

RESEARCH

Open Access



Prevalence of significant anxiety symptoms and associated factors among adult people with HIV/AIDS in care and treatment clinic centers in Kilimanjaro region, Tanzania: a cross-sectional study

Frank Kiwango^{1,2,3*}, Eric Mboya⁴, Florian Emanuel Ghaimo^{2,3}, Neema Ng'unda^{2,3}, Carl Mhina^{2,5}, Editruda Gamassa^{1,2}, Kim Madundo^{1,2}, Ester Steven Mzilangwe³, Lydia Vedasto Masika^{2,6}, Iddi Haruna⁷, Saidi Bakari Kuganda⁷, Blandina Mmbaga^{2,6} and Sylvia Kaaya³

Background People with human immunodeficiency virus (PWH) are more prone to generalized anxiety disorder. There is a limited understanding of the prevalence of significant anxiety symptoms and its associated risk factors among adult PWH in the Tanzanian context. This study aims to determine the prevalence of significant anxiety symptoms and related risk factors among adult PWH attending care and treatment clinics in Moshi Municipality, Kilimanjaro Region.

Methods We used a multistage random cluster sampling approach to select participants at four Care and treatment centers (CTCs) of Kilimanjaro Christian Medical Centre, Mawenzi Regional Referral Hospital, Majengo, and Pasua Health Centre, by location at tertiary, secondary, and primary health care levels. The seven-item Generalized Anxiety Disorder (GAD-7) screening tool assessed levels of generalized anxiety symptoms with significance set at scores ≥ 10 . Sociodemographic, clinical, and psychosocial characteristics were collected using a semi-structured questionnaire. Bivariate analyses determined factors associated with significant anxiety symptoms (GAD-7 ≥ 10) at p -values ≤ 0.20 for inclusion in the multivariate model. Adjusted prevalence ratios with confidence intervals are reported with significance set at a p -value of < 0.05 .

Results Out of 593 PWH participants, 12.48% screened positive for significant anxiety symptoms. Participants treated at the tertiary health facility level (aPR = 2.91, 95% CI: 2.48–3.41, P -value = 0.001), early adulthood 25–44 years (aPR = 1.75, 95% CI: 1.27–2.42, P -value = 0.001), with higher anxiety sensitivity (aPR = 3.28, 95% CI: 2.08–5.19, P -value = 0.001), and higher levels of perceived social support (aPR = 2.09; 95% CI: 1.34–3.27, P -value = 0.001) showed a higher likelihood of significant generalized anxiety symptoms.

*Correspondence:
Frank Kiwango
frankkiwango@gmail.com

Full list of author information is available at the end of the article



© The Author(s) 2025. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

Conclusions Significant anxiety symptoms were common among adult PWH. Integrating routine generalized anxiety screening and raising PWH's and primary caregivers' awareness of GAD is recommended.

Trial registration Clinical trial number not applicable.

Keywords Anxiety prevalence, PWH, HIV, Tanzania, And GAD

Background

The World Health Organization 2021 report estimates that 39.9 million people have human immunodeficiency virus (PWH) globally, and two-thirds of them reside in Africa [1]. In Tanzania, HIV/AIDS is a severe public health problem, with reports of 1.6 million PWH [2]. PWH are more prone to common mental disorders, including generalized anxiety disorder (GAD) [3]. Furthermore, HIV/AIDS and GAD have a bi-directional association, which leads to a high likelihood of co-occurrence, where the presence of one condition can exacerbate the symptom and severity of the other [3, 4].

The prevalence of significant anxiety symptoms in PWH in European countries is higher than in Asian and African countries. For example, in Italy and England, levels of significant anxiety symptoms among PWH are estimated at 47% and 34% [5]. In contrast, in sub-Saharan Africa, including Tanzania rates of significant anxiety symptoms range from 3.8 to 32.6% [6, 7, 8].

Various psychosocial risk factors have been associated with significant anxiety symptoms in PWH, including inadequate social support [5–7] and HIV-related stigma [5, 8, 9]. At a more individual level, substance use [5, 10, 11] high vs. lower anxiety sensitivity [4, 12], younger compared to older age [5, 13, 14] being female rather than male [9, 14, 15] and the presence of comorbid depressive disorder in PWH is associated with significantly higher levels of anxiety symptoms [8, 13]. Studies show significant anxiety symptoms in PWH are associated with poor treatment outcomes, including the decline in CD4 count and an increase in viral load levels (VL) [5, 16, 17]. Though the mechanisms of these poor treatment outcomes are not yet obvious, significant generalized anxiety symptoms can likely reduce antiretroviral drugs (ART) adherence such as has been shown in samples from other Africa and samples from low and middle-income countries (LMIC) [18, 19]. Furthermore, HIV-related stigma, substance use, and perceived poor social support are potentially intervenable anxiety risk factors, and their recognition may better allow for holistic clinical management of both the physical and psychological health of PWH.

Limited studies explore the occurrence of generalized anxiety in PWH in Tanzania and its potential effects on HIV treatment outcomes. Also, there is a notable gap in HIV care policies and guidelines addressing the mental health needs of this population, whereby current

guidelines are primarily focused on biomedical aspects such as ART adherence and opportunistic infection management with limited integration of mental health screening [20]. More over-retrievable studies in PWH in Tanzania have not described factors associated with considerable anxiety symptoms [21, 22]. This lack of evidence have hindered the development of context-specific interventions tailored to the unique challenges faced by Tanzania PWH. This study seeks to determine the prevalence of significant generalized anxiety symptoms in PWH and its associated factors among adult PWH attending HIV Care and treatment centers (CTCs). The finding aims to provide critical insights that can support policy revision that emphasizes the integration of mental health services in HIV care and may inform clinic-based interventions, such as the need for prevention by early diagnosis and treatment of significant anxiety symptoms among PWH, to potentially reverse poor clinical outcomes such as declines in ART adherence.

Methods

Study design

This was a hospital-based cross-sectional analytical study design, which was ideal for determining the prevalence of significant anxiety symptoms and associated factors among adults PWH attending CTCs in Moshi municipal, Kilimanjaro Region from September to October 2023. It was time-efficient and cost-effective and did not require follow-up-of-clients.

