

Loss to Follow Up and Missing Clinical Information, a Challenge of Hiv Management Care In A Developing Country; a 14-Year Retrospective Analysis

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Abstract

Background: HIV/AIDS, a transmissible and deadly disease is now a chronic manageable disease. However, loss to follow-up (LTFU) is threatening its manageability by increasing the risk of drug resistance and transmission of resistant strains. Missing critical client information may not be random but predictive of LTFU. The study aims to determine the period prevalence, incidence rates, patterns, predictors and the predictive relationship of missing clinical information with LTFU in an HIV Treatment Program in a developing country.

Methods: A 14-year retrospective analysis was conducted on routinely collected data validated using the Retention and Audit Determination Tool (RADET) from adult HIV clients who initiated treatment from 2008 to 2021 in the HIV treatment centre of Imo State University Teaching Hospital, Nigeria. LTFU was established when a client had not been seen at the clinic for at least 90 days after the last missed scheduled clinic appointment. Kaplan Meier (KM) curves, log-rank test and Cox proportional hazards regression analyses were used to determine the distributions of LTFU and predictors with the level of significance set at $p \leq 0.05$.

Results: The 14-year period prevalence was 39.4% with an incidence rate of 13 new cases of loss to follow-up per 100 HIV clients per year. The majority of the HIV clients (59.3%) had at least one critical missing file information. LTFU were significantly more likely to occur in those aged less than 45 years old (aHR: 1.38, $p < 0.001$) who are males (aHR: 1.19, $p = 0.006$), suspected or diagnosed with TB (aHR: 7.78, $p < 0.001$) and weighing 70kg or less (aHR: 1.79, $p < 0.001$). Missing viral load information (aHR: 51.37 $p < 0.001$) and missing HAART regimen line information (aHR: 8.44, $p < 0.001$) were the most predictive of LTFU in the model.

Conclusion: Though LTFU in HIV patients linked to treatment, appears to be reducing, it is still a significant threat in the management of HIV disease. Further reduction in LTFU could be achieved by institutionalizing biometric capture, improving HIV/TB services and training staff in HIV-enhanced adherence counselling services.

Key Words: HIV, Loss to Follow-Up, Missing Patient Information, Nigeria

Abbreviations

HIV/AIDS: Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome

LTFU: Loss to follow up

RADET: Retention and Audit Determination Tool

TB: Tuberculosis

aHR: Adjusted hazard ratio

HAART: Highly Active Anti-Retroviral Therapy

EMR: Electronic medical records

LGA: Local Government Area

IMSUTH: Imo State University Teaching Hospital

APT: Appointment

PH: Proportional hazard

1. Introduction

Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) has become a controlled but still, potentially transmissible and deadly disease. The combination of Highly Active Anti-Retroviral Therapy (HAART) and high adherence rates has significantly reduced the morbidity and mortality impact of this disease and has changed its course to a chronic manageable disease with better quality and longevity of life [1,2]. However, the challenges and effect of non-adherence and non-compliance as a result of disengagement from clinical care is of significant public health concern in the management outcome of HIV disease. Treatment, good adherence, and regular follow-up have contributed significantly to reducing new HIV infections, related deaths, and risk of transmission [1,2]. Nevertheless, as of 2020, the African region had the highest number of new infections contributing close to 60% of the global incidence burden [3]. So, the disengagement from HIV care, especially in Africa, will significantly impact the management of HIV disease due to the consequent increase in drug resistance, transmission of resistant strains, and rate of hospitalizations [2].

There are many reasons why confirmed cases of HIV disease are disengaged from a specific centre's care after being linked to treatment. These reasons can be broadly categorized based on outcomes such as documented death, which could be from HIV disease or other causes; documented transfers, which could be due to issues of accessibility or stigmatization; and loss to follow up (LTFU), where the outcomes are unknown and also, not distinctly defined as it may often include clients that have self-transferred out or died without documentation or proper notification. Most clients who are not seen in the HIV clinic by three months after their last missed clinic appointment have a very high probability of not returning [4]. Therefore, in practice, loss to follow-up can be said to have occurred when a client has not been seen at the clinic for at least 90 days after the last missed scheduled clinic appointment [4]. The length of the period of LTFU is of significance, because, the longer a person living with HIV is lost to care, the likelihood that treatment adherence may be non-existent or low with associated viral load rebounds. Also, they become potential sources of HIV transmission with a possible outcome of death [5].

The Management of LTFU is faced with the challenges of follow-up with up to 55% of previously linked clients in HIV programmes across Africa subsequently becoming untraceable due to incorrect or missing contact numbers and addresses [6]. The effectiveness of follow-up tracing is linked with the completeness and correctness of health records which is a fundamental dimension of data quality [7]. Sub-Saharan Africa has increasingly been adopting the use of Electronic Medical Records (EMR) through the collaboration and support of international agencies and African institutions in HIV treatment programs [8]. Despite this support, the level of EMR utilization in Africa is low and when present, it is suboptimal due to poor infrastructure, high maintenance cost, and lack of Information Communication Technology (ICT) oriented manpower [9]. This has led to the practice of parallel use of paper-based free text and standardized forms that are subsequently inputted by data clerks into the electronic database. This process has resulted in high rates of missing patient information [10].

