Published in final edited form as:

AIDS Care. 2023 February ; 35(2): 182–190. doi:10.1080/09540121.2022.2032574.

Mental health and ART adherence among adolescents living with HIV in Mozambique

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Abstract

Little is known about the mental health needs of adolescents living with HIV (ALWH) in Mozambique, including the potential relationship between mental health challenges and poor antiretroviral treatment (ART) adherence.

We examined mental health problems (anxiety, depression, post-traumatic stress disorder [PTSD] symptoms and impairment) and their association with self-reported ART adherence among ALWH ages 15–19 in Nampula, Mozambique. The associations between each mental health problem area and sub-optimal adherence were estimated using logistic regression, controlling for age, education, and social support, with interaction by gender.

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Conflicts of Interest: The authors have no conflicts of interests to declare.

Males had significantly higher anxiety (5.6 vs 4.3, p=0.01), depression (5.8 vs 4.1, p=0.005), and PTSD (13.3 vs 9.8, p=0.02) symptoms and impairment (1.8 vs 0.56, p<0.0001) scores than females. Proportion reporting sub-optimal adherence (65%) did not differ by gender. Higher anxiety, depression, and PTSD symptom and impairment scores were significantly associated with higher odds of sub-optimal ART adherence in males but not females.

Among Mozambican ALWH, mental health problems were prevalent and two-thirds had ART adherence less than 90%. Worse mental health was associated with increased odds of sub-optimal ART adherence in males but not females. Interventions are needed to address mental health problems and improve ART adherence in Mozambican ALWH, particularly among males.

Keywords

Adolescents Living with HIV (ALWH); mental health; ART adherence; perinatal HIV infection (PHIV); Mozambique; gender differences

Introduction

Mozambique has one of the most severe HIV epidemics in the world, with 2.2 million people living with HIV, including 140,000 adolescents living with HIV (ALWH) (UNAIDS, 2018). Despite progress in scaling-up ART access, only 45% of people living with HIV in Mozambique are virally suppressed, with significant gender and age differences (53% of women are suppressed vs 35% of men and only 27% of children ages 0–14) [2]. The country also faces a significant mental health treatment gap, with only 1.37 mental health workers per 100,000 residents (WHO, 2017b) compared to 71.7 in high income countries (WHO, 2017a). There is very little data on the mental health burden among youth in Mozambique and no specific information on ALWH (Chhabra et al., 2020; Institute for Health Metrics and Evaluation, 2017). Mental health problems are consistently associated with poor ART adherence in adults living with HIV and may have similar negative effects among adolescents (Bucek et al., 2018; Gonzalez et al., 2011; Kacanek et al., 2015; S. H. Kim et al., 2014a; Mellins & Malee, 2013; Nguyen et al., 2020; Shubber et al., 2016; Uthman et al., 2014). A limited number of studies have examined the mental health and ART adherence needs among ALWH in Southern and Eastern Africa (Adeyemo et al., 2020; Boyes et al., 2019; Fawzi et al., 2016; Kamau et al., 2012; M. H. Kim et al., 2014, 2017; Murray et al., 2020; Okawa et al., 2018; Smith et al., 2019), but to our knowledge, no such studies have been done in Mozambique. Understanding the mental health needs of ALWH in Mozambique and how they relate to ART adherence can inform interventions to leverage limited resources in this setting.

This study examined the mental health of ALWH in Mozambique and how mental health relates to ART adherence in this population. Given the disproportionate burden of HIV on adolescent girls in this context, and studies demonstrating gender differences in both mental health and ART adherence among person living with HIV (Cavazos-Rehg et al., 2020; Han et al., 2013; Hankin et al., 1998; Kamau et al., 2012; S. H. Kim et al., 2014b; Rutter et al., 1976; Ssewamala et al., 2015), we also examined gender differences in rates of mental

health problems and their association with ART adherence to inform optimal approaches to effective HIV service delivery.

