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Health-Related Quality of Life Dynamics of HIV-positive South African Women up to ART Initiation: Evidence from the CAPRISA 002 Acute Infection Cohort Study

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Abstract

Few studies have investigated the long-term dynamics in health-related quality of life (HRQoL) among HIV-positive persons from acute infection. From 2004, 160 women were enrolled into the CAPRISA 002 Acute Infection study at two sites in the province of KwaZulu-Natal and underwent 3–6 monthly HRQoL assessments using the functional assessment of HIV infection (FAHI) instrument. Overall and 5 sub-scale FAHI scores [physical well-being (PWB), emotional well-being (EWB), functional and global well-being (FGWB), social well-being (SWB) and cognitive functioning (CF)] were calculated up to antiretroviral therapy (ART) initiation and scores at enrollment were compared to the acute, early and established infection phases. Mixed-effects regression models adjusting for behavioral and clinical factors were applied to assess HRQoL trends and the proportion of women meeting minimally important differences was calculated. Our analyses revealed that overall/sub-scale scores improved over time, except from PWB and CF. A higher educational status, contraceptive use and a higher BMI were the strongest predictors of higher overall/sub-scale FAHI scores. CD4 count and HIV viral load were strongly associated with PWB and CF, but not overall FAHI and other sub-scales. Women newly diagnosed with acute HIV infection face profound HRQoL challenges. While early ART delivery may be important for PWB and CF, factors such as education, contraception provision and good nutritional status should be promoted to maximize HRQoL in HIV positive individuals.

Keywords

Health-related quality of life; South Africa; Acute HIV infection; Functional assessment of HIV infection

Introduction

The success of HIV treatment in preventing AIDS and death from HIV, together with a recent sharp rise in the life-expectancy among South Africans living with HIV [1] has refocused the emphasis on health-related quality of life (HRQoL) outcomes. Notably, HRQoL is predictive of good adherence to life-long therapy [2, 3] and is an important component of the well-being of individuals living with a chronic disease for which there is currently no cure [4].

While there is no standard definition [5], the World Health Organization Quality of Life Group generally defines quality of life [6] as “individuals’ perception of their position in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns”. Similarly, HRQoL, quality of life related to the health condition or the impact of illness, is often described in terms of a multi-dimensional concept [7], incorporating the subjective assessment of individual well-being encompassing

various aspects of an individual's life including, physical, mental and functional dimensions. HRQoL is recognized as a dynamic phenomenon [8], changing over time depending on an individual's circumstances.

Although international research on HRQoL in populations affected by HIV/AIDS dates back approximately two decades [9], there has been very limited focus on this important issue in South Africa, a country characterized by the highest burden of HIV infection globally with 5.6 million people living with HIV in 2011 [10], and an unrelenting tuberculosis co-epidemic [11].

Despite the rapid expansion of access to antiretroviral therapy (ART) [12], the aim of achieving universal ART access still remains a major challenge for South Africa. This is compounded by approximately one in five people who are newly diagnosed with HIV, refusing ART treatment, despite being eligible, according to one South Africa study [13]. Our study focused on the HRQoL of HIV-positive South African women up to ART initiation in the KwaZulu-Natal Province, a region in South Africa that historically encountered one of the highest HIV prevalence rates globally and considerably higher rates in women than in men [14].

Notably, so far, most studies of HRQoL have been of cross-sectional design and have been conducted in populations of individuals with established HIV disease, often on ART. In contrast, this study was conducted in a cohort of acutely infected women enrolled near HIV seroconversion and followed up repeatedly over an extended ART-free period. We were therefore able to observe the impact of HIV infection on HRQoL over time, and to investigate the demographic, behavioral and clinical correlates of evolving HRQoL outcomes prior to ART initiation.