Setting

The study sites were CTCs in Moshi, Kilimanjaro region. Moshi Municipal Council is one of seven districts located in the Kilimanjaro region, with a population of 1,996,952 people and an area of 58 square kilometers [23]. The municipality has 21 wards in urban and peri-urban areas and 19 HIV CTCs serving 800–1,200 clients per week. The services provided at CTCs are integrated into all health facilities, from higher tertiary care to the lower primary care levels [24]. Trained medical staff provide several services, for PWH including counseling, community awareness campaigns, testing and treatment, initiation of anti-retroviral therapy (ARTs), clinical management of opportunistic diseases, and psychosocial support [24]. Four (4) CTC centers, namely the Kilimanjaro Christian Medical Center (KCMC) a tertiary level facility, Mawenzi Regional Referral Hospital (MRRH) a

secondary level facility, Pasua, and Majengo Health Centers which are primary health level facilities, all located within the municipal, were selected as study sites to allow for adequate representation in the study sample of clients accessing HIV services at different levels of the health care delivery system.

Study population

The study included all adults (≥ 18 years) attending the CTCs in Moshi municipal who had been diagnosed with HIV, and provided written informed consent and met the study inclusion criteria.

Eligibility criteria

Inclusion criteria The study included out-patient clients registered to receive CTC services and have been initiated on ART for at least six months.

Exclusion criteria The study excluded PWH who were too ill to participate.

Sample size

Sample size ($N=593$) was calculated based on Cochran's formula $[N = Z^2 P(1-P)/d^2]$ whereby N =estimated sample size, Z =confidence level at 95% (standard value of 1.96), d =Margin of error at 5%, P =Prevalence of Anxiety among PWH (37.8%) which was obtained from a Tanzanian study [21]. We also adjusted for a 10% non-response rate. Given that we had a stratified random cluster sample, we adjusted for this design effect [25] using an intra-cluster correlation (ICC) of 0.005 [26].

Sampling procedure

Multistage cluster sampling was applied to select four (4) among 19 CTCs in the Moshi municipality. The facilities were stratified to include CTCs located at all levels of the health care delivery system in Tanzania, including tertiary, secondary, and primary health facility levels. At the tertiary level, the Kilimanjaro Christian Medical Center (KCMC) was included; for the secondary level, the Mawenzi Regional Referral Hospital (MRRH) was included. These are the only tertiary and secondary-level healthcare facilities in the municipality. At the Primary level, Pasua and Majengo Health Centers were randomly selected from a list of large CTCs, defined as CTCs with more than 1,000 registered clients. From the municipal CTC2 database, 2,645, 3,883, 1,083, and 1,347 clients were registered at KCMC, MRRH, Pasua, and Majengo Health Centers, respectively. The number of clients enrolled in each facility was determined by the probability proportional to the size of each facility using the ratios of 0.29:0.43:0.12:0.15, respectively. Thus, 175, 262, 66, and 90 clients were enrolled from KCMC, MRRH, Pasua,

and Majengo health centers, respectively, meeting the minimum sample size of 593.

The study team used a systematic random sampling approach to select and enroll participants at study facilities by generating a random number every morning for each facility (>0 and <9 for KCMC, <14 for MRRH and <4 for Pasua, and <6 for Majengo) to identify the first client to be enrolled at each facility. The next participant enrolled was after every 3rd client for KCMC, MRRH, and Majengo and every 5th client for Pasua Health Center.

Data collection and management

The study was conducted for one month from September to October 2023 by eight research assistants (RA's) with medical backgrounds (medical doctors) who received training on assessment tools from the PI for one week.

Participants were assured of the confidentiality of the information they provided as the questionnaire had a unique number and not the client's name, assuring that the information they provided could not be linked to them personally in reports, and the information collected on forms such as consent forms were stored in a locked cabinet and questionnaires collected on Red-Cap software, were entered on a password protected computers that are accessible only to the research team. For privacy, all interviews were conducted in empty consultation rooms to ensure privacy, and the process did not interfere with the clinics' routine activities.

The interviews were administered by RAs and PI in Kiswahili language which took approximately twenty minutes and provided enough time to answer the questionnaire. At the end of the interviews, the study team cross-checked the questionnaires to ensure completeness and thanked each participant. Furthermore, the team helped participants to navigate clinic services. There was no compensation for the participants.

Data collection tools

Demographic covariates A demographic semi-structured survey tool was used to collect information on the participant's age, sex, marital status, education level, employment status, and substance use (ever used any substances in the past twelve months) [27].

Medical records extraction Patient files, the clinic electronic database, and CTC2 cards were used to extract the most recently documented viral load results (less than 12 months).

Social support The Duke-UNC Functional Social Support Questionnaire (FSSQ) was used to assess the recent perceived social support. It was designed to assess perceived social support [28] and has 14 questions scored

on a five-point scale with responses ranging from 1 to 5 (never, much less than I would like, less than I would like, and much as I would like). For this study, scores were divided into tertiles to create equally weighted ordinal levels from low (14–23.3), average (23.4–46.6), and good (46.7–70) social support. The FSSQ has demonstrated good construct validity and good reliability at Cronbach's alpha 0.92³⁰. In our study, FSSQ has demonstrated good internal consistency with a Cronbach's alpha = 0.87.

