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The Impact of HIV Status, HIV Disease Progression and Post-Traumatic Stress Symptoms on the Health-Related Quality of Life of Rwandan Women Genocide Survivors

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Abstract

Purpose—We examined whether established associations between HIV disease and HIV disease progression on worse health-related quality of life (HQOL) were applicable to women with severe trauma histories, in this case Rwandan women genocide survivors, the majority of whom were HIV infected. Additionally, this study attempted to clarify whether post-traumatic stress symptoms were uniquely associated with HQOL or confounded with depression.

Methods—The Rwandan Women's Interassociation Study and Assessment (RWISA) was a longitudinal prospective study of HIV-infected and uninfected women. At study entry 922 women (705 HIV+ and 217 HIV−) completed measures of symptoms of post-traumatic stress and HQOL as well as other demographic, clinical and behavioral characteristics.

Results—Even after controlling for potential confounders and mediators, HIV+ women, in particular those with the lowest CD4 counts, scored significantly worse on HQOL and overall QOL than did HIV− women. Even after controlling for depression and HIV disease progression,

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women with more post-traumatic stress symptoms scored worse on HQOL and overall QOL than women with fewer post-traumatic stress symptoms.

Conclusions—This study demonstrated that post-traumatic stress symptoms were independently associated with HQOL and overall QOL, independent of depression and other confounders or potential mediators. Future research should examine whether the long term impact of treatment on physical and psychological symptoms of HIV and post-traumatic stress symptoms would generate improvement in HQOL.

Keywords

Quality of Life; Posttraumatic Stress Disorder; HIV; Women; Rwanda

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The 1994 Rwandan genocide resulted in an estimated 800,000 deaths, repeated exposure to traumatic events by millions of Rwandans, including sexual assault of hundreds of thousands of women, displacement of over half the Rwandan population, and a breakdown of infrastructure both during and in the aftermath of genocide [1, 2]. Rape was used systematically as a weapon in the genocide [3]. It is estimated that tens of thousands of women may have been infected with HIV as a result of genocidal rape [4] and the HIV incidence in Rwanda may have increased by 6% [5]. The prevalence of posttraumatic stress disorder (PTSD) among Rwandan women eight to eleven years after the genocide ranged from 30%–60% [6, 7], and the prevalence of depression eleven years after the genocide was 29% [7].

Given the systematic use of rape as a weapon, the United Nations Commission on Human Rights advocated for the development of health care services that target the physical and psychological needs of women [29]. Grassroots women's organizations were created to address the medical and psychosocial needs of female genocide survivors [8]. These women's organizations, in turn, requested international assistance for HIV-infected genocidal rape survivors, as these women were becoming sick and dying [8]. Public-private partnerships were created to develop clinics to treat HIV and trauma and to provide concrete services in order to improve their physical and psychological functioning and overall quality of life [8]. Despite the efforts directed at addressing the medical and psychosocial needs of women genocide survivors, to date no studies have examined their health-related quality of life (HQOL) and the association of physical and psychological factors on their HQOL.

HQOL "refers to how health impacts on an individual's ability to function and his or her perceived well-being in physical, mental, and social domains of life" [9]. HQOL has been examined extensively in individuals with HIV disease. In both the U.S. and in developing countries, individuals with symptomatic HIV or AIDS have lower HQOL than do HIV− individuals or asymptomatic HIV+ individuals [10–13]. In developing countries, initiation of highly active antiretroviral therapy (HAART) is associated with improvements in most HQOL domains [14–16].

An association between greater depressive symptoms and lower HQOL, or quality of life (QOL) in general has been well established in the general population [9, 17–18] and in HIV + individuals in the U.S. and Africa [12, 19–21]. The independent association of post-

traumatic stress symptoms on HQOL has been less well understood, and has often been studied concurrently with depression [17–18]. One study examined the association between post-traumatic stress symptoms and HQOL among HIV-infected adults [21]. They found post-traumatic stress symptoms in combination with multiple factors, such as the number of lifetime trauma experiences and the number of current stressful events, were associated with lower HQOL. The researchers did not examine post-traumatic stress symptoms and depressive symptoms concurrently due to concerns with multicollinearity [21].

The purpose of this study was to examine whether the established associations between HIV disease and HIV disease progression on worse health-related quality of life (HQOL) were applicable to women with severe trauma histories, in this case Rwandan women genocide survivors, the majority of whom was HIV infected. Additionally, this study attempted to clarify whether post-traumatic stress symptoms had independent associations beyond confounding with depression. This study focused on women survivors in response to a request by grassroots Rwandan women's organizations for assistance treating HIV infected women. The predictor variables of interest in this study were HIV status, HIV disease progression, as measured by CD4 counts (for those who were HIV infected), and post-traumatic stress symptoms. Consistent with the findings reported in the literature, we hypothesized that: 1) HIV+ women independently would score worse across all HQOL domains and overall QOL than HIV− women; and 2) HIV+ women with more advanced HIV disease (CD4 counts <200/mm^3) would independently score worse across all HQOL domains and overall QOL than HIV− women and HIV+ women with higher CD4 counts. Further, we hypothesized that 3) even after controlling for depression, HIV status and HIV disease progression, women with more post-traumatic stress symptoms would score worse across all HQOL domains than women with fewer post-traumatic stress symptoms.

