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Original Research Article

Quality of care, loss to follow-up and mortality among paediatric and adolescent HIV patients on antiretroviral therapy in Abuja, Nigeria: a 15-year retrospective review

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ABSTRACT

Background: Loss to follow up, and mortality still remains very high among HIV positive children and adolescents in many under privileged settings, in spite of massive scale up of anti-retroviral treatment. We assessed the quality of care using 7-point indicators, loss to follow up, and mortality among HIV positive children and adolescents in our health institution.
Method: A 15-year (2006 to 2020) retrospective review was conducted among HIV positive children who assessed care in paediatric out-patient special treatment clinic of our tertiary health institution in Nigeria for above objective.
Results: Of the 563 subjects initiated on antiretroviral therapy, 349 (62.0%) still remained on treatment. There were 285 (50.6%) males, highest enrollment 280 (49.7%) was at 2006-2010, most 192 (34.1%) were 0-24 months of age, 244 (43.3%) were under-weight, and 176 (31.3%) had severe immune suppression at enrollment. Sixty-eight (12.1%) were lost to follow-up, mortality was 14 (2.5%), 103 (18.3.1%), and 25 (4.4%) were transferred to adult clinic, and to other centers. While over 85% had a high-quality indicator score of 458 (81.4%), with significant difference between the male and female (x^2=8.56, p=0.003,), only 231 (66.2%) had adequate viral suppression of <20 cpoies/ml at the end the review period. There was significant association between quality indicator score and loss to follow up**,** OR=0.033 (0.02-0.06), p>0.001 with multivariate analysis.
Conclusions: Though the study recorded high quality score services to HIV positive children and adolescents in our center, loss to follow-up, and mortality was however high. More is needed to be done to improve the viral load suppression among our clients.

Keywords: Quality of care, HIV positive children and adolescents, Antiretroviral therapy, Process indicators, Loss to follow-up, Mortality

INTRODUCTION

Over the past 15 years' anti-retroviral therapy (ART) has been massively scaled up in low and middle income countries, and by mid-2017 over 21 million people were on ART globally.[1,2] Nigeria is second to South Africa in the global burden of HIV with over 3.3 million of her population living with this virus of which 360,000 were children below 15 years.[1] Access to pediatric ART in low and middle income countries has recorded dramatically increase from 71,500 in 2005 to 740,000 by 2013, translating to increase of 11% to 23%.[2] However, in many

of these under privileged settings, mortality and loss to follow up still remains high.[3,4] For optimal care and treatment to be achieved, infected children must be provided with quality services to addresses their multifaceted needs, which ranges from adherence counseling for optimal viral suppression, to timely laboratory monitoring, screening for opportunistic infections, disclosure issues, nutritional support, and other relevant services.[5] Quality of health care is defined as the extent to which the elements of health care services provided to individuals and populations improves their desired health outcomes in consistent with the current professional knowledge.[6,7] These elements otherwise known as performance indicators include the structures in the health care system, process of care, and outcomes resulting from care.[6,7] Structure implies human resource availability in the health care setting; process of care is the aspects of encounter with the patient and tests ordered; while outcome is the patient's subsequent health status.[6,7] Structures and processes influences outcome, directly or indirectly, and this is particularly worrisome in low income settings where resources for structural or procedural changes of processes of care indicators are highly limited.

With 24% HIV global disease burden, and 3% global health workforce, severe health worker shortage became a very crucial issue especially in sub-Saharan African countries. Task shifting was then accepted globally as a strategy to improve access to care and meet the demand for initiating and managing more patients on ART.[8] This involve redistribution of healthcare tasks to make efficient use of available workers by shifting from physicians' task to nurses. Numerous studies in sub-Saharan Africa have attested positive outcome of task-shifting and decentralization of services.[9-11] Studies has also attested some positive outcome with process indicators such as CD4 cell count, viral load, adherence to ART, nutrition support, and disclosures, though most of these clinical outcome are frequently collected for programmatic monitoring and evaluation of infected patients.[12-14]