Coping strategies The Brief COPE was used to assess different coping strategies. It assessed 14 coping domains with two items each (28 items). For each item, respondents were required to indicate whether they used the coping response on four-point Likert scale scores where (1 = I usually don't do this at all; 2 = I usually do this a little bit; 3 = I usually do this a medium amount; 4 = I usually do this a lot) and were summarized to determine adaptive and maladaptive coping strategies. Adaptive coping included the following coping strategies: active coping, use of emotional supports, instrumental supports, positive reframing, religiosity, planning, acceptance, and humor. Maladaptive coping strategies included self-blame, venting, behavioral disengagement, and denial. A sum score was calculated separately for the adaptive and maladaptive subscales categorized into tertiles based on distribution in the population [29]. For adaptive coping mechanism, tertiles were grouped from low (16–37), medium (38–47), to high (48–61), and for maladaptive coping mechanism, tertiles were grouped from low (12–17), medium (18–21), to high (22–41). The higher scores in adaptive coping strategies indicate a greater reliance on better coping strategy and higher scores in maladaptive strategies indicate a greater reliance on poor coping strategy. The scale has demonstrated good construct validity and good reliability at Cronbach's alpha 0.7 [30]. It has not been validated in the Tanzanian context. In our study, the tool reliability was assessed and demonstrated good internal consistency at Cronbach's alpha = 0.92.

Anxiety sensitivity index Anxiety sensitivity was assessed using the Short-Scale Anxiety Sensitivity Index (SSASI). These five (5) items scale assesses a dispositional tendency to fear somatic and cognitive symptoms of anxiety due to a belief that these symptoms may be harmful. Items were rated on a scale of 0 (very little) to 4 (very much) and summed to create a total score, with higher scores indicating greater anxiety sensitivity. A 1.5 standard deviation (SD) above the mean (4.4) was used as a cut-off score to categorize participants with higher versus lower anxiety sensitivity [31]. SSASI had good internal consistency (alpha = 0.81) and has shown excellent convergent and discriminant validity in the USA [31]. It has not been validated in Tanzanian context. In our study,

SSASI has demonstrated a good internal consistency with a Cronbach's alpha of 0.90.

Depression The Patient Health Questionnaire 9 (PHQ-9) assessed for clinically significant depressive symptoms. The measure comprises nine items, each scored from 0 (no symptoms at all) to 3 (symptoms nearly every day), with a maximum score of 27. The cut-off points with a score ≥ 9 is equivalent to a probable moderate to severe depressive episode, in clients attending outpatient care services in the Tanzanian context [32]. The Kiswahili PHQ-9 demonstrates very good internal consistency, with a Cronbach's alpha of 0.83; detecting probable DSM IV major depression at a cut-off score of ≥ 9 with 78% sensitivity and 87% specificity [33].

HIV/AIDS stigma HIV/AIDS Stigma Instrument (HASI) uses 12 items to assess HIV-related stigma. Items include concerns about personalized stigma, negative self-image, disclosure, and public attitude concerns. It is rated on a four-point scale from "1–Strongly disagree" to "4–Strongly agree" for a score range of 12–48, with higher scores indicating higher anticipated HIV stigma. The cut-off points ≥ 30 was used to indicate a relatively higher level of perceived HIV stigma, while a score of less than 30, indicates low perceived HIV stigma [34]. The HASI has been validated for use in Tanzanian and it has a good construct validity and reliability was adequate at Cronbach's alpha of > 0.70 [35].

Generalized anxiety disorder Generalized Anxiety Disorder – 7 (GAD-7) was used to determine the symptoms and severity of generalized anxiety disorder. The GAD-7 is a 7-item questionnaire that asks for experiences with anxiety symptoms in the past two weeks with the total score ranging from 0 to 21. The total score was calculated by assigning scores of 0 to 3 to the response options of "not at all," "several days in the past two weeks," "more than half the days in the past two weeks," and "nearly every day in the past two weeks," respectively. Cut-off scores equivalent to ≥ 10 indicated clinically significant anxiety while less than 10 indicated none or mild anxiety. The scale has a sensitivity of 89% and a specificity of 73%. The scale internal consistency was good (Cronbach's alpha = 0.82). The Swahili GAD-7 has been validated in Kenya among adults living with HIV/AIDS [36].

Pre-testing of data collection tools

Locally adapted Swahili measures were sought from authors who have culturally adapted and validated measures for use in the Tanzanian or East African context. In May 2023, for two measures, the Brief Cope and the Anxiety Sensitivity Index, the original English data collection tools were translated to Swahili first: forward translation

to Swahili, followed by independent back translation to English by a person unfamiliar with the original tool. A panel comprising the principal investigator, a clinician in mental health, and a nurse reviewed a discrepancy report of the original and back-translated English versions to check for discrepancies that signify changes in the meaning of items in the original English version after back-translation. Items with discrepancies were reviewed, discussed, and corrected to ensure meanings in the original English version were captured in the Swahili version.

In a sample of 30 adult PWH (15 male and 15 female) at the HIV CTC of Muhimbili National Hospital in Dar-es-Salaam region, the Swahili tool was piloted for face validity and finalized for fieldwork in the Kilimanjaro region. Participants used in the pilot study were not included in the main study in Kilimanjaro region to avoid introducing bias.

Data analyses

Data was entered by Redcap software v5.27.8 and analyzed using STATA software version 15. Normality of data was assessed using the Shapiro-Wilk normality test, where variables that followed a normal distribution were reported as mean and standard deviation (SD) while variables that were not normally distributed were reported by using median and Interquartile range (IQR).

Bivariable analyses identified social demographic covariates and factors of interest associated with clinically significant generalized anxiety symptoms at p -values of ≤ 0.2 for inclusion into the multivariable analyses' models while adjusting for potential confounders. Before the regression analysis, collinearity was assessed with highest variance inflation factor been less than 4. Prevalence ratios were obtained using Modified Poisson regression model [37] and reported with their corresponding 95% confidence intervals and p -values. We used weights to account for unequal selection probabilities and adjusted for clustering and stratification using robust standard error while calculating the prevalence of significant anxiety symptoms where $P < 0.05$ was considered statistically significant.

Results

We enrolled 593 participants in the study, 44.2% (262/593) at the secondary health facility. The mean age of the participants was 47.5 (SD = 13.2) years, 72.3% (429/593) were female, 41% (243/593) were married or cohabiting, 69.7% (413/593) had none or primary education, 77.4% (459/593) were employed or self-employed. 16.4% (97/593) had comorbid probable depression, 10.5% (62/593) had high anxiety sensitivity, and 20.2% (120/593) had detectable viral load with a median viral load of 20 copies/ml. 49.1% (291/593) had used substances in the past twelve months, and 9.6% (57/593) reported a recent

high level of perceived social support. 27.3 (162/593), reported relatively high levels of perceived HIV-related stigma, 32.2% (191/593) and 32.5%, (193/593) reporting high levels of both adaptive and maladaptive coping strategies respectively [Table 1].