Methods

Study Population

The CAPRISA 002 Acute HIV infection study is an ongoing prospective cohort study which started recruitment in 2004 at two sites within the province of KwaZulu-Natal, South Africa: Durban, the largest city in KwaZulu-Natal; and Vulindlela, a rural community located 130 km northwest of Durban. Originally the study recruited a cohort of HIV-uninfected women 18 years and older at high risk of HIV infection (Phase 1) with the aim to investigate the natural history of HIV-1 subtype C infection and to assess risk factors for disease progression. Those women who acquired HIV were enrolled into Phase 2 (acute infection). In addition, women who enrolled and seroconverted in other CAPRISA prevention trials including the CAPRISA 004 microbicide trial have also entered the CAPRISA 002 study at the Phase 2 stage. Acute HIV infection status of all study participants was established based on plasma HIV-1 RNA testing using Amplicor or TaqMan (Roche Diagnostics, Rotkreuz, Switzerland) prior to seroconversion or a positive HIV antibody status with a documented HIV negative antibody test within 5 months of enrolling into the study. HIV antibody testing was performed with two parallel rapid tests using Determine (Abbott Laboratories, Abbott Park, IL, USA) and Capillus or Uni-Gold (Trinity Biotech, Jamestown, NY, USA) depending on the study cohort. All discordant rapid HIV antibody tests were confirmed with

Enzygnost EIA using the BEP 2000 (Siemens, Marburg, Germany). The moment of HIV infection was estimated as 14 days before a positive RNA PCR test (if RNA positive and antibody negative) or the midpoint between the last antibody negative and first antibody positive result. Women who met the inclusion criteria were provided with a complete description of the CAPRISA 002 study, and written informed consent was obtained for participation and specimen storage. Consent forms and study information for participants were available in English and isiZulu, the local language in the province. The study methodology, including recruitment methods and eligibility criteria for the CAPRISA 002 and 004 studies, was previously described in detail [15, 16].

Study participants had their initial acute infection baseline assessment immediately after HIV diagnosis. Participants were then followed-up in three phases defined by their distance to the time of infection; acute infection (Phase II ≤3 months, but excluding the baseline assessment), early infection (Phase III >3–12 months) and established infection (Phase IV >12 months) and were censored at ART initiation. Clinical management of participants and ART initiation was conducted according to the South African Adult HIV Treatment Guidelines [17] with women starting treatment at a CD4 count of 200 cells/μl until 2009 and at 350 cells/μl since then. Participant follow-up in the CAPRISA 002 Acute Infection study continues and additional data is currently being collected for women on ART (Phase V).

At the time of this study, 142 of 160 study participants had entered Phase IV with a median HIV-positive follow-up of 46.1 months (interquartile range 32.2–58.5) since baseline assessment up to ART initiation. The median number of assessments per study participant was 27 visits (range 2–45). Participants were reimbursed for their time and travel expense at each assessment. All study participants received HIV post-test counseling, education on onward transmission and condom provision, as well as sexually transmitted infection risk reduction counseling and referral for treatment if required. All participants requiring clinical care received it either at the CAPRISA clinical research sites in Durban or Vulindlela, or were referred to a specialist facility. The Biomedical Research Ethics Committee of the University of KwaZulu-Natal approved the study.

Measures

Once enrolled into the study, face-to-face interviews were conducted in either English or isiZulu by trained research clinicians, nurses or counselors, and study data were obtained at various stages depending on the types of measures being assessed. HRQoL, the primary outcome of this study, was assessed via participant self-report at baseline, month 3 and bi-annually thereafter by trained clinical research interviewers using the functional assessment of HIV infection (FAHI) instrument [18, 19]. Specifically developed to capture perspectives on HRQoL of individuals living with HIV/AIDS, FAHI is psychometrically reliable and a validated instrument containing 44 items. The instrument, available both in English and isiZulu, has been used in a previous study involving people living with HIV infection in KwaZulu-Natal, South Africa [20]. Multiple iterations of translation/back translation and a linguistic validation on the quality of the translation and cultural appropriateness were conducted by CAPRISA and the team which created FAHI. The instrument captures five subscales of HRQoL: physical well-being (PWB) (ten items), emotional well-being (EWB)

(ten items), functional and global well-being (FGWB) (13 items), social well-being (SWB) (eight items), and cognitive functioning (CF) (three items). Each item is rated on a 5-point ordinal scale of 0 (not at all) to 4 (very much). An overall HRQoL score (44 items) was calculated by summing the subscale scores, and ranged from 0 to 176, with a higher score indicating a better HRQoL. The Cronbach alpha, internal consistency coefficient of the overall FAHI, was 0.86. Consistency coefficients for the PWB, EWB, FGWB, SWB, and CF sub-scales were 0.88, 0.83, 0.85, 0.72 and 0.65, respectively.

