Quality of life and its sociodemographic and clinicalpredictorsamong people on antiretroviral therapy (ART) at a resource-limited clinic.

Ndaimani Augustine[1], Nyamakura Rudo[2], Zvinavashe Mathilda[3], Haruzivishe Clara[4], Mukona Doreen[5], Mhlanga Maxwell[6]

[1-6]*(Department of Nursing Science, University of Zimbabwe College of Health sciences, Zimbabwe)*

Abstract: *Improved life expectancy of people on antiretroviral therapy has increased focus on quality of life issues. The objectives of this study were to assess the quality of life in people on antiretroviral therapy; determine the sociodemographic and clinical predictors of quality of life in people on antiretroviral therapy and to evaluate the reliability of the World Health Organization Quality of Life BREF (WHOQOL BREF) instrument. The study was conducted using a descriptive correlational survey at Masvingo Provincial Hospital Opportunistic infections (OI) Clinic.A randomly selected sample of 300 participants, on antiretroviral drugs was interviewed through standardized interviewing. The interview schedule had 36 items, inclusive of the 26-item WHOQOL BREF.Transformed qualities of life were: Domain 1 (Mean = 67.2, SD = 16.08) followed by Domain 2 (Mean = 65.56; SD = 16.11), Domain3 (Mean = 63.83; SD = 19.30) and, lastly, Domain 4 (Mean = 55.84; SD = 16.71). The mean transformed overall quality of life score was 63.11 (SD = 14.06). Statistically significant positive correlates for quality of life included being male, a period of more than 3 years on ART, monthly income above US$250 and Islam religion. Statistically significant negative correlates of quality of life included being an urban dweller, being single, unemployed, a pensioner or a traditionalist. The coefficients of determination for the predictors was $r^2 = 0.19$, $r^2 = 0.22$, $r^2 = 0.23$ and $r^2 = 0.31$ for domain 1, 2, 3 and 4 respectively. There was no significant linear relationship between quality of life and respondends'CD4 count. The Cronbach's alpha for the WHOQOL BREF instrument was 0.92. More interventions need to be done for urban dwellers, single individuals, pensioners, unemployed people and traditionalists on ART to improve their quality of life. Quality of life should not be extrapolated from the patient's CD4 count dynamics alone, but should rather be determined separately. The WHOQOL BREF is reliable for monitoring quality of life of individuals on ART.*
Key words: *Antiretroviral therapy, Human immunodeficiency virus (HIV), Quality of life, Sociodemographic, WHOQOL BREF.*

I. Introduction

With the 42% decrease in AIDS-related deaths between 2004 and 2015, and increased life expectancy of people on antiretroviral therapy from 36 years (2001) to 55 years (2014), albeit at a cost of US$21.7 through the Global response to HIV and AIDS there is an increasing emphasis on quality of life in people living with HIV, rather than mere survival. The global AIDS response reduced AIDS related deaths to about 1.2 million annually[1]. Quality of life is becoming one of the most important outcome and many people commit to antiretroviral therapy to improve it[2-6]. Quality of life refers to an individual's perception of their standing in life with respect to what they expect in life according to their norms and values, including happiness and satisfaction with life. It involves personal satisfaction in the way in which an individual lives[7-9]. This generally implies that quality of life is optimal when a person's happiness and comfort needs are met. Changes in World Health Organization (WHO) guidelines on antiretroviral therapy (ART) result in more and more people living with HIV and AIDS being commenced and maintained on lifelong ART regardless of their CD4 count, depending on sustainability[10-12].Of the 36.9 million people living with HIV, AIDS, 15 million are already on antiretroviral therapy. Antiretroviral therapy has dramatically improved life expectancy of people living with HIV & AIDS [2;13].As life expectancy increases due to ART, people living with HIV & AIDS are becoming more concerned with better quality of life. Factors associated with reduced quality of life include female gender, side effects of ART, opportunistic infections, low level of education, poverty, low level of social interaction, CD4 count below 200 cells/mm^3 and old age [14-17]Increased quality of life has been shown to be associated with a CD4 above 500 cells/mm^3, support from significant others, male gender or an annual income of more than US$20 000[14;16;18]. Documented studies mainly measured quality of life, in middle and high income countries prior to the recent changes in ART guidelines [19]. Considering the importance of quality of life in ART, the fact that 71% of people living with HIV & AIDS live in low income Sub-Saharan Africa it was necessary to determine the quality of life, particularly at resource limited clinic in Zimbabwe which is a low income country. More so, there

was a need to assess quality of life in light of recent changes in WHO ART guidelines. This study sought to determine the quality of life among people on ART, using the WHOQOL BREF, and its sociodemographic correlates.