Prevalence of significant anxiety symptoms among PWH

In this study, the weighted prevalence of significant anxiety symptoms among PWH in Moshi municipal was 12.48%.

Factors associated with significant anxiety symptoms among PWH

At Bivariate analysis, the following factors were significantly associated with having high anxiety symptoms; attending secondary (cPR = 2.66, 95% CI: 1.29–5.48, P -value = 0.008) and tertiary (cPR = 5.36, 95% CI: 2.83–10.17, P -value = 0.001) health facilities, being in early adulthood; 25–44 years (cPR = 2.14, 95% CI: 1.07–4.30, P -value = 0.032), use of substances (cPR = 4.87, 95% CI: 1.44–16.54, P -value = 0.011), having depression symptoms (cPR = 11.34, 95% CI: 4.26–30.14, P -value = 0.001), having higher viral load levels (cPR = 2.54, 95% CI: 1.03–6.26, P -value = 0.043) having higher anxiety sensitivity (cPR = 12.56, 95% CI: 8.17–19.32, P -value = 0.001), having higher levels of perceived social support (cPR = 3.93; 95% CI: 3.45–4.47, P -value = 0.001), also having medium (cPR = 1.63, 95% CI: 1.10–2.41, P -value = 0.016) and high (cPR = 3.61, 95% CI: 3.29–3.95, P -value = 0.001) maladaptive coping mechanisms.

At multivariate analysis, the following factors were significantly associated with having high anxiety symptoms; attending the tertiary health facility (aPR = 2.91, 95% CI: 2.48–3.41, P -value = 0.001), being in early adulthood; 25–44 years (aPR = 1.75, 95% CI: 1.27–2.42, P -value = 0.001), having higher anxiety sensitivity (aPR = 3.28, 95% CI: 2.08–5.19, P -value = 0.001), and having higher levels of perceived social support (aPR = 2.09; 95% CI: 1.34–3.27, P -value = 0.001). There was no significant association between other characteristics and anxiety symptoms in this study [Table 2].

Discussion

The prevalence of significant anxiety symptoms among adults PWH in CTC centers in Tanzania was 12.48%, using a GAD-7 screener cut-off score of 10. This prevalence is closely similar to the rates of significant anxiety symptoms among adults PWH in other African samples with rates of 9% and 13.8% in South Africa (assessed using the GAD-7 screener) and Guinea (assessed using HADS), respectively [13, 38]. However, other studies, report higher prevalence rates of significant anxiety symptoms in PWH when compared to this study's findings. For example, in Italy, and England, levels of

Table 1 Frequency distribution among PWH (N=593)

Characteristics	Measures
Site level	
Primary	156 (23.3)
Secondary	262 (44.2)
Tertiary	175 (29.5)
Age group, Mean (SD)	47.5 (13.2)
18–24	36 (6.1%)
25–44	185 (31.2)
45–60	276 (46.5)
>60	96 (16.2)
Sex	
Male	164 (27.7)
Female	429 (72.3)
Level of education	
None or Primary	413 (69.7)
Secondary or higher	180 (30.3)
Marital status	
Single	129 (21.8)
Cohabiting/married	243 (41.0)
Divorced/widowed	221 (37.2)
Employment status	
Unemployed	134 (22.6)
Substance use	
No	302 (50.9)
Yes	21 (49.1)
Depressive symptoms	
No	496 (83.6)
Yes	97 (16.4)
Viral Load	
Not detectable (≤ 20 copies/ml)	473 (79.8)
Detectable (undefined > 20 copies/ml)	120 (20.2)
Anxiety sensitivity, median (IQR)	0.0 (0–3)
Low (0–7.4)	531 (89.5)
High (7.5–20)	62 (10.5)
Perceived social support, median (IQR)	25 (15–36)
Low (14–23.3)	389 (65.6)
Average (23.4–46.6)	147 (24.8)
Good (46.7–70)	57 (9.6)
Perceived stigma, median (IQR)	24 (19–30)
Low (0–29)	431 (72.7)
High (30–48)	162 (27.3)
Coping Mechanisms	
Adaptive coping mechanism tertiles, median (IQR)	43 (33–50)
Low (16–37)	198 (33.4)
Medium (38–47)	204 (34.4)
High (48–61)	191 (32.2)
Maldaptive coping mechanism tertile, median (IQR)	19 (16–23)
Low (12–17)	213 (35.9)
Medium (18–21)	187 (31.6)
High (22–41)	193 (32.5)

KEY: IQR: Interquartile range**SD:** Standard deviation

self-rated and clinician-rated anxiety using HADS among PWH, were 47% and 34% respectively [39]. These variations may be related to differences in anxiety screening tools used, cultural disparities in the expression of anxiety, and different inclusion criteria in studies across contexts.

Factors associated with significant generalized anxiety symptoms in these findings included being in early adulthood, being treated at tertiary health facility levels, having high anxiety sensitivity levels, and having good social support.

In this study, significant anxiety symptoms were associated with early adulthood age. Some studies show that age has been associated with significant anxiety symptoms in PWH. Some reports from Nigeria show significant anxiety symptoms are more prevalent in younger than older PWH [14]. In other low-and middle-income countries, similar findings have been observed. For example, in Pakistan, PWH aged 18 to 25 years were 5.3 times more likely to develop significant anxiety symptoms than older PWH, perhaps due to emerging adulthood being a window period for more rapid psychological and social development [5]. A few studies in SSA support this observation, such as studies in Nigeria and Guinea that both used the HADS to assess significant anxiety symptoms, having a younger age was associated with a 2.8 times greater likelihood of significant anxiety symptoms than older age [14].