Methods

We conducted this analysis within the Rwandan Women's Interassociation Study and Assessment (RWISA), a longitudinal prospective study of HIV infected and uninfected women. RWISA's purpose was to simultaneously study the impact of HIV infection and the genocide on the physical and mental health of women. It was approved by the Rwandan National Ethics Committee and the Institutional Review Board of Montefiore Medical Center, Bronx, NY, USA.

Study population—710 HIV+ and 226 HIV− women enrolled in RWISA in 2005, with follow up visits scheduled every six months. Participants were recruited primarily through grassroots Rwandan women's associations (89.1%) and clinical care sites for HIV infected patients (10.9%). Inclusion criteria were female sex, age > 25 years at study entry, having lived in Rwanda during the genocide, and having no history of receiving antiretroviral treatment, with the possible exception of a single dose of nevirapine during pregnancy to prevent mother-to-child transmission of HIV. Antiretroviral treatment was only beginning to be introduced in Rwanda at the time of study enrollment so very few HIV infected Rwandans had prior exposure to HAART. At study entry if women were identified as being eligible for antiretroviral treatment (as per CD4 counts), they were immediately started on

HAART. Additionally, eligible participants had to be able to provide informed consent, complete the interview in the Kinyarwanda language, travel to and from the research site, and agree to be tested for HIV. Because one of the main objectives of RWISA was to identify the impact of genocidal rape on HIV infection, by balanced design 50% of both HIV+ and HIV− participants reported experiencing genocidal rape. Approximately 75% of participants were HIV+; nearly all the women knew or thought they knew their HIV status prior to study enrollment. Participants received transportation support, a meal, and monetary remuneration for participating.

The enrollment visit lasted approximately three hours and consisted of an interview, physical exam and specimen collection. The interview contained six separate forms covering demographics, medical and health history, health care utilization, and psychosocial questions assessing HQOL, symptoms of depression and post-traumatic stress and trauma experiences during the 1994 genocide. All instruments were translated and back translated and adapted for this sample according to World Health Organization guidelines (see [7] for more detailed information). Trained nurses and trauma counselors conducted the interviews in the Kinyarwanda language. Participants who experienced emotional distress as a result of the interview were provided trauma counseling both immediately onsite and by referral, as needed.

Measures

Participants answered demographic questions about their age, marital status, living arrangements, socioeconomic status (education, employment, income, use of a food program) and health factors such as number of emergency room visits in the last six months, whether they had health insurance and their ability to pay for healthcare. Blood was drawn to measure CD4 cell counts. CD4 cell counts measured the general health of the immune system, with higher CD4 counts indicating a healthier immune system. CD4 counts $>350/mm^3$ in HIV+ women represented a relatively healthy immune system whereas CD4 counts $<200/mm^3$ indicated a significantly compromised immune system (and was one of the markers for an AIDS diagnosis).

Health-Related Quality of Life (HQOL) was measured using the Short Form (SF)-21, an instrument derived from the 38 item Medical Outcomes Study HQOL instrument, a general measure of health-related quality of life [22]. The SF-21 was created specifically for HIV+ populations and measured quality of life among 9 domains or subscales: current health perceptions, physical functioning, energy/fatigue, emotional well-being, cognitive functioning, role functioning, social functioning, pain, and a categorical health rating. Each subscale contained one to four items. Item responses were converted to scores each ranging from 0 – 100, with higher scores representing better functioning. Items for each subscale were then averaged to create a subscale score. The SF-21 HQOL categorical health rating subscale contained only one item, asking respondents to rate their health in general. Unlike other questions, this item used an analog scale (i.e., smiling and frowning faces as anchor points). We omitted this question/subscale to simplify administering the SF-21 in an interview format. Other researchers using the SF-21 in cross-cultural contexts also omitted this question/subscale due to concerns with clarity [23]. We also asked respondents to rate

their overall quality of life on a 0 to 10 scale which we multiplied by 10 to obtain a score ranging from 0 – 100.

Respondents who answered at least 80% of the items for a subscale were included in analyses involving that subscale. Among these respondents, missing items were imputed using the mean of the non-missing items for that subscale [24]. The SF-21 was validated with HIV+ adults in the U.S.; had demonstrated reliability and validity with the original MOS HQOL scale; and correlated with HIV symptom status and level of disability [22]. The internal consistency reliability for the entire scale in this study was Cronbach alpha = 0.91. Subscale alphas were generally between 0.51 and 0.87, with the exception of energy/fatigue that had an alpha of 0.00 (see Table 1). Because of the poor internal consistency reliability of the energy/fatigue subscale, it was not included in the analyses.

Depressive symptoms—Depressive symptoms were measured by the 20 item Center for Epidemiological Studies-Depression scale (CES-D). Item scores ranged from 0 to 3 and were summed to provide an overall depression score. A threshold score of 16 represented clinically significant symptoms of depression [25]. If 1 to 3 items were missing, the full CES-D score was imputed using the person – mean approach [24]. Internal consistency reliability for the entire scale was Cronbach alpha = .82.

Post-traumatic stress symptoms—The 40 item Harvard Trauma Questionnaire (HTQ) was used to measure trauma symptoms. For purposes of this study, the 16 HTQ items that corresponded to the three categories of symptoms associated with post-traumatic stress disorder [26] were used. These questions were asked in the context of potentially traumatic events experienced during the genocide. The scale for each item ranged from 1 to 4, and a mean score >2 indicated that the individual had symptoms consistent with PTSD [27]. If 1 to 3 items were missing, the full HTQ score was imputed using the person – mean approach [24]. The internal consistency reliability for the subscale was Cronbach alpha = .88.