Methods

Data come from the baseline survey of CombinADO, an implementation science study evaluating a multicomponent intervention to improve ALWH health outcomes. The study was approved by Columbia University Irving Medical Center Institutional Review Board and Comite Nactional de Bioetica para Saude of the Ministry of Health in Mozambique.

Study Population.

ALWH aged 15–19 years with confirmed HIV were recruited from three public health facilities in the city of Nampula, Mozambique from June-December 2019. Facility records were queried to identify male and female ALWH, aged 15–19 years, and active on ART. Informed consent was obtained from ALWH aged 18–19 years or emancipated. Assent was obtained from ALWH aged 15–17 years and informed consent from their adult caregivers. Participants received $5 USD transportation reimbursement for participation.

An estimated 310 ALWH 15–19 years and active on ART were registered at the two facilities, 296 ALWH were screened, 233 were eligible, and 195 enrolled (49 male/146 female). Due to the low number of males enrolled, a third, nearby health facility was added, where an additional 18 were screened and enrolled.

Data Collection.

Surveys were administered by interviewers in Portuguese in private spaces at the health facilities and recorded electronically on tablets. Routine data on HIV care were abstracted from medical charts as available.

Mental Health Measures.

Anxiety symptoms were measured using the GAD-7 (General Anxiety Disorder-7); scores ranged from 0–21, with scores ≥10 indicating generalized anxiety disorder (Spitzer et al., 2006). Depression symptoms were measured using the PHQ-A, an adolescent version of the PHQ-9 (Patient Health Questionnaire-9); scores ranged from 0–27 with scores ≥10 indicating major depression (Johnson et al., 2002; Kroenke et al., 2001). The CPSS-V was used to assess frequency of PTSD symptoms (how often a traumatic event has bothered the participant in the past month; scores ranged from 0–60), and PTSD impairment (yes/no responses to whether the traumatic event has gotten in the way of aspects of the participants' life; scores ranged from 0–7) (Foa et al., 2018).

ART Adherence Measure.

We measured self-reported ART adherence using a 3-item scale, translated and back-translated into Portuguese, that was developed through cognitive interviewing and has been validated in the United States and South Africa (Fowler et al., 2016; T. Phillips et al., 2017; T. K. Phillips et al., 2019; Wilson et al., 2014, 2016). Participants reported for the past 30 days: (1) number of days with missed ART doses, (2) how good a job they did taking

medicines, and (3) how often they took the medication the way they were supposed to (T. Phillips et al., 2017; Wilson et al., 2014, 2016). A combined score was created by re-coding each item with equal weighting and aggregating all three items to create a score ranging from 0–100% (Wilson et al., 2014, 2016). Sub-optimal adherence was defined as <90%.

Statistical Analysis.

We summarized participant characteristics and tested for differences by gender using chi-square and t-tests. We estimated mean and median anxiety and depression scores, PTSD symptom and impairment scores, and ART adherence scores and tested for differences by gender using t-tests. We also estimated percent screening positive for generalized anxiety and major depression, and percent with sub-optimal ART adherence and tested for differences by gender using chi-square tests. Finally, we estimated odds ratios (ORs) and 95% confidence intervals (CI) for the association between sub-optimal ART adherence (the dependent variable) and poor MH – defined as higher (1) anxiety scores, (2) depression scores, (3) PTSD symptom scores, and (4) PTSD impairment scores using separate models for each MH measure. We used a directed acyclic graph (DAG) that considered sociodemographic (age, gender, education, orphan status, socioeconomic status), service (health care access), and support factors (social support) and identified a minimally sufficient adjustment set of age, gender, education, and social support. We considered two model structures: in Model 1, we adjusted for age, gender, education, and social support (4 models total); in Model 2, we adjusted for the same variables and included an interaction term for gender and the mental health variable being examined (e.g., gender*depression interaction term in the model examining the association between depression and suboptimal adherence; 4 models total) to obtain the estimated ORs for males and females. All analyses were performed using SAS (Version 9.4, Cary, NC).

