



Disability and Health Outcomes – From a Cohort of People on Long Term ART

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Abstract

HIV and AIDS remains a major health problem in South Africa even after two decades since the introduction of antiretroviral therapy. Long term survival with HIV is associated with new health related issues and a risk of functional limitation/disability. The aim of this study was to assess the impact and predictors of functional limitation associated with HIV/AIDS among people living with HIV (PLHIV) in South Africa.

This study is a cross-sectional survey using a cohort in an urban area in Gauteng province South Africa. Questionnaires that were interview administered were used to collect information on demographics, disability, mental and physical health state, adherence and livelihood.

A total of 1044 participants with an average age of 42 ± 12 years, were included in the study and 51.9% of the participants reported functional limitation (WHODAS ≥ 2). These were reported mainly in the participation (40.2%) and mobility domains (38.7%). In addition, adherence to ARV, physical health symptoms and depression were strongly associated with functional limitations/disability.

HIV as a chronic disease is associated with functional limitations that are not addressed and pose a risk of long term disability and negative adherence outcomes. Therefore, wellness for people living with HIV/AIDS (PLHIV) needs to include interventions that can prevent and manage disability.

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Introduction

Human Immunodeficiency Virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS) remain key priority health areas in HIV-endemic countries in spite of its thirty year trajectory (1). An estimated 7,000,000 people were living with HIV in South Africa in the year 2015 (2). Due to life saving antiretroviral treatment (ART) more people survive. As a result, the focus of HIV management has shifted in recent years from that of a deadly disease towards managing a chronic condition (3). Managing chronicity requires a move towards a more integrated approach of treatment, care and support that includes rehabilitation in the continuum of care (3-5). There is similarity in this approach with the systems thinking proposed by Valdiserri in his call for improved focus on demographic and epidemiological data in order to develop high quality systems of care (1). There is very little understanding of the long term health outcomes of living with chronic HIV in Africa and the related services needed to manage associated health needs after long periods on ART (3, 4, 6). Co morbidities such as TB, cancer and depression have already received some attention (7-9). We have even less understanding on the long-term effects beyond the investigation of HIV-related conditions and comorbidities.

Recent evidence has suggested that people living with HIV including those on ART experience a diverse set of disabilities (5, 10-13). The United Nations (UN) Convention on the Rights of Persons with Disabilities (CRPD) has been instrumental in many policy debates including HIV/AIDS. The CRPD offers a tool to protect and promote the rights of people with disability but also those in need of rehabilitation because they are affected by chronicity. The intersection of disability in HIV requires a careful exploration of the impact of the virus and treatment from a multi-systemic perspective. There is however a dearth of empirical information on the intersection of HIV and disability to inform policy and practice. Understanding the scope, types of disabling effects as well as its impact on health outcomes and treatment adherence is crucial to inform management of HIV as a chronic condition (3, 6). Existing literature used the international classification of function (ICF) as a lens to understand the relationship between HIV and disability (5, 6, 10, 11, 13-15). The ICF is a classification system of health components of function and disability.

Studies using this lens indicate a high burden of disability with diverse conditions among people living with HIV and those on ART. However, we have little quantitative evidence from representative cohort studies that can predict better the scope and types of disability in populations living with HIV and its impact on health and ART adherence.

The HIV-Live Study, collaboration between Health, Economics, HIV and AIDS Research Division (HEARD) and University of the Witwatersrand

Johannesburg South Africa, sought to address this gap investigating the disabling experiences in three different cohorts and settings. The study investigated the intersection of functional limitation as a proxy for disability, other health outcomes, treatment adherence and livelihood outcomes.

A recent publication reported the results of HIV disability and associations with health outcomes in the first cohort study (HIV-Live) in a semi-rural area in KwaZulu-Natal considered the epicentre of the pandemic in South Africa (6). The results of the second cohort in the urban setting of Gauteng (second highest prevalence in the country) are presented in this paper. The main aim of the study was to investigate the scope and types of functional limitations/disability and the association with health and adherence outcomes with the specific objectives being to determine socio-demographics, livelihood, and medical history, physical, functional and mental health of the cohort.

