Beyond Viral Suppression: Quality of Life among stable ART Clients in a Differentiated Service Delivery Intervention in Tanzania

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Abstract

Background: More people living with HIV (PLHIV) in resource-limited settings are virally suppressed and living longer, mainly due to an increased access to effective antiretroviral therapy (ART). With the expansion of ART programmes, the World Health Organisation recommended differentiated service delivery (DSD) as an alternative less resource-demanding way of accessing HIV services. While maintaining quality of care and continued adherence among patients are health system's priorities, monitoring patient's quality of life is key to ensure sustainability and uptake of services. However, health-related quality of life (HRQoL) is understudied in sub-Saharan Africa (SSA). We aimed to assess HRQoL among stable ART clients accessing ART care in adherence clubs implemented in Tanzania.

Methods: We conducted a cross-sectional survey from May to August 2019 among stable ART clients randomly sampled among those accessing clinics and clubs daily in two sites, a rural and peri-urban setting in the Shinyanga region. HRQoL data was collected, after obtaining informed consent, using the interviewer-administered Functional Assessment of HIV infection (FAHI), a validated HIV-specific HRQoL instrument. We also collected on socio-demographic, HIV care and service accessibility factors. Descriptive analysis, modified Poisson regression with robust variance and a stepwise multiple linear regression were performed to analyse HRQoL and its determinants.

Results: A total of 629 participants were enrolled, of which 40% were DSD patients. DSD and clinic participants showed similar HRQoL scores [mean (SD), p value]; FAHI total [152.2 (22.2) vs 153.8 (20.6), p 0.687]. Accessibility factors, e.g. less time spent during and less frequent DSD meetings, contributed to emotional wellbeing among DSD participants compared to those in clinic (53.4% vs 18.5%,p=<0.001). Satisfactory (>80% of achievable) HRQoL scoring was independently associated with (relative risk [95% confidence interval], p value) being male (1.18[1.06-1.31], p 0.002); being married (1.22 [1.01-1.45, p 0.043); and living in an urban setting (1.28 [1.09-1.49], p 0.001).

Conclusions: DSD does not appear to compromise HRQoL and, encouragingly, it could contribute to an improvement in emotional wellbeing among patients. While DSD shows promise in improving acceptability among patients and, therefore, sustainability of such services, our research highlights future research avenues to identify supporting interventions to improve other HRQoL domains among PLHIV.

Background

Access to effective antiretroviral therapy (ART) has contributed largely to an increased number of people living with HIV (PLHIV) being virally suppressed and living longer (1−4).However, the physical consequences of long-term exposure to ARVs has yet to be fully elucidated and evidence associates PLHIV on ART with an increased risk of cardiovascular disease, liver disease and various malignancies(5−8). While PLHIV report significantly lower health related quality of life (HRQoL) when compared to the general population in high income countries (HIC) (9), HRQoL among PLHIV is understudied in low and middle income countries (LMIC), especially in sub-Saharan Africa (SSA). With increasing number of PLHIV on ART who are aging in SSA, including a fourth 90 in the UNAIDS global HIV targets will ensure the much-needed monitoring of HRQoL(10,11).

HRQoL is a multidimensional concept depicting an individual's subjective perception of current health status and outlook of the future (12,13). HRQoL studies assess individuals' perception of their health and how it affects or is affected by other aspects of life(13). Among PLHIV, ART impacted HRQoL positively, especially in LMIC when ART start was guided by CD4 thresholds (1,14,15). Subsequent studies predicted factors associated with good HRQoL among PLHIV e.g. being married, absence of co-morbidities, higher education, living in an urban setting, status disclosure, being on ART longer, being employed, fewer pills and good adherence (16−21). Conversely, factors found to

be associated with lower HRQoL included stigma, same-sex relationships, being symptomatic, illiteracy and not being sexually active (18,19,22–24). HRQoL studies among virally suppressed PLHIV are limited in LMIC (9,23,25).

In SSA, HRQoL studies have mostly been conducted among clients who access ART in clinical settings (24,26–28). Differentiated service delivery (DSD) offer virally-suppressed PLHIV alternative models of HIV care both within or and outside of the clinic (29). Out-of-clinic models limit contact with the formal health system and rely upon community health workers (CHW) who are mostly trained volunteers for service delivery. Most evaluations of such models focused on adherence and quality of care yet changes in delivery models of care may also affect HRQoL.

With 1.6 million PLHIV and a prevalence of 4.6% among adults in 2018, it is estimated that only 62% of PLHIV on ART in Tanzania are virally suppressed (30). Though studies show favorable patient-related outcomes with DSD interventions elsewhere, there is dearth of evidence within the Tanzanian context (31–33). Our study aimed to assess HRQoL among stable ART clients accessing ART care in a flagship Test and Treat (T&T) project in north-western Tanzania. We compared HRQoL scores and determinants of HRQoL between stable ART clients receiving either standard clinic-based care or ART clubs DSD care.

