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MEDICINAL HERBS USED BY HIV-POSITIVE PEOPLE IN LESOTHO

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Abstract

Background: The use of medicinal herbs whose efficacy and toxicities are not known by HIV-positive people in Lesotho is a threat to the effectiveness of antiretroviral treatment. This study explored some medicinal herbs used by HIV-positive people in Lesotho and the reasons for their use.
Methods: This was a cross sectional study based on a questionnaire distributed to purposively-sampled HIV-positive people in Leribe and Maseru districts of Lesotho. The participants' socio-demographic and clinical variables were summarized using frequency tables in Stata version 13 statistical software. Data variables for medicinal herbs used, frequency of use, uses by the participants and in the literature, parts of plants used and the method of preparation were also explored.
Results: Out of 400 questionnaires distributed to the participants, 389 were returned with data acceptable for analysis. Ages of the participants ranged from 18 to 75 years (Mean=43 $\pm$ 11.6). Out of the 272 (69.9%) participants who conceded that they had used medicinal herbs at least once, 30 (7.7%) participants used medicinal herbs frequently while 242 (62.2 %) rarely used the herbs. At least 20 plant species belonging to 16 families were reportedly used by the participants. Asteraceae was the most common plant family reportedly used by the participants. *Allium sativum* and *Dicoma anomala,* reportedly used by 21.0% and 14.3% respectively, were the most commonly used medicinal herbs in this population. In addition, boosting the immune system and treating gastrointestinal ailments, apparently cited by 32% and 28% participants respectively, were the most commonly reported reasons for using medicinal herbs.
Conclusion: A considerable proportion (69.9%) of HIV-positive people use medicinal herbs in this population, and 7.7% use them frequently. At least 20 plant species belonging to 16 families were reportedly used by the participants. HIV counselling protocols in Lesotho should emphasize the dangers of using medicinal herbs whose safety and compatibility with antiretroviral drugs is not known. The efficacy and toxicity profiles of the medicinal plants identified in this study need to be investigated. Furthermore, the effects of these plants on antiretroviral treatment outcomes including herb-drug interactions need to be explored.

Key words: *Allium sativum;* Anti-retroviral treatment*; Dicoma anomala;* Herb-drug interaction; HIV; Medicinal herb

Introduction

Background to the Research Problem

Available statistics shows that Lesotho, which has an estimated adult HIV prevalence rate of 23%, has the third highest HIV prevalence worldwide (WHO, 2014). The use of medicinal herbs to treat *Human immunodeficiency virus* (HIV) and *Acquired immunodeficiency syndrome* (AIDS) in developing countries, including Lesotho, remains a contentious issue due to their unknown safety profiles. Medicinal herbs are often preferred because they are affordable and are purported to have less side effects compared to pharmaceutical drugs (Rafieian-Kopaei, 2011). The HIV/AIDS burden and cultural norms in African countries have continued to promote the use of medicinal herbs as complementary and alternative medicines to clinical antiretroviral drugs (Puoane, Hughes, Uwimana, Johnson, & Folk, 2012).

In the context of the African traditional religion, the worshiping of a Supreme Being connects Africans with their ancestors and is at the core of how they treat diseases (Dilger, Burchardt, & van Dijk, 2010). The African traditional religion surmises that HIV/AIDS partly results from punishment by the Supreme Being (Wasti, Randall, Simkhada, & van Teijlingen, 2011). The religion therefore encourages that herbalists, traditional healers and diviners be consulted as part of the treatment of disease conditions. Many Basotho in Lesotho who believe in the African traditional religion observe this cultural norm (African Technology Policy Studies, 2013).

Hussain (2011) notes that medicinal herb dosages are often not evaluated in clinical trials. Resultantly, their dosages and safety are not known (Petzer & Mngqundaniso, 2008). In some cases, there are concerns about deliberate adulteration of herbs with clinical drugs by some herbalists and contamination by microbial organisms when herbs are prepared in unhygienic conditions (Hussain, 2011).

The Interaction between Medicinal Herbs and Conventional Drugs

According to Hussain (2011), herb-drug interaction is the alteration of a therapeutic drug by a medicinal herb. Herb-drug

interactions are either pharmacokinetic or pharmacodynamic in nature. Pharmacokinetic interaction is the effect of a medicinal herb on the absorption, distribution, metabolism, or excretion of a therapeutic drug, while pharmacodynamic interactions are often attributed to pharmacological activity of herbs, which results in the potentiated or decreased action of drugs (Chen et al., 2012; Hussain, 2011). Enzyme induction and inhibition particularly in the intestines, liver and kidneys is thought to play an important role in the pharmacokinetic and pharmacodynamic herb-drug interactions (Chen et al., 2012).