II. Materials And Methods

The study was carried out through a cross-sectional survey on PLWHA who attended to Masvingo Provincial Hospital opportunistic infections (OI) clinic for their scheduled and consultation visits. The Hospital is a public tertiary referral health centre for Masvingo Province which is divided into 7 districts and a population of 1.5 million people. A sample of 300 participants was recruited for the study based on systematic sampling. The sample size was calculated using the Dobson formula, to achieve a power of 0.8, effect size of 0.5 and 95% precision of estimate, and a possible attrition rate of 20%. Data was collected through standardised interviews using a 36-item interview schedule. The interview schedule had 2 sections: section A with 10 closed ended items on demographic and clinical data and section B with 26 items constituting the WHOQOL BREF Field Trial Version. The tool has 26 items, 3 of which are reverse scored. The first 2 items pertain to overall perceived quality of life. Domain 1 has 7 items relating to physical health, domain 2 has 6 items concerning psychological well-being, domain 3 has 3 items relating to social relationships and, lastly, domain 4 has 8 items pertaining to the patient's environment. Raw scores in the 4 quality of life domains are transformed using tables provided with the instrument [20]. The WHOQOL BREF was tested in many countries, including Zimbabwe, and demonstrated an internal consistency ranging between 0.63 and 0.86 [14;16;21-23]. The content validity of the items in section was improved by having the instruments examined by researchers from the University of Zimbabwe College Of Health Sciences and clinicians at the study site. The instrument was pre-tested on 5 respondents to check and improve the order and clarity of the items. Data was collected over 8 weeks from 14 April to 6 June 2013 between 8:00am and 15:00pm. The study was approved by the Joint Research Ethics Committee for the University of Zimbabwe College of Health Sciences and Parirenyatwa Group of Hospitals and the Medical Research Council of Zimbabwe. Signed consent was also sought from participants before each interview after an explanation of the study was done to the respective participants. Anonymous coded data was stored in a lockable drawer. The data was analysed, using Stata 13, through descriptive statistics and multiple linear regression using the sociodemographic and clinical factors as predictors and each of the 4 quality of life domains as the outcome. An overall transformed quality of life score was computed by averaging the scores from the 4 domains.

III. Results

There were 177 (59%) females from the sample of 300 respondents. The age of the respondents was normally distributed with a mean of 40.9 (9.5). Table 1 is a summary of other demographic features of the participants. The married, 143 (47.7%) formed the bulk of the sample. Most participants, 189 (63%) had secondary school education as their highest level of education while 6 (2%) had never attended formal school. There were more participants staying in rural areas; 158 (52.5%) compared to Masvingo urban 142 (47.3%). The participants were prominently unemployed, 118 (39.3%); 84 (28%) were self-employed. Two hundred and forty two (80.7%) had a monthly income ranging between zero and US$250. The majority, 271 (90.3%) were Christians while 3 (1%) were of Guta RaMwari religion. Lastly, 105 (35%) had been on ART for a successive period of more than 3 years. One hundred and twenty four (41.4%) had been on ART for a year or below.