Being treated at the tertiary level of health facility was associated with higher odds of reporting significant anxiety symptoms compared to primary-level facilities. This may be explained by tertiary care level hospitals handling more complex patients, such as advanced stages of HIV/AIDS or additional health comorbidities contributing to higher anxiety levels [40]. It is also possible that persons with generalized anxiety may be less able to adhere to medication and hence have more HIV disease progression with associated comorbidity that necessitates referral [41]. There is also evidence, particularly in low- and middle-income countries such as Tanzania, of inadequate provision of mental health services at lower-level health-care services compared to higher-level centers, increasing the possibility of referral of PWH to tertiary levels with specialized mental health care, when significant anxiety symptoms are recognized [42].

Having higher anxiety sensitivity traits in this study was strongly associated with significant anxiety symptoms. Other studies in England and the USA have reported similar associations [43]. Genetic predisposition is likely the cause of this observation and points out the need for psychosocial and pharmacological intervention. Also, PWH who have high anxiety sensitivity may be attuned to perceived bodily changes or adverse effects of antiretroviral drugs (ARVs), leading to increased anxiety about

Table 2 Factors associated with significant anxiety symptoms among PWH (*N* = 74)

Variable	Significant Anxiety Symptoms; <i>N</i> = 74 (%)	Crude PR; 95% CI	<i>P</i> -Value	Adjusted PR; 95% CI	<i>P</i> -Value
Site level	11 (7.06)	Ref	0.008	1.21; 0.93–1.56	0.153
Primary	19 (7.25)	2.66; 1.29–5.48	0.001	2.91; 2.48–3.41	0.001
Secondary	44 (25.14)	5.36; 2.83–10.17			
Tertiary					
Age group (years)	6 (16.67)	2.00; 0.41–9.86	0.394	1.48; 0.57–3.83	0.418
18–24	33 (17.84)	2.14; 1.07–4.30	0.032	1.75; 1.27–2.42	0.001
25–44	27 (9.78)	1.17; 0.43–3.21	0.755	0.92; 0.72–1.17	0.502
45–60	8 (8.33)	Ref			
60+					
Sex	19 (11.59)	Ref	0.791		
Male	55 (12.82)	1.11; 0.52–2.34			
Female					
Level of education	51 (11.25)	Ref	0.630		
None or Primary	23 (12.78)	1.06; 0.81–1.40			
Secondary or higher					
Marital status	14 (10.85)	Ref	0.359		
Single	33 (13.58)	1.25; 0.78–2.02	0.748		
Cohabiting/Married	27 (12.22)	1.13; 0.55–2.32			
Divorced/widowed					
Employment status	21 (15.67)	1.36; 0.81–2.27	0.245		
Unemployed	53 (11.59)	Ref			
Employed/ Self employed					
Substance use (≤ 12 months)	13 (4.30)	Ref	0.011	Ref	0.066
No	61 (20.96)	4.87; 1.44–16.54		2.34; 0.95–5.83	
Yes					
Probable depression	23 (4.64)	Ref	0.001	Ref	0.081
No	51 (58)	11.34; 4.26–30.14		3.19; 0.87–11.73	
Yes					
Viral load	45 (9.51)	Ref	0.043	Ref	0.408
Undetectable (≤ 20copies/ml)	29 (24.17)	2.54; 1.03–6.26		1.13; 0.68–2.56	
Detectable (> 20 copies/ml)					
Anxiety sensitivity	30 (5.65)	Ref	0.001	Ref	0.001
Low (0–7.4)	44 (70.97)	12.56; 8.17–19.32		3.28; 2.08–5.19	
High (7.5–20)					
Perceived social support	33 (8.48)	Ref	0.003	Ref	0.009
Low (14–23.3)	22 (14.97)	1.76; 1.22–2.56	0.001	1.34; 1.08–1.67	0.001
Average (23.4–46.6)	19 (33.33)	3.93; 3.45–4.47		2.09; 1.34–3.27	
Good (46.7–70)					
Perceived stigma	44 (10.07)	Ref	0.148	Ref	0.199
Low (0–29)	30 (18.35)	1.82; 0.81–4.11		0.81; 0.59–1.12	
High (30–48)					
Adaptive coping mechanisms	28 (13.90)	1.39; 0.76–2.55	0.288		
Low (16–37)	25 (11.92)	1.19; 0.91–1.57	0.207		
Medium (38–47)	21 (10.00)	Ref			
High (48–61)					
Maladaptive coping mechanisms	14 (5.94)	Ref	0.016	1.19; 0.92–1.55	0.180
Low (12–17)	19 (9.66)	1.63; 1.10–2.41	0.001	1.25; 0.95–1.66	0.116
Medium (18–21)	41 (21.43)	3.61; 3.29–3.95			
High (22–41)					

treatment and its impact on their well-being⁴⁴¹⁷. This is an important finding in terms of practice changes, as there are interventions to help individuals with high anxiety sensitivity to prevent the occurrence of generalized anxiety disorder.

However, the findings in this report did not align with other studies, such as in Pakistan and Ethiopia [5, 7] where PWH who had good social support were more

likely to screen positive for significant anxiety symptoms. This can be explained by the fact that in the African context, family members are one's immediate support base, providing social, financial, and emotional support when persons suffer from a chronic disease such as HIV/AIDS hence, they tend to have consequently high expectations for a person's recovery [44]. These expectations can lead to PWH having significant anxiety due to worries about

being a burden to the family since they do provide extra support because of his/her illness.

Predictors reported elsewhere to be associated with significant anxiety symptoms, such as sex, marital status, employment status, viral load levels, substance use, having symptoms of depression, perceived stigma, and coping mechanisms, did not show significant association in our study. Our findings are contrary to the findings from other studies, such as in Pakistan [5] Ethiopia [9], and Brazil [45] report that sex, employment status, and perceived stigma were associated with significant anxiety symptoms. These different findings may be due to socio-economic or cultural variations in our sample, compared to samples from Pakistan, Ethiopia, and Brazil. However, bivariate analysis initially showed substance use, depression symptoms, viral load levels, and maladaptive coping strategies were associated with significant anxiety symptoms, after adjusting for other variables, these factors were no longer significant predictors of significant anxiety symptoms.

