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Persons living with HIV infection on antiretroviral therapy also consulting traditional healers: a study in three African countries

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Abstract

Traditional healers provide healthcare to a substantial proportion of people living with HIV infection (PLHIV) in high HIV burden countries in sub-Saharan Africa. However, the impact on the health of retained patients visiting traditional healers is unknown. In 2011, a study to asses adherence to anti-retroviral therapy (ART) performed in 18 purposefully selected HIV treatment centers in Tanzania, Zambia and Uganda showed that 'consulting a traditional healer/herbalist because of HIV' was an independent risk factor for incomplete ART adherence. To identify characteristics of PLHIV on ART who were also consulting traditional healers, we conducted a secondary analysis of the data from this study. It was found that 260 (5.8%) of the 4451 patients enrolled in the study had consulted a traditional healer during the last three months because of HIV. In multivariable analysis, patients with fewer HIV symptoms, those who had been on ART for >5.3 years and those from Tanzania were more likely to have consulted a traditional healer. However, at the time of the study, there was a famous healer in Manyara district, Loliondo village of Tanzania who claimed his herbal remedy was able to cure all chronic diseases including HIV. HIV treatment programs should be aware that patients with fewer HIV symptoms, those who have been on ART for five or more years, and patients attending ART centers near famous traditional healers are likely to consult traditional healers. Such patients may need more support or counseling about the risks of both stopping ART and poor adherence. Considering the realities of inadequate human resources for health and the burden of disease caused by HIV in sub-Saharan Africa, facilitating a collaboration between allopathic and traditional health practitioners is recommended.

Keywords

HIV, antiretroviral therapy, traditional healers, adherence, Uganda, Tanzania, Zambia

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Introduction

The high burden of disease caused by human immunodeficiency virus (HIV) infection in sub-Saharan Africa has worsened the already existing problem of

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inadequate human resources for health.[1,2] An estimated 80–85% of people living with HIV infection (PLHIV) in sub-Saharan Africa first consult traditional healers before visiting allopathic practitioners.[3–5] PLHIV consult traditional healers mainly because these healers have a strong connection with the community, hold familiar belief systems with their patients and also because they maintain a deeper understanding of the culture.[5,6] Since traditional healers represent an important healthcare resource in the treatment of PLHIV in sub-Saharan Africa, a fruitful collaboration between allopathic health practitioners and traditional healers is necessary. The use of traditional healers also reinforces the need to link health-seeking behaviour outside the allopathic health system to HIV treatment outcomes.[7]

The impact of consulting traditional healers on the health outcomes of PLHIV and their retention in care remains unknown. Some studies have shown little or no impact while others suggest that visiting traditional healers leads to greater likelihood of patients dropping out of care. One review of studies to assess the role of complementary and alternative medicine (CAM) on ART uptake and subsequent adherence showed no consensus on whether use of CAM interferes with ART uptake or adherence.[8] Delays in seeking care caused by 'healer-shopping' have been reported in Mozambique but not in Uganda[9,10] and it is unclear if this practice has clinical implications in the majority of cases. Delaying, interrupting or discontinuing ART by PLHIV has severe, long-term effects due to rapid disease progression and HIV transmission risk to one's sexual partner(s).[11–15] For pregnant HIV-infected women, delaying or opting out of care increases the risk of maternal HIV transmission to the offspring in addition to personal risk.[16–18] Indeed, all PLHIV should be counselled about adherence and issues related to traditional healers given the widespread interface with traditional healers. However, those consulting a traditional healer for HIV should benefit from additional targeted counseling to understand and address the drivers of this practice and especially to minimise potential negative outcomes.

In 2011, a study to assess adherence to ART performed in HIV treatment centers in Tanzania, Zambia and Uganda found five independent variables associated with incomplete adherence: having high levels of internalised stigma, screening positive for alcohol abuse, ever consulting a traditional healer/herbalist because of HIV and having higher numbers of HIV-related symptoms.[19] We performed a secondary analysis of the data from this three-country study to examine socio-demographic, psychosocial, health facility and ART-regimen-related characteristics of PLHIV on ART who consulted traditional healers because of HIV in the last three months in comparison with those who did not do so.