Table I: Demographic Characteristics (N=300)

Sociodemographic characteristic	Frequency	Percentage
Marital status		
Married	143	47.7
Single	55	18.3
Divorced	24	8.0
Widowed	64	21.3
Cohabitating	14	4.7
Level of Education		
Never	6	2.0
Primary	75	25.0
Secondary	189	63.0
Tertiary	30	10.0
Place of Residence		
Urban	142	47.3
Rural	158	52.7
Employment Status		
Formally employed	65	21.7
Self employed	84	28.0
Student	21	7.0
Pensioner	12	4.0
Unemployed	118	39.3
Monthly income in US$		
0 to 250	242	80.7
251 to 600	41	13.7
Above 600	17	5.7
Religion		
Christianity	271	90.3
Traditionalist	21	7.0
Islam	5	1.7
Other	3	1.0
Period on ART		
Below 3 months	38	12.7
3 to 12 months	86	28.7
1 year to 3 years	71	23.7
Above 3 years	105	35.0

Fig. I below shows that the CD4 count was positively skewed in both males and females although males generally had lower CD4 counts compared to their female counterparts. The median CD4 for males was 88 cells/mm^3 (IQR = 142) while for females it was 96 cells/mm^3 (IQR = 160).
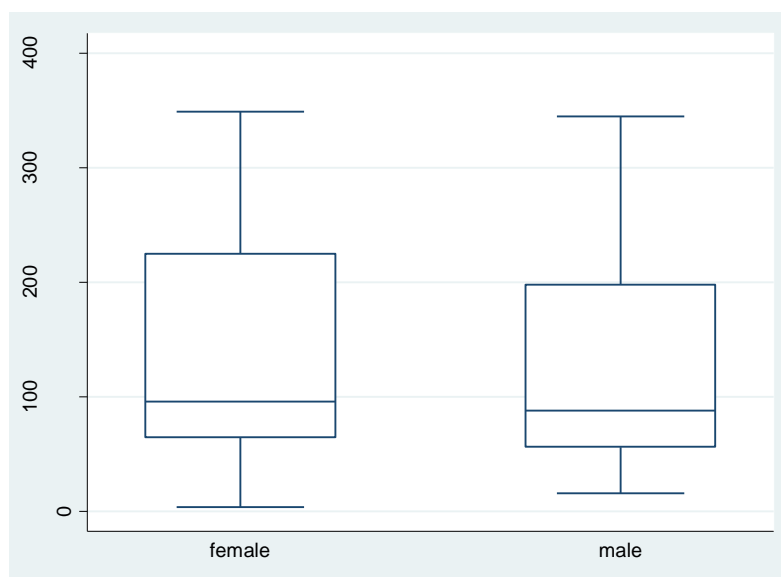
Figure I: Box Plots Of Respondents'cd4 Count

Quality of life scores are summarized in Table II. The WHOQOL BREF yielded a Cronbach's Alpha of 0.92. Quality of life scores for the 4 domains and the total transformed Quality of life were normally distributed. Highest quality scores were achieved for Domain 1 (Mean = 67.2, SD = 16.08) followed by Domain 2 (Mean = 65.56; SD = 16.11), Domain3 (Mean = 63.83; SD = 19.30) and, lastly, Domain 4 (Mean = 55.84; SD = 16.71). The mean transformed overall quality of life score was 63.11 (SD = 14.06). All the means were statistically significant.

Table Ii: Participants' Transformed Scores For Domain 1 (Physical Health): (N=300).

Variable	Frequency	Percentage
Domain 1 transformed score		
0 – 25	7	2.3
26 – 50	33	11.0
51 – 75	166	55.3
76 – 100	94	31.3
Domain 2 transformed score		
0 – 25	10	3.3
26 – 50	43	14.3
51 – 75	183	61.0
76 – 100	64	21.3
Domain 3 transformed score		
0 – 25	21	7.0
26 – 50	73	24.3
51 – 75	142	47.3
76 – 100	64	21.3
Domain 4 transformed score		
0 – 25	15	5.0
26 – 50	111	37.0
51 – 75	148	49.3
76 – 100	26	8.7
Total Transformed score		
0 – 25	6	2.0
26 – 50	51	17.0
51 – 75	185	61.7
76 – 100	58	19.3
Total	300	100

Table III summarizes linear regression coefficients of predictors of quality of life Domains 1 to 4. The coefficients of determination were Domain 1: ($r^2 = 0.19$, F (23; 276) = 2.85; p>F = 0.000), Domain 2: ($r^2=0.22$. F (23; 276) = 3.34, p>F = 0.000), Domain 3: ($r^2 = 0.23$, F (23, 276) = 3.65, p>F = 0.000) and Domain 4: ($r^2=0.31$, F (23, 276) = 5.55; p>F = 0.000). Only statistically significant correlates are shown. Positive predictors of quality of life include male sex, being on ART for more than 3 years, monthly income above US$250 and Islam religion. Negative predictors of quality of life included residence in an urban area, being single, unemployed, a pensioner and traditionalist.