Limitations

Due to the cross-sectional nature of this study, it is impossible to infer causality between the independent and dependent variables. Also, the study was subjected to social desirability bias where the social-cultural norms surrounding the stigma of mental health may have limited the participants' intentions of sharing information on the presence of anxiety symptoms. The research team mitigated this by ensuring confidentiality and privacy during the interviews. Apart from that the tool used required participants to remember information of anxiety symptoms from the past two weeks, which led to recall bias. This was mitigated by providing adequate time for response from the participants. Some of the side effects of ARVs such as fatigue can contribute to physical discomfort and psychological distress potentially leading to anxiety-like symptoms. Finally, the Brief Cope Scale and SSASI have not been culturally adapted and validated in the Tanzanian context. This was mitigated by steps addressed in the translation and qualitative exploration of items that were difficult to respond.

Strength of the study

The study met the estimated sample size of 593 participants with a high response rate from the study participants. Also, both bivariate and multivariate analyses were conducted to determine the independence of factors associated with significant anxiety symptoms in PWH attending CTCs.

Conclusion

Significant anxiety symptoms were found to be common among adult PWH in this study, with about one in eight PWH reporting having significant anxiety symptoms. Results from the survey show that being in early adulthood, being treated at the tertiary health facility level versus primary and secondary levels, having high anxiety sensitivity, and having good social support were associated with significant anxiety symptoms. Therefore, screening for anxiety symptoms among individuals attending CTCs is recommended. Identifying individuals who screen positive for significant anxiety symptoms will allow for further diagnostic assessment and intervention among PWH.

Abbreviations

AIDS	Acquired immune-deficiency syndrome
ART	Antiretroviral therapy
CTC	Care and treatment centers
GAD	7-Generalized anxiety disorder 7
HADS	Hospital anxiety and depression scale
HASI	HIV/AIDS stigma instrument
HIV	Human immune deficiency virus
PSS	Perceived social support scale
MUHAS	Muhimbili university of health and allied sciences
PWH	People with HIV
RA	Research assistant
SPSS	Statistical package for social sciences
SSA	Sub-Saharan Africa
SSASI	Short scale anxiety sensitivity index
WHO	World health organization

Acknowledgements

We wish to thank the persons with HIV attending care, who agreed to participate and provided the data in these analyses. We also acknowledge all members of the CTC centers in KCMC, Mawenzi Regional Referral Hospital, Pasua, and Majengo Health Centers in Moshi Municipal, without whom this study would not be possible. I am also very thankful to my research assistants and colleagues who supported me during the conduct of this study.

Author contributions

FK led the designing of the study, collected, analyzed, and interpreted the data, writing the manuscript. E.M analyzed and interpreted the data. FE collected and analyzed the data. NN collected and analyzed the data. CM analyzed, interpreted the data, and edited the manuscript. KM interpreted the data and edited the manuscript. ES designed the study and interpreted the data. EG interpreted the data. BM co-supervised the study and edited the manuscript, SK co-supervised the study and interpretation of findings, LVM analyzed and interpreted the data, IH co-supervised the study and edited the manuscript, SK supervised the design, data collection, reporting, and interpretation of findings, as well as providing manuscript writing support. All authors reviewed the manuscript.

Funding

This study was supported by Kilimanjaro Christian Research Institute (KCRI), KCMC-DUKE collaboration, under the D43-TW009595 Grant.

Data availability

Availability of data and materials: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The MUHAS Senate Research and Publications Committee provided the ethical clearance (MUHAS-REC-07-2023-1828), while permission to conduct the study was sought from the Municipal Health Office and Medical Officers in Charge of the respective CTC clinics. All participants were verbally informed about the research and provided with information on what participation would entail and the potential risks and benefits. Participants were then asked to read the consent form and sign it to ensure written informed consent was attained from those agreeing to participate. Those who were diagnosed with clinically significant anxiety symptoms (GAD-7 ≥ 10) were referred to the mental health and psychiatric clinic of their respective or nearby facilities.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

¹Department of Mental Health and Psychiatry, Kilimanjaro Christian Medical Centre, P.O.Box 3010, Moshi, Kilimanjaro, Tanzania

²School of Medicine, KCMC University, P.O.Box 2240, Moshi, Kilimanjaro, Tanzania

³Department of Mental Health and Psychiatry, Muhimbili University of Health and Allied Sciences, P.O.Box 65001, Dare-es-Salaam, Tanzania

⁴Epidemiology and Biostatistics Department, Muhimbili University of Health and Allied Sciences, P.O.Box 65001, Dare-es-Salaam, Tanzania

⁵Department of Population Health Sciences, School of Medicine, Duke University, 215 Morris Street, Durham, NC 27701, United States of America

⁶Kilimanjaro Clinical Research Institute, P.O.Box 2236, Moshi, Kilimanjaro, Tanzania

⁷Department of Mental Health and Psychiatry, Muhimbili National Hospital, P.O. Box 65000, Dare-es-Salaam, Tanzania

