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Use of Traditional Herbal Medicine by AIDS Patients in Kabarole District, Western Uganda

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Abstract. The objective of this cross-sectional study was to assess the use of traditional herbal medicine by AIDS patients in Kabarole District, western Uganda. Using systematic sampling, 137 AIDS patients were selected from outpatient departments of 3 hospitals and interviewed via questionnaire. The questions related to such areas as type and frequency of herbal medicine intake, concomitant herb–pharmaceutical drug use (including herb–antiretroviral drug cotherapy), and the perceived effectiveness of herbal medicine. Overall, 63.5% of AIDS patients had used herbal medicine after HIV diagnosis. Same-day herbal medicine and pharmaceutical drugs use was reported by 32.8% of AIDS patients. Patterns of traditional herbal medicine use were quite similar between those on antiretroviral therapy and those who received supportive therapy only. The primary conclusion is that AIDS outpatients commonly use herbal medicine for the treatment of HIV/AIDS. Pharmacological interactions between antiretroviral drugs and traditional herbal medicines need to be further examined.

INTRODUCTION

Herbal medicine—defined by the World Health Organization (WHO) as "herbs, herbal materials, herbal preparations and finished herbal products, that contain as active ingredients parts of plants, or plant materials, or combinations thereof"—is used to treat a multitude of ailments throughout the world.[1] Despite the physical availability and subsidized costs of several pharmaceutical drugs, the majority of Africans lack the financial means to afford conventional treatments on a consistent and/or sustainable basis.[2] Africans living with HIV/AIDS are no exception, and access to essential drugs, including antiretroviral (ARV) drugs, is often well beyond their means.[3–5] As conventional medical care (CMC) co-exists with traditional medicine systems in many regions of Africa and elsewhere, people may use medicine from one system exclusively or they may acquire medicine from each health system and use it simultaneously or sequentially. King and Homsy noted this kind of medical pluralism among patients in sub-Saharan Africa.[6]

The specific pharmacokinetic and pharmacodynamic interactions between various combinations of herbal medicine and pharmaceutical drugs have rarely been investigated, leaving the overall consequences of medical pluralism largely unknown. This is particularly true of the potential interactions between African herbal medicines and ARV drugs despite concern being raised about such interactions: African potato (*Hypoxis hemerocallidea*) and *Sutherlandia* can potentially inhibit ARV drug metabolism and transport.[7] In North America, commonly used herbal dietary supplements have been found to impede on ARV drug effectiveness. Specifically, garlic supplements (*Allium sativum*) and St. John's wort (*Hypericum perforatum*) have detrimental effects on the plasma concentrations of saquinavir and indinavir, respectively.[8,9] Crucially, reduced plasma concentrations of ARV drugs can lead to limited effectiveness of antiretroviral therapy.[10]

There has not been a substantial impetus to carry out African traditional herbal medicine (THM) and ARV drug interaction studies, perhaps owing to paltry antiretroviral therapy (ART) coverage rates in Africa. For example, the WHO noted an ART coverage rate of only 2% in Africa in 2003.[11] Intensified international efforts bolstered the ART coverage rate to 11% in sub-Saharan African by June 2005, with ≈ 500,000 people receiving ART.[12] In Uganda alone, ART coverage increased from 20,000 people in June 2004 to ≈ 64,000 people by June 2005.[13] It can be reasonably inferred, however, that more cases of medical pluralism involving herbs and ARV drugs will arise as ART coverage rates increase. Thus, cause for concern about potential THM–ARV drug interactions also grows.

The substantial reliance on THM by the majority of the sub-Saharan Africa population led to the generally accepted conclusion that THM is used for the treatment of HIV-related symptoms.[14,15] This study sought to identify and deepen the understanding of the role of THM in the treatment of HIV/AIDS among HIV-infected adults enrolled in conventional HIV/AIDS treatment programs in Uganda (one country in sub-Saharan Africa that is actively pursuing ART program expansion).