Table Iii: Regression Coefficients For Predictors Of Quality Of Life Domains

Predictor	Slope	Standard error	95% confidence interval
Domain 1: Physical health			
Sex			
Female	Reference		
Male	4.25	2.09	0.13; 8.37
Place of residence			
Rural	Reference		
Urban	-5.50	1.92	-9.28; -1.71
Period on ART			
1 – 3 years	Reference		
Above 3 years	8.83	2.51	3.89; 13.76
Intercept	74.30	10.56	53.50; 95.10
Domain 2: Psychological well being			
Marital status			
Cohabitating	Reference		
Single	-12.82	4.76	-22.20; -3.46
Place of residence			
Rural	Reference		
Urban	-6.50	1.90	-10.23; -2.77
Monthly income in US$			
0 – 250	Reference		
251 – 600	7.82	2.96	2.00; 13.64
Religion			
Christianity	Reference		
Islam	15.50	7.43	0.86; 30.10
Period on ART			
1 – 3 years	Reference		
Above 3 years	9.19	2.47	4.33; 14.06
Intercept	66.61	10.42	46.10; 87.12
Domain 3: Social relations			
Sex			
Male	9.19	2.45	4.38; 13.01
Marital status			
Cohabitating	Reference		
Single	-21.51	5.64	-32.61; -10.40
Constant	65.49	12.36	41.16; 89.81
Domain 4: Environment			
Employment			
Formally employed	Reference		
Unemployed	-10.07	2.64	-15.27; -4.88
Pensioner	-15.45	4.87	-25.03; -5.87
Monthly income in US$			
0 – 250	Reference		
251 – 600	6.76	2.87	1.11; 12.40
Above 600	8.98	3.99	4.88; 15.27
Religion			
Christianity	Reference		
Traditionalist	-13.67	3.89	-21.33; -6.00
Other	26.85	8.99	9.15; 44.56
Period on ART			
1 – 3 years	Reference		
Above 3 years	7.89	2.40	3.17; 12.61
Intercept	58.66	10.10	38.77; 78.55

Table IV below summarizes the multiple linear regression of sociodemographic predictors of overall transformed quality of life. The coefficient of determination was 0.23, implying that the sociodemographic factors were responsible for 23% of the variation in quality of life. The coefficient was significant, with F (23, 276) = 3.75 (p=0.00). Compared to females, males had a generally better quality of life (β = 4.46; SEB = 1.78). Being single was associated with a reduction in overall quality of life (β = -9.31; SEB = 4.10) compared to cohabitating. Although cohabitation promised to be associated with a better overall quality of life compared

to married, widowed and divorced people, the results were not statistically significant. In terms of religion, being a traditionalist was associated with a reduction in quality of life (β = -7.36; SEB = 3.46). Lastly, being on antiretroviral therapy for more than 3 years was associated with an increase in quality of life, compare to being on ART for 1 to 3 years. A post hoc analysis showed that an income of \$251 - \$600 positively correlated with the psychological domain of quality of life (β = 5.86; SEB = 2.71; CI = 0.53; 11.19) and the environmental domain (β = 11.05; SEB = 2.71; CI = 5.72; 16.38). A monthly income above \$600 was associated with a high environmental quality of life (β = 14.8; SEB = 4.03; 6.89; 55.51) (not shown). The model intercept was 66.26 (SEB = 8.97; 95%CI = 48.60; 83.92). Other sociodemographic predictors are shown although they were not statistically significant.