Self-care behavior encompasses important aspects of HRQoL [21].. HIV knowledge and risk behavior assessments, conducted at baseline, month 3 and bi-annually thereafter, captured the recent sexual history, in particular, the frequency of various sexual acts (peno-vaginal, anal, oral, and sex acts under the influence of alcohol or other substances) and the number of casual partners, irrespective of marital status. For each type of sexual act, risky sexual behavior was categorized as no/low risk, if the study participant responded having no sex or sex with a condom being used every time, or high risk, if the study participant responded having sex without the use of a condom every time based on self-report. Risk predictors related to the casual partners, were coded as no/low risk, if the study participant did not report having any casual partners, or high risk if the study participant responded having at least one casual partner. Information pertaining to contraceptive use and knowledge about HIV transmission were only obtained at baseline.

During the routine clinical examinations at every study visit, measurements for body mass index (BMI) and specimens for laboratory assessment (including CD4 and viral load) were obtained. The BMI was categorized into three groups: underweight (<18.5 kg/m^2), normal (18.5–24.9 kg/m^2) and overweight/obese (≥ 25 kg/m^2).

Data Analyses

Descriptive statistics were used to summarize baseline characteristics and the various FAHI scores (overall score, PWB, EWB, FGWB, SWB and CF) at baseline, acute infection, early infection and established infection. Paired comparisons between baseline scores and the other phases of HIV infection were conducted using Wilcoxon signed-rank tests. Tobit regression was used to determine the covariates associated with baseline FAHI scores. Linear mixed effects regression models were fitted to longitudinal FAHI scores to assess trends over time and factors associated with change from baseline, adjusting for demographic, HIV knowledge/behavioral risk, clinical and biological factors.

The proportion of women who met minimally important differences (MID) above the threshold in Phase IV was calculated. For this analysis we focused on two distribution-based methods to derive MID; the first being half the standard deviation of the baseline score [22] (SD method), and secondly the standard error of measurement (SEM method), which is a deviation of the baseline score multiplied by the square root of 1 minus the reliability coefficient [23]. Figures were used to illustrate the overall and sub-scale HRQoL score trends over time. The trend in the observed score was fitted using the fractional polynomial prediction method. All analyses were conducted using STATA version 12 (StataCorp, College Station, TX, USA) and SAS version 9.3 (SAS Institute Inc., Cary, NC, USA).

Results

Baseline Characteristics of the Cohort

The baseline characteristics assessment of the 160 study participants is presented in Table 1. The median estimated time from HIV infection to the initial (baseline) assessment was 42 days (IQR 28-62). All participants were women, with a median age of 24 years (range 18–59). Almost all (99.4 %) were black South African, 70.6 % (113) reported having completed grades 11 or 12 of schooling, and 75.0 % (120) had a stable partner or were married. Twenty women (12.5 %) reported to be engaging in sex work and half (50 %) had children who were financially dependent on them. The mean CD4 count at enrollment into the study was 566 cells/mm^3 (229–1358) and median log viral load was 4.5 copies/ml (2.6–6.3).

Quality of Life Dynamics Over Time

The overall FAHI and five sub-scale scores [PWB, EWB, FGWB, SWB and CF] were calculated for each phase as presented in Table 2. The overall HRQoL score was lowest at baseline. EWB, FGWB, SWB and the overall HRQoL scores increased from HIV diagnosis (baseline) through acute and early infection (Phases II and III) and established infection (Phase IV) for all comparisons with baseline. PWB scores remained stable throughout all phases, while CF scores initially increased up until the early infection phase and then declined during established infection. Figure 1 illustrates the overall and five sub-scale FAHI scores over time. Based on visual assessment, the overall FAHI, EWB, FGWB, and SWB scores showed a marked improvement over time, particularly within the first year of follow-up, while a slowly declining trend was seen for PWB and CF.

Baseline Predictors of Quality of Life

Results of the baseline regression analyses using the Tobit model indicated that lower educational status [overall ($\beta = -18.8$, $p = 0.02$), PWB ($\beta = -11.1$, $p = 0.01$)] and ages 21–24 compared to 18–20 years [PWB ($\beta = -6.6$, $p = 0.03$)] were negatively associated with certain FAHI domains. In contrast, the use of a contraceptive [overall ($\beta = 8.6$, $p = 0.04$), EWB ($\beta = 4.4$, $p = 0.03$)], a married status [overall ($\beta = 24.0$, $p = 0.01$), PWB ($\beta = 7.8$, $p < 0.05$), EWB ($\beta = 9.6$, $p = 0.01$)], and higher HIV-1 viral load ($\beta = 1.8$, $p = 0.01$) and CD4 counts ($\beta = 0.01$, $p = 0.01$) (SWB) were positively associated with certain FAHI domains.