Unlike successes with structural indicators and outcome, correlation between process indicators and outcomes variables has not been well explored in resource limited settings.[15,16] Such studies have shown significant challenges such as high rates of loss to follow-up, and early mortality which they attributed to late presentation of their clients, malnutrition, lack of caregiver involvement, non-disclosure, and HIV-related stigma.[16-18] Though coordinated efforts have been put in place in Nigeria to increase access to paediatric and adolescent ART since 2005, the standard of care and treatment has not been given priority to this unprecedented scale-up in ART when compared to the adult population. Hence this study was carried out to explore the process indicator of quality of care to pediatric and adolescent patients on ART in our center, and determine its association to loss to follow-up, and mortality.

METHODS

A retrospective study was conducted among 563 HIV positive children and adolescents aged 2 months to 18 years initiated on ART at the paediatric out-patient special treatment clinic (POSTC) of the university of Abuja teaching hospital (UATH) over a 15-year period of May 2006 to June 2020. POSTC is an out-patient clinical service area where HIV infected children/adolescents and exposed babies were followed up for treatment and monitoring. It has consulting rooms for the doctors, the nurses, and adherence counselors. Record clerks, pharmacists, laboratory technicians, laboratory scientists and nutritionists are also at their disposal on week days (Monday-Friday, from 7.30 am to 4 pm). UATH is a 350-bed capacity referral hospital, sub-serving the people of federal capital territory (FCT) Abuja and four neighboring states of Kogi, Nassarawa, Niger, and parts of Kaduna state. Is one of the first centers to start offering free HIV/AIDS services in the country, through the President Emergency Plan for AIDs relief (PEPFAR) and federal government of Nigeria since 2005.

The subjects were all paediatric and adolescent HIV infected patients diagnosed by either by serological method or by deoxy-ribonucleic acid polymerase chain reaction test and started on ARV therapy during the 15-year review period. Eligibility for the study were age 2 months to 18 years HIV infected, and initiated on ART. Excluded were all the exposed infants, and those outside the age bracket for inclusion criteria. The seven processes of care indicators used in this study was as recommended by the WHO, and outlined in 2016 national guidelines on paediatric HIV and AIDS treatment and care in Nigeria.[19] They are: screening for tuberculosis (TB) at enrollment, adherence counselling at last visit, documentation of adherence measurement and counselling at last visit, prescription of co-trimoxazole prophylaxis for pneumocystis jiroveci pneumonia at any time since enrollment, at least one CD4 count in the last six months, VL in the last one year, and documented of weight and height/length at last visit. Screening for hepatitis B surface antigen at entry into care was also determined though not part of process indicator used. TB screening used includes: history of poor weight gain, fever of >1 month, cough of >3 weeks, history of contact with adult with TB, radiological evidence of TB. Adherence counselling and assessments involve asking the patient or the caregiver the number of ART doses missed within the last three days. A level of 95% or more is accepted as the required level to prevent resistance and to achieve an undetectable VL. Pharmacy records are equally reviewed, and returned syrup measured, pill counting is routinely done. Co-trimoxazole prophylaxis, screening for hepatitis B surface antigen, CD4 cell count, and VL are also done without cost to the patients, however since 2018, patients started bearing the cost of their CD4 analysis. Baseline VL is not part of standard of care to most facilities in the country, however VL is routinely done at no cost to the patients 6 months after the commencement of ART.

A quality score was calculated, one point was assigned for each service received, and zero points when there were no services. A total of seven points was assigned if a patient received all the seven services. Scores were categorized into high and low. High is assigned to score of 4 or greater, and low <3. The two main outcome variables were lost to follow-up, and death. Loss to follow-up was defined as no evidence of a visit to the clinic or drug pick up for 90 days following the last scheduled appointment. Death was only counted if verified by the patient's family or when it occurred in the hospital. CD4 cell count was measured using automated Partec Cyflow easy count kit (Partec code no. 05-8401 Western Germany), while VL measurement was with (Roche Smp /prep /cobs Taqman 96, USA). Their weight in kilogram (kg) was measured with Seca 755 mechanical weighing scale, and read to the nearest 0.5 kg. Height/length was measured with Seca standiometer/ infantometer, 755 model to the nearest 0.1 centimeter. BMI was calculated using weight (kg)/height $(m)^2$, the result was plotted on the WHO approved BMI percentile, and Z score.