Methods

Study setting and population

The T&T project is hosted by the Catholic Diocese of Shinyanga which cover both Shinyanga and Simiyu regions in north-western Tanzania. Besides Shinyanga urban, Kahama urban and Bariadi districts, the regions are largely rural. Project sites are four HIV care and treatment centres (CTC) referred to as hubs, two hubs each in Shinyanga region (i.e. Ngokolo and Bugisi) and in Simiyu region (i.e. Songambele and Mwamapala). Data were collected from May to August 2019. Participants were recruited at the two hubs in Shinyanga region and their related ART clubs. Eligibility criteria included being adult ≥ 18 years and stable on ART according to the Tanzanian guidelines: on ART 1st line regimen ≥ 6-months, viral load < 50 copies/ml and no current chronic illness (34). At the hubs, participants were randomly sampled from eligible clients expected for daily clinic appointment. Eligible participants were approached as they attended clinic appointments or club meetings. At the clubs, all members were approached as stability was an eligibility criterion for DSD participation. Those patients consenting completed the interviewer-administered questionnaire.

Data Collection

We used a HIV specific HRQoL tool which has been validated for low literacy Swahili population, the Kiswahili translation of the Functional Assessment of HIV Infection (FAHI) (35). Outcomes of interest were the total and domain specific FAHI scores. In the present study, Cronbach alpha was 0.68, 0.73, 0.67, 0.71 and 0.81 for the PWB, EWB, FGWB, SWB and CF domains respectively indicating acceptable internal consistency. The FAHI is a 47-item tool with five domains namely physical wellbeing (PWB) – 10 items, emotional wellbeing (EWB) – 10 items, functional & global wellbeing (FGWB) – 13 items, social wellbeing (SWB)-8 items and cognitive functioning (CF) – 3 items (36). Scores ranged for each item between 1 and 4. We derived (a) domain scores by summing respective item scores – ranges for PWB and EWB were 10 to 40, FGWB 13 to 52, SWB 8 to 32 and CF 3 to12; (b) total FAHI scores by summing all five domain scores – ranging between 44 and 176; (c) FAHI proportional score by calculating each individual score as a proportion of the maximum possible total or domain scores; and (d) a dichotomous (satisfactory/less than satisfactory FAHI HRQoL) variable for total and domains. We considered a score in the highest quintile i.e. ≥80% of FAHI total or domain scores as satisfactory.

Secondary outcomes were factors associated with satisfactory HRQoL and domain scores. Three categories of additional data were collected to assess these factors: socio-demographic (location, sex, age, educational level, marital status, employment status and income level), HIV care (duration on ART, CD4 count at ART start and recency of viral load result) and service access (location, time spent during clinic visit/club meeting[wait time], time spent travelling to clinic/club[travel time] and frequency of service-delivery). Data entry, collation and cleaning was done using EpiData (37).

Sample Size And Statistical Analysis

Our sample size calculation was based on EQ-index scores and extrapolated to proportional FAHI scores. We assumed a difference in proportional scores of 0.10 (0.80 to 0.90) between clinic and DSD participants, a standard deviation of 0.40 as determined by Louwagie et al in South Africa and 10% refusal rate requiring thus a minimum of 542 participants overall with 271 participants per service delivery group to have 80% power to reject the null hypothesis of no difference(1).

Categorical variables were presented as percentages and continuous variables as means (± standard deviation) or medians (± interquartile range) as appropriate. Comparisons between clinic and DSD participants were done using Mann Whitney or Kruskal Wallis tests. Association between socio-demographic, HIV care and service access factors and satisfactory FAHI HRQoL were examined using modified Poisson regression with robust variance which has been shown to give more accurate estimates than logistics regression(38). Sex, age, marital status, and variables showing significant bivariate association at p-value of < 0.1 were included in the multivariable model. A 3-step hierarchical multiple linear regression was used to quantify the contribution of the three factor categories to the variance of FAHI scores observed. Socio-demographic variables were entered the model in the first step, followed by HIV care variables and lastly, service access variables.

We examined variables for multicollinearity using tolerance values and variance inflation factor (VIF) statistics. We generated a Receiver Operative Characteristic (ROC) i.e. area under curve (AUC) to test the predictive ability of the model. We assessed the 33 and 28 missing observations dropped from the clinic and DSD in the step 3 hierarchical linear models respectively to observe any significant differences in mean FAHItotal. All analyses were performed using STATA software version 16.0.