Predictors of Quality of Life Dynamics

Assessment of the trends in the overall and sub-scale HRQoL scores using mixed-effects regression models and adjusting for demographic, HIV behavioral risk and clinical/biological factors (full model), are presented in Table 3. The overall FAHI, EWB, FGWB, and SWB improved over time. PWB and CF declined over time, but this did not reach statistical significance. In the adjusted analysis several covariates were strongly associated with FAHI outcomes. Among these were a higher educational status, which was associated with a higher overall and all sub-scale FAHI scores except from SWB, contraceptive use (associated with a higher overall FAHI, FGWB, and SWB scores) and a higher BMI (associated with higher overall FAHI, PWB and FGWB scores). While a higher CD4 count

was associated with a better PWB and CF, there was no association with HIV viral load. A stable partnership was associated with better FGWB and CF scores.

A preliminary analysis using unadjusted regression models indicated that sex worker status was associated with a lower overall FAHI score, a higher viral load was associated with a lower PWB, FGWB and CF, and knowledge of how HIV transmits was associated with a higher EWB score.

Meaningful Improvement in Quality of Life

Table 4 shows the proportion of women who achieved a potentially meaningful difference in their FAHI scores. There was no substantial difference between the MID SD and SEM methods. Over 60 % of study participants experienced meaningful improvements in their overall HRQoL score. Half of the study participants showed improvements in EWB, approximately 70 % in SWB and one-third showed improvements in FGWB. In contrast, only a small proportion reached a meaningful threshold in PWB and CF.

Discussion

Our study, utilizing rare data from a prospective cohort study of subtype-C infected women with an extensive follow-up period, indicates that overall HRQoL, and more specifically EWB, FGWB and SWB improved over time from acute HIV infection up to ART initiation. No improvements were found in the PWB and CF of participants. With the caveat that post-HIV support and services including counseling, HIV education and medical treatment were available during the course of the study, women diagnosed with acute HIV infection showed remarkable resilience in the EWB, FGWB and SWB aspects of their lives.

Our findings suggest that women newly diagnosed with acute HIV infection face profound HRQoL challenges, immediately after HIV diagnosis. Compared to other studies which utilized FAHI [19, 24, 25], the baseline levels of HRQoL were relatively high in our study. This may have been explained by the fact that baseline assessments were conducted during the acute infection phase and participants had already been receiving care in prevention studies while HIV uninfected. It is plausible that certain domains, such as PWB, could have been rated higher during acute and early infection when there were fewer severe symptoms compared to during the later stages of the HIV infection course. Nonetheless, the time immediately after diagnosis is one of uncertainty for women living with acute HIV infection, as evidenced by the lowest overall HRQoL scores measured at that time of the study. Fear of rejection and social discrimination associated with HIV disclosure may be stigmatizing [26], and negatively influencing quality of EWB and social relationships. Time of HIV diagnosis can often be marked by maladaptive coping strategies to the stressful event. Affective responses during this period can range from fear of death [27] and ostracism [28], to complete denial [29] of the disease and intense anger towards oneself and others. Behavioral responses, though not all negative, can range anywhere from an ‘autopilot’ reaction to highly self-destructive behavior involving substance use and acting out sexually [30]. This in turn can have negative repercussions, for example, on PWB, and can hamper recovery.

Our study highlights the potential challenge for improvements in EWB and SWB. Biological and clinical predictors (CD4 count, viral load and BMI) were strongly correlated, but limited to the physical or functional aspects of HRQoL. In fact, in the bivariate analysis during follow-up assessments and Tobit regression model for baseline analyses, higher CD4 count and lower viral load were associated with a lower SWB. This complex relationship potentially highlights the social turmoil experienced by recently diagnosed women, despite relatively good immune status. Role theories highlight the tension between personal and social expectations [31] and its influence on SWB [32], perceived quality in functioning and circumstance in relations to community and society. This may also partially help explain unmet life expectations (and thus lower HRQoL scores) among those with relatively good immune status.