Other relevant information collected were: gender, age at ART initiation, baseline and current CD4 count cell count, VL 6 months after initiation of ART, and 6 months prior to the review, baseline and current BMI percentile and Z scores, initial and current ART regimen.

For patients <2 years of age, severe immunosuppression was defined as an initial CD4 count <750 cells/mm^3 or a percentage less than 15%, moderate immunosuppression was defined as CD4 count of between 750 and 1500 cells/mm^3 or a percentage of between 15% and 25%. No immunosuppression was an initial CD4 count of 1500 cells/mm^3 or more or a percentage of 25% or more. For patients between 2-5 years of age, severe immunosuppression was an initial CD4 count <500 cells/ mm^3 or percentage <15%, moderate immunosuppression was initial CD4 count of 500 to 1000 cells/mm^3 or between 15% to 25%, and no immunosuppression was initial CD4 count of 1000 cells/mm^3 or 25% or more. For patients 5 years and above, severe immunosuppression was initial CD4 count <200 cells/mm^3 or<15%, moderate immunosuppression was CD4 count of 200 to 500 cells/mm^3 or between 15% to 25%, and no immunosuppression was CD4 count ≥500 cells/mm^3 or ≥25%.[19] Viral suppressions is VL ≤20 copies/ml, and no suppression is when >20 copies/ml.[19]

Ethics

Clearance for the study was from the UATH ethics committee.

Statistics

Data entry and analysis was with statistical package for social sciences (SPSS) version 22 for the generation of frequency tables, mean, standard deviation and ranges. Student t test was used to compare group means, while chi-square was used to analyse categorical data. Logistic regression was used for the covariates that were significant in the bivariate analysis. P<0.05 was considered statistically significant.

RESULTS

Table 1 showed the demographic characteristics of the study population at initiation of ART, and at the end of 15 years review period. Of a total of 563 subjects initiated on ART, 349 (61.9%) were still on treatment at the end of the review period. There were 285 (50.6%) males with male to female ratio 1:1 at enrolment, ages 0-24 months accounted for the highest number of patients 192 (34.1%) initiated on ART, while the year 2006-2010 recorded the highest 280 (49.7%) number of enrolees. While their mean CD4 cell count at time of initiation was 470.95±513.57 cells/µ, 176 (31.3%) had severe immune suppression, 164 (29.1%) had moderate suppression, and 223 (39.6%) had no immune suppression. More of the severely suppressed subjects at the time of initiation on ART were <5 years 130/176 (73.9%), and those with no immune suppression were >5-18 years 191/223 (85.7%). At same time of initiation, 244 (43.3%) of the subjects were underweight, 317 (56.3%) had normal weight, 2 (0.4%) were overweight, and none was obese. Over 75% were started on ART combination of zidovudine (AZT) + lamivudine (3TC) + nevirapine (NVP), others combinations used were stavudine (D4T) +3TC+NVP 22(3.9%), AZT+3TC+ efavirenz (EFV) 18(3.3%), AZT+3TC+ lopinavir/ritonavir (LPV/r) 54 (9.6%), and tenofovir (TDF) +3TC+ dolutogravir (DTG) 14 (2.9%). After six months on ART, the mean VL of the subjects was 269,432.5±4253 copies/ml, 358 (63.6%) did not achieve viral suppression of <20 copies/ml, while 205 (36.4%) had viral suppression.