Table Iv: Linear Regression Coefficients For Predictors Of Overall Transformed Quality Of Life

Predictor	Slope	Standard error	95% CI
Age	0.04	0.10	-1.54; 0.23
CD4 Count	0.01	0.01	-0.011; 0.02
Sex			
Female	1		
Male	4.46	1.78	0.96; 7.96
Marital status			
Cohabitating	1		
Married	- 0.86	3.78	-8.29; 6.58
Divorced	- 0.95	4.51	-9.83; 7.93
Widowed	- 1.25	4.08	-9.28; 6.77
Single	- 9.31	4.10	-17.37; -1.24
Level of Education			
Never attended school	1		
Secondary	-3.73	6.04	-15.62; 817
Primary	-6.60	5.91	-18.23; 5.05
Tertiary	-10.14	6.81	-23.54; 3.26
Area of residence			
Rural	1		
Urban	-4.13	1.63	-7.34; -0.92
Employment			
Formally employed	1		
Student	-0.13	4.19	-8.38; 8.12
Pensioner	-3.12	4.32	-11.63; 5.39
Unemployed	-4.58	2.34	-9.19; 0.03
Self-employed	1.87	2.41	-2.87; 6.81
Income in US\$			
0 – 250	1		
Above 600	2.83	3.54	-4.14; 9.80
251 – 600	4.35	2.55	-0.67; 9.36
Religion			
Christianity	1		
Traditionalist	-7.36	3.46	-14.17; -0.55
Islam	9.36	6.40	-3.23; 21.95
Other	12.71	7.99	-3.00; 28.43
Period on Antiretroviral therapy			
1 – 3 years	1		
Below 3 months	-0.43	2.89	-6.12; 5.26
3 – 12 month	1.38	2.28	-3.11; 5.86
Above 3 years	7.62	2.13	4.43; 11.81
Constant	66.26	8.97	48.60; 83.92

IV. Discussion

The sample of 300 participants had enough statistical power, results of the current study can be safely extrapolated to the population[24].The mean age of 40.8 years and modal age of 41 years was consistent with other studies on the same subject and the Zimbabwean demographic profile[25]. The 59% of the respondents were female, a figure slightly higher than ZDHS figures which estimated that 53.8% of people living with HIV & AIDS were female, the rest being male [25]. There are 691 350 males and 795 254 females in Masvingo26. The disproportionate gender prevalence of HIV may also be attributed to poor capability of females in Masvingo to negotiate for safer sex with their male partners. Moreover, since 92% of HIV in Zimbabwe is through sexual intercourse, females are more at risk of infection due to their anatomy and the fact that they are receptive during sexual intercourse. In the present study 47.7% participants were married. This figure is lower than the 59% national census figure for Masvingo and the 76.6% for a similar study in China[25;26]. This may imply that married people in Masvingo are less vulnerable to HIV infection since more unmarried people were in the sample. Alternatively it may imply that there is poor spousal support in HIV & AIDS management and few married people are reluctant to enter the HIV treatment cascade. Only 2% had no formal education. This is

commensurate with the high literacy levels in Zimbabwe[27]. Thus most participants could understand and possibly make use of HIV-related public health education campaigns. High knowledge levels might translate to positive living which may improve some quality of life domains. However the national Census found that 13% in Masvingo had never attended school [26]. The disparity with the current findings may have been because most of the participant were relatively young, hence, could have been exposed to either formal education or adult literacy classes which were common soon after independence, 1980. A post-hoc analysis showed that 99% were aged 65 years or below. That was consistent with the current life expectancy of people on ART. In the current study 47.3% stayed in urban areas while 52.7% stayed in rural areas. The province is reported to have 90% of its populace residing in rural areas [26].Thus, Masvingo urban dwellers are more vulnerable to HIV infection compared to their rural counterparts. Thirty-five percent had been on ART for more than 3 years, 23.7% between 1 and 3 years, 28.7% for 3 to 12 months and 12.7% below 3 months. The findings are below other reported findings. [28]. This may be explained by an intensified ART scale-up in Zimbabwe and ART coverage which recently was increased to cover PLWHA with a CD4 below 350 cells/mm^3 up from a CD4 count below 200 cells/mm^3. Hence, more PLWHA who had taken ART for less than one year[19;29]. Another explanation may be because of high AIDS related mortality during the country's recession from 2000 to 2008.In this study, 74.3% had a CD4 count below 200 cells/mm^3. The mean CD4 count was 135.5 cells/mm^3. CD4 levels were lower than in other similar studies[16] and corresponded with severe immunosuppression[19]. During the time of data collection some centres were commencing people on ART based on WHO clinical staging, due to shortage of CD4 count machines. The shortage of the machines also implied that people could take long before rechecking CD4 count during which time it could drastically fall before they could get commenced on ART.Also, late commencement of people on ART may have stemmed from denial, stigma, faith-related issues, financial constraints, particularly prior to decentralisation of HIV & AIDS services.

