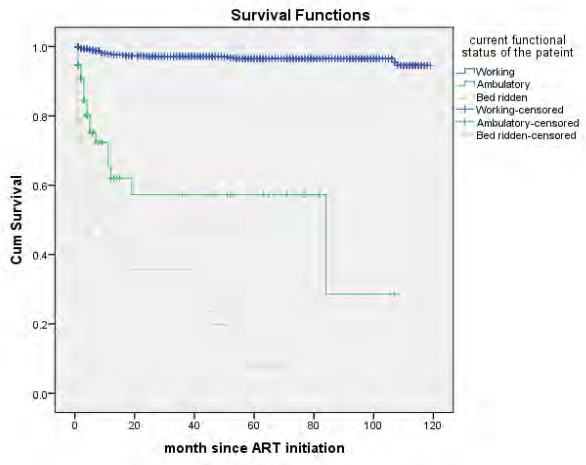
Survival Function by addiction to soft drugs

Patients who are addicted to soft drugs were at high risk of death compared to those who are not (log rank test, p< 0.015)



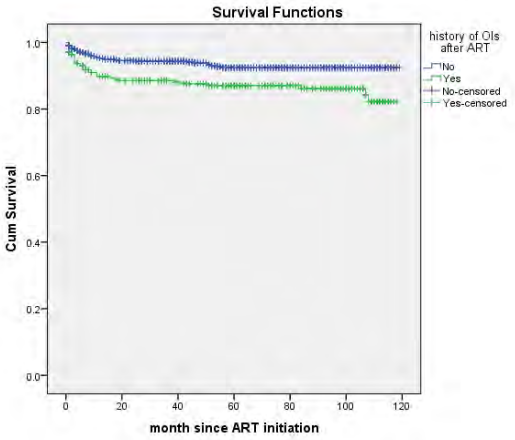
Survival Function by current weight category

Patients with current weight of <40 kg were at high risk of death compared to those who has >40kg (log rank test, p<Log rank 0.000)



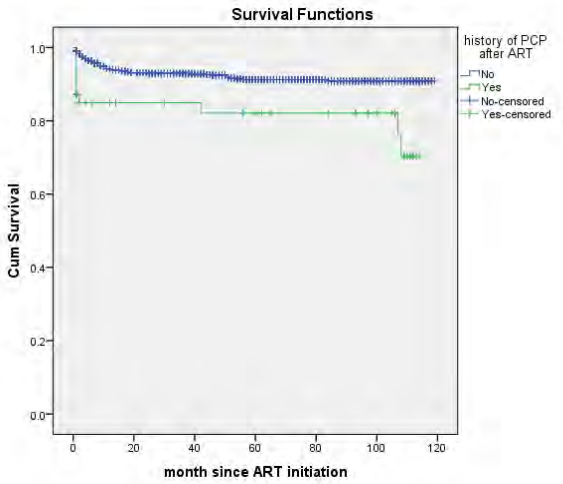
Survival Function by current functional status

Patients with current bed ridden functional status were at high risk of death compared to those with ambulatory and working functional status (log rank test, p<0.000)



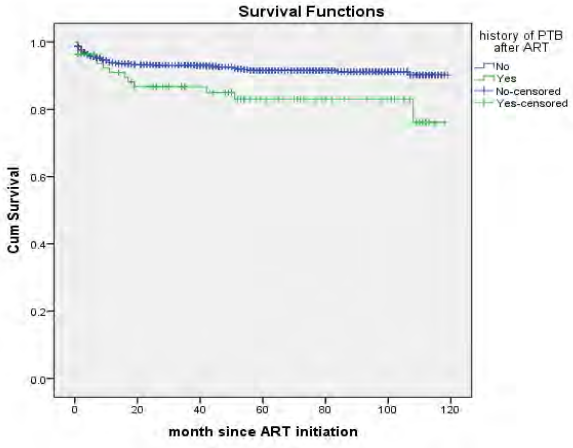
Survival Function by history of OIs after ART

Patients with history of OIs after Art were at high risk of death compared to those who has no history of OIs (log rank test, p<0.002)



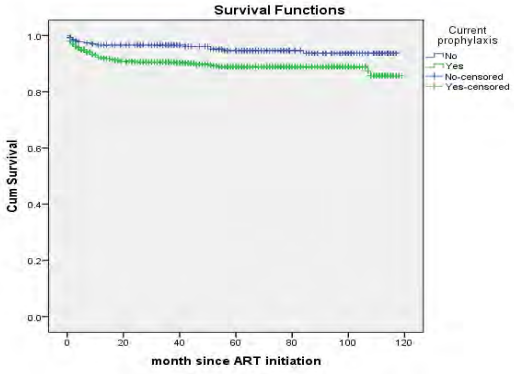
Survival Function by history of PCP after ART

Patients with history of PCP after Art were at high risk of death compared to those who has no history of OIs (log rank test, p<0.001)



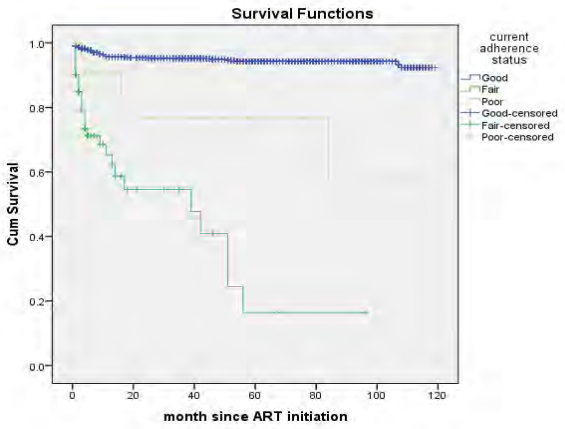
Survival Function by history of PTB after ART

Patients with history of PTB after Art were at high risk of death compared to those who has no history of PTB (log rank test, p<0.013)



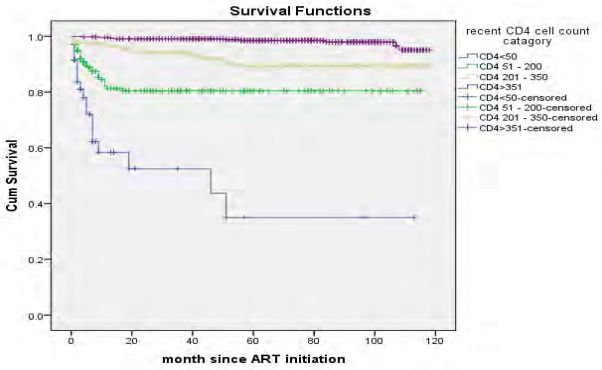
Survival Function by current prophylaxis

Patients with current prophylaxis were at high risk of death compared to those who were not (log rank test, p<0.006)



Survival Function by current adherence status

Patients with poor adherence during follow up period were at high risk of death compared to those with fair and good adherence (log rank test, p<0.000)



Survival Function by recent CD4 count category

Patients with recent CD4 cell count of <50 cells were at high risk of death compared to other categories (log rank test, p<0.000)