Missing client information has been reported to be substantial, inevitable, common and multifaceted; and this may involve missing variables in demographic, clinical and laboratory information [11,12]. Missing information may arise from a lack of collection where the test is not done or the client is not asked about the variable, or from a lack of documentation where the test is done or the client is asked about the variable but it is not recorded [13]. There are various underlying reasons why patient information is not collected or documented and some of these reasons may be hinged on stigma and issues of confidentiality and therefore, may not be random or due to the process of data collection but related to the outcome of LTFU [12,14].

Despite being eligible for HAART with the test and treat policy, many people living with HIV in middle and low-income countries are unwilling to initiate treatment; and the fundamental reasons for non-initiation such as fear of stigmatization and issues of non-confidentiality may persist even when treatment is eventually initiated [14]. Therefore, anecdotally, there may be tendencies to withhold information, provide false information or even use third parties working in the health facility as proxies resulting in a lack of appropriate patient monitoring, adherence counselling and incomplete patient information. As a result, the frequency of miss-

ingness of client information probably could convey the likelihood that the client will be lost to follow-up, therefore, this study aims to determine the period prevalence, incidence rates, patterns, predictors of HIV Treatment loss to follow up and its relationship to missing patient information.

2. Method

2.1 Study Area

The study site, Imo State University Teaching hospital HIV treatment centre is an outpatient clinic situated in Orlu Local Government Area (LGA), one of the 12 LGAs that comprise Imo West Senatorial zone and occupies an area of 132.95 km² with a population density of about 1,074 persons/km² according to the 2006 census [15]. Imo State University Teaching Hospital, Orlu is a tertiary institution of comprehensive training, research and health care delivery. Since the inception of the HIV treatment centre, it has enrolled over 8000 adults and children living with HIV disease in Imo State and neighbouring States.

2.2 Study Design/Selection Criteria

The study design was a 14-year record-based retrospective analysis of HIV clients who initiated treatment from 1st April 2008 to 4th November 2021. The study included clients aged 18 years and above and there were no exclusion criteria.

2.3 Event, Censorship, Follow-up and Survival time

The study event “loss to follow-up” was established when a client had not been seen at the clinic for at least 90 days after the last missed scheduled clinic appointment. Notified deaths and documented transfers were left-censored and HIV clients that continued with treatment at least up to the end of the study period were right-censored.

The follow-up time contributed by the study participants was determined by the time the follow-up began when the client was enrolled into care and commenced HAART (Treatment Enrollment) to the end of the follow-up period when the client either died and was notified, or transferred out and was documented, or lost to follow up with no documented reason or remained in care till the end of the study period.

The survival time used to plot the survival distributions is the time duration from HIV client treatment enrollment to the event “loss to follow-up”.

2.4 Data Collection and Analysis

Data were extracted from the HIV IMSUTH database that comprises routinely collected data validated using the Retention and Audit Determination Tool (RADET). The extracted data was exported to the IBM-SPSS software platform and analyzed using version 23. Frequency tables, percentages, mean, median, standard deviation, and interquartile range were used to summarize the data.

Time to LTFU was modelled using survival analysis methods; Kaplan Meier curves and the log-rank test was used to compare the survival distributions of time to LTFU between subgroups of categorical variables.

A multivariate Cox proportional hazards regression analysis was used to determine the predictors of LTFU by examining the independent contributions of age, gender, HAART regimen line, TB status and bodyweight to “loss to follow-up”. Violation of the PH assumption using the Log (-Log) survival versus time graph and the proportion of missing information in each variable was taken into consideration in developing the cox regression model. Viral load data were excluded from the model because of PH violation and missing information which was more than 20%. Missing data for purposes of the Cox regression analysis was handled using list wise deletion.

Furthermore, another multivariate Cox proportional hazards regression model was developed to determine the predictive relationship of missing information with LTFU. The following variables with missing information were subcategorized based on missing status; HAART regimen line, TB status, body weight, and viral load. These variables were subsequently included in the final model except the variable “phone number on file” after assessing for violation of the PH assumption.

Adjusted hazard ratios (aHRs) and 95% confidence intervals (CIs) were computed and the level of significance was set at $p \leq 0.05$.

3. Results

A total of 8223 cases were selected from the database comprising HIV clients who initiated treatment in the HIV treatment centre of Imo State University Teaching Hospital. The total follow-up time was 24316 person-years.