Results

Sociodemographic Characteristics.

We enrolled 213 ALWH aged 15–19 years (Table 1); 69% were female (n=146) and 31% male (n=67), with males slightly younger than females (median 17 vs. 18 years, p<0.001). Fifty-eight percent of females reported ever being pregnant. Although nearly all participants were aware of their HIV-positive status (98%, p=0.5), males were younger at HIV diagnosis (median 12 vs.17 years, p<0.001) and at ART initiation (median 13 vs. 17 years, p<0.001) than females. Moreover, most males reported a family member as their primary caregiver (96%) compared to females who reported a mix of family members (58%), partners (21%), and caring for themselves (20%). Significantly more males were currently enrolled in school (87% vs. 52%, p<0.001).

Mental Health and ART Adherence.

Overall, average scores for anxiety (mean: 4.7, median: 4) and depression (mean: 4.6, median: 3) were below the clinical cut point of 10, with only 12.2% screening positive for generalized anxiety disorder and 11.7% for major depression (Table 2). Although ALWH reported some PTSD symptoms (mean score: 11.0, median: 8), PTSD impairment scores

were low (mean: 1.0, median: 0). ALWH had a mean ART adherence score of 85.4% (median: 88.9%) with only 35.1% scoring ≥90%.

Although we found no significant gender differences in proportion who screened positive for generalized anxiety (p=0.4) or major depression (p=0.3) diagnoses (impairment), male ALWH had significantly higher mean symptom scores for anxiety (p=0.01) and depression (p=0.005) than females. Males also had significantly higher PTSD symptom (p=0.02) and PTSD impairment (p<0.0001) scores. Mean ART adherence scores (p=0.7) and percent with adherence scores ≥90% (p=0.8) were similar between males and females.

Association between Mental Health and ART Adherence

In multivariable logistic regression models adjusted for age, gender, education, and social support, poorer mental health was significantly associated with sub-optimal ART adherence (adherence scores <90%) in male, but not female ALWH (Table 3). Male ALWH had 34% higher odds of sub-optimal adherence for every one-point increase in anxiety score (OR=1.34, 95% CI: 1.08, 1.67); 31% higher odds for every one-point increase in depression score (OR=1.31, 1.07, 1.60); 12% higher odds for every one-point increase in PTSD symptom score (OR=1.12, 95% CI: 1.03, 1.22); and 82% higher odds for every one-point increase in PTSD impairment score (OR=1.82, 95% CI: 1.15, 2.87). In contrast, among female ALWH, none of the mental health variables were significantly associated with ART adherence.

Discussion

To our knowledge, this is the first published study to document mental health problems in Mozambican ALWH. Among 213 ALWH engaged in HIV care in Nampula, 12% screened positive for clinical indicators of generalized anxiety and 12% for clinical indicators of major depression. Overall PTSD symptom scores and PTSD-related impairment scores were low. Male ALWH had significantly higher depression and anxiety symptom, and PTSD symptom and impairment scores than female ALWH. Only 35% of the cohort had optimal ART adherence, and poor mental health was associated with sub-optimal ART adherence in male, but not female ALWH. These findings warrant attention given the very high burden of adolescent HIV infection and limited resources for mental health care in Mozambique, and the implications for ART adherence and overall well-being.

Few studies have examined the mental health of ALWH in low resource contexts, despite evidence suggesting a high level of psychological distress in these settings (Lowenthal et al., 2012; Menon et al., 2007; Musisi & Kinyanda, 2009). In Mozambique, existing general mental health services are limited, with no adolescent-specific services. Expanding access to mental health care is a current priority of the Ministry of Health (Santos et al., 2016). Defining the magnitude of specific adolescent mental health problems can inform efforts to efficiently provide services in this very low-resource setting and keep this topic a high priority for policy makers. Rates of depression and anxiety in our sample were at the low end of those previously identified among ALWH in other African countries (12%- 52%) (Adeyemo et al., 2020; Cavazos-Rehg et al., 2020; Dow et al., 2016; Kamau et al., 2012; Kemigisha et al., 2019; M. H. Kim et al., 2014; Okawa et al., 2018). Importantly, the one

study on sub-Saharan ALWH that used the same measure and clinical diagnostic cut-off for depression as our study found the same rate (12%) to our study (Dow et al., 2016).