Ethical approval for the study was obtained from the National Institute for Medical research (NIMR; approval number NIMR/HQ/R.8c/Vol. I/674).

Results

Characteristics of study population

Of 667 PLHIV approached to participate, 641 consented to participate (response rate of 96.1%), and 629 were included in the final analysis (12 excluded due to non-eligibility). While overall majority of participants were female (63%), there were significantly more men in clinic-based care compared to DSD, and clinic-based participants were also significantly older (see Table 1). The mean numbers of years-on-ART and mean CD4 count at ART-start were significantly longer (4.9 vs 4.1 years, p < 0.001) and higher (398.1 vs 341.4 cells/mm^3, p < 0.001) for DSD participants. DSD participants reported shorter time spent on travel (84.7 vs 34.3 min, p < 0.001) and during club meetings (140.3 vs 83.8 min, p < 0.001). There were more DSD participants in the urban area (34.1% vs 60.6%). Table 1 provides details on the characteristics of study participants according to service delivery mode.

Table 1
Socio-demographic, HIV-related, and delivery mode-related characteristics according to service delivery mode.

	Clinic-based (N = 378)	DSD (N = 251)	p-value*
Sociodemographic information			
Location, n (%)	324 (65.8)	168 (34.1)	< 0.001
- Bugisi (Rural)	54 (39.4)	83 (60.6)	
- Ngokolo (Urban)			
Sex (n, %)	224 (59.3)	172 (68.5)	0.018
- Female	154 (40,7)	79 (31.5)	
- Male			
Age in years, median (IQR)	39.3 (33.3−48.1)	44.7 (37.6−54.0)	< 0.001
Age-groups, n, (%)	25 (6.6)	6 (2.4)	< 0.001
- < 25	96 (25.1)	35 (13.9)	
- 25−34	137 (36.2)	91 (36.3)	
- 35−44	75 (19.8)	62 (24.7)	
- 45−54	33 (8.7)	40 (15.9)	
- 55−64	13 (3.4)	17 (6.8)	
- ≥ 65			
Educational level, n (%)	97 (25.7)	60 (23.9)	0.744
- No education	261 (69.1)	180 (71.7)	
- Primary	20 (5.3)	11 (4.4)	
- ≥Secondary			
Marital status (n, %)	94 (24.9)	80 (31.9)	0.092
- Single	144 (38.1)	78 (31.1)	
- Married	140 (37.0)	93 (37.1)	
- Separated/Divorced/Widowed			
Employment status (n, %)	53 (14.0)	60 (23.9)	0.002
- Unemployed			

*P-values presented are calculated using Mann Whitney U or Kruskal Wallis tests as appropriate. Abbreviations: n, number; %, percentage; SD, standard deviation; TSH, Tanzanian shilling; IQR, interquartile range; ART, antiretroviral treatment; VL, viral load

	Clinic-based (N = 378)	DSD (N = 251)	p-value*
Income level (TSH), median (IQR)	87000 (50000–172000)	80000 (50000–150000)	0.315
- < 100,000	206 (54.5)	148 (59.0)	
- 100,000-300,000	116 (30.7)	63 (25.1)	
- > 300,000	56 (14.8)	40 (15.9)	
HIV care information			
Years on ART, median [IQR]	3.4 [2.1–5.8]	4.2 [2.2–7.3]	0.001
Years on ART group around mean	219 (59.4)	130 (53.3)	0.161
- ≤ 4.4 years	150 (40.6)	114 (46.7)	
- > 4.4 years			
CD4 at ART start in cells/mm^3, median [IQR]	273.5 [155–449]	340 [184.5–513]	0.003
CD4 at ART start groups	126 (34.8)	63 (26.7)	0.045
- < 200	236 (65.2)	173 (73.3)	
- ≥ 200			
Viral load in copies/ml, median [IQR]	10 [10–10]	10 [10–10]	0.876
Viral load group	375 (99.2)	237 (94.4)	< 0.001
- < 50 copies/ml	-	9 (3.6)	
- ≥ 50	3 (0.8)	5 (2.0)	
- missing			
Time since last VL record, n (%)	179 (47.4)	113 (45.0)	< 0.001
- ≤ 6months	170 (44.9)	85 (33.9)	
- 6 months – 1 year	26 (6.9)	49 (19.5)	
- > 1 year	3 (0.8)	4 (1.6)	
- missing			
Service access information			
Time spent in clinic/club in minutes, median [IQR]	115.2 [57.6-172.8]	43.2 [28.8-115.2]	< 0.001
Length of stay, n (%)	129 (34.1)	177 (70.5)	< 0.001
- Short (≤ 1hr 30 min)	246 (65.1)	71 (28.3)	
- Long (> 1hr 30 min)			