Our study cohort exhibited signs of a decline in PWB and CF over time up to ART initiation. Such finding was somewhat expected based on past studies [33, 34], but whether this could indicate the onset of an HIV-associated neurocognitive decline [35, 36] due to a prolonged exposure to HIV remains to be seen. Nevertheless, the study provides some additional evidence to justify, perhaps, timely provision of ART, to reverse the detrimental effects of HIV. However, maximizing HRQoL and improving well-being aspects of quality of life among this population, means looking beyond biological markers and the provision of ART alone as being sufficient for an intervention. Women living with HIV compared to HIV-positive men often face different types of life challenges and responsibilities, including lower education [37], transportation challenges to accessing HIV care [38], and having children [39]. Power imbalance in negotiating condom use to partners in KwaZulu-Natal, South Africa [40] is also recognized as one of the factors in contributing to the transmission of HIV/AIDS in this region. Gender difference plays a significant role in quality of life [41–43] in the lives of women living with HIV, and more than any other covariates, educational attainment was strongly associated with almost all aspects of HRQoL in our study. As shown by the low baseline HRQoL scores, particularly among young women (ages 21–24), raising educational levels of women fosters HIV knowledge and may encourage protective behaviors, such as self-assertion with regards to contraceptive use and negotiation for safer sex. For these reasons, our study not only advocates for the importance of broader policy need for empowering women through education, but also improving access to evidence/community-based behavioral interventions tailored to the needs specifically of women living with HIV, similar to that of Women Involved in Life Learning from Other Women (WiLLOW) model [44], which teaches coping skills and maintains a social support network relevant in the South African context.

The major strength of this study is the assessment of HRQoL longitudinally up to 90 months post-infection with retention rates of 95 %. While HRQoL studies related to HIV are not new, our study provides a rare illustration of the wide-ranging trajectories and developmental processes of women living with HIV in relation to HRQoL, beginning from the acute infection stage.

There were a number of limitations to our study. Firstly, all study participants were entitled to post-HIV care including counseling, health education and provision of medical care. The proportion of study participants who utilized these services or how much these services may

have affected the HRQoL outcomes is unknown. Secondly, full-scale culturally adapted FAHI instruments were not available, which may have affected the reliability of certain domains, for example, CF assessment. While all instruments on the CAPRISA 002 were pre-tested with participant feedback, future studies should adhere to the recommended cultural adaptation guidelines [45, 46]. Lastly, our study included only pre-selected domains using FAHI, which is only a first step towards better understanding the priorities and domains unique to each individual, and how they relate to individual goals and expectations of living with HIV. To this end, further studies based on qualitative methods may be warranted to accurately identify pertinent domains and their relative importance [47].

Conclusions

Women newly diagnosed with acute HIV infection face profound challenges, requiring an evidence-based approach to maximizing HRQoL. Effective provision of ART will continue to be an essential intervention for the management of HIV-infected individuals in certain aspects of HRQoL, but it alone is insufficient. While individual-level, clinical-, and behavior-changing interventions are critical, broader structural inequities which impede access and empowerment of women through education also need to be addressed. Our study provides a rare illustration of extensive life trajectories of women living with HIV over time up to ART initiation, beginning from the acute infection stage. Even as newly diagnosed women faced multifaceted challenges, their EWB, FGWB and SWB aspects of HRQoL improved with time, showing resilience in the aftermath of being diagnosed with a life-threatening disease.