We found that male ALWH may be particularly vulnerable as they reported significantly higher levels of anxiety, depression, and PTSD symptoms and impairment compared to females. While some studies have indicated that internalizing disorders, including depression, anxiety, and PTSD, are more common among female ALWH, results have been mixed (Hankin et al., 1998; Rutter et al., 1976). Research on ALWH in Kenya and Uganda found that males were at higher risk of depression than females (Cavazos-Rehg et al., 2020; Han et al., 2013; Kamau et al., 2012; Ssewamala et al., 2015)., possibly due to males experiencing more trauma or stigma than female ALWH. Gender differences in mental health may also be due to differences in social pressures and norms about masculinity – including pressure to suppress emotions, earn money, and hide perceived weaknesses – which may increase risk of mental disorders and reduce access and willingness to engage in mental health care among males (Krumm et al., 2017; Randell et al., 2016; Seidler et al., 2016). Future studies are needed on gender differences and potential mediating factors such as mode of infection, age of disclosure, and family living situation to better understand the mechanisms through which male ALWH may be at increased risk of mental health problems and to offer more tailored support.

Self-reported ART adherence was low in both male and female ALWH – only 35% had ART adherence scores ≧ 90%. However, our mean adherence score of 85% is comparable to pooled estimates of ART adherence from a meta-analysis of adolescents and young adults in Africa (S. H. Kim et al., 2014a). While newer ART regimens are generally more robust and may be more forgiving to adherence lapses, high levels of adherence are still essential to control viral replication and reduce transmission risk (Bangsberg, 2006; Cohen et al., 2011; Paterson et al., 2000, 2002; Protopopescu et al., 2017). Our findings are in line with results from other studies across populations and chronic health conditions showing that adolescence is a challenging time for managing treatment adherence (Hanghøj & Boisen, 2014), and highlight the urgent need to understand and address barriers to ART adherence among ALWH.

Mental health conditions have consistently been associated with poor ART adherence, including in a limited number of studies of ALWH (Kacanek et al., 2015; Kang et al., 2015; MacDonell et al., 2013; Murphy et al., 2005; Naar-King et al., 2006; Nugent et al., 2010; Reisner et al., 2009; Williams et al., 2006), though few studies have been conducted in ALWH in Africa (Fawzi et al., 2016; M. H. Kim et al., 2017; Mutumba et al., 2016; Petersen et al., 2010), and none to our knowledge in Mozambique. We found that while ART adherence did not differ by gender, male but not female ALWH who had higher depression, anxiety, PTSD symptoms, or PTSD impairment had significantly worse adherence. Similar to the gender differences we observed in mental health symptoms, the stronger association between poor mental health and sub-optimal ART adherence in male ALWH may be due to male ALWH facing different challenges including less social support, more stigma around mental illness, and less engagement in healthcare, all of which may impact willingness to seek mental health treatment and adherence support (Krumm et al., 2017; Randell et al., 2016; Seidler et al., 2016). Even after considering potential confounding variables (e.g., age,

education, social support) in our model, the differential association between mental health and suboptimal ART adherence remained in males but not females.