*P-values presented are calculated using Mann Whitney U or Kruskal Wallis tests as appropriate. Abbreviations: n, number; %, percentage; SD, standard deviation; TSH, Tanzanian shilling; IQR, interquartile range; ART, antiretroviral treatment; VL, viral load

	Clinic-based (N = 378)	DSD (N = 251)	p-value*
Time spent travelling to clinic/club in minutes, median [IQR]	57.6 [28.8-115.2]	28.8 [14.4−28.8]	< 0.001
	214 (56.6)	232 (92.4)	< 0.001
	161 (42.4)	17 (6.8)	
Travel time group, n (%)			
- Short (≤ 1hr)			
- Long (> 1hr)			
Frequency of visits/meetings, n (%)	355 (93.9)	121 (48.2)	< 0.001
- More (≤ every 2 months)	23 (6.1)	130 (51.8)	
- Less (> every 2 months)			
*P-values presented are calculated using Mann Whitney U or Kruskal Wallis tests as appropriate. Abbreviations: n, number; %, percentage; SD, standard deviation; TSH, Tanzanian shilling; IQR, interquartile range; ART, antiretroviral treatment; VL, viral load			

Fahi Total And Domain Scores By Service Delivery Model

Clinic and DSD participants show comparable mean HRQoL scores across domains with only slight differences in the physical and emotional wellbeing domains (36.4 vs 35.5, max-40 p < 0.01) and (32.1 vs 32.8, max-40 p < 0.05) (Fig. 1a). No differences were observed in satisfactory HRQoL percentages across domains except for FGWB where more clinic participants revealed satisfactory HRQoL as compared to DSD. Satisfactory HRQoL overall was highest in the CF domain (89.2 vs 93.6) and lowest in the EWB (68.8 vs 68.5) and SWB (74.1 vs71.7) domains (Fig. 1b).

Associations between sociodemographic, HIV-related and delivery mode-related factors and satisfactory overall HRQoL

Satisfactory overall HRQoL was associated with being male ((prevalence ratio1.18, 95% confidence interval 1.06−1.31), with being married (1.22, 1.02−1.47) and living in an urban setting (1.28, 1.09−1.49) in DSD care (see - Table 2). Less than satisfactory HRQoL was observed with increasing age among clinic participants, increasing income and increased meeting duration among DSD participants. HIV care factors were generally not associated with satisfactory overall HRQoL, while time spent during clinic/club was the only service access factor associated with satisfactory overall HRQoL.

Associations between sociodemographic, HIV care and service access factors and satisfactory domain HRQoL

Compared to being single, satisfactory HRQoL was associated with being married in the PWB, FGWB and SWB domains among DSD participants. Being separated, divorced, or widowed was positively associated with satisfactory HRQoL for both clinic and DSD participants only in the SWB

domain. Living in an urban area was significantly associated with satisfactory HRQoL for both clinic and

DSD participants in the EWB domains and only among DSD participants in the SWB and PWB domains. Less than satisfactory HRQoL was generally associated with declining age across domains but significant among clinic participants in the PWB, FGWB and SWB domains. In the EWB domain however, the reverse was observed among DSD participants across all age groups but significant with among those aged over 65 years. Surprisingly, less satisfactory HRQoL was also linked with increased income level in the PWB and EWB domain. Generally, HIV-related factors were not associated with satisfactory HRQoL. Among service delivery-related factors, DSD participants reported less than satisfactory HRQoL only for longer time spent during clinic/club in the PWB, EWB and SWB domains (Table 2 and **Additional file 1** [for additional results of FGWB & CF domains]).

Table 2
Modified Poisson Regression with Robust Variance: Multivariable Association between Sociodemographic, HIV and Service delivery-related variables and satisfactory FAHI QoL scores#