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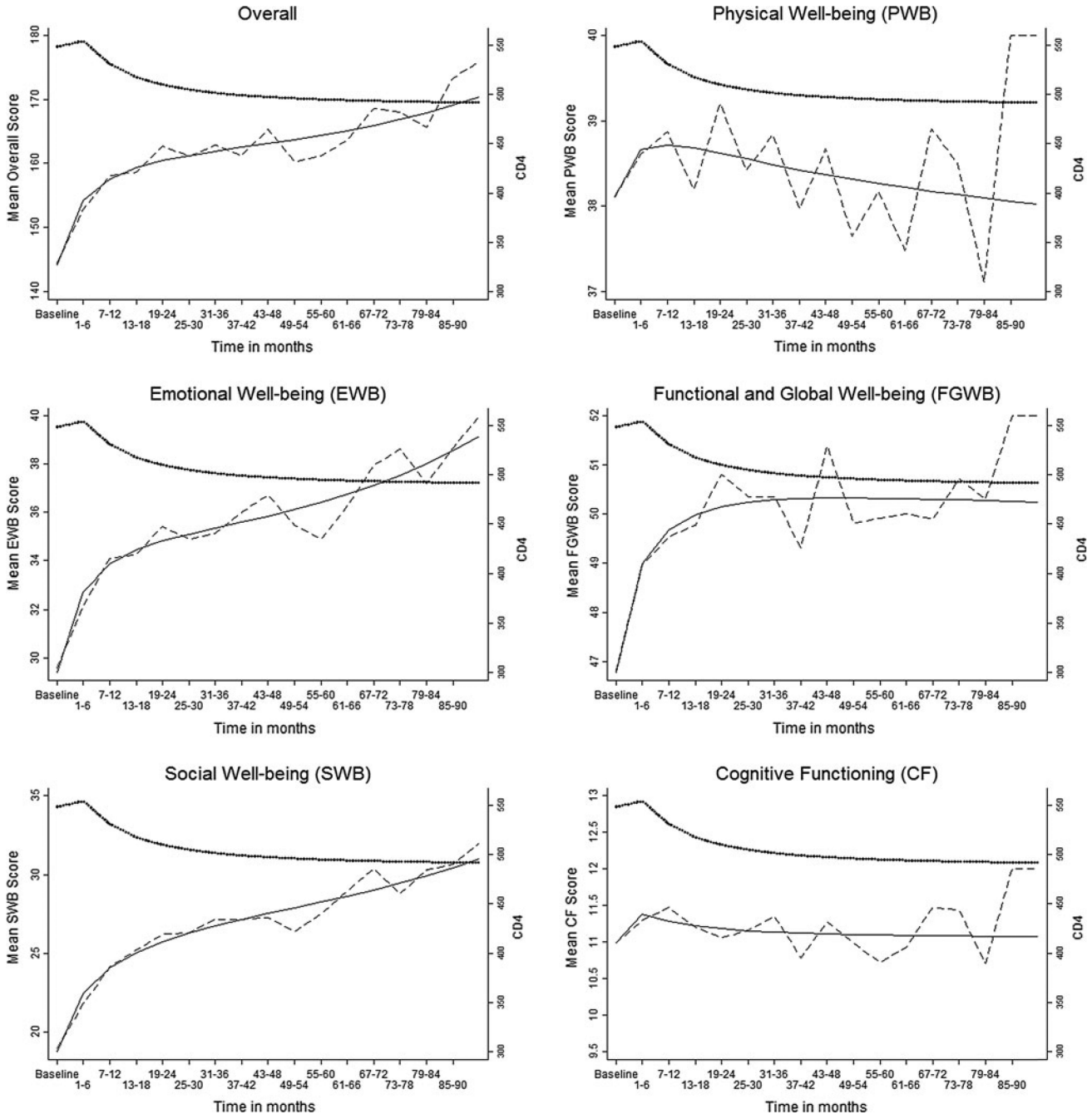

Fig. 1.

Overall and sub-scale FAHI scores over time, *Long dotted line* observed score for FAHI, *Solid line* fitted score for FAHI, *Dark dot line* fitted score for CD4 count

Table 1

Baseline characteristics of South African women in the CAPRISA 002 study (N = 160)

Variable	Category	*n*	%
Age (years)	18–20	28	17.5
	21–24	61	38.1
	25–29	41	25.6
	30–39	22	13.8
	40–59	8	5.0
Race	Black	159	99.4
	Coloured	1	0.6
Marital status	Married/stable partner	120	75.0
	Many partners	11	6.9
	No partner—single	29	18.1
Presence of casual partners	Yes	25	15.8
Highest completed education	Less than high school <8th grade	7	4.4
	High school up to 10th grade	40	25.0
	At least grade 11/12	113	70.6
Any financially child dependents	Yes	80	50.0
Contraception use	Yes	127	79.4
Knowledge of HIV	Yes	141	88.1
Sex work	Yes	20	12.5
BMI	Underweight	4	2.5
	Normal	58	36.3
	Overweight/obese	98	61.2
CD4 count[a]	Cells per mm^3	Mean = 566.2	SD = 220.7
Log viral load[a]	Copies/mL	Mean = 4.3	SD = 0.9

[a] 3-month post infection

Table 2

Overall and subscale FAHI score comparisons of HIV diagnosis with acute, early and established infection