One limitation of our study is that we were not able to ascertain whether ALWH acquired HIV perinatally or behaviorally. ALWH with perinatal infection may face unique challenges that could differentially impact their MH and ART adherence (Abrams et al., 2018; Bucek et al., 2019; Havens, J. F., & Mellins, 2008; Kang et al., 2011; Mellins & Malee, 2013; Nguyen et al., 2020; Petersen et al., 2010) compared to ALWH with behaviorally-acquired HIV infection (Antelman et al., 2007; Ickovics et al., 2001; Momplaisir et al., 2015; Turner & Honikman, 2016). We conducted sensitivity analyses using multiple proxy measures for behavioral HIV infection and found that our results were robust. However, it is difficult to completely untangle possible gender differences from differences stemming from the experience of perinatally- versus behaviorally-acquired infection.

Another potential limitation is that we used self-report measures of adherence, which can be affected by social desirability. Although we used an adherence measure that has been validated in the US and South Africa and that was created using extensive cognitive interviewing, this was the first use of this measure in Portuguese, and we do not have parallel validity data in this setting.

Finally, the number of males in our sample was much smaller than females and there may have been gender differences in mode of infection. Though HIV prevalence in the Nampula province is higher in male than female ALWH (5.1% vs 3.4%), it is likely that fewer males than females with HIV are accessing ART services, as has been found in other contexts (Ministério da Saúde (MISAU), 2015). We increased the number of males in our sample by expanding recruitment to an additional clinic, and based on clinic records, we recruited nearly all male ALWH in care at these clinics. Related, all participants were enrolled in a care system and, thus, we cannot generalize to those who are not receiving care. Furthermore, the survey was conducted in Nampula city, in north of the country, so the findings may not be generalizable to all ALWH living in Mozambique.

Conclusions

Our findings are the first to evaluate MH problems among ALWH in Nampula, Mozambique. We highlight the urgent need to improve ART adherence among adolescents and to examine how male versus female ALWH may differentially experience mental health challenges and how these differences may impact adherence. It will be critical to find ways to reach and tailor mental health support to the unique needs and vulnerabilities of male ALWH, while still addressing the needs of female ALWH. Differentiated care models, including those that integrate mental health services, may be instrumental to this effort. as well as models of care that integrate mental health MH assessment and services into primary care where reaching males may be more successful.

Source of Funding:

Funding for this study was provided by the Eunice Kennedy Shriver National Institute of Child Health and Human Development (5UG3HD096926), National Institute of Mental Health (P30MH43520, T32MH19139,

K01MH120258), National Institute of General Medical Sciences Institutional Development Award Number (U54GM115677), and the Providence/Boston Center for AIDS Research (P30AI042853). The contents are solely the responsibility of ICAP at Columbia and do not necessarily reflect the views of the United States Government.

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Table 1.

Sociodemographic characteristics of adolescents living with HIV enrolled in HIV care at three health facilities in Nampula, Mozambique, by gender

	Overall		Male (n=67, 31%)		Female (n=146, 69%)		Difference by gender
	n	%	n	%	n	%	p-value
Age, median (IQR)	18	16, 19	17	15, 18	18	17, 19	<0.001
Age at HIV diagnosis, median (IQR)	16	11, 18	12	7, 16	17	15, 18	<0.001
Age at ART initiation, median (IQR)	16	12, 18	13	9, 16	17	15, 18	<0.001
Don't know	23	11.1	5	7.7	18	12.6	0.3
Adolescents aware of HIV status	208	97.7	65	97.0	143	98.0	0.5
Primary caregiver							
Family member[A]	149	70.0	64	95.5	85	58.2	<0.001
Partner (husband, boyfriend)	31	14.6	0	0.0	31	21.2	
Self	30	14.1	1	1.5	29	19.9	
Other	3	1.4	2	3.0	1	0.7	
Primary provider of financial support							
Family member[A]	140	65.7	61	91.0	79	54.1	<0.001
Partner (husband, boyfriend)	59	27.7	0	0.0	59	40.4	
Self	5	2.4	1	1.5	4	2.7	
Other	9	4.2	5	7.5	4	2.7	
Adolescent or caregiver can afford							
Three meals a day	166	78.3	49	74.2	117	80.1	0.3
School fees[B]	128	96.2	56	98.3	72	94.7	0.4
Visit to the doctor when you are ill	206	97.2	63	95.5	143	98.0	0.4
All of the medicines needed when you are ill	196	92.5	58	87.9	138	94.5	0.09
Social support, mean (SD)	3.45	0.57	3.51	0.48	3.42	0.62	0.3
Current school enrollment							
In school	134	62.9	58	86.6	76	52.1	<0.001
Not in school	79	37.1	9	13.4	70	48.0	
Highest education							
None	4	1.88	0	0	4	2.74	0.2
Some Primary	64	30.05	16	23.88	48	32.88	
Some Secondary	141	66.20	49	73.13	92	63.01	
Some Technical or Tertiary	4	1.88	2	2.99	2	1.37	
Ever been pregnant (females only)							
Yes					84	57.5	
No					62	42.5	