	FAHItotal		PWB		EWB		SWB	
	Clinic	DSD	Clinic	DSD	Clinic	DSD	Clinic	DSD
Covariates								
Sociodemographic								
Sex	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
- Female	**1.18**	1.03	1.00	0.94	1.09	0.93	**1.18**	1.14
- Male	**[1.06–1.31]** **	[0.87–1.22]	[0.91–1.11]	[0.80–1.10]	[0.93–1.26]	[0.78–1.12]	**[1.03–1.34]***	[0.98–1.33]
Age	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
- 18−25	**0.86**	1.10	**0.86**	1.22	0.89	1.06	0.83	1.12
- 25−35	**[0.74–0.99]***	[0.85–1.43]	**[0.75–0.98]***	[0.92–1.62]	[0.66–1.19]	[0.77–1.46]	[0.68–1.02]	[0.74–1.70]
- 35−45	**0.77**	1.11	**0.86**	1.23	0.89	1.23	**0.73**	1.07
- 45−55	**[0.66–0.90]****	[0.88–1.39]	**[0.76–0.98]***	[0.94–1.61]	[0.67–1.19]	[0.91–1.66]	**[0.60–0.90]****	[0.72–1.59]
- 55−65	**0.73**	0.95	**0.86**	1.06	0.82	1.98	**0.77**	0.94
- >65	**[0.62–0.87]****	[0.73–1.23]	**[0.74–0.99]***	[0.78–1.44]	[0.60–1.12]	[0.71–1.33]	**[0.63–0.96]***	[0.62–1.41]
	0.77	0.97	0.91	1.17	0.96	1.02	0.81	1.08
	[0.62–0.94]*	[0.72–1.31]	[0.77–1.07]	[0.87–1.59]	[0.68–1.34]	[0.70–1.49]	[0.61–1.07]	[0.70–1.67]
	0.62	0.81	**0.63**	0.88	0.87	**1.49**	0.82	1.04
	[0.39-1.00]*	[0.51–1.28]	**[0.41–0.99]***	[0.54–1.43]	[0.54–1.39]	**[1.02–2.18]***	[0.54–1.23]	[0.62–1.76]
Education	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
- None	1.03	0.95	0.96	0.92	1.01	0.97	1.08	**0.75**
- Primary	[0.92–1.17]	[0.79–1.14]	[0.87–1.06]	[0.78–1.08]	[0.86–1.18]	[0.81–1.16]	[0.93–1.25]	**[0.63–0.89]****
- ≥Secondary			0.87	1.11	0.96	1.28	1.03	0.87
			[0.69–1.08]	[0.93–1.34]	[0.68–1.35]	[0.95–1.73]	[0.76–1.40]	[0.62–1.20]
	0.91	1.18						
	[0.67–1.22]	[0.93–1.50]						

	FAHItotal		PWB		EWB		SWB	
Marital status	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
- Single								
- Married	1.15 [0.99–1.34]	1.22 [1.02–1.46]*	1.21 [0.99.1.27]	1.23 [1.03–1.46]*	1.17 [0.96–1.42]	1.13 [0.93–1.37]	1.45 [1.18–1.78]**	1.56 [1.23–1.98]**
- Separated/Divorced/Widow	1.13 [0.97–1.31]	1.13 [0.95–1.35]	1.07 [0.95–1.21]	1.09 [0.92–1.29]	1.05 [0.87–2.28]	1.00 [0.83–1.21]	1.25 [1.01–1.55]*	1.60 [1.27–2.02]**
Employment			Ref	Ref				
- Unemployed			1.03 [0.89–1.19]	**0.88** [0.77–0.99]*				
- Employed								
Income level	Ref	Ref			Ref	Ref		
- < 100,000	**0.87** [0.76–0.99]*	**0.82** [0.68–0.99]*			**0.81** [0.68–0.96]*	0.88 [0.73–1.07]		
- 100,000-300,000	1.01 [0.89–1.13]	**0.77** [0.61–0.98]*			0.82 [0.66–1.02]	0.79 [0.62-1.00]		
- > 300,000								
Location	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
- Bugisi (Rural)	1.12 [0.97–1.28]	**1.28** [1.09–1.49]**	**1.13** [1.02–1.25]*	**1.18** [1.06–1.31]**	**1.40** [1.22–1.61]**	**1.39** [1.17–1.65]**	1.00 [0.83–1.21]	**1.25** [1.09–1.45]**
- Ngokolo (Urban)								
HIV care variables not associated with satisfactory HRQoL in bivariate analysis								
Service access								
Wait time mins	Ref	**0.66** [0.52–0.84]**	0.98 [0.89–1.08]	**0.82** [0.69–0.97]*	0.90 [0.78–1.04]	**0.35** [0.24–0.50]**	0.93 [0.82–1.06]	**0.65** [0.51–0.83]**
- < 90 min	0.99 [0.89–1.10]							
- > 90 min								

Legend

*p < 0.01; **p < 0.001. Significant ratios in bold. # See Additional file 1 for table with FGWB and CF domain results

Contribution of sociodemographic, HIV care and Service access factors to variance observed in HRQoL

Table 3 shows the contribution of sociodemographic, HIV care and service access factors to the variance observed in HRQoL scores. The analyses revealed that among clinic participants, the variance in overall HRQoL score FAHI total explainable by sociodemographic variables in the first step was 8.4%. The addition of HIV care variables in the second step increased the variance explained to 12.4%. Finally, service access variables in the third step brought the total to

14.9%. For DSD participants, the variance explained was 11.9%, 16.7% and 43.6% in the first, second and third steps, respectively. Across all domains, the variance in HRQoL explainable by the 3-step hierarchical model for clinic participants were modest (see Table 3). The highest was reported in the EWB domain i.e. 8.5%, 11.4% and 18.5% and lowest in the CF domain i.e. 5.9%, 9.1% and 9.8% respectively. Much higher proportion of variance was explained in overall FAHI 43.5, PWB 30.2, EWB 53.4 and SWB 35.1 among DSD participants. **Additional file 2** shows the details of the hierarchical linear regression with coefficients of all covariate in each step.