Statistical analysis

Associations between demographic variables, depression symptoms, post-traumatic stress symptoms, 7 HQOL subscales (2 subscales were omitted as described above), and overall QOL by HIV status were calculated using Chi square tests for categorical variables and two sample t tests for continuous variables. To examine the unadjusted associations between the predictor and outcome variables, univariate linear regression was conducted for each outcome. All variables with the exception of CD4 counts had non-extreme distributions without outliers or excessive skewness greater than 3.

Finally, two sets of multivariate hierarchical regression analyses were conducted to examine the residual association of HIV status / severity and post-traumatic stress symptoms after adjusting for the following groups of confounders/mediators: 1) sociodemographic characteristics (age, marital status, number of individuals living in the household, and education), 2) economic indicators (employment, income, use of a food program, having health insurance, and ability to pay for medical care and prescriptions), 3) mental health symptoms and stressors [post-traumatic stress symptoms (HTQ>2), depression symptoms (CES-D >=16), and experiencing genocidal rape], and 4) HIV status (HIV+ vs. HIV−) and

for HIV+ participants, HIV disease progression, as measured by CD4 counts (CD4 counts >350/mm^3, CD4 counts 200–350/mm^3, and CD4 counts <200/mm^3). Statistical analyses were performed using SAS, version 9.2.

Results

A total of 936 women (710 HIV+ and 226 HIV−) participated in the baseline interview. Fourteen women who did not answer any HQOL questions were omitted from the analyses, leaving 922 (705 HIV+ and 217 HIV−) participants. HIV+ women were younger ($p < 0.001$), more likely to have health insurance ($p=0.002$), better educated ($p=0.03$), and had higher monthly incomes ($p=0.02$; see Table 2 for participants' socio-demographic and clinical characteristics by HIV status). Slightly more than one third of HIV+ women had CD4 counts <200/mm^3 and 28% had CD4 counts >350/mm^3. HIV− women were more likely to reside in their own homes, reside with partners, and have more household members living with them ($p<0.001$ for all). The average CES-D score was 23.0 for all RWISA participants, and HIV+ women had significantly higher (worse) CES-D scores than HIV− women. The majority of RWISA participants had HTQ scores >2. Sixty-six percent of HIV− women had HTQ scores >2, compared to 58% of HIV+ women ($p=0.05$). There were significant differences in HQOL subscale scores by HIV status ($p<0.002$ for all subscales) with HIV+ women having significantly lower (worse) scores on all HQOL subscales. HIV+ women also reported lower overall QOL than did HIV− women ($p=0.02$).

Univariate associations of participant characteristics with HQOL subscales and overall QOL were presented in Table 3. The numbers in the cells represented the numerical change on a specific HQOL subscale score for every one unit change in the predictor variable. For example, the HIV+ vs. HIV− row and physical function column had −13.43 in the cell, indicating that on average HIV+ women scored 13.43 points lower on physical functioning HQOL than did HIV− women. It was consistent (after adjusting for round off error) with the average physical functioning scores of 71.45 for HIV+ and 58.01 for HIV− women in Table 2. For interpretation of the numbers in the cells of Table 3, the scores ranged from 0 to 100 (see Table 2 for the overall means for each of these scores among HIV+ and HIV− women).

HIV infection, and for HIV + women lower CD4 count, were significantly associated with lower values for all HQOL subscales and overall QOL ($p<0.05$ for all and typically < 0.001). HIV+ women with both CD4 counts <200 and 200–350/mm^3 had significantly lower scores on all HQOL subscales, as compared to HIV− women. HIV+ women with CD4 counts > 350/mm^3 did not differ from HIV− women on most of the HQOL subscales (except current health perceptions and physical functioning subscales) or overall QOL. Women with HTQ scores >2 had significantly worse HQOL on all subscales and overall QOL scores as compared to women who had HTQ scores <=2 ($p<0.001$ for all HQOL variables). Women with CES-D scores >=16 had significantly worse HQOL (with large magnitudes of differences) on all subscales and overall QOL than did women whose depression scores did not reach this cut-off point ($p<0.001$ for all variables).

Among the demographic variables, marital status was significantly associated with all HQOL subscales and overall QOL, with married/partnered women having better HQOL and

overall QOL ($p<0.001$ for all variables). Markers of poverty (unemployment, lower income, and inability to pay for medical care and prescriptions) were all significantly associated with lower HQOL subscales (with the exception of social functioning) and overall QOL ($p<0.05$ for all).

We performed a multivariate hierarchical regression analysis to determine the residual association of HIV (Table 4) with HQOL subscales and general QOL after sequentially adjusting for the following groups of potential confounders/mediators: 1) first sociodemographic characteristics, 2) then also economic indicators, 3) then also mental health symptoms and stressors and 4) finally HIV disease progression, as measured by CD4 counts. With HIV as the only variable in the model, HIV+ women had significantly worse scores on all of the HQOL subscales and overall QOL than did HIV− women. The largest difference in scores between HIV+ women and HIV− women was in the HQOL physical functioning subscale, with HIV+ women scoring ~13 points lower ($p<0.001$) than HIV− women (on a 100 point scale). The smallest difference in scores was in overall QOL, with HIV+ women scoring ~3 points lower than HIV− women ($p=0.02$).