Materials and methods

The methodology of the three-country study has been described previously.[19,20] In brief, from May to October 2011, data were collected from 18 health facilities in Tanzania, Zambia and Uganda. Six sites per country were purposefully chosen, in which each site contributed 250 participants to explore the impact of different HIV program characteristics on patient retention and treatment adherence outcomes. Eligibility included having been receiving HIV care and treatment at the study sites, at least 18 years of age at ART initiation, initiated ART at least six months prior to data collection, and ability to speak one of the selected study languages. Systematic sampling was done for every fifth patient at the larger facilities and every third patient at the smaller clinics. Patients who were ineligible, unwilling or unavailable were excluded, with the study team approaching the next patient on ART attending the clinic to participate. After selection, potential participants were screened for eligibility by trained research interviewers, and if they consented, they were enrolled in the study.

Measurements

During patient interviews, data were collected on basic demographic variables (age, gender, and marital status), socio-economic status and psychosocial factors (internalised stigma, depression, social support, having consulted a traditional healer because of HIV in the last three months).

Socio-economic status was assessed using the wealth index which consisted of country-specific questions. Each household asset was assigned a weight generated through principal component analysis, and the resulting asset scores categorised into wealth tertiles.[21–24] Tertiles were defined within each country.

Stigma was assessed using five yes/no questions from the internalised AIDS Stigma Scale.[25,26] The Hopkins Symptoms Checklist depression subscale (HSCL-15) was used to measure depression.[27] Social support was assessed using The Duke University of North Carolina Functional Social Support Questionnaire with nine questions and an added 10th question on receiving social help to remember to take one's ART.[28,29] Having consulted a traditional healer for HIV in the last three months was assessed using a yes/no question.

Clinical information was abstracted from the medical charts, including the current ART regimen, date of ART initiation, pre-ART initiation CD4+ cell count and WHO stage. HIV symptoms were assessed using a modified 20-item HIV symptom Index.[30] The 20 items are scored on a 5-point Likert scale; however, during translation and pretesting of the study tools, we

modified the responses to a 4-point Likert scale with 0 indicating absence of symptoms and 3 indicating that the patient had serious symptoms.[20]

Program characteristics were assessed during interviews with ART healthcare providers who included: clinic managers, doctors, nurses, pharmacists and lay workers. Data collected included information on level and size of hospital (National referral hospital, provincial/regional/district hospital, primary/community-based health care), type of facility (governmental, mission facility), location (rural or peri-urban, urban) and ART distribution location (at the treatment center or within the community).

Participants' adherence to ART was assessed using self-reports, pharmacy refill data and healthcare provider reports. One self-report measure used was the Adult AIDS Clinical Trials Group (AACTG) measure that asked participants to specify the number of tablets missed for each drug each day in the last three days.[31] This measure was followed by a question on how many tablets they had missed in the last 30 days. Adherence for both measures was calculated by dividing the number of pills missed divided by the total number of pills that should have been consumed over that time period. Two other adherence measures used included a three-question CASE adherence Index Scale,[32] containing a composite score with more than 10 implying good adherence, and a 30-day Visual Analogue Scale,[33] from 0 indicating complete non-adherence to 100 indicating perfect adherence. After the interviews, participants' adherence in the last month was estimated by healthcare providers based on the provider's knowledge of the participant and their medical records. A pharmacy medication possession ratio (MPR) was constructed using pharmacy refill data by summarising the number of pills dispensed to participants in the last six months before the interview divided by the total number of pills participants should have received during that time.[19]

Analysis

We compared socio-demographic characteristics, psychosocial characteristics, health facilities used and ART regimen usage between those who had consulted a traditional healer in because of HIV in the last three months versus those who did not by using Fisher's exact test or Chi square test. A priori variables such as country and gender, and any covariates from the bivariate analysis which had p-value < 0.1 from the likelihood test from Generalised Estimating Equations (GEE) model were included in the multivariable model. Collinearity was assessed throughout the model selection process. The final model also included some variables that were not $p<0.1$ but were clinically and theoretically important to adjust for the potential confounders. Multivariable analysis was performed using GEE to account for the correlated nature of the data. All statistical analyses were performed using SAS software (SAS Institute, Cary, NC, USA, and version 9.3).

Ethical statement

The multi-country study was reviewed and approved by the ethics review board of the United States Centers for Disease Control and Prevention (CDC), the ethics committees of the six partner institutions, the national ethical review committees in each participating country and FHI 360. All study participants provided written informed consent.