Variable	Frequency N=8223	Per cent
Age		
Youth (18-24 years)	644	7.8
Young Aged (25-44 years)	5219	63.4
Middle Aged (45-60 years)	2084	25.3
Elderly (Older than 60 years)	276	3.4
Mean (SD) yrs. 38.6 (10.9)		
Gender		
Female	5586	67.9
Male	2637	32.1
Phone number on file		
Available	5884	71.6
Missing Information	2339	28.4
Client place of Origin		
Abia	85	1.0
Akwa Ibom	26	0.3
Anambra	331	4.0
Benue	14	0.2
Cross River	13	0.2
Delta	11	0.1
Ebonyi	43	0.5
Enugu	47	0.6
Imo	7600	92.4
Rivers	25	0.3
Other States in Nigeria	28	0.3
Appointment Status		
Active- Appointment on time	4100	49.9
Active- Missed APT (Up to 30 days)	117	1.4
Active-Missed APT (>30 to 60 days)	80	1.0
Active- Missed APT (>60 to 90 days)	10	0.1
NOT Active	3916	47.6

Table 1: Sociodemographic characteristics of HIV clients enrolled in the HIV Treatment Centre of IMSUTH

Table 1 shows that a majority of the HIV clients enrolled were between the ages of 25 to 44 years (63.4%), female (67.9%) with more than one-quarter of the clients without phone information on

file (28.4%). However, close to half of the clients (49.9%) were actively taking their drugs and had not missed their scheduled appointment.

Variable	Frequency N=8223	Per cent
Body Weight Grouping		
Below average wt. (< 55kg)	1585	19.3
Average wt. (55-70kg)	3677	44.7
Above-average wt. (> 70kg)	1444	17.6
Missing Information	1517	18.4
Mean (SD)kg 51.49 (27.35)		
TB Status		
No TB Sign or Symptom	7222	87.8
TB Suspected/Diagnosed	199	2.4
Missing Information	802	9.8
HAART Regimen Line		
1st line treatment	7310	88.9
2nd line treatment	236	2.9
Missing information	677	8.2
Viral Load Grouping		
Low Undetectable (< 50cpm)	3227	39.2
Low Detectable (50-200cpm)	250	3.0
Moderate (> 200 - 1000cpm)	163	2.0
High (> 1000cpm)	407	4.9
Missing Information	4176	50.8
Median (IQR) cpm 20.0 (18.0)		
Client Status		
Active	4307	52.4
Dead	399	4.9
LTFU	3240	39.4
Transferred out	278	3.4

Table 2: Clinical characteristics of HIV clients enrolled in the HIV Treatment Centre of IMSUTH

Table 2 shows the 14-year period prevalence rate of LTFU as 39.4% and the computed incidence rate as 13 cases of loss to follow-up per 100 HIV clients per year. A majority of the HIV clients weighed 55kg or more (62.3%) and had undetectable viral loads (39.2%). Most of the clients were on first-line HAART drugs

(88.9%) and were without symptoms or signs of Tuberculosis (87.8%). Furthermore, missing clinical information ranged from 8.2% to 50.8% with the highest proportion from missing viral load information.

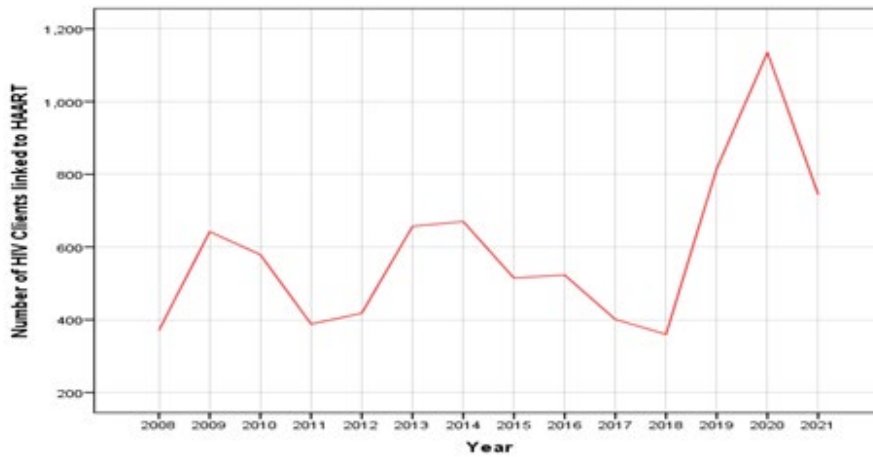


Figure 1: Pattern of HAART enrollment among HIV clients in IMSUTH

In figure 1, a gradual decrease was observed in the number of clients enrolled and linked to HAART from 2014 to 2018 with a sudden increase from 2018 to 2020 followed by a decrease in 2021.