Received: 9 October 2024 / Accepted: 24 March 2025

Published online: 02 April 2025

References

1. UNAIDS. Fact Sheet 2024 - Latest Global and Regional HIV Statistics on the Status of the AIDS Epidemic.; 2024.
2. Wang Y, Kiwuwa-Muyingo S, Kadengye DT. Understating the barriers to achievement of the UNAIDS 90-90-90 goal in Tanzania using a population-based HIV impact assessment survey 2016–2017. *AIDS Care - Psychological and Socio-Medical aspects of AIDS/HIV*. 2022;34(6):797–804. <https://doi.org/10.1080/09540121.2021.1923631>
3. Collins PY, Vellozo J, Concepcion T et al. Intervening for HIV prevention and mental health: a review of global literature. Published online 2021. <https://doi.org/10.1002/jia2.25710/full>
4. Brandt C, Zvolensky MJ, Woods SP, Gonzalez A, Safren SA, O'Leirigh CM. Anxiety symptoms and disorders among adults living with HIV and AIDS: A critical review and integrative synthesis of the empirical literature. *Clin Psychol Rev*. 2017;51:164–84. <https://doi.org/10.1016/j.cpr.2016.11.005>
5. Ahmed A, Saqlain M, Umair MM, et al. Stigma, social support, illicit drug use, and other predictors of anxiety and depression among HIV/AIDS patients in Pakistan: A Cross-Sectional study. *Front Public Health*. 2021;9. <https://doi.org/10.3389/fpubh.2021.745545>
6. Too EK, Abubakar A, Nasambu C, et al. Prevalence and factors associated with common mental disorders in young people living with HIV in sub-Saharan Africa: a systematic review. Published Online. 2021. <https://doi.org/10.1002/jia2.25705/full>
7. Duko B, Toma A, Asnake S, Abraham Y. Depression, anxiety and their correlates among patients with HIV in South Ethiopia: an institution-based cross-sectional study. *Front Psychiatry*. 2019;10(MAY). <https://doi.org/10.3389/fpsyt.2019.00290>
8. Armoon B, Fleury MJ, Bayat AH, et al. HIV related stigma associated with social support, alcohol use disorders, depression, anxiety, and suicidal ideation among people living with HIV: a systematic review and meta-analysis. *Int J Ment Health Syst*. 2022;16(1). <https://doi.org/10.1186/s13033-022-00527-w>
9. Tesfaw G, Ayano G, Awoke T, et al. Prevalence and correlates of depression and anxiety among patients with HIV on-follow up at alert hospital, addis Ababa, Ethiopia. *BMC Psychiatry*. 2016;16(1). <https://doi.org/10.1186/s12888-016-1037-9>
10. Omuojine JP, Nguah B, Ayisi-Boateng SK, Sarfo NS, Ovbiagele F. Contemporary prevalence and predictors of anxiety among patients living with HIV/AIDS in Ghana. *Ghana Med J*. 2022;56(3):169–75. <https://doi.org/10.4314/gmj.v56i3.6>
11. Chen WT, Shiu C, Yang JP, et al. Substance use, anxiety, and self-management efficacy in HIV-positive individuals: A mediation analysis. *J Subst Use*. 2018;23(4):408–14. <https://doi.org/10.1080/14659891.2018.1436603>
12. Capron DW, Gonzalez A, Parent J, Zvolensky MJ, Schmidt NB. Suicidality and anxiety sensitivity in adults with HIV. *AIDS Patient Care STDS*. 2012;26(5):298–303. <https://doi.org/10.1089/apc.2011.0429>
13. Camara A, Sow MS, Touré A et al. Anxiety and depression among HIV patients of the infectious disease department of Conakry university hospital in 2018. *Epidemiol Infect*. Published online 2019. <https://doi.org/10.1017/S095026881900222X>
14. Olatayo Adeoti A, Dada MU, Fadare JO. Prevalence of depression and anxiety disorders in people living with HIV/AIDS in a tertiary hospital in South Western Nigeria. *Med Rep Case Stud*. 2018;03(01). <https://doi.org/10.4172/2572-5130.1000150>
15. Bedaso A, Belagavi D, Bekele G, Mekonnen N. Factors associated with anxiety disorder among ART clients attending antiretroviral therapy clinic at Hawassa university referral hospital, Hawassa, SNNPR, Ethiopia. *J Psychiatry*. 2016;20(1). <https://doi.org/10.4172/2378-5756.1000394>
16. Truong M, Rane MS, Govere S, et al. Depression and anxiety as barriers to Art initiation, retention in care, and treatment outcomes in KwaZulu-Natal, South Africa. *EClinicalMedicine*. 2021;31. <https://doi.org/10.1016/j.eclim.2020.100621>
17. Cohen M, Hoffman RG, Cromwell C et al. The prevalence of distress in persons with human immunodeficiency virus infection. *Psychosomatics*. 2002;43(1):10–5. <https://doi.org/10.1176/appi.psy.43.1.10>
18. Parcesepe AM, Bernard C, Agler R, et al. Mental health and HIV: research priorities related to the implementation and scale up of treat all in sub-Saharan Africa. *J Virus Erad*. 2018;4:16–25. [https://doi.org/10.1016/S2055-6640\(20\)30341-1](https://doi.org/10.1016/S2055-6640(20)30341-1)
19. Wykowski J, Kemp CG, Vellozo J, Rao D, Drain PK. Associations between anxiety and adherence to antiretroviral medications in Low- and Middle-Income countries: A systematic review and Meta-analysis. *AIDS Behav*. 2019;23(8):2059–71. <https://doi.org/10.1007/s10461-018-02390-8>
20. National AIDS control program. National guideline for the management of HIV and aids.ministry of health, community, gender, elderly and children. United Republic of Tanzania; 2019.
21. Knettel BA, Wanda L, Amiri I, et al. Assessing the influence of community health worker support on early antiretroviral therapy adherence, anticipated stigma, and mental health among people living with HIV in Tanzania. *AIDS Patient Care STDS*. 2021;35(8):308–17. <https://doi.org/10.1089/apc.2021.0028>
22. Marwick KFM, Kaaya SF. Prevalence of depression and anxiety disorders in HIV-positive outpatients in rural Tanzania. *AIDS Care - Psychol Socio-Medical Aspects AIDS/HIV*. 2010;22(4):415–9. <https://doi.org/10.1080/09540120903253981>
23. National Bureau of Statistics. Tanzania in figs. 2012. Dar es Salaam, Tanzania: National Bureau of Statistics; 2013.
24. Ministry of Health (MoH) [Tanzania Mainland], Ministry of Health (MoH) [Zanzibar], National Bureau of Statistics (NBS), Office of the Chief Government Statistician (OCGS), & ICF. Tanzania Demographic and Health Survey and Malaria Indicator Survey 2022 Final Report. Dodoma, Tanzania, and Rockville, Maryland, USA: MoH, NBS, OCGS, and ICF. 2023
25. Alimohamadi Y, Sepandi M. Considering the design effect in cluster sampling. *J Cardiovasc Thorac Res*. 2019;11(1):78–78. <https://doi.org/10.15171/jcvtr.2019.14>
26. Adams G, Gulliford MC, Ukoumunne OC, Eldridge S, Chinn S, Campbell MJ. Patterns of intra-cluster correlation from primary care research to inform study design and analysis. *J Clin Epidemiol*. 2004;57(8):785–94. <https://doi.org/10.1016/j.jclinepi.2003.12.013>
27. Tanzania Demographic and Health Survey. 2004. www.measuredhs.com
28. Broadhead WE, Gehlbach SH, de Gruy FV, Kaplan BH. The Duke-UNC Functional Social Support Questionnaire. Measurement of social support in family medicine patients. *Med Care*. 1998;26(7):709–23. <https://doi.org/10.1097/00005650-198807000-00006>. PMID: 3393031.