4.2 Quality of life

Transformed WHOQOL BREF scores range from 0 to 100. In the current study, the mean transformed quality of life was 67.2 for the physical domain, 65.6 for the psychological well-being domain, 68.3 for the social relationships domain and 55.8 for the environmental domain. The values are relatively higher than previous findings[30]. For, instance, in India the mean quality of life score were 47.63 for environmental domain, 47.4 for the psychological well-being domain, 46.37 for the physical health domain and 43.37 for the social relationships domain[18]. The discrepancy may be attributed to enhanced social support through peer social groups, availability of treatment partners and the presence of a local non-governmental organisation which fosters social support. Use of self-reports may have possibly resulted in over-reporting of satisficing quality of life. Low scores on the environmental domain seemed to be mainly due to lack of finances to lead a decent life, lack of recreational activities in rural areas and transport costs to get medical attention. The fact that many participants preferred the OI centre to their local treatment centres may suggest fear of stigma and discrimination if their local community knew about their HIV positive status. However, there were constant opportunities for up to date knowledge on HIV/AIDS and ART as each working day started with a well-participated health education session conducted by OI clinic nurses. The high physical health despite low CD4 count may need further investigation.

The Cronbach's alpha, internal consistency, for the individual domains ranged between 0.63 and 0.81. The highest value was for domain 1, physical health and the least value was for domain 3, social relationships which has only 3 items. The results are consistent with findings from previous studies [14;16]. The instrument has showed a resolute internal consistency over time. The overall reliability was excellent due to standardized interviewing of participants.

The sociodemographic and clinical predictors of quality of life were responsible for between 0.19 and 0.31 of the changes in quality of life. Thus, being on ART alone does not guarantee quality of life. Many other factors are responsible for the other 0.69 to 0.81 of the changes in quality of life. CD4 count is not significantly related to quality of life, confirming findings in a recent Ugandan cohort [3] and a Tanzanian study [6]. In the study, being male, a monthly income of more than US$250 and being on ART for more than 3 years was associated with high quality of life. The findings tally with findings elsewhere [6;30;31]. However, the income needed for improvement in quality of life was quite low compared to the annual of above US$20 000 due to a low cost of living in Masvingo, let alone in the rural areas. There is a need to increase income generating projects targeted at people on ART to improve, not only environmental quality of life but also other quality of life domains due to associated exercise, relaxation and mental preoccupation with productive activities. The current study showed that it needs about 3 years on ART for quality of life to improve significantly, maybe due to adjustment to side effects of antiretroviral drugs and psychosocial adjustment. However, a period of above 3 months on Art promises to be associated with improved quality of life, although the positive linear association was not statistically significant. The promise may be due to the new Tenofovir®-based ART regime which has fewer side-effects, hence may lead to improved quality of life. If robust interventions are targeted at the

period,to improve knowledge, acceptance or stabilise uncomfortable side-effects, there may be considerable improvements in quality of life. The positive relationship between Islam religion and the psychological well-being domain of quality of life may have been due to the fact that all the Moslems in the sample were males. Being male, in the study, was associated with a higher quality of life, though in the physical health and social relations domains. Muslims constituted 1.7% of the sample. However, there is need for further investigation on the Islam practices, diet, or attitudes which strengthens their psychological well-being.

The negative relationship between unemployment and quality of life is documented elsewhere [6;30;31]. This could explain the negative linear relationship, in the present study, between unemployment or being a pensioner and quality of life. Moreover, a low income coupled with a raised cost of living in urban areas may have negatively impacted on the quality of life for urban dwellers. A notable finding was the marital status of being single. It was consistently associated with a low quality of life compared to cohabitation. It may be due to the impact of HIV on future plans, for instance, child bearing and lack of an intimate partner for social support. Cohabitation, with there being no strings attached may produce more happiness than other marital status. Cohabitation may have other advantages such as presence of treatment buddies, financial and psychological support. Traditional religion was associated with a reduction in quality of life, possibly due to concurrent use of herbal medicine with ART. There is need to characterize quality of life in people who concurrently take herbal medicine with antiretroviral therapy.