Methods

A combination of a disability and livelihood framework formed the theoretical basis to investigate the relationship between disability and other outcomes in a cohort of people on ART in South Africa. The overall methodology was developed to include a cross-sectional survey in three cohorts: a semi urban area in KwaZulu-Natal (longitudinal observational study) and two cohorts in the urban area of Gauteng (SA) and United States of America. The cohort in Gauteng was at Helen Joseph Hospital, Themba Lethu HIV clinic where the largest antiretroviral treatment site in the South Africa, operates. Since 2004 over 140,000 patients have been initiated on antiretroviral (ARV) and currently has 8000 patients on treatment.

Each participant was approached as during their routine visit for treatment review and collection of medication. All patients were routinely screened for height, weight, BMI, blood pressure and are screened further by a doctor. Participants had to be attending the outpatient HIV clinic, be between the ages of 18-65 years and have been on ART for six months or longer. Exclusion criteria included participants with any acute opportunistic infection such as active TB or pneumonia and if the patient was pregnant as this would have impacted the disability measure.

A trained research assistant who herself was a patient attending this clinic approached the patients during their visit, explained the purpose of the study and sought initial permission to interview the patient. Three trained research assistants including the principle investigator collected data. All three were trained clinicians and could explain the concepts when misunderstanding arose. The questionnaires were translated into isiZulu and the researchers could use the standardised translated questionnaire where needed. The patient file was accessed after permission was granted by the patient. The length of time on ART and the presence of recent opportunistic infections were

extracted as well as the most recent CD4 count. The information extracted was verified with the patient in the interview.

Ethics approval was obtained from the Human and research ethics committee at the University of the Witwatersrand, Johannesburg, South Africa and written informed consent of the participant was obtained.

The estimated sample size for this study was calculated at 1050 with Stata 12.1 with a one sample comparison of proportions (one sample size computation), a 90% power and two-sided test and alpha level of 5% with a hypothesized 55% of the population with disability. Therefore, the estimated sample size was 1050.

The data collection tool was developed using literature (4-6, 13-17) as well as established and validated scales (see Table 1). Included in the survey tool were demographics, biomarkers and scales for livelihood capitals (human, financial, social, natural and physical capital), patients' health medical history, functional limitations/disability, depression symptoms and treatment adherence.

The International Classification of Function (ICF) was used as a conceptual framework to define disability. The ICF defines disability as an umbrella term for impairments, activity limitations and participation restrictions. In addition, the interaction between a persons health condition and their context which includes their environmental and personal factors as part of the concept of disability. The central element of disability is therefore the experience of functional or activity limitation on the basis of the interaction between changes in body function (impairment) and unaccommodating environments. As such, scales to investigate function and activity limitations were included in the tool and assessed through the WHODAS 2.0 (18). Importantly, their health condition was also measured using health symptoms commonly experienced by people living with HIV/AIDS PLHIV. Adherence was measured using Mannheimers CASE adherence index (19).

Table 1 outlines the instruments used in this study, the variables measured along with the psychometric properties of the instruments and the data analysis approach. Shapiro Wilk test was conducted and the data were non-linear for the main outcome measures ($p < 0.001$). Subsequently Kendall's Tau and Mann Whitney U tests were used to examine the relationship between the dependent and independent variables. While Kendall's Tau is not directly comparable to Pearson's r , as it provides a smaller coefficient, but it can be converted using a formula from Walker (20). Linear regression was used to determine the predictors of the independent variables. All data analysis was done using the IBM SPSS 22.0.

Results

A total of 1044 participants were enrolled, 71.8% were females with an average age of 42 ± 12 years. The average (median) WHODAS weighted score in this population was 0.5 ± 8 and 51.9% (542) of the participants reported disability ($\text{WHODAS} \geq 2$). Average income was 5260 South African Rand across three months and 84.6% have at least some form of high school education. Only a few participants reported having no source of income ($n=43$) and no formal schooling ($n=17$). Socio-demographic characteristics are outlined in Table 2. Functional limitations as a proxy for disability were reported in all the six domains with a higher prevalence in the participation (40.2 %), mobility (38.7 %), cognition (33 %) and the life activity domains (32.9%) as shown in Figure 1.