After adjusting the model for sociodemographic characteristics and economic indicators, disparities in scores between HIV+ women and HIV− women remained essentially the same or widened for all HQOL subscales and overall QOL. HIV+ women now scored from an adjusted ~15 points lower (physical functioning subscale) to an adjusted ~4 points lower (overall QOL) than did HIV− women ($p<0.001$ to $p=0.002$).

After further adjusting for mental health symptoms and stressors, the differences in scores between HIV+ and HIV− women on all HQOL subscales and overall QOL were reduced. HIV+ women scored an adjusted ~11 points lower (physical functioning subscale) to ~3 points lower (emotional well-being) than did HIV− women ($p<0.001$ to $p=0.02$), but HIV+ women no longer had adjusted differences from HIV− women on the HQOL subscales of cognitive functioning, social functioning, and overall QOL.

Further adjusting for CD4 counts within HIV+ women yielded the largest disparities in HQOL subscale scores between HIV+ women with the lowest CD4 counts ($CD4<200/mm^3$) and HIV− women. HIV+ women with the lowest CD4 counts scored ~17 points lower (physical functioning and pain HQOL subscales) to ~4 points lower (overall QOL) than did HIV− women ($p<0.001$ to $p=0.01$). There were no adjusted differences in scores between HIV+ women with the highest CD4 counts ($>350/mm^3$) and HIV− women on all HQOL subscales (except physical functioning) or overall QOL. HIV+ women with the highest CD4 counts scored an adjusted ~6 points lower on physical functioning HQOL than did HIV− women ($p=0.02$).

We then performed the same multivariate hierarchical regression analyses as described for Table 4 to determine the residual association of post-traumatic stress with HQOL subscales and overall QOL (Table 5). For this second multivariate hierarchical regression analysis, with post-traumatic stress symptoms as the only variable in the model, women with more post-traumatic stress symptoms (HTQ>2) scored significantly worse than women with fewer post-traumatic stress symptoms (HTQ<=2) on all HQOL subscales and overall QOL.

Differences in scores ranged from ~11 points on the pain HQOL subscale to ~5 points on the cognitive functioning HQOL subscale and overall QOL ($p<0.001$ for all subscales).

When sociodemographic characteristics and economic indicators were adjusted for in the model, the disparities in scores, although smaller, remained statistically significant for all HQOL subscales and overall QOL. Women with higher post-traumatic stress symptoms scored an adjusted ~9 points lower (pain subscale) to ~4 points lower (current health functioning and cognitive functioning subscales and overall QOL) than did women with lower post-traumatic stress symptoms ($p <0.001$ to $p=0.01$).

Further adjusting for depression symptoms and experiencing genocidal rape then HIV status and CD4 counts in models (D) and (E) modified the differences only slightly. Women with higher post-traumatic stress symptoms continued to score significantly worse on all HQOL subscales and overall QOL than did women with lower post-traumatic stress symptoms, with differences in Model E ranging from ~7 points on the pain subscale ($p=0.002$) to ~3 points on current health functioning, emotional well-being, and cognitive functioning HQOL subscales and overall QOL ($p=0.001$ to $p=0.05$).

Discussion

This study examined the residual associations of HIV status /disease progression and post-traumatic stress symptoms with HQOL and overall QOL of Rwandan women genocide survivors, after sequentially adjusting for groups of sociodemographic characteristics, economic indicators, and mental health variables as potential confounders/mediators. The results partially supported our hypothesis that HIV+ women independently would have worse HQOL subscale scores and overall QOL than HIV− women, and fully supported our hypothesis that HIV+ women with more advanced HIV disease (as measured by CD4 counts) would independently have worse HQOL subscale scores and overall QOL than HIV − women. Before adjusting for other variables, HIV+ women consistently scored worse on all HQOL subscales and overall QOL than did HIV− women. When sociodemographic characteristics and economic factors were adjusted for, disparities in HQOL subscale scores and overall QOL between HIV+ and HIV− women actually increased for most of the HQOL subscales and for overall QOL. In this study, HIV+ women were younger, better educated, and more economically advantaged (i.e., had higher incomes and were more likely to have health insurance) than HIV− women It appears these sociodemographic and economic characteristics served as protective factors in reducing the impact of HIV status on HQOL and overall QOL.

HQOL and overall QOL score differences between HIV+ women and HIV− women were reduced or disappeared altogether in models adjusting for depressive symptoms, post traumatic stress symptoms and experiencing genocidal rape. These findings indicate that mental health was more strongly associated with HQOL and overall QOL than was HIV status. The negative association between depressive symptoms and HQOL and overall QOL has been well established [9, 12, 17–21]. In this study, HIV+ women had significantly higher depressive symptoms than HIV− women, so the finding that the association between HIV status and HQOL and overall QOL was significantly reduced, or disappeared

altogether, when mental health factors were accounted for was surprising. Another surprising finding was that significantly more HIV− than HIV+ women in this study had HTQ scores >2 (suggesting that they met the diagnostic criteria for post-traumatic stress disorder). The literature has fairly consistently demonstrated that HIV+ individuals have higher rates of post-traumatic stress disorder than HIV− individuals [28]. Finally, the role of HIV did not completely disappear in this model, however. After further adjusting for CD4 counts of HIV+ women, HIV+ women with the lowest CD4 counts had significantly worse HQOL subscale scores and overall QOL than HIV− women and HIV+ women with higher CD4 counts. Hence, HIV disease progression impacted HQOL and overall QOL over that of mental health variables and HIV status.