V. Conclusion

Quality of life is quite high on the physical health, psychological well-being domains and low on the environmental domain. There was a positive linear relationship between being a male, having been on ART for more than 3 years, a monthly salary US$251 and above and being a Moslem. On the other hand, quality of life was negatively associated with being single, urban dwellers, unemployed, pensioners and traditionalists. Vigilant interventions need to be done for urban dwellers, single individuals, pensioners, unemployed people and traditionalists on ART to improve their quality of life. Income generating projects targeted at people on ART may improve their quality of life. Quality of life cannot be extrapolated from the patient's CD4 count dynamics, but should rather be determined as a separate intervention. The WHOQOL BREF instrument is a brief and reliable tool for monitoring quality of life of individuals on ART. There is need to examine why physical health quality of life may remain high while the CD4 count is low implying a high risk of opportunistic infections. Finally, being on ART alone does not improve quality of life. It is responsible for less than a third of changes in quality of life.

Acknowledgements

Reference List

[1]. Joint United Nations Programme on HIV/AIDS. How AIDS changed everything. 2015. UNAIDS, Geneva.Ref Type: Generic
[2]. Patterson S, Cescon A, Samji H, Chan K, Zhang W, Raboud J, et al. Life expectancy of HIV-positive individuals on combination antiretroviral therapy in Canada. BMC Infect Dis 2015;15:274.
[3]. Mwesigire DM, Martin F, Seeley J, Katamba A. Relationship between CD4 count and quality of life over time among HIV patients in Uganda: a cohort study. Health Qual Life Outcomes 2015;13:144.
[4]. Feng MC, Feng JY, Yu CT, Chen LH, Yang PH, Shih CC, et al. Stress, needs, and quality of life of people living with human immunodeficiency virus/AIDS in Taiwan. Kaohsiung J Med Sci 2015 Sep;31(9):485-92.
[5]. Maluccio JA, Palermo T, Kadiyala S, Rawat R. Improving Health-Related Quality of Life among People Living with HIV: Results from an Impact Evaluation of a Food Assistance Program in Uganda. PLoS One 2015;10(8):e0135879.
[6]. Magafu MG, Moji K, Igumbor EU, Hashizume M, Mizota T, Komazawa O, et al. Usefulness of highly active antiretroviral therapy on health-related quality of life of adult recipients in Tanzania. AIDS patient care and STDS 2009;23(7):563-70.
[7]. Arjun BY, Unnikrishnan B, Ramapuram JT, Thapar R, Mithra P, Kumar N, et al. Factors Influencing Quality of Life among People Living with HIV in Coastal South India. J Int Assoc Provid AIDS Care 2015 Aug 6.
[8]. Mutabazi-Mwesigire D, Katamba A, Martin F, Seeley J, Wu AW. Factors That Affect Quality of Life among People Living with HIV Attending an Urban Clinic in Uganda: A Cohort Study. PLoS One 2015;10(6):e0126810.
[9]. Lifson AR, Grandits GA, Gardner EM, Wolff MJ, Pulik P, Williams I, et al. Quality of life assessment among HIV-positive persons entering the INSIGHT Strategic Timing of AntiRetroviral Treatment (START) trial. HIV Med 2015 Apr;16 Suppl 1:88-96.
[10]. World Health Organization. Antiretroviral therapy for HIV infection in adults and adolescentsrecommendations for a public health approach - 2010 revision. 2010 rev ed. Geneva: World Health Organization; 2010.
[11]. Plazy M, Dabis F, Naidu K, Orne-Gliemann J, Barnighausen T, Dray-Spira R. Change of treatment guidelines and evolution of ART initiation in rural South Africa: data of a large HIV care and treatment programme. BMC Infect Dis 2015;15:452.
[12]. Lima VD, Reuter A, Harrigan PR, Lourenco L, Chau W, Hull M, et al. Initiation of antiretroviral therapy at high CD4+ cell counts is associated with positive treatment outcomes. AIDS 2015 Sep 10;29(14):1871-82.
[13]. Suligoi B, Zucchetto A, Grande E, Camoni L, Dal ML, Frova L, et al. Risk factors for early mortality after AIDS in the cART era: A population-based cohort study in Italy. BMC Infect Dis 2015;15:229.
[14]. Vosvick M, Koopman C, Gore-Felton C, Thoresen C, Krumboltz J, Spiegel D. Relationship of functional quality of life to strategies for coping with the stress of living with HIV/AIDS. Psychosomatics 2003;44(1):51-8.
[15]. Taylor TN, Dolezal C, Tross S, Holmes WC. Comparison of HIV/AIDS-specific quality of life change in Zimbabwean patients at western medicine versus traditional African medicine care sites. J Acquir Immune Defic Syndr 2008 Dec 15;49(5):552-6.