Relationship between functional limitations, health outcomes and socio-demographics

Gender ($r_{\tau b} = 0.10, p < 0.001$) and exposure to shock ($r_{\tau b} = 0.32, p < 0.001$) showed significant association with functional limitations. Similarly, duration of HIV and ART was showed significant association with functional limitations ($p < 0.001$). All other socio-demographic variables showed no significant association with functional limitations, $p > 0.05$. Correlation analysis (Kendall Tau b) showed a positive weak

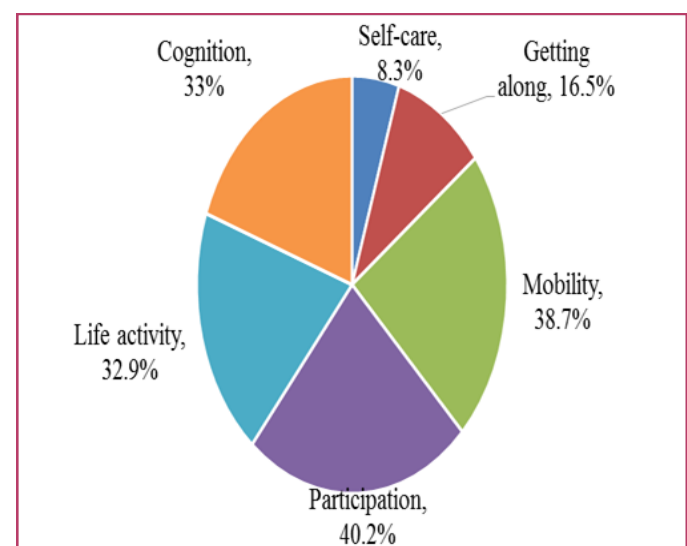


Figure 1: Functional limitations in the six domains

Table 1. Instruments used in the study, variables measured, psychometric properties of the instruments and data analysis approach.

Element measured	Tool	Variables	Literature Source, reliability and validity	Data analysis
Socio-demographic	Socio-demographic questionnaire	Age gender and marital status (* other factors are indicated in the livelihoods section)	-	Descriptive and correlations
Livelihood	HIV-Live livelihood capitals (self-developed from literature)	Education , financial capital, including source of income, physical and natural capital including housing, source of income, water and sanitation, social capital and food security	Livelihood-.728 Physical & natural capital -.699 Social capital -.908 Food security -.790 (21)	Descriptive
Medical history	Medical symptoms questionnaire	Confusion, Memory loss, Breathlessness, Fatigue, Diarrhea, Nausea, Stomach Pain, Headache, Change in taste, Change in taste, . Skin itching/ changes. Muscular pain, Heartburn, Sore mouth, Vomiting, Fever, Kidney stones. Included in this section were the patient weight height, CD4 count	(22)	Overall score converted to a metric of 0- 100% where 100 = full health and 0 experiencing all symptoms.
Physical and functional health	WHODAS World health Organisation disability assessment scale 2.0 (5 point Likert scale)	Mobility (standing and walking), Self-care (washing , getting dressed), Participation (involvement in life situations), Cognition (learning concentration and memory),getting along (dealing with people and maintaining friendship)and life activities (work and education)	Internal consistency reliability was 0.94 (Cronbach's alpha). It showed moderate convergent validity with EQ5D and RAND-12 (0.41-0.76) (23)	WHO item response theory-scoring and data analysis system was used and the analysis uses overall weighted score of 36, 36 = lowest level of function.
Mental health	CESD-10 (4 point Likert scale)	Ten questions prompting Status as far as depression, level of bother, how fearful, hopeful, happy or lonely one is and the effort required to get going.	The CES D -10 showed good internal consistency reliability with the original CES D 20 ($\alpha = 0.88$ (24, 25)	A sum of the scores was taken and a cut off of 16 and above was considered at risk of depression. A converted summary score is calculated with a metric of 0-100 (100 is equal to no symptoms of depression and 0 depicts severe symptoms of depression.)
Adherence	CASE adherence index	Three unique adherence questions combined to form a composite score	CASE adherence index showed strong correlation with the three day self-reported adherence (ROC curve >0.86, $p < 0.001$). (26)	A sum of the scores was calculated out of 16, with scores below 11 indicating adherence issues.