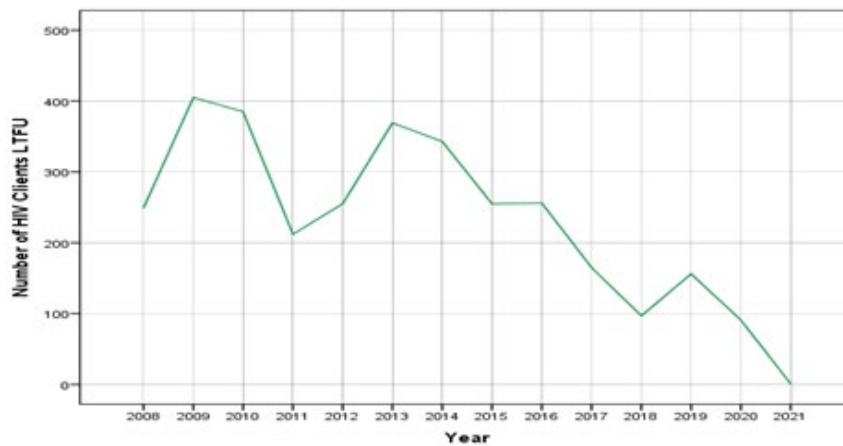


Figure 2: Pattern of LTFU among HIV Clients in IMSUTH

In figure 2, a gradual decrease was observed in the number of clients lost to follow-up from 2013 to 2021 with a spike between 2018 and 2019.

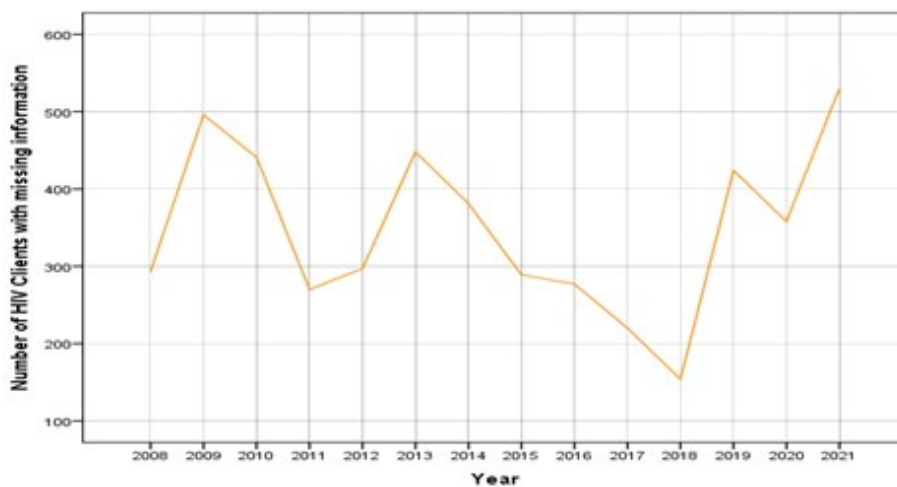


Figure 3: Pattern of missing information among HIV Clients in IMSUTH

In figure 3, a gradual decrease was observed in the number of HIV clients with at least one missing information from 2013 to 2018 which was followed by an increase from 2018 to 2021 with a dip between 2019 and 2020.

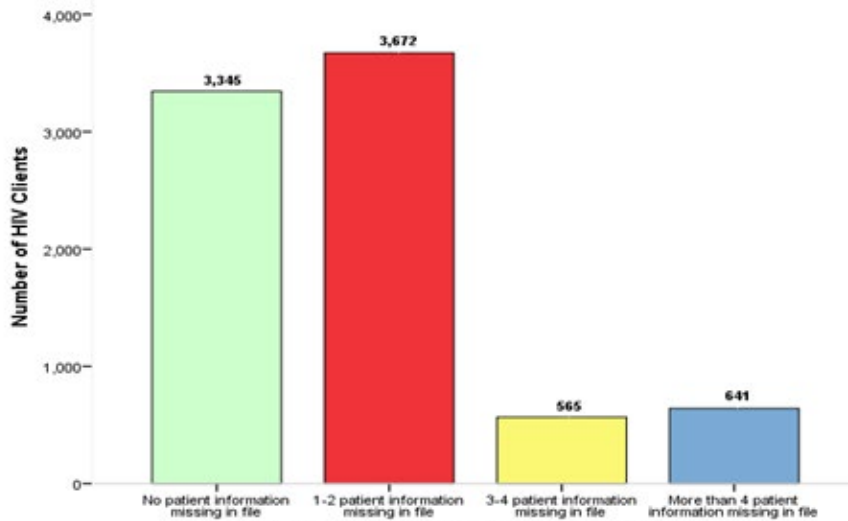


Figure 4: Distribution of missing HIV Client information in IMSUTH

Figure 4 shows that a majority of HIV clients (59.3%) had at least one missing piece of information in their files.