Results

In the multi-country study, out of the 4977 eligible, 482 (9.7%) declined to participate; of the remaining 4495 participants, data about consulting traditional healers were missing for 44 participants. Overall, 260 of the 4451 participants (5.8%) had 'consulted a traditional healer because of HIV in the last three months; 195 (75%) of them were from Tanzania, 33 (12.7%) from Uganda and 32 (12.3%) from Zambia. Socio-demographic characteristics of the study population stratified by consulted/did not consult a traditional healer because of HIV in the last three months are shown in Table 1.

Female gender, lack of formal education and high wealth index were significantly associated with having consulted a traditional healer because of HIV in the last three months ($p<0.05$).

The psychosocial and HIV-related characteristics stratified by consulted/did not consult a traditional healer because of HIV in the last three months are shown in Table 2.

Patients with less social support or care and those with HIV symptoms were more likely to have consulted a traditional healers because of HIV in the last three months ($p<0.01$).

Patients who consulted traditional healers because of HIV in the last three months were more likely to be seen in national referral hospitals, provincial/regional and mission facilities. Patients who never consulted traditional healers were from government facilities and non-religious NGOs (Table 3).

ART-regimen characteristics stratified by having consulted/not having consulted a traditional healer because of HIV in the last three months are shown in Table 4.

Time on ART and current ART regimen were associated with having consulted a traditional healer because of HIV in the last three months ($p<0.0001$).

Table 1. Socio-demographic characteristics of people in HIV treatment centers who consulted and those who did not consult a traditional healer because of HIV in the last three months.

Variable	Consulted, *n*=260 (%)	Did not consult, *n*=4191 (%)	Overall, *n*=4451 (%)	*p*-Value
Age				
<35	58 (22.3)	1084 (25.9)	1142 (25.7)	0.203
>35	196 (75.4)	3029 (72.3)	3225 (72.5)	
Missing	6 (2.3)	78 (1.8)	84 (1.8)	
Gender				
Male	64 (24.6)	1371 (32.7)	1435 (32.2)	0.007
Female	196 (75.4)	2820 (67.3)	3016 (67.8)	
Marital status				
Single	130 (50)	2057 (49.1)	2187 (49.1)	0.723
Married	12 (4.7)	277 (6.6)	289 (6.4)	
Cohabitating	24 (9.2)	411 (9.8)	435 (9.77)	
Divorced/separated	40 (15.4)	652 (15.6)	692 (15.5)	
Widow/widowed	53 (20.3)	783 (18.7)	836 (18.7)	
Missing	1 (0.4)	11 (0.2)	12 (0.2)	
Schooling completed				
None	34 (13.1)	593 (14.2)	627 (14.0)	0.030
Primary	158 (60.8)	2204 (52.6)	2362 (53.0)	
Secondary	60 (23.1)	1114 (26.6)	1174 (26.0)	
Higher than secondary	8 (3.1)	272 (6.5)	280 (6.0)	
Other	–	6 (1.1)	6 (1.0)	
Religion				
Catholic	85 (32.7)	1196 (28.7)	1281 (28.8)	0.532
Protestant	83 (31.9)	1141 (27.4)	1224 (27.5)	
Other Christian	29 (11.2)	1011 (24.3)	1040 (23.6)	
Islam	59 (22.7)	780 (18.7)	839 (19.2)	
Traditionalist	2 (0.8)	6 (0.1)	8 (0.1)	
Atheist	1 (0.4)	14 (0.3)	15 (0.4)	
Other	1 (0.4)	17 (0.30)	18 (0.4)	
Wealth index				
Low	70 (26.9)	1412 (33.7)	1482 (33.4)	0.04
Middle	88 (33.9)	1402 (33.5)	1490 (33.4)	
High	102 (39.2)	1377 (33.9)	1479 (33.2)	

Table 2. Psychosocial characteristics of people in HIV treatment centers who consulted and those who did not consult a traditional healer because of HIV in the last three months.

Variable	Consulted, *n* (%)	Did not consult, *n* (%)	Overall, *n* (%)	*p*-Value
Symptoms of depression				
No	230 (88.5)	3638 (86.8)	3864 (86.9)	0.439
Yes	30 (11.5)	553 (13.2)	583 (13.1)	
HIV status undisclosed				
No	246 (94.6)	3634 (86.9)	4180 (93.9)	0.623
Yes	14 (5.4)	257 (6.1)	271 (6.1)	

(continued)

Table 2. Continued.