OBJECTIVES

Objectives of the study were as follows:

1. Identify the frequency of THM use in AIDS patients in western Uganda;
2. Examine the differences in THM use between AIDS patients on ART and those on supportive therapy (that is, non-ART conventional medical care);
3. Identify the most commonly used herbal medicines; and
4. Determine factors associated with the use of THM.

METHODS

Study site. Data collection was completed from September to December, 2004 in Fort Portal, a municipality in the Kabarole District of western Uganda. The populations of Fort

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Portal and Kabarole District are 41,000 and 359,180 persons, respectively.[16,17] Three HIV/AIDS programs in Fort Portal—The Joint Clinical Research Center (JCRC), The Prevention of Mother-to-Child Transmission (PMTCT) program, and The AIDS Clinic in Virika Hospital—served as recruitment and study sites. Although each of these facilities provided voluntary testing and counseling services, the JCRC and PMTCT treatment programs included ART whereas the AIDS Clinic in Virika Hospital provided only supportive treatment (that is, no ART) for its AIDS patients. Recruitment of AIDS outpatients through the 3 HIV/AIDS programs ensured that 2 treatment subgroups were obtained, namely, respondents who were receiving antiretroviral therapy (TX-ART) and those who were not (that is, supportive HIV/AIDS treatment; TX-SUP). Although these 3 programs mostly serve the population of Kabarole District, some AIDS patients in the nearby districts of Kamwenge, Kyenjojo, Bundibugyo, and Kasese also accessed the treatment programs.

Sample selection. A cross-sectional study design was used, as is common with traditional medicine investigations within HIV-infected populations and non-HIV populations alike.[18–23] Systematic sampling was used to recruit HIV-infected adults.

The inclusion criteria were being an HIV-infected adult between 18 and 55 years of age and being on treatment in 1 of the 3 aforementioned treatment study sites. Exclusion criteria were being an HIV-infected person < 18 years of age or > 55 years of age; being HIV seronegative; and not being a current patient at any of the 3 HIV/AIDS treatment program study sites. At each recruitment site and throughout the adult clinic days, the staff who regularly attended to AIDS outpatients asked every second male and every second female who attended a particular clinic and met the inclusion criteria if they would be interested in participating in this HIV/AIDS research study. If the potential respondent indicated an interest in participating, the staff member then referred her/him to a research assistant for further information and study consent. None of those approached refused to be part of the study. Only 2 AIDS patients were excluded from the sample because of age > 55 years.

The sample size calculation was based on the assumption that 80% of the Ugandan population used traditional medicine.[1,24] For the sample size calculation, a significance level of 0.05 and a power of 0.80 were chosen. A sample of 62 respondents in each treatment subgroup would have provided the power to detect a difference of 10% between the treatment subgroups. A decision was made *a priori* to increase the desired sample in each treatment subgroup to at least 68 respondents to ensure ample subjects had been entered into the study in the event that some subjects were unable or unwilling to complete the full interview and/or if some subjects subsequently decided to withdraw from the study. A total of 69 TX-ART subjects and 68 TX-SUP subjects were recruited, with a total of 137 participants included in the study.

AIDS patients receiving ART were treated according to the Ugandan Treatment Guidelines of the Ministry of Health with the first-line drug regimen of lamivudine, stavudine, and nevirapine (Triomune 30). This fixed-dose combination has been tolerated relatively well with rare severe adverse reactions, according to the treating physicians of our patients as well from our own experience. We cannot definitively specify the treatment regimes for all of our patients, as individual patients were not asked the names of the antiretroviral drugs they were being treated with. However, we are certain that most were on Triomune 30. Adherence data for ART of our patients were not collected, as such data were not easily obtained; the treating physicians of our patients estimated that ART adherence rates varied between 70% and 80%. Supportive treatment consisted of pain management, trimethoprim–sulfadoxin prophylaxis, and the treatment of opportunistic infections.