At the end of 15 years review (2006-2020), more males 189 (54.2%) than females 160 (45.8%) were on treatment, more adolescents aged >10-18 years 136 (38.9%) were also on treatment, and most subjects 141 (40.4%) were on treatment between 2016-2020. Their mean CD4 cell count at the end of the period was 748.53±412.25 cells/ml, 231(66.2%) achieved adequate viral suppression of <20 copies/ml, while 118 (33.8%) were yet to achieve such. Of the 349 subjects on treatment at the end of the period, 48 (13.8%) were still severely immune suppressed, 72 (20.6%) had moderate suppression, while 229 (65.6%) had no immune suppression. Those with severe immune suppression at the end of the review period were the age range of >5-18 years as against 0-24 months seen during the time of initiation. Most on treatment had normal BMI 322 (92.3%), 3 (0.9%) had underweight, 19 (5.4%) were overweight, and 5 (1.4%) were obese. For the ART use during the treatment phase, 102 (29.2) were still on AZT+3TC+NVP, 124 (35.5%) and 43 (12.3%) were on AZT+3TC+LPV/r, and ABC+3TC+LPV/r, while 51 (14.6%) were on TDF/3TC/DTG.

Table 2 showed the process of care indicators and outcome variables of the study population. All the quality indicators used in the assessment of process of care in this study scored greater than 50%. Screening for TB at enrolment was 461 (81.9%), measurement and documentation of adherence counselling at last visit was 201(57.6%), adherence counselling at the last visit was 279 (80.0%), prescription of co-trimoxazole at initiation of ART was 504 (89.5%), one CD4 count measurement in the last six months of the review was 309(88.5%), VL measurement in the last six months was 293 (84.0%), and documentation of weight and height/ length at last visit was 325 (93.1%). Though all process of care indicators in this study recorded greater than 50% performance, some however showed statistically significant difference between male and female subjects. The two that recorded significant difference between male and female were documentation of adherence counselling at last visit (x^2=3.7, p=0.054), and VL measurement in the last six months (x^2=5.08, p=0.024). Those that did not display any significant difference were screening for TB at enrolment, (x^2=0.82, p=0.33), adherence measurement at last visit (x^2=0.86, p=0.35), co-trimoxazole prescription (x^2=0.005, p=0.946), CD4 count measurement at the last six months (x^2=2.9, p=0.09), and weight, length/height documented at last visit (x^2=3.7, p=0.06). Over 85% of the subjects had a high-quality indicator score of 458 (81.4%) with statistically significant difference between male and female on the quality score, (x^2=8.56, p=0.003). No such difference was seen with low quality score and gender, 105 (18.7%), (x^2=1.13, p=0.253).

Outcome variable showed that of 563 (100%) enrolled for ART, 349 (61.9%) were still treatment, 68 (12.1%) were loss to follow-up of mean duration of 7.4±4.9 years, documented mortality of 14 (2.5%), transfer to adult clinic, and to other centers were 113 (20.1%), and 25 (4.4%) respectively. The outcome variable that showed statistically significant difference with gender was mean duration of loss to follow up, t=2.4, p=0.020.

Table 3 depicts the relationship between loss to follow-up with demographic and clinical variables. The only variable that showed significant association with loss to follow-up was high indicator quality score: OR=0.033 (CI 0.02-0.06), p>0.001 for bi-variate analysis, and OR=0.033(CI 0.02-0.06), p>0.001 for multi-variate. The other variables did not show any statistical relationship; their p<0.05.

Table 4 also showed the relationship between mortality with demographic and clinical variables The only variable that also showed significant association with mortality was high indicator quality score: OR=0.053 (CI 0.017-0.167), p>0.001 for bi-variate analysis, and OR=10.814 (CI 2.707-43.20)), p=0.001 for multi-variate. The other variables did not show any statistical relationship; their p<0.05. Immune suppression showed significant relationship with bi-variate but not with multi-variate analysis.

Table 1: Demographic characteristics of the study population at initiation of ART and the end of 15 years review period.