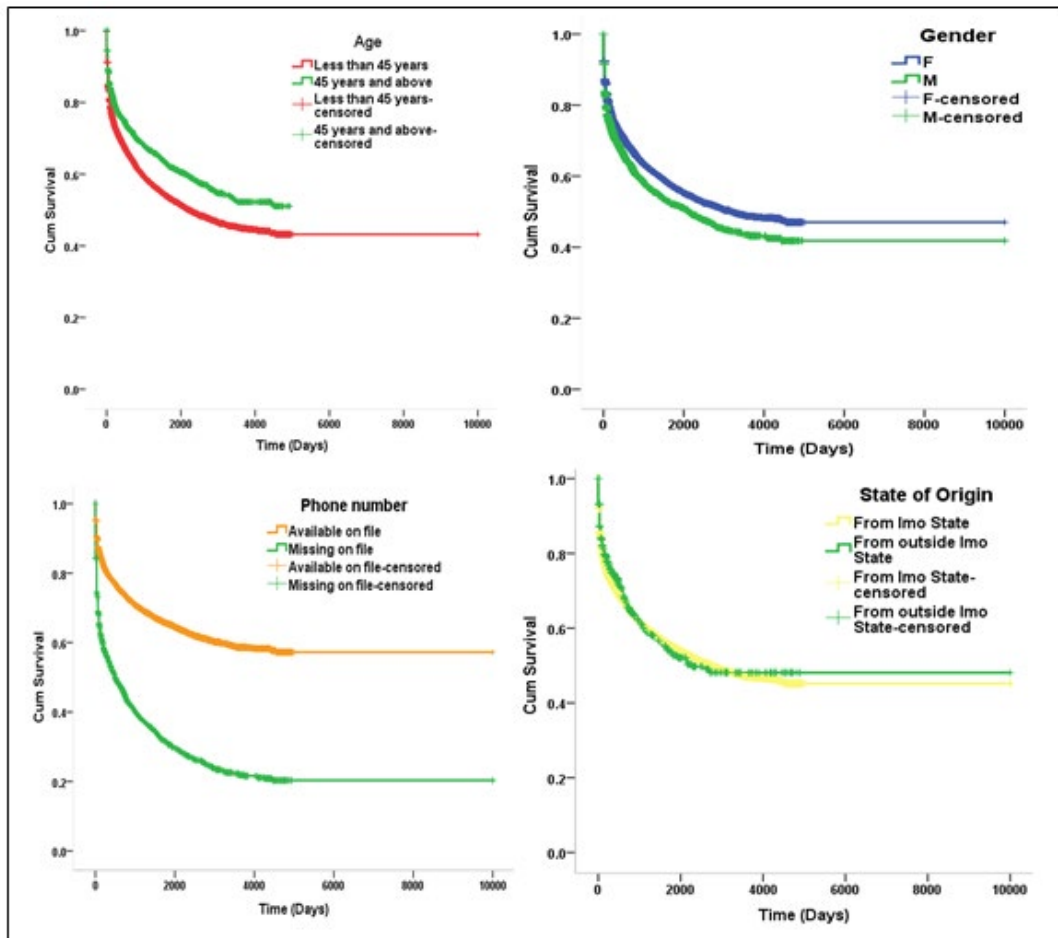


Figure 5: Survival distributions based on the Sociodemographic Characteristics of IMSUTH HIV clients

In figure 5, the survival distributions show a statistically significant shorter time duration from treatment enrollment to loss to follow-up in HIV clients aged less than 45 years compared to those 45 years or older ($\text{Log } R\chi^2 = 45.9, p < 0.001$), in males compared to

females ($\text{Log } R\chi^2 = 19.4, p < 0.001$) and in those that have missing phone number information compared to those that have phone number information on file ($\text{Log } R\chi^2 = 892.0, p < 0.001$).