Table 2: Socio-demographic characteristics of the participants

Characteristics	Total (n=1044)	People WHODAS 0-1 (n=502)	People WHODAS ≥ 2 (n=542)	P
Age, median (IQR) years	42(12)	42(11)	42(12.3)	0.53
Age category, n (%)				
18-29	68(6.5)	33(6.6)	35(6.5)	
30-39	335(32.1)	164(32.7)	171(31.5)	
40-49	459(44)	223(44.4)	236(43.5)	
50-59	168(16.1)	76(15.1)	92(17)	
60+	14(1.3)	6(1.2)	8(1.5)	
*Gender, n (%)				0
Men	291(28.2)	164(32.7)	127(23.5)	
Women	750(71.8)	337(67.3)	413(76.5)	
Marital Status, n (%)				0.06
Never married, single	513(49.1)	235(46.8)	278(51.3)	
Currently married	250(23.9)	125(24.9)	125(23.1)	
Divorced or Widowed	208(19.9)	97(19.3)	111(20.5)	
Cohabiting	73(7)	45(9)	28(5.2)	
*Education status, n (%)				0.14
No formal schooling	17(1.6)	10(2)	7(1.3)	
Some primary	143(13.7)	80(16)	63(11.6)	
High school	769(73.7)	367(73.3)	402(74.2)	
Post high school	113(10.8)	44(8.8)	69(12.7)	
Refused/don't know	1(0.1)	-	1(0.2)	
*Source of Income, n (%)				0.79
Earned Income	604(58.3)	286(57.5)	318(59)	
Disability grant	14(1.4)	-	14(2.6)	
Other Grants	77(7.4)	19(3.8)	58(10.8)	
No Income	43(4.2)	30(6)	13(2.4)	
Refused	197(19)	122(24.5)	75(13.9)	
Other income	94(9.1)	38(7.6)	56(10.4)	
Gifts	7(0.7)	2(0.4)	5(0.9)	
Income, median (IQR)	5260.6(9000)	4500(9000)	3600(6540)	

Table 2 (continued on next page..)

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Characteristics	Total (n=1044)	People WHODAS 0-1 (n =502)	People WHODAS ≥ 2 (n = 542)	P
WHODAS weighted score,				0
mean out of 36 ($\pm$ SD)	0.5(8)	0(0)	8(9)	
CES-10 Score,				0
mean out of 30 ($\pm$ SD)	11(9)	10(10)	12(10)	
*Adherence score, median (IQR)	16(2.8)	16(1)	14.2(3)	
Adherence score above 10, n (%)	148(14.2)	65(13)	83(15.4)	0
Adherence score of 10 or less, n (%)	893(85.8)	436(87)	457(84.6)	
Health Symptoms,				0
mean out of 16 ($\pm$ SD)	5(6)	4(5)	6(5)	
*BMI, median (IQR)	25(8.1)	24.9(7.5)	25.2(8.6)	
Normal	432(42.7)	245(44.4)	187(40.7)	
Underweight	73(7.2)	36(6.5)	37(8)	0.37
Overweight	273(27)	155(28.1)	118(25.7)	
Obese	234(23.1)	116(21)	118(25.7)	
*CD4 Count, n (%)				0.25
< 200	762(77.5)	366(77.9)	396(77.2)	
≥ 200	221(22.5)	104(22.1)	117(22.8)	
*Years of HIV diagnosis, median (IQR)	8(6)	7(6)	9(6)	0
*Years on ART, median (IQR)	6(5)	6(5)	7(6)	0.01