Variables at initiation of ART, (563),	Frequency (%) or means (SD)	Variables after ART treatment, (349)	Frequency (%) or mean±SD
Age at ART initiation (years)			
0-24 months	192 (34.1)	2	40 (11.5)
25-60 months	121 (21.5)	2-<5	61 (17.5)
5-<10	139 (24.7)	5-<10	112 (32.1)
10-18	111 (19.7)	10-18	136 (38.9)
Sex			
Male	285 (50.6)	Male	189 (54.2)
Female	278 (49.4)	Female	160 (45.8)
Year at initiation of ART		**Year on treatment**	
2006-2010	0 (0.0)	2006-2010	103 (29.5)
2011-2015	1 (7.1)	2011-2015	92 (26.4)
2016-2020	13 (92.9.)	2011-2015	141 (40.4)
Mean CD4 at initiation (cells/µl)	470.95±113.57	**Mean CD4 at treatment (cells/µl)**	748.53±412.25
Severe immune suppression (years)			
0-24 months	66 (11.7)	0-24 months	14 (4.0)
>2 -5	64 (11.4)	>2 -5	16 (4.3)
>5-18	46 (8.2)	>5-18	18 (5.2)
Total	176 (31.3)	Total	48 (13.8)
Moderate immune suppression (years)			
0-24 months	27 (4.8)	0-24 months	14 (4.0)
>2 -5	33 (5.9)	>2 -5	21 (6.0)
>5-18	104 (18.4)	>5-18	37 (10.6)
Total	164 (29.1)	Total	72 (20.6)

Continued.

Variables at initiation of ART, (563),	Frequency (%) or means (SD)	Variables after ART treatment, (349)	Frequency (%) or mean±SD
No immune suppression (years)			
0-24 months	13 (2.3)	0-24 months	10 (2.9)
>2-5	19 (3.4)	>2 -5	43 (12.3)
>5-18	191 (33.9)	>5-18	176 (50.4)
Total	223 (39.6)	Total	229 (65.6)
Mean BMI at initiation of ART (kg/m^2)	25.02±19.62	**Mean BMI at 15 years period of treatment (kg/m^2)**	44.61±19.09
Underweight	244 (43.3)	Underweight	3 (0.9)
Normal	317 (56.3)	Normal	322 (92.3)
Overweight	2 (0.4)	Overweight	19 (5.4)
Obese	0 (0.0)	Obese	5 (1.4)
Type of ART at initiation		**Current ART regimen**	
AZT/3TC/NVP	434 (77.1)	AZT/3TC/NVP	102 (29.2)
D4T/3TC/NVP	22 (3.9)	AZT/3TC/EFV	11 (3.2)
AZT/3TC/EFV	18 (3.3)	ABC/3TC/LPV/r	43 (12.3)
AZT/3TC/LPV/r	54 (9.6)	AZT/3TC/LPV/r	124 (35.5)
TDF/3TC/DTG	14 (2.9)	TDF/3TC/DTG	51 (14.6)
Others	21 (3.8)	Others	18 (5.2)
Mean VL 6 months of ART	269,432.5± 4253	**Mean VL at 15 years review period**	19,835.2±974.13
Non suppressed (>20 copies/ml)	358 (63.6)	Non suppressed (>20 copies/ml)	118 (33.8)
Suppression (<20copies/ml)	205 (36.4)	Suppression (<20 copies/ml)	231 (66.2)

Table 2: Process of care indicators and outcome variables.