Phase	**HIV diagnosis: enrollment (*N* = 160)**	**Acute infection: phase II (*n* = 144)**			**Early infection: phase III (*n* = 145)**			**Established infection: phase IV (*n* = 140)**		
Domains	**Baseline**	**≤3 months (excluding baseline)**			**>3 and ≤ 12 Months**			**>12 Months (but pre-ART)**		
	Median score	**Median score**	***z***	***p***	**Median score**	***z***	***p***	**Median score**	***z***	***p***
Overall	146.5	155	–4.9	<0.01	159	–6.6	<0.01	163.5	–8.7	<0.01
PWB	40	40	–0.7	0.46	40	–1.5	0.14	39.5	1.8	0.08
EWB	31	33	–2.9	<0.01	34	–5.4	<0.01	36	–7.5	<0.01
FGWB	49	51	–3.9	<0.01	52	–4.6	<0.01	51	–5.7	<0.01
SWB	18	21.5	–3.4	<0.01	24	–5.5	<0.01	28.1	–8.2	<0.01
CF	12	12	–1.5	0.13	12	–2.1	0.03	11.5	2.7	<0.01

Overall total quality of life score (0–176), *PWB* physical well-being (0–10), *EWB* emotional well-being (0–40), *FGWB* functional and global well-being (0–52), *SWB* social well-being (0–32), *CF* cognitive functioning (0–12)

All *p* value based on Wilcoxon sign-rank pair test

Table 3

Trend analysis for overall and sub-scale FAHI outcomes using adjusted mixed-effects models

	FAHI QOL (Overall)		Physical well-being (sub 1)		Emotional well-being (sub 2)		Functional and global well-being (sub 3)		Social well-being (sub 4)		Cognitive function (sub 5)	
	β	***p***	***β***	***p***	***β***	***p***	***β***	***p***	***β***	***p***	***β***	***p***
Months enrolled	0.22 (0.02)	<0.01‡‡‡	–0.010 (0.007)	0.15‡	0.09 (0.008)	<0.01‡‡‡	0.02 (0.007)	<0.01‡‡‡	0.12 (0.010)	<0.01‡‡‡	–0.004 (0.003)	0.19‡‡
Age category (18–20)												
Age 21–24	–1.31 (2.04)	0.52	–0.15 (0.47)	0.75	–0.52 (0.73)	0.48	–0.04 (0.49)	0.93	0.09 (1.15)	0.94	–0.73 (0.22)	<0.01‡‡‡
Age 25–29	0.47 (2.25)	0.84	–0.08 (0.52)	0.87	–0.19 (0.80)	0.81	0.53 (0.54)	0.33	0.84 (1.27)	0.51	–0.50 (0.25)	0.05
Age 30–39	3.85 (3.22)	0.23	0.62 (0.75)	0.40	0.78 (1.16)	0.50	1.83 (0.78)	0.02	1.20 (1.81)	0.51	0.05 (0.35)	0.90
Age 40-59	3.53 (3.65)	0.34	-0.81 (0.81)	0.32	2.05 (1.30)	0.12	-0.23 (0.85)	0.79‡‡	3.57 (2.09)	0.09	-0.83 (0.39)	0.04‡‡
Education (>10)												
School <8	-5.55 (3.58)	0.12‡‡	0.40 (0.85)	0.64	-1.43 (1.26)	0.26‡	-2.54 (0.86)	<0.01‡‡‡	-1.93 (1.99)	0.33	-0.67 (0.39)	0.09‡
School 8-10	-4.33 (1.72)	0.01‡‡‡	-0.95 (0.40)	0.02‡‡‡	-1.36 (0.61)	0.03‡‡‡	-1.13 (0.41)	<0.01‡‡‡	-0.40 (0.97)	0.68	-0.62 (0.19)	<0.01‡‡‡
Marital status (many partners)												
Stable	2.96 (3.53)	0.40	0.66 (0.78)	0.39	0.44 (1.25)	0.73	1.92 (0.84)	0.02	-0.44 (1.94)	0.82	0.83 (0.37)	0.03‡‡‡
Single	3.09 (3.89)	0.43	0.32 (0.88)	0.72	0.78 (1.39)	0.57	2.13 (0.94)	0.03‡‡	-0.62 (2.15)	0.77	0.84 (0.42)	0.05‡‡‡
Child dependants	-0.22 (0.78)	0.78	0.10 (0.18)	0.58	0.13 (0.28)	0.63	-0.27 (0.19)	0.15	-0.19 (0.44)	0.67	-0.04 (0.09)	0.68
Sex worker status	-3.31 (2.89)	0.25‡‡	0.56 (0.65)	0.39	-1.48 (1.04)	0.16‡	0.71 (0.68)	0.30	-2.52 (1.62)	0.12	0.04 (0.31)	0.90
Risky peno-vaginal sex act[a]	1.47 (1.33)	0.27	0.50 (0.41)	0.23	0.68 (0.49)	0.17	-0.34 (0.44)	0.44	0.33 (0.61)	0.59	-0.13 (0.18)	0.49
Risky anal sex act[a]	2.60 (5.58)	0.69	0.60 (1.72)	0.76	-1.48 (2.07)	0.55	0.74 (1.83)	0.72	2.58 (2.57)	0.42	0.94 (0.76)	0.34
Risky oral sex act[a]	0.16 (4.57)	0.97	0.30 (1.48)	0.85	-3.80 (1.70)	0.08‡	0.58 (1.58)	0.73	4.10 (2.06)	0.10	-0.15 (0.64)	0.83
Risky drunk sex act[a]	5.03 (3.58)	0.21	0.99 (1.11)	0.40	0.33 (1.29)	0.81	2.67 (1.21)	0.07	-0.87 (1.57)	0.60	0.35 (0.48)	0.49
Presence of casual partners	0.39 (1.86)	0.83	0.34 (0.58)	0.56	-0.34 (0.68)	0.62	0.28 (0.63)	0.65	-0.33 (0.84)	0.69	0.02 (0.26)	0.95
Use of contraception	4.42 (1.93)	0.02‡‡	0.40 (0.43)	0.35	1.31 (0.69)	0.06‡	0.90 (0.45)	0.05‡	2.44 (1.10)	0.03	-0.10 (0.20)	0.62
Knowledge of HIV	1.17 (2.18)	0.59	1.21 (0.50)	0.02‡‡‡	1.50 (0.78)	0.06‡‡	-0.45 (0.52)	0.39	-1.35 (1.24)	0.28	-0.08 (0.24)	0.73