Our third hypothesis, that women with higher post-traumatic stress symptoms would have lower HQOL and overall QOL, even after controlling for depression, HIV status, and HIV disease progression, was also supported. After controlling for HIV disease progression and symptoms of depression, women with higher post-traumatic stress symptoms continued to independently score lower on HQOL subscales and overall QOL than did women with fewer post-traumatic stress symptoms. This finding demonstrated that post-traumatic stress symptoms were uniquely associated with HQOL and overall QOL, despite having high correlation with depression, and should therefore be treated as an independent construct. While residual confounding (say with depression) through inadequacy of the CES-D scale perhaps cannot be ruled out, the fact that the residual association of HTQ changed so little after adjustment for depression made this unlikely.

The magnitude of independent association of HIV disease progression with HQOL measures was stronger than that of post-traumatic stress symptoms especially for physical functioning and pain. The final adjusted disparities between HIV+ women with CD4 < 200/mm^3 and HIV− women in Table 4 ranged from ~4 to ~17 depending on the measure. This compared to final adjusted disparities ranging from ~3 to ~7 in Table 5. For interpretation of these magnitudes, all scores ranged form 0 to 100 and their overall standard deviations ranged from ~15 to ~30. Given that HIV disease progression is marked by worse physical and mental health, increased pain, and decreased functioning, the finding that HIV disease progression was most strongly associated with worse HQOL and overall QOL was not unexpected.

This study was unique in many respects: 1) this study took place in a resource-limited country, Rwanda; 2) the women in the study had significant trauma histories, with half experiencing genocidal rape and 3) this study included both HIV+ and HIV− women for comparison. Not surprisingly, rates of depression and post-traumatic stress symptoms were high. Seventy-eight percent of the women had CES-D scores >=16, suggestive of significant symptoms of depression, and 60% had HTQ scores >2, representing greater likelihood of post-traumatic stress disorder. HIV+ women had significantly more depressive symptoms and were significantly more likely to have CES-D scores >= 16 than HIV− women. Although HIV+ and HIV− women did not differ with regard to the number of post-traumatic stress symptoms, HIV− women were significantly more likely to have HTQ scores > 2.

These findings have public health implications for providers treating Rwandan women genocide survivors. As demonstrated in other studies in developing countries [14–16], initiating HAART is expected to lead to improved health and increased longevity, which in turn could lead to improved HQOL and overall QOL across the spectrum of adjusted HIV disease related disparities (reaching as high as 16 on a scale of 100 in untreated HIV+ women with CD4<200/mm^3). Hence, outreach efforts to identify individuals with HIV and to engage them in care are critical.

Improved physical health is not expected to lead to improved post-traumatic stress symptoms, so addressing physical health needs in the absence of mental health needs may produce only modest improvements in HQOL. Given that post-traumatic stress symptoms are independently associated with HQOL and overall QOL (adjusted disparities ranging from 3 to 7 on an overall scale of 100), it is anticipated that trauma-focused psychosocial treatments will lead to a reduction in post-traumatic stress symptoms, which in turn may lead to improvement in HQOL and overall QOL. Access to quality mental health treatment is a public health challenge in Rwanda and the Rwandan government has partnered with international agencies and grassroots organizations to develop high quality, holistic mental health care [29]. The impact of these services on reducing post-traumatic stress symptoms and improving HQOL and overall QOL is an area for future research.

There were several limitations to this study. This study's generalizability may be limited by recruitment primarily from healthcare facilities and grassroots women's organizations. It was possible that participants' psychological distress and lower HQOL led them to seek care; hence, these women may over-represent the degree of depression and post-traumatic stress symptoms in the general population of Rwandan women. Another potential limitation of the study was the validity of the CES-D measure in HIV+ individuals because the scale measured somatic symptoms consistent with both depression and HIV-related illness [30]. This study was one of the first to use the SF-21 with African women. One of its subscales, energy/fatigue, had extremely low internal consistency reliability in this sample and was therefore omitted. Otherwise, the other HQOL subscales differentiated between women with and without HIV, and among women with HIV infection, HQOL subscale scores were differentiated by CD4 counts. This latter finding was consistent with another study that used the SF-21 in developing countries [23], suggesting that it had cross-cultural utility as a HQOL measure.

Not surprisingly, we observed strong independent associations with HIV infection, and in particular advanced HIV disease, with worse measures of HQOL. Moreover, this study found that post-traumatic stress symptoms were independently associated with lower HQOL and overall QOL, independent of depression and other confounders or potential mediators. Future research should examine the long-term impact of both medical and psychological treatment on the HQOL and overall QOL of women genocide survivors and persons infected with HIV. There are established HIV treatment protocols with demonstrated efficacy. Evidence based treatments also exist for post-traumatic stress symptoms and depression. However, the validity of these psychological treatments with Rwandan women needs to be established.

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Table 1

Internal Consistency Reliability for HQOL Subscales[1], CES-D, and HTQ Subscale

HQOL Subscale (n = 20 items)	Standardized alpha
Physical Functioning (n = 4 items)	0.77
Role Functioning (n = 2 items)	0.88
Energy/Fatigue[2] (n = 2 items)	0.00
Social Functioning (n = 2 items)	0.70
Cognitive Functioning (n = 2 items)	0.68
Pain[2] (n = 2 items)	0.87
Emotional Well-being[3] (n = 3 items)	0.51
Current Health Perceptions (n = 3 items)	0.62
CES-D (n = 20 items)	0.82
HTQ Subscale (n = 16 items)	0.88

[1] Calculations included only respondents who answered all HQOL items (n = 818).