Quality indicators and outcome variables	Total, n (%)	Male, n (%)	Female, n (%)	X^2	P
Quality indicators					
Screened for TB before initiation of ART (563)	461 (81.9)	233 (50.5)	228 (49.5)	0.82	0.33
Adherence measured, documented at last visit (349)	201 (57.6)	91 (45.3)	110 (54.7)	3.7	0.054
Adherence counselling at last visit (349)	279 (80)	139 (49.9)	140 (50.1)	0.86	0.35
Co-trimoxazole prescribed after initiation of ART (563)	504 (89.5)	257 (51.0)	247 (49.0)	0.005	0.946
CD4 measurement in the last 6 months (349)	309 (88.5)	167 (54.1)	142 (45.9)	2.9	0.09
VL measurement in last 6 months (349)	293 (84.0)	158 (53.9)	135 (46.1)	5.08	0.024
Weight, height/ length documented at last visit (349)	325 (93.1)	168 (51.8)	157 (48.2)	3.7	0.06
HB screening at initiation of ART (563)	143 (25.4)	43 (30.2)	100 (69.8)		
High quality indicator score	458 (81.4)	227 (49.6)	231 (50.4)	8.56	0.003
Low quality score	105 (18.7)	58 (55.2)	46 (43.8)	1.31	0.253
Outcome variable					
Number enrolled on ART	563 (100)	285 (50.6)	278 (49.4)	1.077	0.299
Number on treatment at the end of the review period	349 (61.9)	189 (54.2)	160 (45.8)	1.072	0.295
Loss to follow up	68 (12.1)	32 (5.7)	36 (6.4)	5.4	0.251
Mean duration of loss to follow up (years)	7.4±4.9	6.0±4.9	8.8±4.6	t=2.4	0.020
Transfer to adult clinic	113 (20.1)	50 (8.9)	63 (11.1)	4.8	0.142
Transfer to other centers	25 (4.4)	12 (2.1)	13 (2.3)	5.1	0.384
Documented mortality	14 (2.5)	8 (1.4)	5 (0.9)	4.3	0.117

Table 3: Relationship between loss to follow up with demographic and clinical variables.

Variables	Loss to follow up frequency, n=68 (%)	Bivariate analysis OR (95% CI)	P value	Multivariate analysis OR (95% CI)	P value
Age at ART initiation (years)					
0-<5	36 (52.9)	0			
>5-10	18 (26.5)	0.96 (0.53-1.75)	0.89		
>10-18	14 (20.6)	1.48 (0.76-2.88)	0.25		

Continued.

Variables	Loss to follow up frequency, n=68 (%)	Bivariate analysis OR (95% CI)	P value	Multivariate analysis OR (95% CI)	P value
Sex					
Male	36 (52.9)	1.1 (0.67-1.83)	0.70		
Female	32 (47.1)	0			
Immune suppression					
No suppression	40 (61.5)	0			
Moderate	13 (20)	0.88 (0.45-1.78)	0.739		
Severe	12 (18.5)	0.6 (0.31-1.14)	0.119		
Mean BMI at ART initiation (kg/m^2)					
Normal	16 (33.3)	0			
Underweight	31 (64.6)	1.47 (0.78-2.8)	0.234		
Over weight	1 (2.1)	3.06 (0.3-31.2)	0.345		
Obese	0				
Type of ART at initiation					
AZT/3TC/NVP	33 (48.5)				
D4T/3TC/NVP	1 (1.5)	6.34 (0.77-53.16)	0.08		
AZT/3TC/LPV/r	0 (0)	0			
TDF/FTC/LPV/r	1 (1.5)	2.55 (0.31-20.89)	0.382		
Duration on ART (Years)					
0-<5	25 (41)	0			
>5-10	16 (26.2)	0.73 (0.37-1.4)	0.345		
>10-15	20 (32.8)	0.91 (0.48-1.7)	0.762		
Quality indicator score					
High	15 (22.1)	0.033 (0.02-0.06)	<0.001	0.033 (0.02-0.06)	<0.001
Low	53 (77.9)	0			

Table 4: Relationship between mortality and demographic/ clinical variables.