Table 3: Relationship between socio demographics and health outcome measures

Variable	WHODAS $r_{tb}(p)$	Adherence $r_{tb}(p)$	Mental health $r_{tb}(p)$
Socio-demographics			
Age	0.04(0.12)	0.02(0.36)	0.10 (0.00)
Gender	0.10(0.00)**	0.04(0.17)	0.09(0.00)
Marital status	-0.04(0.15)	-0.03(0.19)	0.01 (0.73)
Education	0.05(0.05)	-0.12(0.00)**	-0.13(0.00)**
Income	0.03(0.19)	-0.00(0.90)	-0.22(0.00)**
Years on ARV	0.07(0.01)	-0.05(0.07)	0.04(0.06)
Years of HIV diagnosis	0.07(0.00)	-0.05(0.05)	0.03(0.24)
Exposure to shock	0.32(0.00)	-0.08(0.01)**	0.15(0.00)**
Clinical outcome measures			
Mental health	0.19(0.00)**	0.03(0.16)	1
Adherence	-0.12(0.00)**	1	0.03(0.16)
Physical health	0.21(0.00)**	0.01(0.82)	0.31(0.00)**
WHODAS	1	-0.12(0.00)**	0.19 (0.00)**
CD4	-0.00(0.72)	0.04(0.18)	-0.05(0.06)
BMI	0.01(0.54)	0.04(0.14)	-0.02(0.41)

correlation between functional limitations and outcome measures of physical health symptoms

($r_{tb} = 0.21, p < 0.01$) and mental health scores

($r_{tb} = 0.19, p < 0.01$), whereas, there was a negative weak correlation between adherence score and

WHODAS scores ($r_{tb} = -0.15, p < 0.01$). Table 3 shows the result of the correlation analysis between the dependent and independent variables.

Independent variables with p-value ≤ 0.25 were included in the linear regression model (27). The variables were log transformed to ensure data linearity. Age, gender, income, exposure to shock, adherence, physical health symptoms, education, marital status, duration on ART, duration of HIV diagnosis and mental health score were included in the multivariate regression analysis. Multivariate linear regression showed that mental health, physical health symptoms, income and exposure to shock are stronger predictors of functional limitations. Whereas, the stronger predictors of mental health scores in the study are age, physical health symptoms, functional limitations/disability and duration of HIV diagnosis. Gender, income, disability score and mental health score were stronger predictors of adherence to ARVs. Table 4 shows the multivariate linear regression results of the independent and dependent variables.

Furthermore, the multivariate results in Table 5 shows the health predictors of functional limitation in the six domains, mobility, cognition, self-care, life activity, getting along and participation after adjusting for age, gender, education, marital status, income, exposure to shock, duration of HIV diagnosis and duration on ART.

A one unit increase in mental health and physical health score increased WHODAS score (functional limitation) by 0.18 and 0.11 respectively. In the specific domains, a unit increase in mental health score increased WHODAS score in the mobility, cognition and participation domain by 0.19, 0.17 and 0.16 respectively. Likewise, a unit increase in physical health symptoms score increased the WHODAS score by 0.11. In the specific domains, a unit increase in physical

health score increased WHODAS score in the cognition and mobility domains by 0.12 and 0.11 respectively.

Also, a one unit decrease in adherence score reduces the WHODAS score by 0.13. In the specific domains, a unit increase in adherence score reduced WHODAS score in the getting along, self-care and life activity domains by 0.28, 0.13 and 0.11 respectively.

Discussion

This study assessed the impact and predictors of HIV-related functional limitations/disability and health outcomes in a cohort of PLHIV on ART for more than six months. In this cohort 51.9% of the participants scored 2 or more on the WHODAS 2.0 using the adjusted measure [14, 28, 29]. This is higher than in the sister study in KZN [6] and suggest a high prevalence of functional limitations that if not addressed may be a risk of disability. In many studies, disability is described differently and often interchangeably between functional and activity limitation, disability and functioning [5], [28-30]. Current measures of disability such as the WHODAS 2.0 or the Washington set of questions [31] make use of this understanding and measure functional limitations to understand disability. This method identifies people with more moderate conditions that can be addressed with therapeutic interventions to severe conditions that need complex rehabilitative interventions. In this cohort the levels of functional limitation/disability remain high, and a large part of this population has more moderate limitations that are also less visible. One difference with existing studies is that previous studies are focused on older people (28-30) living with HIV while 99.7% of this cohort were an economically able age group (20-60). Comparably, Rusch, Nixon [32] reported a higher prevalence of disability in their study with an HIV population. There is also a difference in the gender distribution of functional limitations/disability in this cohort and this is consistent with other studies, females are prone to report more disability than males [6, 10, 11, 29, 33].