Variable	Consulted, *n* (%)	Did not consult, *n* (%)	Overall, *n* (%)	*p*-Value
Disclosed HIV status to partner				
No	94 (36.2)	1530 (36.5)	1624 (36.7)	0.902
Yes	166 (63.9)	2658 (63.5)	2824 (63.4)	
Disclosed to family/other				
No	30 (11.5)	433 (10.3)	463 (10.4)	0.536
Yes	230 (88.5)	3758 (89.7)	3988 (89.6)	
Social support care				
Lowest 10th percentile	44 (17)	475 (11.5)	519 (11.7)	0.007
Higher	215 (83)	3717 (88.5)	3932 (88.3)	
Social support help				
Lowest 10th percentile	54 (20.9)	543 (13.1)	597 (13.4)	<0.001
Higher	205 (79.1)	3599 (86.9)	3804 (85.4)	
Missing	1	49	50 (1.2)	
Internalised stigma				
Higher than median	103 (39.6)	1450 (34.6)	1553 (34.9)	0.101
Lower	157 (60.4)	2738 (65.4)	2895 (65.1)	
Missing	0	4	4	
HIV symptoms bother				
Yes	158 (60.8)	2081 (49.7)	2239 (50.3)	0.001
No	102 (39.2)	2110 (50.3)	2212 (49.7)	

Table 3. Health facilities attended by people who consulted and those who did not consult a traditional healer because of HIV in the last three months.

Variable	Consulted, *n* (%)	Did not consult, *n* (%)	Overall, *n* (%)	*p*-Value
Level of health facility				
National referral hospital	127 (48.9)	616 (14.7)	743 (16.6)	<0.0001
Provincial/regional hospital	63 (24.2)	933 (22.3)	996 (22.2)	
District hospital	45 (17.3)	1428 (34.1)	1473 (33.4)	
Primary/community-based health care	25 (9.6)	1214 (29)	1239 (27.8)	
Type of health facility				
Government	60 (23.1)	2405 (57.4)	2465 (55.4)	<0.0001
Mission facility (supported or not by government)	177 (68.1)	817 (19.5)	994 (22.3)	
Non-religious NGO	23 (8.8)	969 (23.1)	992 (22.3)	
Number of adults on ARVs				
<1000 currently on ARVs	125 (48.1)	1223 (29.2)	1348 (30.3)	<0.0001
1000–2000 currently on ARVs	73 (28.1)	301 (7.2)	374 (8.4)	
2000–4000 currently on ARVs	38 (14.6)	1700 (40.6)	1738 (39.0)	
>4000 currently on ARVs	24 (9.2)	967 (23.7)	991 (22.3)	
Home-based care				
No	32 (12.3)	1952 (46.6)	1984 (44.6)	<0.0001
Yes	228 (87.7)	2239 (53.4)	2467 (55.4)	

(continued)

Table 3. Continued.

Variable	Consulted, *n* (%)	Did not consult, *n* (%)	Overall, *n* (%)	*p*-Value
Setting				
Rural or peri-urban	83 (31.9)	543 (13.1)	626 (14.1)	0.6793
Urban	177 (68.1)	3599 (86.9)	3776 (84.9)	
Three counseling sessions needed for ART initiation				
Yes	68 (26.2)	1045 (24.9)	1113 (25)	0.6595
No	192 (73.8)	3146 (75.1)	3338 (75)	

ARVs: antiretrovirals; ART: antiretroviral therapy; NGO: non-governmental organisation

Table 4. ART-regimen characteristics of people in HIV treatment centers who had consulted and those who did not consult a traditional healer because of HIV in the last three months.