Variables	Mortality frequency, n=14 (%)	Bivariate analysis OR (95% CI)	P value	Multivariate analysis OR (95% CI)	P value
Age at ART initiation (Years)					
0-<5	8 (57.1)	0			
5-<10	4 (28.6)	1.013 (0.313-3.277)	0.983		
10-18	2 (14.3)	1.102 (0.242-5.010)	0.900		
Sex					
Male	8 (57.1)	0.767 (0.263-2.239)	0.626		
Female	6 (42.9)	0			
Immune suppression					
No suppression	0 (0.0)	0			
Moderate	1 (7.1)	165 (0.918-55.902)	0.034	11.175 (3.184-26.854)	0.995
Severe	13 (92.9.)	0.042 (0.005-0.326)	<0.001	0.243 (0.022-2.667)	0.996
Mean BMI at ART initiation (Kg/m^2)					
Normal	0 (0.0)	0			
Underweight	14 (100.0)	0.975 (0.962-0.989)	1.000		
Over weight	-				
Obese	-				
Type of ART at initiation					
AZT/3TC/NVP	9 (64.3)	0			
D4T/3TC/NVP	5 (35.7)	0.091 (0.010-0.845)	0.111		
TDF/FTC/LPV/r	0 (0.0)	1.015 (1.005-1.025)	1.000		
AZT/3TC/LPV/r	0 (0.0)	1.015 (1.005-1.025)	1.000		
Duration on ART (Years)					
0-<5	6 (42.9)	0			
5-<10	5 (35.7)	1.342 (0.443-4.066)	0.602		
10-15	3 (21.4)	0.665 (0.183-2.414)	0.532		

Continued.

Variables	Mortality frequency, n=14 (%)	Bivariate analysis OR (95% CI)	P value	Multivariate analysis OR (95% CI)	P value
Quality indicator score					
High	2 (14.3)	0.053 (0.017-0.167)	<0.001	10.814 (2.707-43.200)	0.001
Low	12 (85.7)	0			

DISCUSSION

This is the first study undertaken to assess quality of care and outcomes of HIV-positive children and adolescents on ART in our center since the inception of HIV program in 2005. Using seven process indicators, our clients had overall indicator performance quality score of greater than 80% in six of the seven indicators used with an average score of 81.4%. Same high-performance score was documented in a similar survey of 23 health facilities across 10 states in Nigeria offering HIV services by Ojikutu et al.[20] In their study, over half of the patients had a performance quality process indicator score of median or higher than four out of six scores used with an average of 55.5%.

High performance score was also recorded in a USA study by Horberg et al where 85% or more performance indicator was recorded in some of the process indicators used for the assessment.[21] This high-performance indicator in this study may be due to the level of human resources availability in POSTC which has 15 (35.0%) of the workforce in special treatment clinic (STC) for both positive children and adults, and heart to heart center unit of the hospital where HIV counselling/ testing is carried out. In addition to workforce, the staff experience in HIV care and treatment is also high in our center.[22] Being one of the first six health facilities to start offering free HIV services in the country since 2005, a lot of manpower development and retraining on HIV treatment and care has taken place since inception till date. There is also availability of modern laboratory services for CD4 and VL analysis, training /retraining of staff, robust homebased care, nutrition services, monitoring and evaluation, and adolescent friendly services may also be contributory to good performance indicator score observed in this study.

The highest performance process of care indicator in this study was measurement of weight and height/ length (93.1%) at each visit. That was not surprising as measurement of weight, and height/ length are needed in the calculation of ART dosage in children and adolescent at each visit, in addition to availability of weighing scale and stadiometer/ infantometer, and high level of skilled nursing services in the center. Ojikutu et al equally documented high-performance indicator of 70% in their weight for age z-score in their study, and also attributed it to the site level of experience, improved availability of scales, and training and retraining of staff.[20] The other process indictors that recorded high performance in this study were: co-trimoxazole prescription after initiation of ART (89.5%), CD4 count measurement at the last 6 months of the review (88.5%), VL measurement in the last 1 year (84%), screened for TB before initiation of ART (81%), and adherence counselling at last visit (80%). Nigerian guideline for HIV prevention, treatment, and care, advocates mandatory pre-treatment baseline CD4 cell count, and subsequent six-monthly measurements.[19]