Our study showed levels of functional limitations/disability are higher in the areas of mobility, cognition and participation and life activity domains. Similarly, Nyirenda, Chatterji [28] reported mobility as well as participation and household activities as the most affected domains in their study with an older population

Table 4: Multivariate linear regression analysis of the health outcome predictors of disability among PLHIV on ARV > 6 months using linear regression

	WHODAS			Adherence			Mental health		
	B	95%CI	p	B	95%CI	p	B	95%CI	p
Mental health	0.18	0.16 – 0.38	0.00	-0.02	-0.04 – 0.02	0.00	-	-	-
Adherence	-0.13	-0.86 – (-0.29)	0.00	-	-	-	-0.02	-0.24 – 0.15	0.64
Physical symptoms	0.11	0.06 – 0.31	0.00	0.03	-0.02 – 0.04	0.45	0.36	0.32 – 0.47	0.00
WHODAS	-	-	-	-0.16	-0.06 – (-0.02)	0.00	0.18	0.07 – 0.17	0.00
Age	-0.00	-0.39 – 0.38	0.98	0.07	-0.01 – 0.19	0.08	0.10	0.14 – 0.65	0.00
Gender	0.06	-0.01 – 0.14	0.08	0.10	0.01 – 0.04	0.01	0.03	-0.03 – 0.07	0.35
Education	0.04	-0.02 – 0.09	0.21	-0.02	-0.02 – 0.01	0.57	-0.03	-0.05 – 0.02	0.39
Marital status	-0.01	-0.04 – 0.03	0.68	-0.02	-0.01 – 0.01	0.60	-0.01	-0.02 – 0.02	0.83
Income	0.13	0.13 – 0.41	0.00	0.21	0.07 – 0.14	0.00	-0.07	-0.19 – 0.00	0.05
Exposure to shock	0.28	0.20 – 0.33	0.00	-0.04	-0.03 – (-0.01)	0.37	0.06	-0.01 – 0.08	0.10
HIV diagnosis	0.02	-0.14 – 0.22	0.64	-0.08	-0.08 – 0.01	0.15	-0.11	-0.25 – (-0.02)	0.02
Years on ARV	0.05	-0.08 – 0.28	0.27	0.00	-0.04 – 0.05	0.94	0.04	-0.06 – 0.17	0.35

Table 5: Multivariate regression analysis of health outcome predictors of disability among PLHIV on ARV > 6 months using linear regression with respect to the WHODAS domains

	Adherence			Mental health			Physical health symptoms		
	B	95%CI	p	B	95%CI	p	B	95%CI	p
WHODAS score	-0.13	-0.87-(-0.30)	0.00	0.18	0.16 – 0.38	0.00	0.11	0.06 – 0.30	0.00
Mobility	-0.09	-0.45 – (-0.06)	0.01	0.19	0.11 – 0.26	0.00	0.10	0.02 – 0.18	0.01
Cognition	-0.10	-0.38 – (-0.07)	0.01	0.17	0.07 – 0.19	0.00	0.12	0.04 – 0.17	0.00
Participation	-0.07	-0.35 – (-0.01)	0.04	0.16	0.07 – 0.20	0.00	0.09	0.01 – 0.16	0.02
Self-care	-0.13	-0.28 – (-0.08)	0.00	0.10	0.01 – 0.08	0.02	-0.03	-0.05 – 0.03	0.55
Getting along	-0.28	-0.58 – (-0.35)	0.00	0.09	0.01 – 0.09	0.02	0.08	-0.00 – 0.09	0.06
Life activity	-0.11	-0.34 – (-0.08)	0.00	0.19	0.07 – 0.17	0.00	0.06	-0.01 – 0.10	0.11

with HIV. Difficulties in mobility are anticipated as HIV is known to affect the musculoskeletal system negatively for example, peripheral neuropathy with direct effects on muscle function as well as apoptotic effects on muscle cells [34, 35]. Clearly, a large number of our cohort reported mobility limitations.