	FAHI QOL (Overall)		Physical well-being (sub 1)		Emotional well-being (sub 2)		Functional and global well-being (sub 3)		Social well-being (sub 4)		Cognitive function (sub 5)	
	β	***p***	***β***	***p***	***β***	***p***	***β***	***p***	***β***	***p***	***β***	***p***
Log viral load[a]	-0.22 (0.59)	0.72	-0.26 (0.17)	0.13‡‡‡	0.04 (0.22)	0.84	-0.21 (0.18)	0.23‡‡‡	0.23 (0.29)	0.42	-0.09 (0.08)	0.25‡‡‡
CD4 count[a]	0.08 (0.13)	0.53	0.08 (0.04)	0.03‡‡‡	0.009 (0.05)	0.85	-0.004 (0.04)	0.92	-0.05 (0.06)	0.40‡‡‡	0.04 (0.02)	0.03‡‡‡
BMI[a] (normal)												
Underweight	-11.82 (5.53)	0.04‡‡	-2.05 (1.76)	0.25	-3.91 (2.06)	0.07‡	-4.10 (1.88)	0.04‡‡	-2.18 (2.52)	0.39	-1.08 (0.77)	0.17
Overweight/obese	1.81 (1.24)	0.15‡‡‡	1.11 (0.33)	<0.01‡‡‡	-0.28 (0.45)	0.53	0.89 (0.35)	0.01‡‡‡	-0.54 (0.62)	0.38	0.24 (0.15)	0.12

‡ $p < 0.10$

‡‡ $p < 0.05$

‡‡‡ $p < 0.01$ for bivariate model. Reference category in parentheses

[a] Time covariant. SE in parentheses

Table 4

Number of participants meeting meaningful difference (MD) improvement (n = 140)

Domains	Mean score difference between baseline enrollment and established infection stage	SD method		SEM method	
		MD	No. meeting threshold	MD	No. meeting threshold
Overall	17.3	9.7	89 (64 %)	7.3	102 (73 %)
PWB	0.3	2.2	17 (12 %)	1.5	27 (19 %)
EWB	5.9	4.2	73 (52 %)	3.5	80 (57 %)
FGWB	3.4	3.8	38 (27 %)	2.9	50 (36 %)
SWB	7.6	3.6	96 (69 %)	3.8	95 (68 %)
CF	0.04	1.1	22 (16 %)	1.3	21 (15 %)

Overall total quality of life score (0–176), *PWB* physical well-being (0–40), *EWB* emotional well-being (0–40), *FGWB* functional and global well-being (0–52), *SWB* social well-being (0–32), *CF* cognitive functioning (0–12)