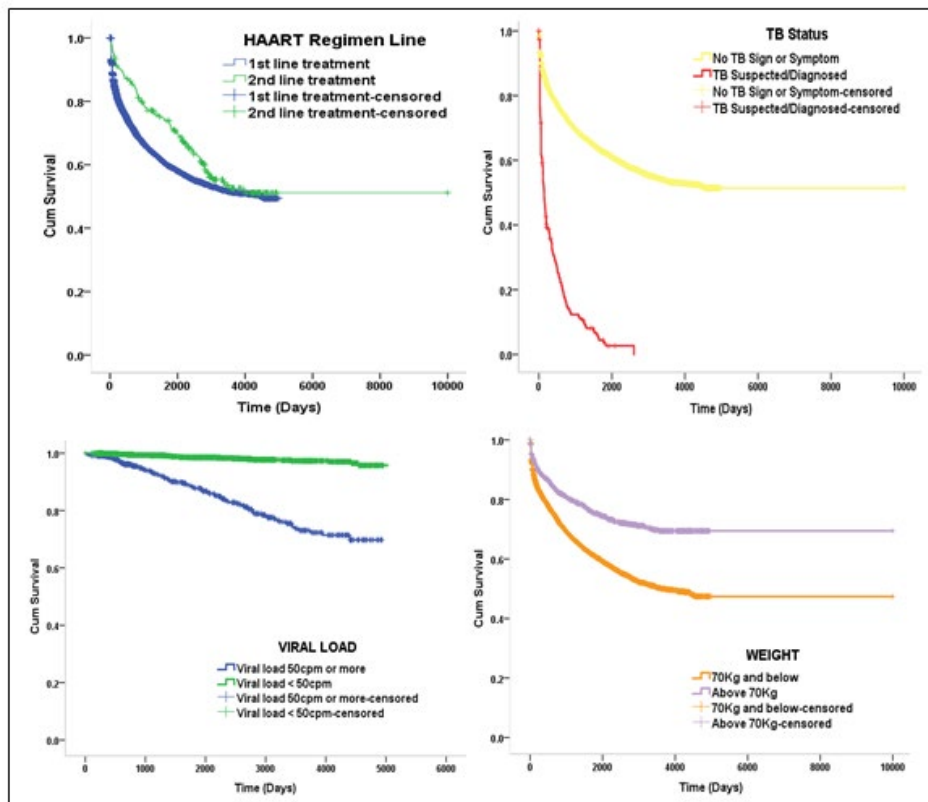


Figure 6: Survival distributions based on the Clinical Characteristics of IMSUTH HIV clients

In figure 6, the survival distributions show a statistically significant shorter time duration from treatment enrollment to loss to follow-up in HIV clients on first-line treatment regimen compared to those on second-line treatment regimen (Log $R\chi^2= 5.0, p=0.025$), in those suspected and diagnosed with tuberculosis compared to

those with no sign or symptom of tuberculosis (Log $R\chi^2= 554.5, p<0.001$), in those that have viral loads of 50 copies per ml or more compared to those that have less than 50 copies per ml (Log $R\chi^2= 254.6, p<0.001$), and in those that weigh 70kg or less compared to those that weigh more than 70kg (Log $R\chi^2= 104.0, p<0.001$).

Variable	Adjusted Hazard Ratio	95% Confidence Interval	p-value
Age			
Less than 45 years old	1.379	1.202-1.582	<0.001
45 years and older	1.000	-----	
Gender			
Male	1.189	1.051-1.345	0.006
Female	1.000	-----	
Body Weight			
70kg or less	1.789	1.533-2.086	<0.001
More than 70kg	1.000	-----	
TB Status			
TB Suspected/Diagnosed	7.775	6.286-9.616	<0.001
No TB Sign or Symptom	1.000	-----	
HAART Regimen Line			
1st line treatment	0.996	0.772-1.285	0.975
2nd line treatment	1.000	-----	

Table 3: Predictors of LTFU among enrolled IMSUTH HIV clients (Multivariate Cox proportional hazards regression analysis)

Table 3 shows that HIV clients who were male, less than 45 years old, suspected or diagnosed with TB, weighing 70kg or less were significantly more likely to be lost to follow-up when compared with their respective co-subcategories ($p < 0.05$).

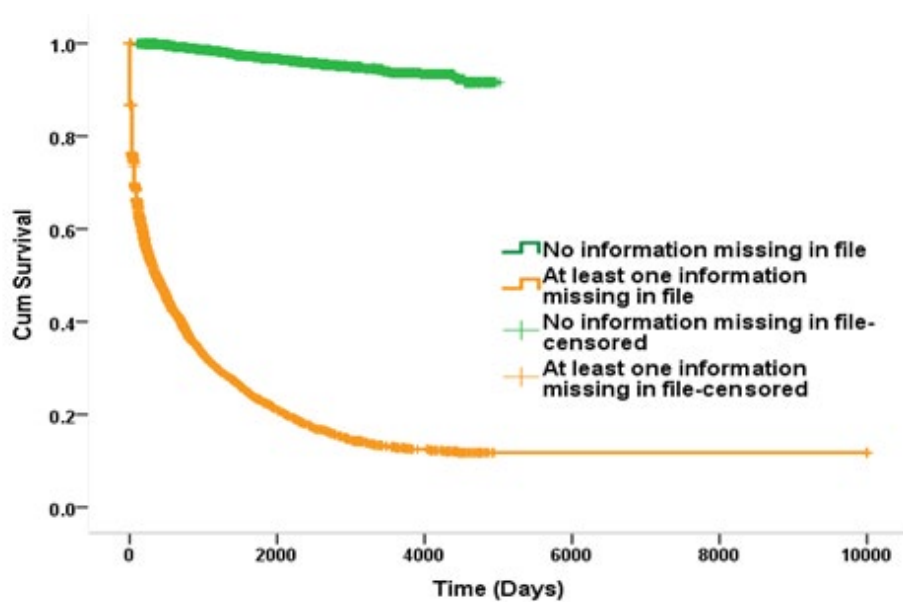


Figure 7: Survival distributions of missing information status of HIV clients in IMSUTH

In figure 7, the survival distribution shows a statistically significant shorter time duration from treatment enrollment to loss to follow-up in HIV clients that had at least one information missing

on file compared to those with no information missing on file (Log $R\chi^2 = 3977.5, p < 0.001$).