Data collection. Data were collected using a semistructured questionnaire with closed and open-ended questions during a face-to-face interview. The questionnaire was translated into the local language (Rutooro) and verified by a second translator, and when inconsistencies were found, they were corrected. Pretesting of the questionnaire was completed with 4 HIV-infected persons not involved in the study. The interview questionnaire consisted of 41 questions. Interviews lasted an average of 75 minutes and were completed in private offices located within the 3 study sites. Respondents completed the interview in their preferred language of either Rutooro or English, with Rutooro responses being translated into English. Open-ended questions were used to acquire lists of HIV-related symptoms experienced; types of HIV-related symptoms treated with THM; and the names of herbal medicine used. A test–retest procedure was completed with a randomized sample of 14 respondents to assess the reliability of questionnaire responses. The time interval between test and retest was 7 days. The test–retest procedure revealed an average κ value of 0.88, indicating overall excellent agreement and satisfactory reliability of the questionnaire.

Data analysis. Descriptive analysis (frequency, mean, and median calculations) was completed. Tests of univariate association were compiled with the χ^2 test for categorical variables, Student's independent t test for continuous variables approximately normally distributed, and Mann–Whitney U tests for continuous variables that were not normally distributed. Uni- and multivariate regression models were developed with "use of traditional herbal medicine" as the dependent variable. Two logistic regression models were developed with the independent variable "THM use": one with the number of reported symptoms and one with the reported type of symptoms. The independent variables were respondents' demographic characteristics, time since diagnosis of HIV infection, use of THM prior to HIV diagnosis, number and type of HIV-related symptoms experienced, and the perceived effectiveness of THM based on previous experience. Statistical analyses were carried out with SPSS[25] with the level of significance set at $P < 0.05$.

Study approval and ethical considerations. The University of Alberta's Health Research Ethics Board provided ethical approval for the study. In Uganda, approval for the study was obtained from the Uganda National Council of Science and Technology. Within Kabarole District, the study was approved by the District Director for Health Services, the Team Leader of Basic Health Services, and the Medical Directors of the three HIV/AIDS treatment program sites. Each participant was informed about the study and signed a consent form. Identification numbers were assigned to each subject to keep all participant identities anonymous.

RESULTS

A total of 137 HIV-infected adults were recruited into the study based on fulfillment of the inclusion criteria. Within the study sample, 69 respondents were receiving ART and 68 respondents were receiving only supportive treatment. The mean age of participants was similar between AIDS patients on ART and AIDS patients not on ART but on supportive medicine (36.5 ± 7.0 versus 36.1 ± 7.6 years, $P = 0.763$). Overall, AIDS participants receiving only supportive treatment had lower levels of educational attainment and were more often divorced, separated, or widowed than were AIDS patients on ART. For more demographic details, see Table 1.

The median time interval between HIV diagnosis and study interview was 13 months. A significant difference was noted between treatment subgroups, with a median time interval between HIV diagnosis and study participation of 8.5 months for AIDS patients on ART compared with 15.0 months for AIDS patients receiving only supportive treatment (Mann–Whitney U test, $P = 0.011$).

Traditional herbal medicine was commonly used by study respondents, with 122 (90.4%) respondents reporting use of THM prior to diagnosis of HIV infection. The majority of respondents ($N = 87$, 63.5%) also reported using THM after diagnosis of HIV infection. Table 2 provides information about respondents' use of THM before and after HIV diagnosis, including the comparison of AIDS patients on ART and AIDS patients receiving only supportive treatment.

Ninety-eight different herbal plants had been used by the study participants, and, as the specific name of the THM was not known in 45 instances, the number of botanical resources may have been even greater. An average of 3 different herbal remedies (range, 1–27) were used by each participant with no difference between AIDS patients in either group (Mann–Whitney U test, $P = 0.534$). The most frequently reported herbal medicines used to treat culturally defined HIV-related symptoms are listed in Table 3.

When asked why participants used THM, the most common reasons they gave (in descending order of frequency) were as follows: availability/abundance of THM (32.6%); treatment effectiveness of THM (14.6%); proximity of the herbs to the patient (16.3%); familiarity with THM (10.9%); and affordability (9.3%). Within this study, the majority of patients (81.5%) gathered herbs and prepared the herbal remedies on their own with the assistance of a relative or friend. Specific to AIDS patients receiving ART, the predominant reason for THM use was that patients simply wanted to relieve the symptoms they experienced. Several other responses indicated that THM was used because participants believed that pharmaceutical drugs had failed to treat the symptom adequately; the desire by AIDS patients on ART to have rapid symptom relief; and that family and/or friends had advised individual ART patients that THM could be of benefit. Table 3 also shows which herbal medicines were used for which type of symptoms.