Variable	Consulted, *n* (%)	Did not consulted, *n* (%)	Overall, *n* (%)	*p*-Value
Pre-ART CD4 cell count				
$<50/mm^3$	54 (20.8)	838 (20)	892 (20.1)	0.7139
$51–100/mm^3$	12 (4.7)	164 (3.9)	176 (4.0)	
$101–200/mm^3$	59 (22.7)	861 (20.5)	920 (20.6)	
$201–350/mm^3$	65 (25)	1212 (28.9)	1277 (28.7)	
$>350/mm^3$	38 (14.6)	550 (13.1)	588 (13.2)	
Missing	32 (12.3)	566 (13.5)	598 (13.4)	
Pill burden				
<4	214 (84.3)	3314 (81)	3528 (79.3)	0.1965
>4	40 (15.7)	778 (19)	818 (18.7)	
Time on ART				
<2.2 years	43 (16.5)	1051 (25.1)	1094 (24.6)	<0.0001
2.2–5.3 years	114 (43.9)	2110 (50.4)	2224 (50.0)	
>5.3 years	103 (39.6)	1030 (24.5)	1133 (25.4)	
Current ART regimens*				
D4T, 3TC, NVP	71 (28.1)	647 (16.1)	718 (16.1)	<0.0001
TDF, 3TC/FTC, EFV	28 (11.1)	669 (16.6)	697 (15.7)	
AZT, 3TC, EFV	50 (19.8)	715 (17.8)	765 (17.2)	
AZT, 3TC, NVP	70 (27.7)	1352 (33.6)	1422 (31.9)	
Other regimen	34 (13.4)	645 (16.1)	679 (15.3)	

*A few participants did not report whether they consulted a traditional healer
3TC: lamivudine; ART: antoretroviral therapy; AZT: zidovudine; D4T: stavudine; EFV: efavirenz; FTC: emtricitabine; NVP: nevirapine

In the multivariable model, patients with fewer HIV symptoms, those who had been on ART for >5.3 years and those from Tanzania were more likely to have consulted a traditional healer because of HIV in the last three months (Table 5). The three ART treatment centers with the highest proportion of participants who consulted a traditional healer because of HIV in the last three months were also those located most closely to the place where a famous Tanzanian traditional healer was living; these proportions were 54.8% in the Kilimanjaro Medical center (Christian Medical Centre and the Family clinic) and 19.6% in the Haydom Lutheran Hospital, all in Tanzania.

Discussion

In the multi-country study published by Denison et al., having ever visited a traditional healer because of HIV

Table 5. Predictors of consulting a traditional healer (modelled on '1' – 'Consulted a traditional healer').

Variable	Adjusted odds ratio	95% CI	*p*-Value
Gender			
Male (ref)	1.0		
Female	1.19	0.98–1.45	0.08
Wealth index			
Low (ref)	1.0		
Middle	1.16	0.97–1.40	0.11
High	1.22	0.91–1.63	0.18
Home-based care			
None (ref)	1.0		
Home-based care	1.67	0.63–4.40	0.29
Social support care			
High (ref)	1.0		
Low	1.32	0.99–1.76	0.06
HIV symptoms			
Median versus above (ref)	1.0		
Below median	1.27	1.01–1.59	0.04
Time on ART			
<2.2 years (ref)	1.0		
2.2–5.3 years	1.19	0.93–1.53	0.16
>5.3 years	1.93	1.50–2.46	<0.01
Country			
Zambia (ref)	1.0		
Tanzania	9.03	2.22–36.85	<0.01
Uganda	1.29	0.49–3.36	0.60

was associated with incomplete adherence. This study explored the characteristics of PLHIV who visited a traditional healer and the factors associated with visiting a traditional healer in order to further understand of how to better engage HIV clinics with patients and traditional healers.

Overall, 5.8% of the PLHIV receiving ART in HIV programs in three sub-Saharan African countries reported consulting a traditional healer because of HIV in the last three months. The small proportion of participants who reported consulting a traditional healer compared to other studies could be explained by the fact that other studies reported 'ever consulting a traditional healer' or consultation over longer time periods, while our analysis was done only for the last three months.[6,31,34] However, this proportion of ART patients consulting traditional healers is higher than that reported in a study done in South Africa where consulting traditional healers by PLHIV declined from 3.6–12.7% to 0.1% over a period of 13 years.[32] However, differences in study design and methodological limitations between these two studies make it difficult to compare prevalence estimates, but even then this proportion is high for patients already on ART.