Variable	Adjusted Hazard Ratio	95% Confidence Interval	p-value
Body Weight			
Missing information	1.327	1.190-1.480	<0.001
Information available	1.000	-----	
TB Status			
Missing information	2.721	2.363-3.134	<0.001
Information available	1.000	-----	
HAART Regimen Line			
Missing information	8.443	7.253-9.827	<0.001
Information available	1.000	-----	
Viral Load			
Missing information	51.370	43.457-60.725	<0.001
Information available	1.000	-----	

Table 4: Predictive relationship between missing information status of clinical variables and LTFU among enrolled IMSUTH HIV clients (Multivariate Cox proportional hazards regression analysis)

In table 4, the Cox regression model analysis showed that missing information on body weight, TB status, HAART regimen line and viral load respectively were progressively significantly more likely to be predictive of loss to follow-up ($p < 0.05$).

4. Discussion

The study determined the period prevalence rate, incidence rate, patterns, predictors of loss to follow up and the predictive relationship of missing clinical information in an HIV Treatment Program of a Tertiary Health Centre in Nigeria.

Over the 14-year study period, it was observed that the prevalence rate was 39.4% however, a similar study that collected data from January to November 2017 in Lagos University Teaching Hospital in South Western Nigeria reported an LTFU prevalence of 56% [16]. This prevalence appeared to be significantly higher than that observed during the same year in the present study which was about

41%. This higher prevalence was observed even though the LTFU criterium for the Lagos study was 180 days without care services as against 90 days in the present study. Another study done in Ghana from 2006 to 2017 reported a lower LTFU prevalence of 27% using the same LTFU criteria as the present study [17]. Furthermore, the present study, observed that there was an average incidence rate of 13 new cases of loss to follow-up per 100 HIV clients per year (100 person-years). These incidence rates appear to vary over time and place as this study's rate was observed to be close to double the average rate reported in one study in Uganda [18] from 2012 to 2016 where the overall incidence rate of LTFU was 7.5 per 100 person-years of observation [18]. Also, in another similar study in Uganda from 2015 to 2017, an incidence rate of 25 per 100 person-years was reported [19]. However, in the present study, the yearly prevalence and incidence rate of LTFU respectively, generally was observed to have progressively reduced from as high as 63% and 50 new cases per 100 enrolled HIV clients per year in 2009 to as low as 8% and 4 new cases per 100 enrolled HIV clients per year in 2020. This trend could be due to a combination of factors such as decreasing stigmatization, the introduction of biometric capture and community testing-treatment linkage programs.

Furthermore, it was observed that HIV clients who had their phone numbers missing on file had a significantly shorter time duration from treatment enrollment to loss to follow-up and also, there was a significantly higher than expected number of HIV clients not active on treatment with phone numbers missing on file. HIV clients had the highest proportion of those aged 18-24 years old with missing phone numbers on file. Missing phone numbers could be due to some reasons; such as, not being willing to provide a number to further mask identities and the operation of third parties acting as proxies with the intention of collecting drugs for illicit uses; or simply, not having a functional phone as observed in other studies where there was an increased risk of loss to follow up among patients without a contact telephone [18,19].

During the period from 2018 to 2019, there was an increase in treatment enrollment, the number of clients lost to follow-up and the number of clients with missing clinical information in their files. The introduction of biometric capture in 2019 appears to have curtailed some of the actions of third-party operators and despite an increase in treatment enrollment, there was a decrease in the number of clients lost to follow-up and in the number of clients with missing clinical information. The biometric capture appears to be an effective strategy in the follow-up and retention of HIV clients enrolled in treatment.

Age and gender appeared to be related to LTFU with HIV clients less than 45 years old having a higher proportion of those lost to follow compared to those aged 45 years and older. It was also observed that clients less than 45 years old were 38% more likely to be lost to follow-up. On further analysis, younger clients particularly within the age category of 18-24 years old had the highest proportion of those lost to follow up and this was similarly

reported in other studies [18-20] where it was observed that the incidence rate of LTFU was highest in young people.

Younger adults appear to be more mobile due to their job and educational opportunities. Also, they appear to be more sensitive to stigmatization and likely exposure from social media as there is always a possibility of being the subject of discussion in an environment ruled by social media in which this age group is an active and significant participant. These observations may be contributing to the high proportion of LTFU among this age group.

Furthermore, male HIV clients had a higher proportion of clients lost to follow-up compared to females and were 19% more likely to be lost to follow-up. Similarly, studies in Northern Nigeria and rural Tanzania reported that LTFU was associated with being male but on the contrary, a study in urban Uganda reported that females had a higher incidence of LTFU [19-21]. These varying observations could be attributed to the different cultural environment and their respective gender roles in the family unit.