AIDS patients reported a multitude of symptoms that they considered to be directly related to their HIV infection and for which they took THM. The 10 most frequently reported symptoms were fever; cough; rash; headache; diarrhea; stomach/abdominal pain; herpes zoster; loss of weight; sores in the mouth; and flu. Several of the reported HIV-related illnesses (e.g., fever, diarrhea, and skin disorders) are also symptoms that are caused by other infectious diseases, and such symptoms have been commonly treated with herbal medicine for generations, irrespective of the underlying medical condition.[26,27] Therefore, with or without a formal diagnosis or knowledge of the underlying pathology responsible for these symptoms, it is not possible to determine whether patients were using THM for HIV-related symptoms *per se* prior to actually being diagnosed with HIV. When specifically asked about the use of THM for HIV-related symptoms, patients were first asked what symptoms they experienced that they considered to be the result of HIV. This was followed by asking them what THM, if any, they had used for that HIV infection. Although there was not a statistically significant relationship between time since diagnosis and the use of THM for HIV-related symptoms ($P = 0.171$), it is likely of clinical relevance to note that the percentage of AIDS pa-

TABLE 1
Baseline characteristics of respondents

Variable	Total sample		Treatment subgroup: TX-SUP		Treatment subgroup: TX-ART		P value
	$n = 137$	%	$n = 68$	%	$n = 69$	%	
Gender							0.896
Female	96	70.1	48	70.6	48	69.7	
Male	41	29.9	20	29.4	21	30.4	
Age in years*							0.655
20–29	22	16.4	12	18.2	10	14.7	
30–39	66	49.3	30	45.5	36	52.9	
40–49	38	28.4	21	31.8	17	25.0	
50–55	8	6.0	3	4.5	5	7.4	
Marital status							0.001
Single	16	11.7	7	10.3	9	13.0	
Married	58	42.3	18	26.5	40	58.0	
Divorced/ separated	19	13.9	14	20.6	5	7.2	
Widowed	44	32.1	29	42.6	15	21.7	
Highest education							0.013
None	17	12.4	10	14.7	7	10.1	
Primary	79	57.7	45	66.2	34	49.3	
Secondary	26	19.0	11	16.2	15	21.7	
Post-secondary	15	10.9	2	2.9	13	18.8	
Tribal ethnicity							0.957
Batooro	108	78.8	53	77.9	55	79.7	
Bakiga	12	8.8	6	8.8	6	8.7	
Other†	17	12.4	9	13.2	8	11.6	
Residence							0.250
Kabarole	116	84.7	60	88.2	56	81.2	
Other‡	21	15.3	8	11.8	13	18.8	

* Age is missing for 2 TX-SUP and 1 for TX-ART respondents.
† Other included the tribal ethnicities of Banyankole, Banyoro, Bakonjo, Baganda, Kumanu, Mufumbiira, Musoga, Alur, and Langi.
‡ "Other" included the districts of Kyenjojo, Kamwenge, Bundibugyo, and Kasese.

TABLE 2
Use of traditional herbal medicine (THM) by respondents, stratified by treatment subgroup

Use of THM	Treatment subgroup: TX-SUP n (%)	Treatment subgroup: TX-ART n (%)	P value
Pre-HIV diagnosis:			
All symptoms	62 (91.2)	60 (89.6)	0.749
Post-HIV diagnosis:			
All symptoms	46 (67.6)	41 (59.4)	0.317
HIV-related symptoms	43 (63.2)	36 (52.9)	0.224

TABLE 3
Most frequently used THM for the treatment culturally defined HIV-related symptoms (n = 79)