[16].   Xiaoyan X, Sato MK. Quality of life and related factors among people living with HIV in China. Journal of Nursing and Healthcare of Chronic Illness 2011;3(4):513-20.
[17].   Pereira M, Canavarro MC. Gender and age differences in quality of life and the impact of psychopathological symptoms among HIV-infected patients. AIDS and Behavior 2011;15(8):1857-69.
[18].   Nirmal B, Divya KR, Dorairaj VS, Venkateswaran K. Quality of life in HIV/AIDS patients: A cross-sectional study in south India. Indian Journal of Sexually transmitted diseases and AIDS 2008;29(1):15.
[19].   World Health Organization. Antiretroviral therapy of HIV infection in infants and children: towards universal access: recommendations for a public health approach-2010 revision. World Health Organization; 2010.
[20].   Skevington SM, Lotfy M, O'Connell KA. The World Health Organization's WHOQOL-BREF quality of life assessment: psychometric properties and results of the international field trial. A report from the WHOQOL group. Quality of life Research 2004;13(2):299-310.
[21].   Hsiung PC, Fang CT, Chang YY, Chen MY, Wang JD. Comparison of WHOQOL-bREF and SF-36 in patients with HIV infection. Qual Life Res 2005 Feb;14(1):141-50.
[22].   Hou WL, Chen CE, Liu HY, Lai YY, Lee HC, Lee NY, et al. Mediating effects of social support on depression and quality of life among patients with HIV infection in Taiwan. AIDS Care 2014;26(8):996-1003.
[23].   Handajani YS, Djoerban Z, Irawan H. Quality of life people living with HIV/AIDS: outpatient in Kramat 128 Hospital Jakarta. Acta Med Indones 2012 Oct;44(4):310-6.
[24].   Li Y, Baron J. Statistical Power and Sample Size Considerations. Behavioral Research Data Analysis with R. Springer; 2012. p. 129-37.
[25].   Zimbabwe National Statistics Agency (ZIMSTAT), ICF International. Zimbabwe Demographic and Health Survey 2010-1. Calverton, Maryland: ZIMSTAT and ICF International Inc.; 2012.
[26].   ZIMSTAT (Zimbabwe National Statistics Agency). Zimbabwe Population Census 2012. Harare: Population Census Office; 2013.
[27].   Dowd AJ, Friedlander E, Guajardo J, Mann N, Pisani L. Literacy Boost Cross Country Analysis Results. 2013.
[28].   CHEN WEIT, SHIU CS, SIMONI JANE, ZHAO HONG. Complementary and alternative medicine and traditional Chinese medicine in a Chinese population who are HIV positive: Perceptions and beliefs. HIV in Communities of Color 2011.
[29].   Van Damme W, Kober K, Kegels G. Scaling-up antiretroviral treatment in Southern African countries with human resource shortage: how will health systems adapt? Social science & medicine 2008;66(10):2108-21.
[30].   Xiaoyan X, Sato MK. Quality of life and related factors among people living with HIV in China. Journal of Nursing and Healthcare of Chronic Illness 2011;3(4):513-20.
[31].   Pereira M, Canavarro MC. Gender and age differences in quality of life and the impact of psychopathological symptoms among HIV-infected patients. AIDS and Behavior 2011;15(8):1857-69.