Table 3
Contribution of sociodemographic, HIV-related and Service delivery-related factors to variance observed in HRQoL scores

Variance explained by three factor categories (N = clinic vs DSD)												
	FAHItotal		PWB		EWB		FGWB		SWB		CF	
	Clinic	DSD	Clinic	DSD	Clinic	DSD	Clinic	DSD	Clinic	DSD	Clinic	DSD
*Step 1 R^2 (N = 378 vs 251)	0.102	0.229	0.103	0.205	0.085	0.184	0.119	0.222	0.118	0.217	0.059	0.058
^Step 2 R^2 (N = 351 vs 226)	0.145	0.289	0.146	0.243	0.114	0.268	0.169	0.253	0.139	0.258	0.091	0.086
#Step 3 R^2 N = 345 vs 223	0.149	0.435	0.149	0.302	0.185	0.534	0.167	0.297	0.148	0.351	0.098	0.099
AIC Step 3	8.803	8.692	5.969	6.077	6.603	6.415	6.258	6.63	6.723	6.523	4.034	4.081

Legend: *Step 1 - Contribution of sociodemographic factors to variance observed; ^Step 2 - Contribution of HIV care factors to variance observed and #Step 3 – Contribution of service access variables to variance observed form Hierarchical Multiple Linear Regression. Additional file 2 shows the regression coefficients for variables included in the models in steps 1–3.

Goodness Of Fit Statistics

Tolerance values ranged from 0.16 to 0.84 while the VIF values were from 1.19 to 6.3 suggesting that multicollinearity had no impact on the variables included. The AUC for our Poisson regression model was 0.76 showing acceptable ability of our model to discriminate – the effective range is usually from 0.5 to 1. There was no significant difference in mean FAHI total scores when the step 3 models in the hierarchical regression was compared with step 1 models.

Discussion

Our study compared factors influencing HRQoL among stable ART clients accessing care at either HIV clinics or DSD clubs in the Shinyanga region of Tanzania. Majority of participants in our study rate their HRQoL relatively satisfactory. Our results revealed that service access factors contributed considerably to HRQoL among DSD participants. We found that time spent during clinic/club and the settings of service delivery were factors significantly associated with perceived HRQoL.

Understanding HRQoL in African studies is relevant in the current "Treat-all" and DSD era. Previous HRQoL studies mostly compared HIV positive and negative people and/or PLHIV not on and on ART (2)(9). Similar HRQoL among stable clients seen in our study strengthens the case for DSD which may likely impact positively on care delivery to unstable clients concurrently who are more likely to have special needs (39,40). The complex effect of service access factors on overall HRQoL suggest that other non-measured factors are likely also to influence HRQoL.

Time spent during clinic/club was the main service access factor associated with HRQoL in our study followed by reduced frequency of meetings among DSD participants. We found that shorter time spent accessing service and less frequent visits were positively associated with HRQoL. This may reflect the value placed on time saved. Service access factors are more commonly studied in relation to patient satisfaction and retention in care than in HRQoL but both are likely to be related. In Malawi, another DSD model- six-monthly appointments with three monthly refills at the facility, showed reduced time spent in clinic as a favorable outcome predicting retention (41). Similarly, clients reported time saved for other activities as the greatest benefit derived from another DSD intervention in Uganda (42). Relatedly, reduced travel time has been identified as beneficial for DSD participants and enabling its success though it was not independently associated with HRQoL in our study (43,44).

As per HRQoL domains, literature reveals that social and psychological/emotional domains score the lowest in most HRQoL studies among PLHIV (16,21,25,45–49) which is in line with our findings. Reasons adduced for this include stigma and discrimination due to fear and lack of awareness as HIV continues to isolate those infected from meaningful relationships. In our population of stable ART clients, variance explainable to service access factors was notably largest i.e. 53.4% in the EWB domain highlighting the significance of the contribution of DSD among participants who likely face different psychological, emotional and social dilemmas. (16,17,46).