[2] Subscale contained one reverse scored item.

[3] Subscale contained two reverse scored items.

Table 2

Characteristics of RWISA Participants by HIV Status

Characteristics	HIV− (n = 217)	HIV+ (n = 705)	All Participants (n = 922)	p value[a]
Age, %				<0.001
<30 yrs	34 (15.67%)	158 (22.41%)	192 (20.82%)	
30 – 40 yrs	57 (26.27%)	389 (55.18%)	446 (48.37%)	
> 40 yrs	126 (58.06%)	158 (22.41%)	284 (30.80%)	
Married/Partnered, %	80 (37.56%)	256 (36.31%)	336 (36.60%)	0.74
Live w/ partner, % (n=336)	45 (56.25%)	73 (28.52%)	118 (35.12%)	<0.001
# People live w/ you, %				<0.001
0–2	23 (11.22%)	194 (27.75%)	217 (24.00%)	
3	31 15.12%)	131 (18.74%)	162 (17.92%)	
4 – 5	77 (37.56%)	222 (31.76%)	299 (33.08%)	
> 5	74 (36.10%)	152 (21.75%)	226 (25.00%)	
Where live, %				<0.001
Own home/apt	107(50.23%)	177 (25.11%)	284 (30.94%)	
Parent’s home	20 (9.39%)	51 (7.23%)	71 (7.73%)	
Someone else’s home	78 (36.62%)	469 (66.52%)	547 (59.59%)	
Shelter	8 (3.76%)	6 (0.85%)	14 (1.53%)	
Other	0 (0.00%)	2 (0.28%)	2 (0.22%)	
Education, %				0.03
None	67 (31.60%)	156 (22.22%)	223 (24.40%)	
Some primary	69 (32.55%)	269 (38.32%)	338 (36.98%)	
Completed primary	51 (24.06%)	204 (29.06%)	255 (27.90%)	
Secondary or higher	25 (11.79%)	73 (10.40%)	98 (10.72%)	
% Employed	51 (25.00%)	171 (25.04%)	222 (25.03%)	0.99
Income per month, %				0.02
< 10,000 FRW (US$18)	92 (45.10%)	251 (36.12%)	343 (38.15%)	
10,000 – 35,000 FRW	79 (38.73%)	347 (49.93%)	426 (47.39%)	
> 35,000 FRW (US$64)	33 (16.18%)	97 (13.96%)	130 (14.46%)	
% used food program, past 6 months	24 (11.27%)	97 (13.82%)	121 (13.22%)	0.34
CD4, mean (SD)	-	283 (167)		
CD4 categories, %				
> 350	-	195 (27.66%)		
200 – 350	-	269 (38.16%)		
< 200	-	241 (34.18%)		

Characteristics	HIV− (n = 217)	HIV+ (n = 705)	All Participants (n = 922)	p value[a]
% with health insurance	70 (32.71%)	313 (44.71%)	383 (41.90%)	0.002
% cannot pay medical bills	10 (4.90%)	37 (5.32%)	47 (5.23%)	0.81
% paid for R_x, past 6 mos	32 (15.02%)	202 (29.15%)	234 (25.83%)	<0.001
% went to ER, past 6 mos	3 (1.40%)	28 (4.01%)	31 (3.40%)	0.07
CES-D mean (SD)	20.79 (9.60)	23.67 (9.19)	23.02 (9.35)	<0.001
N, (% score > =16)	124 (64.58%)	536 (81.46%)	660 (77.7%)	<0.001
HTQ mean (SD)	2.40 (0.67)	2.31 (0.69)	2.33 (0.69)	0.09
N, (% score > 2)	126 (65.63%)	380 (57.8%)	506 (59.53%)	0.05
Experienced genocidal rape N, (%)	101 (46.98%)	347 (49.64%)	448 (49.02%)	0.49
HQOL subscales mean (SD)				
Physical functioning	71.45 (26.09)	58.01 (27.51)	61.17 (27.76)	<0.001
Role functioning	81.98 (22.91)	76.13 (24.34)	77.51 (24.13)	0.002
Social functioning	69.28 (29.47)	60.85 (28.88)	62.83 (29.22)	<0.001
Cognitive functioning	70.46 (22.21)	64.99 (20.10)	66.28 (20.74)	<0.001
Pain	70.81 (33.71)	60.25 (33.23)	62.74 (33.63)	<0.001
Emotional well being	47.28 (17.11)	41.53 (14.56)	42.88 (15.39)	<0.001
Current health perception	36.07 (20.25)	26.79 (18.51)	28.97 (19.33)	<0.001
Overall QOL mean (SD)	48.92 (16.47)	46.00 (15.81)	46.69 (16.01)	0.02

FRW = Rwandan Francs

[a]For comparisons of HIV positive to HIV negative women

Table 3

Univariate Regression Models for HQOL Subscales and Overall QOL[1]