Rutooro name	Botanical name	Frequency of use (%)	Reported HIV-related symptom treated
Ekibirizi	*Vernonia amygdalina*	42	Fever, general rash, pain (headache, back), cough, stomach ache
Enkoko rutanga	*Aloe barbadensis*	24	Fever, herpes zoster, weakness, diarrhea
Omwihura	*Vernonia turbinata* (or *Momordica foetida**)	14	Cough, nonspecific rash, diarrhea, fever
Omuyembe/amababi g'emiyembe	*Mangifera indica*	11	Cough
Ekijaja/omujaja	*Ocimum suave*	10	Cough, stomach ache, pain (headache), fever
Omusikamooli	*Eurphorbia* spp.	10	Herpes zoster, nonspecific rash
Kalitunsi	*Eucalyptus* ssp.	9	Cough
Ekinyamunsunga	*Plectranthus lanuginosus* (or *Solenostemon latifolius**)	9	Stomach ache, cough, pain (back, headache)
Amapera	*Psidium guajava*	9	Cough
Omweya	*Cythula* ssp.	8	Cough

* In some instances, the research team identified > 1 botanical name for the specific Rutooro THM. As the research team was unable to confirm and/or determine the exact botanical source for the reported THM name in question, both botanical names have been provided. Further, as the scientific identification of the specific botanical species used in the treatment of HIV-related symptoms was not the primary objective of this research, rigorous verification of the botanical species was not undertaken (for example, physical sampling of the botanical species).

tients using THM progressively increased as the time since their diagnosis increased.

To capture the overall pattern of concomitant medicine use, participants were asked if they ever used herbal medicine and pharmaceutical drugs together on the same day. The responses indicated that 40 (29.4%) AIDS patients in the investigation had used herbal and conventional medicines concomitantly. There was no evidence of a statistically significant difference in the frequency of concurrent medicine use between AIDS patients on ART and AIDS patients not on ART (35.3% versus 23.5%, $P = 0.132$). However, this difference may be clinically significant and important to note. Concurrent THM and pharmaceutical drug use was more common among female respondents compared with male respondents (34.7% versus 17.1%, $P = 0.038$). Concurrent use of THM and western drugs was high, in spite of the belief reported by 103 (84.4%) participants that concurrent use of conventional and herbal medicines could be dangerous.

Regarding the concurrent use of antiretroviral drugs and THM, 22 (32.8%) AIDS patients on ART reported they used THM and ARV drugs within the same day. Concomitant THM-ARV drug use was similar between male and female ART recipients ($P = 0.373$). Among these patients on ART, 31.8% administered the herbal medicine and ARV drugs simultaneously, although 6.0% of these respondents only used topical THM simultaneously with ARV drugs. Some ART recipients valued cotherapy based on the nutritious benefits of THM, viewing the role of THM as a dietary supplement that could complement the treatment provided through ARV drugs. Other participants responded that the concurrent use of THM and ARV drugs could have negative effects on the body, although it was believed by some respondents that these negative effects could be mitigated by administrating the medicines at different times within the same day.

Univariate analysis indicated that use of ART, gender, age, marital status, tribal ethnicity, educational level, time since diagnosis, and perceived effectiveness of THM were not independently associated with the use of THM for HIV-related symptoms. Conversely, post-secondary education was associated with the use of THM. Patients who used THM prior to HIV diagnosis were also more likely to use THM for HIV-related symptoms after the diagnosis was made (OR 3.42, 95% CI 1.00–11.74, $P = 0.05$). As well, AIDS patients who reported having more symptoms perceived as being HIV-related were using THM more often (OR 1.17, 95% CI 1.01–1.35, $P = 0.03$). In addition, univariate analysis indicated that increased THM use was associated with the reported symptoms fever, pain, and skin rash (see Table 4).

Multivariate logistic regression with use of THM for HIV-related symptoms as the dependent variable confirmed results from the univariate analysis, namely, that use of THM before HIV diagnosis was made and a higher number of HIV-related symptoms reported by a patient continued to be significant variables associated with the use of THM. It also confirmed the associations between THM use and the reported symptoms of fever and pain from the univariate analysis. The associations between THM use and skin rash, diarrhea, and cough were not significant in the multivariate model (see Table 5). Multivariate analysis did not reveal any new significant associations with THM use and the other variables, except that higher educational status was borderline related with more frequent THM use.