While our finding that being male was associated with a more satisfactory HRQoL aligns with evidence from Tanzania, Burkina Faso, Ghana and Ethiopia (18,50–52), other studies reveal no association or favor women (22,23,53–55). Though these studies did not target stable clients in particular, they illustrate the complexity of associations between gender and HRQoL. These findings also inform implementers on areas to explore when developing interventions.

Similar to findings with gender, age reveals intricacies of associations in literature, showing evidence of declining HRQoL with age (49,50,52,54) among PLHIV, as well as improvement or no association (18,23,53). Our results showed a trend of declining HRQoL with age mainly among clinic participants. Among DSD participants, we found a positive association of age with the EWB domain suggesting a protective effect of DSD on EWB with increasing age. Older adults may enjoy fewer social ties than younger adults and thus reap a larger emotional benefit from DSD. As the PLHIV population on ART ages and comorbidities increase, the emotional support provided by DSD will become increasingly important and could serve as a springboard for additional outreach interventions.

Context such as place of residence has been shown to be associated with HRQoL in LMIC(20,21). Our study showed that urban participants at Ngokolo had higher HRQoL scores across most domains than did their rural counterparts at

Bugisi. Better living conditions, greater awareness about HIV, and the anonymity people generally enjoy living in an urban setting likely creates a less-stigmatizing space for PLHIV. Our findings that educational level, employment and income level was not associated with HRQoL however differs from reports in the literature which associates a better HRQoL among PLHIV with a higher level of education (18,20,48–50); with employment (19,54,56) and relatedly to higher income levels (19,57). The prevailing socio-economic circumstances which is similar among participants irrespective of setting may likely be the explanation and can inform the additional interventions to explore for higher impact.

Despite viral suppression, HIV infection ultimately predicts sup-optimal HRQoL (9,25). The assumption of 'normalcy' in all areas as PLHIV attain viral suppression may be ambitious especially in the context of stigma, living in socio-economically difficult circumstances or with other chronic illnesses. The need to do more in these areas has been advocated especially for PLHIV in the rural areas, for women and for adolescents and young people living with HIV (AYPLHIV) (18,24,25,56,58).

Strengths and limitations

Our study is among few HRQoL studies conducted recently in SSA in the era of DSD. It provides useful insights into factors influencing HRQoL in an African population. Our participants were drawn from different geographical settings which mimics the reality of our population and generated valuable information about the impact of DSD in these settings. Though observational with known biases, the analytical design of our study allowed for comparisons that produced a rich resource useful for informing implementation and policy nonetheless.

Clinic participants were selected for stability as defined by the Tanzanian guideline at the time of data collection while DSD participants were assumed to be stable. This might have biased our results in favor of clinic participants, however viral load-related variables were similar in both groups and not independently associated with HRQoL in our study.

The project sites were mission clinics which may limit the generalizability of our findings. However, we might expect that larger differences in HRQoL scores would be found when comparing DSD and clinics outside mission hospital setting, as better funding and service which characterize our setting likely obscured the effect of DSD

Conclusion

Our results reveal a considerable contribution of service access factors to HRQoL especially in emotional wellbeing among DSD participants. This result is encouraging in that DSD does not appear to compromise HRQoL and could contribute to an improvement in the emotional wellbeing of patients. This highlights DSD as an acceptable option to explore for HIV care (59–62). While DSD shows promise in improving acceptability among patients and, therefore, sustainability of such services, our research highlights future research avenues to identify supporting interventions to improve other HRQoL domains among PLHIV. Service providers will need to engage PLHIV and the community at large to identify supporting interventions relevant for adapting acceptable DSD interventions to maximize its benefit. This research supports the call for monitoring HRQoL by extending the 90 90 90 target with a fourth HRQoL-related 90 (11).

Abbreviations

ART – Anti-Retroviral Therapy

ARV – Antiretroviral

AUC − Area Under Curve

AYPLHIV − Adolescent and Young People Living with HIV

CF − Cognitive Functioning

CI − Confidence Interval

CHW - Community Health Worker

CTC - Care and Treatment Centre

DSD − Differentiated Service Delivery

EWB − Emotional Wellbeing

FAHI − Functional Assessment of HIV Infection

FGWB − Functional and Global Well being

HIC − High Income Country

HIV − Human Immunodeficiency Syndrome

HCW - Health Care Worker

HRQoL − Health Related Quality of Life

LMIC − Low- and Middle-Income Country

NACP - National AIDS Control Program

NIMR - National Institute for Medical Research

MOHCDGEC - Ministry of Health, Community Development, Gender, Elderly and Children Tanzania

PLHIV − People Living with HIV

PWB − Physical Wellbeing

QoL − Quality of Life

ROC − Receiver Operative Characteristics

SD − Standard Deviation

SSA − Sub-Saharan Africa

SWB − Social Wellbeing

T&T − Universal Test & Treat

VL − Viral Load

VLS – Viral Load Suppression

WHO – World Health Organization

Declarations

Ethics Approval and Consent to Participate

Ethics approval for this research study was obtained from NIMR i.e. NIMR/HQ/R.8c/Vol. I/674. Written consent was obtained from individuals who agreed to participate in the study using appropriate forms which had been approved for same as part of the ethics application.