	Current Health	Physical Function	Emotional Wellbeing	Cognitive Function	Role Function	Social Function	Pain	Overall QOL
Health Variables								
HIV+ vs. HIV−	**−9.28**^{c}	**−13.43**^{c}	**−5.75**^{c}	**−5.47**^{c}	**−5.86**^{b}	**−8.44**^{c}	**−10.56**^{c}	**−2.92**^{a}
HIV and CD4:								
CD4>350 vs. HIV−	**−5.31**^{b}	**−6.02**^{a}	−2.36	−3.08	−1.22	−4.90	−2.79	0.15
CD4 200–350 vs. HIV−	**−8.35**^{c}	**−12.86**^{c}	**−4.96**^{c}	**−3.88**^{a}	**−4.80**^{a}	**−7.21**^{b}	**−8.67**^{b}	−1.83
CD4 <200 vs. HIV−	**−13.54**^{c}	**−20.08**^{c}	**−9.38**^{c}	**−9.19**^{c}	**−10.79**^{c}	**−12.67**^{c}	**−18.95**^{c}	**−6.64**^{c}
ER visit in last 6 months	−5.77	−8.23	**−7.51**^{b}	−5.62	**−9.91**^{a}	**−15.99**^{b}	**−14.10**^{a}	−4.98
Mental Health Variables								
CES-D >=16 vs. <16	**−19.38**^{c}	**−22.63**^{c}	**−15.73**^{c}	**−20.56**^{c}	**−17.57**^{c}	**−29.33**^{c}	**−28.46**^{c}	**−15.82**^{c}
HTQ >2 vs. <=2	**−5.88**^{c}	**−7.74**^{c}	**−5.55**^{c}	**−5.29**^{c}	**−7.13**^{c}	**−8.13**^{c}	**−11.01**^{c}	**−5.32**^{c}
Genocidal rape	**−2.68** ^{a}	−2.78	**−4.23**^{c}	−0.62	−2.14	**−4.15**^{a}	−3.46	**−1.28**
Sociodemographic Variables								
Age								
30–40 vs. <30	−1.60	−2.03	0.11	−1.59	0.92	−1.41	−2.37	−0.42
>40 vs. <30	−0.51	**−5.12**^{a}	0.60	−2.14	−2.01	−3.31	−5.15	−1.94
Partnered vs. Other	**5.28**^{c}	**8.46**^{c}	**4.15**^{c}	**4.97**^{c}	**8.32**^{c}	**9.26**^{c}	**10.47**^{c}	**4.45**^{c}
Partner in house	**4.40**^{a}	2.03	**5.18**^{b}	**8.24**^{c}	2.16	5.92	4.14	**3.68**^{a}
# in household:								
3 vs. <3	3.50	3.11	2.42	2.96	3.61	**5.97**^{a}	4.93	1.67
4–5 vs. <3	**3.75**^{a}	**4.92**^{a}	**3.12**^{a}	**3.91**^{a}	2.06	**5.85**^{a}	4.43	**3.27**^{a}

	Current Health	Physical Function	Emotional Wellbeing	Cognitive Function	Role Function	Social Function	Pain	Overall QOL
>5 vs. <3	**5.25**^{b}	**6.01**^{a}	**7.38**^{c}	**5.47**^{b}	2.07	**6.40**^{a}	2.97	**3.95**^{b}
Education:								
some primary vs. none	2.45	**5.23**^{a}	**2.81**^{a}	3.21	2.88	**5.18**^{a}	3.43	**3.82**^{b}
completed primary vs. none	**3.72**^{a}	**5.95**^{a}	**4.52**^{b}	2.95	**5.42**^{a}	2.30	**7.91**^{b}	**3.62**^{a}
secondary vs. none	**5.75**^{a}	4.51	1.59	2.40	1.37	1.46	−0.83	**4.65**^{a}
Economic Status Indicators								
Employed	**7.53**^{c}	**6.29**^{b}	**4.84**^{c}	**6.09**^{c}	**5.85**^{b}	**10.37**^{c}	**8.68**^{c}	**5.97**^{c}
Income:								
10–35K vs. <10k	**5.73**^{c}	**7.69**^{c}	**3.46**^{b}	**6.48**^{c}	**6.87**^{c}	**8.61**^{c}	**11.65**^{c}	**7.16**^{c}
>35k vs. <10k	**10.16**^{c}	**9.12**^{b}	**7.84**^{c}	**7.01**^{c}	**7.94**^{b}	**10.73**^{c}	**9.02**^{b}	**11.99**^{c}
Use food program	**−4.83**^{a}	−4.53	−1.41	−3.92	**−5.53**^{a}	**−6.92**^{a}	**−10.74**^{b}	−2.82
Health insurance	−0.67	−2.29	−0.64	0.49	**4.14**^{a}	−1.87	3.11	1.79
Can pay medical bills	**−12.56**^{c}	**−19.27**^{c}	**−6.43**^{b}	**−12.24**^{c}	**−10.07**^{b}	−8.12	**−22.94**^{c}	**−8.54**^{c}
Pay for R_x	**−8.51**^{c}	**−9.13**^{c}	**−3.95**^{c}	**−10.79**^{c}	**−5.18**^{b}	**−10.62**^{c}	**−6.61**^{b}	**−4.23**^{c}

[1] Coefficients reflect net percent change in the subscale per unit increase in the row variable.