The body weight of HIV clients appeared to have a relationship with being lost to follow-up. It was observed that there was a significantly shorter time duration from treatment enrollment to loss to follow-up in HIV clients weighing 70kg or less and that, they were 79% more likely than those weighing more than 70kg to be LTFU. On further analysis, it was observed that those weighing less than 45kg had the highest proportion of those LTFU (74%) and similarly, it was reported in other studies, that those weighing less than 45kg had the highest incidence rate of LTFU or underweight patients were more likely to be LTFU [18-20]. This observation was different from a study done in Malawi where it was reported that HIV patients lost to follow-up had a higher body mass index [22]. However, severe HIV disease is associated with weight loss and despite treatment commencement, weight recovery may be slow and not felt; as a result, due to culture and individual beliefs, these clients may leave the clinics to seek other options such as religious and traditional remedies to address the weight loss which is an indicator health status. The resulting consequences are that the clients may self-delink from HIV adherence and treatment leading to further weight loss, increased morbidity and eventual mortality. These outcomes may not be known or documented by the health facility, thereby contributing to the pool of clients categorized as LTFU. The key informant interview conducted by Opio et al, reported that some patients relied on spiritual and cultural beliefs for a cure, resulting in being misled and abandoning treatment [19].

Tuberculosis is one of the leading causes of death among people living with HIV and therefore could be contributing significantly to LTFU from undocumented deaths. In the present study, it was observed that only about 10% of those who were suspected or diagnosed with tuberculosis had their deaths documented and as high as 88% were categorized as LTFU therefore, a significant proportion of those categorized as LTFU could be undocumented

deaths. Similarly, a study in Uganda, reported that the highest incidence rates of LTFU were observed in HIV patients suspected or diagnosed with tuberculosis [18]. On the contrary, a study done in Tanzania reported that HIV patients with tuberculosis were less likely to become LTFU [20]. Also, another study done in Indonesia reported that there was no significant relationship between being an HIV patient with TB infection and the incidence of LTFU. However, the present study observed that HIV clients suspected and diagnosed with tuberculosis had a significantly shorter time duration from treatment enrollment to loss to follow-up and were eight times more likely than those without signs or symptoms of tuberculosis to be LTFU. These varying observations could be due to the availability, type and level of HIV/TB care services being provided by the different centres. So, for centres falling short of adequate and appropriate care, it is critical to intensify efforts on specific patient retention strategies, counselling and supportive activities for HIV patients suspected or diagnosed with tuberculosis, to reduce the likelihood of LTFU in these patients.

The preferred and strongly recommended approach for HIV treatment monitoring is viral load testing. Even though HIV patients with viral loads of more than 50 copies per ml are provided with enhanced adherence counselling support, it was observed that HIV clients in the present study with viral loads of 50 copies per ml or more had a shorter time duration from treatment enrollment to loss to follow-up. Similarly, Mancinelli et al reported a higher mean viral load in HIV patients LTFU [22]. So, it may appear that either the enhanced adherence counselling is not effectively being carried out or its effect is not significant enough to maintain the HIV clients in the treatment programme. The key informant interviewer report from the study by Opio et al appears to capture what is happening in our study centre, where only one counsellor serves many clients, so the individual counselling sessions are very short and due to time constraints the counsellor occasionally reverts to group sessions which are unable to address the individual and peculiar concerns and needs of the clients [19].

In the present study, missing information appears to be substantial with as high as 59% of HIV clients having at least one missing clinical information in their file. Furthermore, it was observed that the time duration from treatment enrollment to loss to follow-up was significantly shorter in HIV clients that had at least one missing clinical information compared to those with no information missing on file.

The missing clinical information also appears not to be random or due to the process of data collection but rather, related to the outcome of LTFU as it was observed that missing information in body weight, Tuberculosis status, HIV regimen and viral load were predictors of LTFU. This was similarly observed in a work done by Sharafoddini et al, where it was demonstrated that the presence or absence of laboratory test measurements is informative and has predictive power beyond the measured data themselves [12].

5. Conclusion

LTFU in HIV patients linked to treatment, though appears to be reducing, is still a significant threat in the management of HIV disease. Generally, there should be a high index of suspicion of the likelihood of LTFU when managing people living with HIV disease and specifically in those that are young, with low body weights, suspected or diagnosed with tuberculosis or have high viral loads. To reduce LTFU, strategies such as biometric capture should be institutionalized, special attention should be given to improving the HIV/TB care and counselling services and additional staff for HIV enhanced adherence counselling should be engaged and trained.

Conflict of interests

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

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Authors Contributions

CAI contributed to the study design, literature review, data acquisition, analysis, research interpretation and write-up of the first and final draft. EI, ICN and OMP contributed to the study design, discussions and final draft. PKB contributed to the literature review, data acquisition and final draft and MAI contributed to the literature review, data analysis and final draft. All authors read and approved the final article submitted.

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