Consent for publication

Not Applicable

Availability of data and materials

The dataset used and analyzed during the current study are available from the corresponding author on reasonable request

Competing interests

The authors declare that they have no competing interests.

Authors contribution

ONE, GBG, SH, DN and TRW contributed to the conceptualization and design of the study. ONE conducted the field study and data collection. ONE was responsible for data analysis and interpretation with guidance from DN. ONE, GBG, SH, JdK, TRW were all involved in the interpretation of the results. TRW was responsible for the overall scientific management of the study. ONE wrote the initial draft of the manuscript. All authors contributed to drafts of the manuscript, read, and approved the final version.

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Figures

(a) Mean FAHI HRQoL domain scores **(b) Proportion of individuals with satisfactory HRQoL**
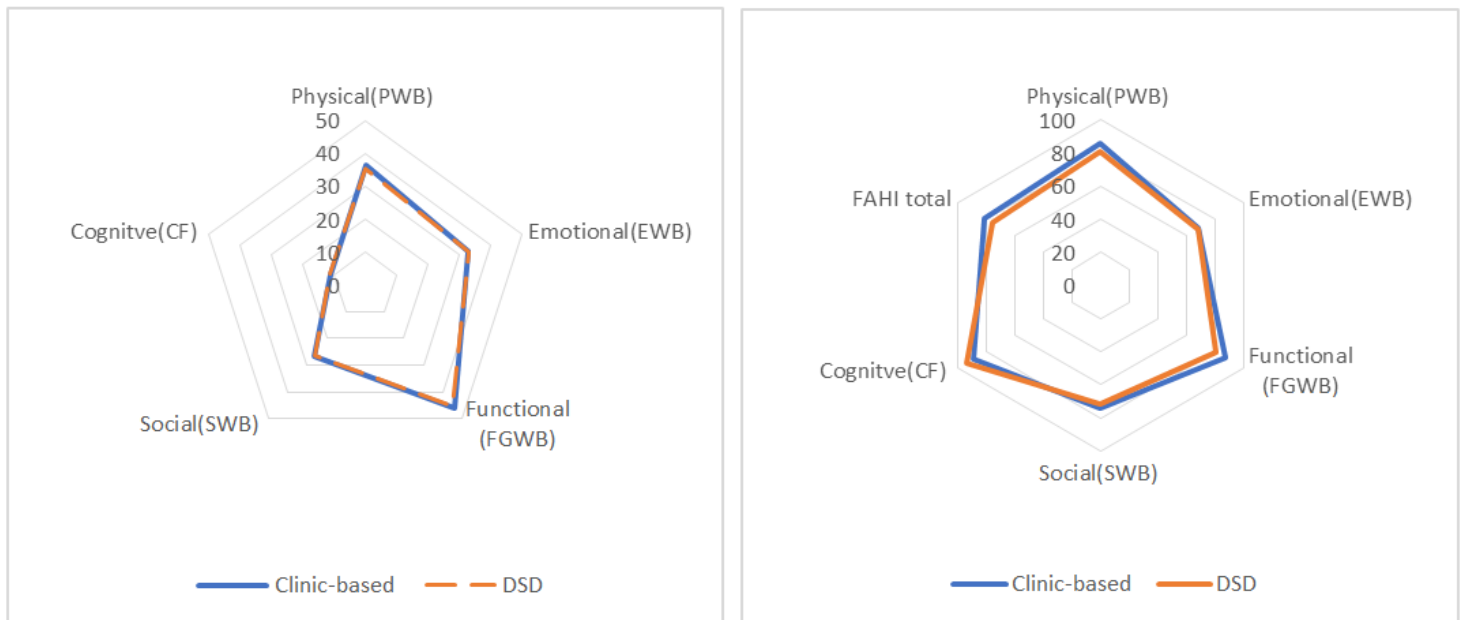
Figure 1

FAHI HRQoL scores by delivery model Abbreviations: PWB, Physical wellbeing; EWB, Emotional wellbeing; FGWB, Functional and Global wellbeing; SWB, Social wellbeing; CF, Cognitive Functioning

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- 2020.09.14QualityoflifeTnTShinyangaAdditionalfile1.xlsx
- 2020.09.14QualityoflifeTnTShinyangaAdditionalfile2.xlsx