DISCUSSION

The demographic characteristics of participants in both the ART group and non-ART group were quite similar, allowing for meaningful and valid comparisons. In addition, responses from both groups were quite similar in regard to frequency of THM use before and after HIV diagnosis; the average number of herbal remedies used for the treatment of HIV-related symptoms; the frequency of concomitant THM–pharmaceutical drug use; the perception of risks associated with THM–pharmaceutical drug cotherapy; and the perceived treatment effectiveness of traditional herbal medicine.

Overall, 63.5% of AIDS participants indicated that they had used traditional herbal medicine after being diagnosed with HIV infection. This finding is important to note. Medical practitioners and researchers should be informed about this to include inquiring about herbal treatments for both HIV-related illnesses and other comorbid conditions as part of their history taking and clinical assessments. Failure to do so may cause health-care workers to inadvertently overlook the full spectrum of potential herb–drug interactions that may be experienced by an AIDS patient.

TABLE 4
Odds ratios (ORs) and 95% confidence intervals (95% CIs) for THM use, univariate analysis

Variable*	% Using THM*	OR (95% CI)	*P*
ART status			0.22
Supportive ($n = 68$)	63	1.00 (reference)	
ART ($n = 68$)	53	0.65 (0.33–1.30)	
Gender			0.76
Female ($n = 95$)	59	1.00 (reference)	
Male ($n = 41$)	56	0.89 (0.42–1.87)	
Age (in years)†		0.99 (0.94–1.04)	0.63
Marital status			
Single ($n = 16$)	75	1.00 (reference)	
Married ($n = 57$)	54	0.40 (0.11–1.38)	0.15
Separated/divorced ($n = 19$)	58	0.46 (0.11–1.96)	0.29
Widow(er) ($n = 44$)	57	0.44 (0.12–1.58)	0.21
Tribal ethnicity			
Batooro ($n = 108$)	60	1.00 (reference)	
Bakiga ($n = 12$)	42	0.47 (0.14–1.59)	0.22
Other ($n = 16$)	56	0.85 (0.29–2.46)	0.76
Educational level			
None ($n = 16$)	38	1.00 (reference)	
Primary ($n = 79$)	61	2.58 (0.85–7.82)	0.09
Secondary ($n = 26$)	54	1.94 (0.54–6.94)	0.31
Post-secondary ($n = 15$)	73	4.58 (0.99–21.12)	0.051
Time since diagnosis‡		1.01 (0.997–1.02)	0.16
≤ 1 year ($n = 67$)	49		
> 1–2 years ($n = 31$)	61		
> 2–4 years ($n = 19$)	68		
> 4 years ($n = 19$)	74		
Use of THM before HIV diagnosis			
No ($n = 13$)	31	1.00 (reference)	
Yes ($n = 121$)	60	3.42 (1.00–11.74)	0.05
Number of HIV-related symptoms§			
1–3 symptoms ($n = 29$)	55		
4–6 symptoms ($n = 45$)	60		
7–9 symptoms ($n = 39$)	69		
10 or more symptoms ($n = 11$)	82		
Type of HIV-related symptom			
Fever			
No ($n = 48$)	33	1.00 (reference)	
Yes ($n = 88$)	72	5.04 (2.36–10.76)	< 0.01
Pain			
No ($n = 59$)	46	1.00 (reference)	
Yes ($n = 77$)	68	2.47 (1.22–4.96)	0.01
Rash			
No ($n = 60$)	48	1.00 (reference)	
Yes ($n = 76$)	66	2.06 (1.03–4.11)	0.04
Diarrhea			
No ($n = 90$)	53	1.00 (reference)	
Yes ($n = 46$)	67	1.81 (0.86–3.80)	0.12
Cough			
No ($n = 65$)	65	1.00 (reference)	
Yes ($n = 71$)	58	1.78 (0.90–3.55)	0.10
Perceived effectiveness of THM			
No help to a little help ($n = 48$)	60	1.00 (reference)	
Moderate to quite a bit of help ($n = 14$)	43	0.49 (0.15–1.64)	0.25
Cures symptoms ($n = 29$)	62	1.07 (0.42–2.76)	0.89

* n is the number of responses provided within each subgroup; % is the percent of the subgroup that used THM for HIV-related symptoms.
† Age in years was used as a continuous variable.
‡ Time since diagnosis was used as a continuous variable.
§ Number of HIV-related symptoms was used as a continuous variable.