Patients with fewer HIV symptoms were more likely to consult traditional healers than those with more symptoms or very sick patients. It is likely that as these patients had been on ART, they knew the benefits (effectiveness) of ART in that those who were very ill were thus motivated to seek treatment at clinics while the less ill resorted to the traditional healers. It is also possible that the very ill patients were too sick to consult traditional healers. Peltzer et al., in their study assessing characteristics of patients consulting traditional health practitioners in the context of HIV/AIDS in urban areas in Kwazulu-Natal, found that most patients were knowledgeable about the effectiveness of ART and the potential for drug interactions if taken concurrently with traditional medicine.[33] However, their study was done among pre-ART patients who may be different from our sample who had been on ART for at least six months but on average for years.

Having been on ART for a longer duration (>5.3 years) was associated with consulting a traditional healer in the last three months. We just propose that these patients could have experienced treatment regimen fatigue after several years of treatment and sought for an alternative. It is also possible that they wanted a cure, which could not be offered by their ART providers at the time. Treatment regimen fatigue as a consequence of long-term regimens has been associated with a decline in adherence over time.[35–37] Treatment regimen fatigue is defined as decreased desire and motivation to maintain vigilance in adhering to a treatment regimen as prescribed by a provider.[38] Over time, patients may question why they continue taking medication when they feel well. It is not surprising that patients with fewer HIV symptoms consulted traditional healers more than the very sick. Effects of treatment regimen fatigue may be worse if a patient is experiencing apparent physical side effects such as lipodystrophy from some ART regimens as it was with stavudine.[39]

The majority of the participants who reported to have consulted traditional healers were from Tanzania (75%). In multivariable analysis, patients from Tanzania were more likely to have consulted a traditional healer than participants from Zambia and Uganda. At the time of the study, there was a famous healer in Manyara district, Loliondo village of Tanzania who claimed that his herbal remedy was able to cure all chronic diseases including HIV. For several months, the healer attracted tens of thousands of rich and poor Tanzanians, Kenyans and Ugandans.[40] A study done by Thielman et al.

indicated that consulting this particular 'Loliondo' healer negatively affected adherence to ART.[41] A study done in South Africa also showed that use of traditional medicine and competition between traditional healers and allopathic treatment were barriers to adherence to ART.[42] As much as traditional healers may play a positive role in HIV care, the participants in this study may have been misled by this specific traditional healer who claimed that he would cure all infections including HIV.[19] This is not new in Africa, where traditional healers, religious leaders and heads of state (The Gambia) have openly claimed to have a cure for HIV.[43–46] This experience is not uncommon with other diseases and appears to be driven by a combination of limited information and desperation for a 'cure' in the absence of effective treatments. Conversely, there has been good evidence from South Africa that the majority of the traditional healers stopped claiming that they could cure HIV as the effectiveness of ART became undeniable.[47] Given that traditional healing remains an important aspect of many people's engagement with healthcare in resource-limited settings, collaboration with traditional healers could assist the bio-medical system in scaling up effective services in HIV prevention and treatment.

The major strength of this analysis is the large number of patients from 18 different health facilities from three countries. The data were collected using standardised data collection tools.

Our study does have limitations that need to be considered. As a cross-sectional study, we only were able to interview those patients actively engaged or retained in care, missing the experiences of people who were not retained. Another limitation of the study is that we did not assess patients' motivations for consulting traditional healers and health outcomes of the practice. The study design did not also allow us to assess the clinical effect of consulting traditional healers on stopping ART or developing poor adherence. Our study was done in 2011, at a time when there was a famous traditional healer in Tanzania. However, traditional healers claiming a cure for incurable diseases is not an uncommon occurrence in sub-Saharan Africa. Therefore, we believe that performing qualitative research on this topic including, for example, in-depth interviews with the patients and key informant interviews with healthcare providers and traditional healers may still be useful. Also, randomised controlled trials of patients who consult/do not consult and prospectively follow them would help assess the health outcomes of consulting traditional healers.

In conclusion, ART treatment centers should be aware that, particularly patients with fewer HIV symptoms, those who have been on ART for a longer period and those who attend ART centers near popularised traditional healers are more likely to consult with traditional healers. Such patients should receive extra counselling about the risk of stopping ART, drug interactions, poor adherence and should be protected from being misled by traditional healers who claim that they can cure HIV. Since the successful ART roll-out, a significant change in attitude towards HIV treatment by the majority of traditional healers has been observed. However, considering the realities of inadequate human resources for health and the burden of disease caused by HIV in sub-Saharan Africa, facilitating a collaboration between allopathic and traditional health practitioners is recommended.[48]

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