[a] = p value 0.01 – 0.05;

[b] = p value 0.001 – 0.01;

[c] = p value <0.001

Table 4

Residual Association of HIV on HQOL Subscales and Overall QOL after Sequential Adjustment for Groups of Confounders

	Current Health	Physical Function	Emotional Wellbeing	Cognitive Function	Role Function	Social Function	Pain	Overall QOL
Model A (HIV Status)								
HIV+ vs. HIV−	−9.28	−13.44	−5.75	−5.47	−5.86	−8.44	−10.56	−2.93
P value	<0.001	<0.001	<0.001	0.001	0.002	<0.001	<0.001	0.02
Model B (Model A + Sociodemographic Characteristics)								
HIV+ vs HIV−	−9.27	−15.39	−5.68	−6.09	−7.02	−9.51	−12.69	−3.54
P value	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.01
Model C (Model B + Economic Indicators)								
HIV+ vs HIV−	−8.92	−15.35	−5.19	−5.77	−8.42	−8.05	−14.61	−4.23
P value	<0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001	0.002
Model D (Model C + Mental Health Symptoms and Stressors)								
HIV+ vs HIV−	−5.70	−11.33	−2.92	−1.57	−6.28	−3.81	−10.72	−1.46
P value	<0.001	<0.001	0.02	0.34	0.003	0.11	<0.001	0.26
Model E (+ Model D + HIV Status/CD4 Category among HIVpositives)								
CD4 >350 vs HIV−	−2.73	−6.16	−0.17	−0.60	−3.14	−1.44	−5.98	0.62
P value	0.15	0.02	0.91	0.76	0.22	0.62	0.08	0.69
CD4 200–350 vs HIV−	−4.96	−10.95	−2.94	0.37	−5.96	−3.25	−9.37	−0.88
P value	0.01	<0.001	0.04	0.84	0.01	0.24	0.004	0.55
CD4 <200 vs HIV−	−9.39	−16.62	−5.47	−4.92	−9.59	−6.72	−16.84	−4.13
P value	<0.001	<0.001	<0.001	0.01	<0.001	0.02	<0.001	0.01

Model A: HIV Status

Model B: HIV Status+ Sociodemographic Characteristics: Age (30–40 vs. <30 and >40 vs. <30), Marital/Partner Status, # Household Members (3 vs. <3, 4–5 vs. <3, >5 vs. <3), Education (some primary vs. none, completed primary vs. none, secondary vs. none).

Model C: HIV Status + Sociodemographic Variables + Economic Indicators: Employed, Income (10–35K vs. <10k, >35k vs. <10k), Use of a Food Program, Health Insurance, Able to Pay for Medications, Able to Pay Medical Bills.

Model D: HIV Status + Sociodemographic Characteristics + Economic Indicators + Mental Health Symptoms and Stressors: Post-Traumatic Stress Symptoms (HTQ >2 vs. <=2), Depression Symptoms (CES-D >=16 vs. <16), and Experiencing Genocidal Rape.

Model E: HIV Status + CD4 categories (CD4>350 vs HIV−, CD4 200–350 vs HIV−, CD4>350 vs HIV−) + Sociodemographic Characteristics + Economic Indicators + Mental Health Symptoms and Stressors

Table 5

Residual Association of Post-traumatic Stress Symptoms on HQOL Subscales and Overall QOL after Sequential Adjustment for Groups of Confounders

	Current Health	Physical Function	Emotional Wellbeing	Cognitive Function	Role Function	Social Function	Pain	Overall QOL
Model A (Post Traumatic Stress Symptom Severity)								
HTQ >2 vs. HTQ<=2	−5.88	−7.74	−5.55	−5.29	−7.13	−8.13	−11.01	−5.32
P value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Model B (Model A + Sociodemographic Characteristics)								
HTQ >2 vs. HTQ<=2	−5.77	−7.12	−5.27	−4.85	−6.48	−7.43	−10.17	−5.18
P value	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001
Model C (Model B + Economic Indicators)								
HTQ >2 vs. HTQ<=2	−4.44	−5.69	−4.85	−3.88	−5.5	−6.46	−8.71	−4.25
P value	0.001	0.003	<0.001	0.01	0.001	0.002	<0.001	<0.001
Model D (Model C + Mental Health Symptoms and Stressors)								
HTQ >2 vs. HTQ<=2	−3.30	−4.48	−3.51	−2.54	−4.14	−4.22	−7.08	−3.17
P value	0.01	0.01	<0.001	0.05	0.01	0.03	0.002	0.002
Model E (Model D + HIV Status / CD4 Category among HIV positives)								
HTQ >2 vs. HTQ<=2	−3.28	−4.41	−3.47	−2.57	−4.38	−4.2	−7.05	−3.15
P value	0.01	0.01	<0.001	0.05	0.01	0.03	0.002	0.002

Model A: Post Traumatic Stress Symptom Severity

Model B: Post Traumatic Stress Symptom Severity + Sociodemographic Characteristics: Age (30–40 vs. <30 and >40 vs. <30), Marital/Partner Status, # Household Members (3 vs. <3, 4–5 vs. <3, >5 vs. <3), Education (some primary vs. none, completed primary vs. none, secondary vs. none).

Model C: Post Traumatic Stress Symptom Severity + Sociodemographic Variables + Economic Indicators: Employed, Income (10–35K vs. <10k, >35k vs. <10k), Use of a Food Program, Health Insurance, Able to Pay for Medications, Able to Pay Medical Bills.

Model D: Post Traumatic Stress Symptom Severity + Sociodemographic Characteristics + Economic Indicators + Mental Health Symptoms and Stressors: Depression Symptoms (CES-D >=16 vs <16), and Experiencing Genocidal Rape.

Model E: Post Traumatic Stress Symptom Severity + HIV−Status/CD4 categories (CD4 >350 vs HIV−, CD4 200–350 vs HIV−, CD4 >350 vs HIV−) + Sociodemographic Characteristics + Economic Indicators + Mental Health Symptoms and Stressors.