It equally advocates baseline VL measurement as essential and desirable especially for those with prior exposure to ARVs but not routinely recommended, however six months' measurement after commencement on ART is mandatory with subsequent annual monitoring. Other contents of the guideline are pre-treatment baseline screening for TB, adherence monitoring at each visit, co-trimoxazole prophylaxis among others. The high performance process of care indicators in this study was not surprising as they were already part of the standard of care in Nigeria guideline for most facilities in the country.[20,21] Other studies also demonstrated similar pattern except for minor variations seen in CD4 ell count in Nigerian study which showed low performance indicator of 37, and was attributed to human resource deficits, dysfunctional equipment, reagent stock-outs, or limited ability to transport samples to central laboratory facility for analysis.[20]

The least of process indicator in this study was adherence measured and documented in the last visit which recorded 57.6%. Adherence which is extent a person's behaviour taking medication, following diet, and/or lifestyle changes, corresponds with agreed recommendations from health care provider had remained bedrock for achieving adequate viral suppression in HIV patients on ART.[23] The low level of measured and documented adherence in the last visit in this study could be reason for high number of the clients (33.8%) with unsuppressed viral load of >20 copier/ml at the end of review period. This was in contrast to over 90% viral control with high median ART medication adherence from USA study.[21]

Hepatitis B and C screening at initiation of ART though not part of process of care indicator in this study but a component of HIV prevention, treatment and care in Nigerian guideline recorded a very low score of 25.4%. Improvement in this screening is required especially with prevalence of 4.6 and 3.9% for hepatitis B and C among positive children and adolescents from previous study in center.[24]

This study showed remarkable difference in demographic and clinical variables of the study population at initiation of ART and the end of the review thus depicting the therapeutic benefits of ART. Though 43.3% were under-weight, 56.3% had normal weight, while 31.3% had

severe immune suppression at initiation of ART, at end of review period only (0.9%) were under-weight, (92.3%) had normal weight, and (13.8%) still had severe immune suppression. The goal of ART is to slow down/ stop HIV/ AIDS progression by suppressing HIV replication, reversing immune-deficiency, and improving quality of life of affected. Several studies have attested to positive outcome of ART.[25-30] Pre report in center also reported improvement in growth curve of positive children from baseline growth curve of less than 5th centile weight for age, and CD4 cell count of 243.0±104.2 cells/mm^3 at initiation of ART to 25th centile and 788.5±2 doc17.0 cells/mm^3 after 12 months on ART.[12]

Retaining children in HIV programme, and mortality from the disease has been very challenging in the sub-region.[32-35] Studies shows lost to follow-up to range from 2.5%, 19%, to as high as 31.9%, and 47.1%.[20,26.29] Mortality also ranges from 2% in Ethiopia, 4.2% in Nigeria, to as high as 13.5% in Gambia, 21% in South Africa, and 26.0% from Mozambique.[20,26,29,31,32]

From the present study, 12.1% of the patients were lost to follow-up, documented mortality was 2.3%, while 20.1% were transferred to adult clinic, and 4.4% to other centers. Reason for the relative high mortality and loss to follow-up in this study might be due the advanced stage of the disease at presentation as severe immune suppression and underweight was reported in 31.3% and 43.3% of the patients at initiation of ART. Other contributory factor may also include; facility long queues for service deliveries, lack of money for food and transport to the health facility, difficulty getting time off from work for parents to bring the children to the hospital, child absenteeism from school, and fear of social rejection from disclosure to other family/ friends and neighbours.[32]

The only variable in this study that showed relationship with loss to follow-up and mortality was high quality score [OR=0.033 (CI: 0.02-0.06, p<0.001)] for loss to follow-up, [OR=10.814 (2.707-43.200), p<0.001] for mortality. Ojikutu et al made similar observation and recorded high quality score as a significantly correlate with both loss to follow-up and mortality, with a higher score associated with decreased loss to follow-up and increased survival.[20] Similar observation also noted from USA study where they also demonstrated association between quality of HIV care and clinical outcomes.[21]

Limitations

Only documented mortality was captured in this study. Many patients may have died at home without reporting to the health facility. Some loss to follow up may also be part of the undocumented mortality.

CONCLUSION

Though study recorded high quality score services to HIV positive children and adolescents in center, loss to follow-up, and mortality however high. More has to be done to improve viral load suppression among clients.

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