TABLE 5
Odds ratios (ORs) and 95% confidence intervals (95% CIs) for THM use, multivariate analysis

Variable	OR (95% CI)	*P*
Model based on no. of symptoms		
No. of HIV-related symptoms*	1.21 (1.03–1.41)	0.02
Use of THM before HIV diagnosis		
No		
Yes	4.96 (1.29–19.06)	0.02
Educational level		
None		
Primary	3.07 (0.89–10.62)	0.08
Secondary	2.93 (0.67–12.82)	0.15
Post-secondary	4.08 (0.79–21.08)	0.09
Model based on type of symptoms		
Type of HIV-related symptom		
Fever		
No		
Yes	5.01 (2.24–11.19)	< 0.01
Pain		
No		
Yes	2.22 (1.02–4.84)	0.04
Educational level		
None		
Primary	3.28 (0.95–11.33)	0.06
Secondary	2.40 (0.58–9.95)	0.23
Post-secondary	4.06 (0.79–20.74)	0.09

* Number of HIV-related symptoms was used as a continuous variable.

Within this investigation, the frequency of herbal medicine use prior to HIV diagnosis was notably higher than previously cited estimates of traditional medicine use (defined as including both medication and nonmedication therapies) in the African population and in Uganda specifically.[1,28] Deficient and inequitable access to conventional health services, as well as the often prohibitive costs of conventional health care that impede frequent and/or sustained use, may explain the continued and potentially increasing use of THM among AIDS patients.[15,29,30] Manfredi and Chiodo also suggest that unconventional therapies remain popular with AIDS patients due to the conventional health-care system's inability to provide a definitive cure for HIV infection.[31] Limited access and/or affordability of conventional health care (including pharmaceuticals) and the current incurability of HIV/AIDS may explain why AIDS patients within our investigation used THM despite its perceived risks.

It could be surmised that reduced costs and improved access to pharmaceuticals would result in reduced dependency on traditional herbal medicine. This is a perspective consistent with the current study's finding that THM use by AIDS outpatients decreased 26.9% after HIV diagnosis. Improved accessibility and affordability of pharmaceuticals was facilitated by the HIV treatment programs through which the participants were recruited, with the programs providing subsidized and/or free essential pharmaceuticals to assist in the management of opportunistic infections and other symptoms. In the absence of reduced pharmaceutical costs within HIV treatment programs, it is highly probable that AIDS outpatients' pre- and post-diagnostic use of THM would remain essentially unchanged.

Importantly, participants on ART reported a higher frequency of concurrent THM–pharmaceutical drug use than participants who were not taking ARV drugs. This difference however, was not statistically significant. Concomitant drug use specifically involving ARV drugs and THM was confirmed by 33% of participants on ART. The significance of this finding cannot be understated; if similar rates of concomitant THM–ARV drug use occur within Uganda and sub-

Saharan Africa as a whole, then ≈ 21,000 Ugandans and ≈164,000 sub-Saharan Africans could be at risk for THM–ARV drug interactions, as inferred from June 2005 ART coverage rates.[12,13] Because the exact level of risk and/or benefits resulting from THM–ARV drug cotherapy amongst AIDS patients is largely unknown, the concerns raised about herb–ARV drug interactions as mentioned in earlier studies cannot be overlooked.[7–9]

Similar to studies in North America and Europe, our findings indicate that herbal medicine is used to complement ART,[18,31] although the frequency of doing so is less in Uganda. Antiretroviral therapy recipients used THM to alleviate some of the negative side effects of ARV drugs such as nausea and diarrhea both in our investigation and that of Chang and colleagues.[32] Overall, the suggestion from Sparber and colleagues, that AIDS patients are increasingly aware of the incurability of HIV and therefore seek unconventional medicine to assist in the management of symptoms or side effects, appears to be equally applicable to our study respondents in Uganda.[33] Reports from developed countries also indicate an association between increased use of complementary therapies and higher degrees of suffering.[23,34,35] As we did not measure the level of suffering of AIDS patients, we could not examine this relationship. The other variable that we thought might be predictive of THM use within our study population was the use of THM prior to HIV diagnosis; this was not the case.