29. Parcesepe AM, Filiatreau LM, Gomez A, et al. Coping strategies and symptoms of mental health disorders among people with HIV initiating HIV care in Cameroon. *AIDS Behav* Published Online. 2023. <https://doi.org/10.1007/s10461-022-03963-4>
30. Mohanraj R, Jeyaseelan V, Kumar S, et al. Cultural adaptation of the brief COPE for persons living with HIV/AIDS in Southern India. *AIDS Behav*. 2015;19(2):341–51. <https://doi.org/10.1007/s10461-014-0872-2>
31. Zvolensky MJ, Garey L, Fergus TA, et al. Refinement of anxiety sensitivity measurement: the short scale anxiety sensitivity index (SSASI). *Psychiatry Res*. 2018;269:549–57. <https://doi.org/10.1016/j.psychres.2018.08.115>
32. Madundo K, Knettel BA, Knippler E, Mbawambo J. Prevalence, severity, and associated factors of depression in newly diagnosed people living with HIV in Kilimanjaro, Tanzania: a cross-sectional study. *BMC Psychiatry*. 2023;23(1). <http://doi.org/10.1186/s12888-022-04496-9>
33. Smith Fawzi MC, Ngakongwa F, Liu Y, et al. Validating the patient health Questionnaire-9 (PHQ-9) for screening of depression in Tanzania. *Neurol Psychiatry Brain Res*. 2019;31:9–14. <https://doi.org/10.1016/j.npbr.2018.11.002>
34. Alemu A, Meskele M, Darebo TD, Handiso TB, Abebe A, Paulos K. Perceived HIV Stigma and Associated Factors Among Adult ART Patients in Wolaita Zone, Southern Ethiopia. *HIV/AIDS - Research and Palliative Care*. 2022;14:487–501. <https://doi.org/10.2147/HIV.S372738>
35. Holzemer WL, Uys LR, Chirwa ML, et al. Validation of the HIV/AIDS stigma Instrument - PLWA (HASI-P). *AIDS Care - Psychol Socio-Medical Aspects AIDS/ HIV*. 2007;19(8):1002–12. <https://doi.org/10.1080/09540120701245999>
36. Nyongesa MK, Mwangi P, Koot HM, Cuijpers P, Newton CRJC, Abubakar A. The reliability, validity and factorial structure of the Swahili version of the 7-item generalized anxiety disorder scale (GAD-7) among adults living with HIV from Kilifi, Kenya. *Ann Gen Psychiatry*. 2020;19(1). <https://doi.org/10.1186/s12991-020-00312-4>
37. Petersen MR, Deddens JA. A comparison of two methods for estimating prevalence ratios. *BMC Med Res Methodol*. 2008;8. <https://doi.org/10.1186/1471-2288-8-9>
38. Rane MS, Hong T, Govere S, et al. Depression and anxiety as risk factors for delayed care-seeking behavior in human immunodeficiency virus-infected individuals in South Africa. *Clin Infect Dis*. 2018;67(9):1411–8. <https://doi.org/10.1093/cid/ciy309>
39. Rahmati J, Ahmadi S, Rezaei S, Hosseini H, Dehnad A, Shabaninejad H, Aryankhesal A, Ghasemyani S, Alihosseini S, Mansour Kiaee Z, Noorani Mejareh Z, Aghalou S, Ghashghaee A, Shoghi M, Ahmadi Nasab M, Khajehvand A. The worldwide prevalence of anxiety in acquired immune deficiency syndrome patients: A systematic review and meta-analysis. *Med J Islam Repub Iran*. 2021;35:101. <https://doi.org/10.47176/mjiri.35.101>. PMID: 34956947; PMCID: PMC8683796.
40. Institute of Medicine (US) Committee on a National Strategy for AIDS, Confronting AIDS. Directions for Public Health, Health Care, and Research. Washington (DC): National Academies Press (US); 1986. Chapter 5, Care of Persons Infected with HIV. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK219135/>
41. Shacham E, Morgan JC, Önen NF, Taniguchi T, Overton ET. Screening anxiety in the HIV clinic. *AIDS Behav*. 2012;16(8):2407–13. <https://doi.org/10.1007/s10461-012-0238-6>
42. Ambikile JS, Iseselo MK. Mental health care and delivery system at Temeke hospital in Dar Es Salaam, Tanzania. *BMC Psychiatry*. 2017;17(1). <https://doi.org/10.1186/s12888-017-1271-9>
43. Gonzalez A, Zvolensky MJ, Solomon SE, Miller CT. Exploration of the relevance of anxiety sensitivity among adults living with HIV/AIDS for Understanding anxiety vulnerability. *J Health Psychol*. 2010;15(1):138–46. <https://doi.org/10.1177/1359105309344898>
44. Iwelunmor J, Airhihenbuwa CO, Okoror TA, Brown DC, Belue R. Family systems and HIV/AIDS in South Africa. *Int Q Community Health Educ*. 2006;27(4):321–35. <https://doi.org/10.2190/IQ.27.4.d>
45. Campos LN, Guimarães MDC, Remien RH. Anxiety and depression symptoms as risk factors for non-adherence to antiretroviral therapy in Brazil. *AIDS Behav*. 2010;14(2):289–99. <https://doi.org/10.1007/s10461-008-9435-8>

Publisher's note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.