[A] Family member included mother, father, sibling, aunt/uncle, or grandparent.

[B] Among those in school (N=133).

Table 2.

Mental health and ART adherence among adolescents living with HIV enrolled in HIV care at three health facilities in Nampula, Mozambique, by gender

	Overall	Male 31.46% (n=67)	Female 68.54% (n=146)	Difference by gender (p-value)
Mental Health				
Anxiety (GAD-7)				
Mean score (SD)	4.7 (3.6)	5.6 (3.5)	4.3 (3.6)	0.01
Median score (IQR)	4 (2, 7)	5 (3, 8)	4 (1, 6)	
Percent screened positive for anxiety (N)	12.2 (26)	14.9 (10)	11.0 (16)	0.4
Depression (PHQ-9)				
Mean score (SD)	4.6 (4.1)	5.8 (4.0)	4.1 (4.1)	0.005
Median score (IQR)	3 (2, 7)	5 (3, 8)	3 (1, 6)	
Percent screened positive for depression (N)	11.7 (25)	14.9 (10)	10.3 (15)	0.3
PTSD Symptom Score (CPSS-V)				
Mean (SD)	11.0 (10.0)	13.3 (9.6)	9.8 (10.0)	0.02
Median (IQR)	8 (4, 15)	10 (7, 21)	7 (3, 12)	
PTSD Impairment Score (CPSS-V)				
Mean (SD)	1.0 (1.8)	1.8 (2.2)	0.6 (1.4)	<0.0001
Median (IQR)	0 (0, 1)	1 (0, 3)	0 (0, 0)	
Self-Reported Adherence				
ART Adherence (Wilson 3-item scale)				
Mean score (SD)	85.4 (12.9)	86.0 (8.4)	85.2 (14.5)	0.7
Median score (IQR)	88.9 (81.1, 94.4)	86.7 (81.1, 93.3)	88.9 (81.1, 94.4)	
Percent with adherence ≥90% (N)	35.1 (73)	32.3 (21)	36.4 (52)	0.8

Table 3.

Association between mental health and sub-optimal ART adherence among adolescents living with HIV in Nampula, Mozambique, by gender

	Odds Ratio and 95% Confidence Interval		
	Model 1[A]	Model 2[B]	
		Male	Female
Anxiety (GAD-7) Score	1.08 (0.98, 1.20)	1.34 (1.08, 1.67)	0.99 (0.88, 1.12)
Depression (PHQ-9) Score	1.12 (1.02, 1.24)	1.31 (1.07, 1.60)	1.04 (0.93, 1.12)
PTSD Symptom Score	1.04 (1.00, 1.08)	1.12 (1.03, 1.22)	1.00 (0.95, 1.05)
PTSD Impairment Score	1.31 (1.02, 1.69)	1.82 (1.15, 2.87)	0.95 (0.67, 1.33)

[A] Covariates in Model 1 include age, gender, education, and social support

[B] Covariates in Model 2 include age, gender, education, social support, and a mental health measure (i.e., anxiety, depression, PTSD) by gender interaction term