In our study, adherence to ARV was a strongly associated with overall disability and this is true in all six WHODAS 2.0 domains. Similar results were reported in the sister cohort study in KZN. The HIV live study is the first study to measure the direct association between disability (as functional limitation) and adherence. The role of adherence to ARV in the progression of HIV and occurrence of related comorbidities has been reported in several studies [36-38]. Adherence to ARV therapy reduces or delays the progression of HIV to AIDS and reduces the risk of comorbidities [36, 38]. At this point we are unable to fully understand the direction of this relationship. It is however plausible that the lack of adherence increases the risk of opportunistic infections and comorbidities and therefore disability. It is also plausible that disability negatively impacts health seeking behaviour and therefore adherence to treatment. Much work has been done on adherence to ARVs however no study has been conducted to examine to what extent adherence is related to the onset of disability.

The physical health state of participants was also associated with disability in the mobility, cognition and participation domains. A poorer state of health is often directly associated with a decreased level of function in the general population [39, 40]. In addition, adherence to ARVs has been shown to improve overall health status of PLHIV [36, 38]. In this cohort as well as its sister study [6], there is an relationship between adherence and functional limitations/disability. Similarly, in both studies depression correlated with increasing disability and all the subcategories of the WHODAS2.0 scores. A discussion on the implication of depression and disability is beyond scope of this paper, but a matter for further analysis and publication.

Preventing and managing disability is important as it impacts the productivity of a community, function and health related quality of life (HRQOL) [41]. In practice, the management of disability is both multi-sectoral and person centred [41]. The response to needs of PLHIV

could be divided into micro (person), meso (community) and macro (policy). At person level, functional limitations can be managed to mitigate the impact on individuals' function in their daily life through interventions with a rehabilitation team, including physiotherapy, occupational, speech therapy and social workers. At meso level further studies are needed to explore the specific details of mobility, cognition and life participation. At the meso level, community based interventions are implemented through specific evidence based interventions to mitigate functional limitations experienced by people living with HIV and is important for effectiveness. The results reflect nuanced effects of functional limitations/disability that have similarities with disability in the general population but also exhibit important differences peculiar to HIV. Of interest is the relationship between functional limitations, adherence and mental health and participation related problems.

Finally, at macro level, the impact of HIV-related disability on policy is important to consider. The last South African National Strategic Plan for STIs HIV and TB for 2012-2016 related to disability in two areas of wellness and health and the provision of services to people with disability (PWD). There was however no mention of the need to include rehabilitative services. The new South African National Strategic Plan on HIV/TB/STIs 2017-2022[42] has recently recognised the need to address the new health related needs of people living long term with chronic HIV or TB and therefore included rehabilitation into the framework.

The results of this study can be used to inform the implementation of the ambitious new plan through providing a better understanding of the link between disability, adherence and mental health (depression). In a similar vein the new South African Framework and Strategy for Disability and Rehabilitations Services (2015) [43] clearly identifies HIV as major cause of increased disability prevalence in South Africa and calls for integration of services. The results of this study could provide a starting point to discuss potential needed services.

The relationship between HIV and disability also has the potential to impact the current targeted outcomes in important policy statements such as the 90:90:90 UN statements if disability is excluded [2]. The need to integrate services therefore has been recognised by the

WHO consolidated guidelines on antiretroviral treatment (2016). These guidelines acknowledge the need to integrate palliative and rehabilitative services. How this can be implemented within the global response to HIV and AIDS still needs to be outlined better.

Limitations of Study

A limitation in this study was the inclusion criteria which included people on ART for six months or longer. The line of ART therapy was not considered and this could affect the prevalence and the intensity of disability in the study population.

Conclusions

The large number of people on ART experiencing functional limitations and its impact on other health outcomes in this cohort highlights the need of a continuum of HIV care that prevents and mitigates disability. Wellness for PLHIV will not be complete without the inclusion of rehabilitative services that can prevent and manage known disability. Conversely, the provision of services for people with disabilities (e.g. assistive devices, therapy, and environmental accessibility) is closely tied to these efforts of addressing disability among PLHIV as a consequence of HIV. Hence prevention and accommodating disability need to become a central part of managing living with HIV over a life-time. In addition, impact of HIV on PWD where they are like any other population group impacted by HIV and may suffer a double burden of HIV disability.

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