The symptoms reported by our AIDS patients that were associated with THM use were fever and pain. The other symptoms (skin rash, diarrhea, and cough) were not significant. The association between THM use and the symptoms fever and pain is important to note and most likely does not apply to AIDS patients only, because these symptoms are general and nonspecific for any medical condition including HIV/AIDS. However, this information may facilitate health providers in recognizing THM use by AIDS patients and provide opportunities for counseling their clients on the co-use of THM and pharmaceuticals.

Female AIDS outpatients were noted to participate in concurrent THM–pharmaceutical drug use more frequently than male AIDS outpatients. Geissler and colleagues found that girls and boys were treated both with THM and pharmaceutical drugs in childhood, but, with increasing age, females relied more heavily on THM than boys and boys were given more frequently pharmaceutical drugs.[29] It is therefore speculated that the higher rates of medical pluralism noted among the female AIDS patients in our study is related to the more frequent use of THM among females in general.

The level of education attained was higher in the ART group. The association between higher educational levels and better access to health services (e.g., ART services) has been described in many studies and is again confirmed by us. The stark differences in marital status between respondents in the treatment groups are attributed to the recruitment of women through the PMTCT program because women who are accessing the PMTCT program are more likely to be married. The male-to-female ratio is also distorted by recruitment from the PMTCT program, where attendees are naturally women. As a result, the male-to-female ratio in our study does not reflect the true situation in the population, where we would have expected to have more male than female participants because men usually take preference for treatment and also control resources required for ART (e.g., drug costs, transport costs, etc.).

LIMITATIONS OF THE STUDY

1) The study findings may not be generalizable to AIDS patients outside of western Uganda, to AIDS patients < 18 years of age or > 55 years of age, and to AIDS patients who do not access HIV/AIDS treatment services; 2) The cross-sectional study design did not permit an investigation of the cause–effect relationship between AIDS and THM use; 3) Recall bias of study respondents cannot be excluded; and 4) We did not verify the AIDS diagnosis from medical records but relied on the verbal account of the participants. However, as all participants were attending the special AIDS clinic in the recruitment sites, it is unlikely that non-AIDS patients were among them.

CONCLUSION

Traditional herbal medicines are commonly used by AIDS outpatients on ART in Uganda. As drug interactions between herbs and ARV drugs have been described and such interactions are known to lower the serum level of ARV drugs, it is important to keep in mind that THM may decrease the effectiveness of ART. Equally important is the consideration of the potential for medicinal plants to have an adjuvant effect on ARV drug efficacy as has been seen with chloroquine: the bioactive constituent *malagashanine*, derived from the plant species *Strychnos* in Madagascar, rendered chloroquine more effective in the treatment of chloroquine-resistant malaria.[36]

The authors assert that further pharmacological investigations are needed to identify the potential risks, benefits, and interaction or non-interaction associated with concomitant ARV drug and African THM use. It would also be prudent for future research to explore the effect of THM use amongst AIDS patients receiving ART in terms of morbidity and mortality patterns.

Until future research is available, it is recommended that health-care workers be vigilant about cautioning AIDS patients on ART who also use herbal remedies that this practice *may* reduce the treatment effectiveness of ARV drugs. In our opinion, there is not enough evidence available to advise patients on ARV drugs to strictly avoid THM because THM may also be of benefit to them. A more comprehensive risk–benefit analysis of THM can only be done based on more evidence. At this point in time, practitioners can only advise their patients of both the potential risks and benefits of THM and leave the use of THM to the patients' discretion. It is our opinion that if THM practices are not duly researched, the effectiveness of antiretroviral therapy and the overall success of ART programs in Uganda (and sub-Saharan Africa) may be seriously compromised.

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