Pharmacokinetic and pharmacodynamic interactions may alter the concentration of a therapeutic drug in the blood. The most common interactions include the interaction with the hepatic cytochrome P450 enzymes, the P-glycoprotein drug transporters and the organic anion transporters (Hussain, 2011). For example, *Allium sativum* (garlic) is known to pharmacokinetically reduce the serum concentration of protease inhibitors (PIs) such as saquinavir and indinavir (Langlois-Klassen, Kipp, Jhangri, & Rubaale, 2007; Nagata et al., 2011). *Hypericum perforatum* (St John's wort) is also known to significantly reduce blood concentrations of several drugs, including amitriptyline, warfarin and indinavir (Chen et al., 2012).

Medicinal Herbs Believed to Have Antiviral Properties and Their Effects

According to Peltzer et al. (2011) and Langlois-Klassen et al. (2007), *Hypoxis hemerocallidea* (African potato), *Hypericum perforatum* (St. John's wort), *Sutherlandia frutescens* (Sutherlandia) and *Allium sativum* (garlic) are some of the most commonly used herbs by HIV-positive people in sub- Saharan Africa.

African potato is commonly used as an immune booster (Mills, Cooper, Seely, & Kanfer, 2005). The active ingredients in the African potato which are thought to have anti-HIV activity include phytosterols, hypoxide, aglycone and rooperol (Wink & Van Wyk, 2004). However, according to Müller and Kanfer (2011), African potato may interfere with antiretroviral drugs such as efavirenz through inhibition of cytochrome P450 and P-glycoprotein, which are important liver enzymes that metabolise and eliminate antiretroviral drugs.

Hypericum perforatum (St. John's wort), is a small shrub which contains hyperforin, hypericin, pseudohypericin, flavonoids and oligomeric procyanidines (Nathan, 2001; Wink & Van Wyk, 2004). Petijová, Skyba, and Cellárová (2012), note that biologically active metabolites such as hypericins and phloroglucinols in this plant may have anti-cancer, antiviral and anti-inflammatory properties. However, Hussain (2011) notes that St. John's wort has potential toxic effects through substrate-mediated inhibition or inducement of cytochrome liver enzymes, including an intestinal and a hepatic cytochrome known as CYP3A4.

Allium sativum (Garlic) is a perennial herb which contains sulphur-containing biologically active compounds, including S-allyl-l-cysteine, diallyl disulfide, diallyl trisulfide, ajoene, and allicin, which gives it its antimicrobial, antioxidative, antiviral, anticancer and lipid lowering effects (Lee et al., 2012; Motsei, Lindsey, Van Staden, & Jäger, 2003).

Sutherlandia frutescens (Sutherlandia) is another perennial shrub believed to have anti-HIV activity. The herb contains triterpenoids glycosides, flavonoids, amino-acids, including L-canavine which is a non-protein amino-acid and pinitol, which is a cyclitol (Wink & Van Wyk, 2004). Canavine has been demonstrated to have the capacity to disturb protein biosynthesis, a property which is thought to contribute to its anticancer and antiviral activity (Wink & Van Wyk, 2004). Sutherlandia has been used to treat HIV symptoms and opportunistic infections, including tuberculosis, chronic fatigue, influenza, indigestion, peptic ulcers, and diarrhoea (Mills et al., 2005). However, like African potato, sutherlandia inhibits cytochrome P450 and P-glycoprotein, which implies that the herb may interfere with antiretroviral treatment (Müller & Kanfer, 2011).

To improve antiretroviral treatment outcomes in Lesotho, more data on the medicinal herbs used by HIV-positive people and the reasons for their use is required. This study therefore explored some medicinal herbs used by HIV-positive people in Lesotho and the reasons for their use.

Methods

Study Setting

The study was conducted at antiretroviral therapy (ART) centres of Motebang Government Hospital in Leribe District and St. Joseph's District Hospital in Maseru District. Maseru District has an HIV prevalence rate of about 27%, while that of Leribe is estimated at 25%. In 2009, about 80,190 people in Maseru and 68,850 people in Leribe were HIV-positive (GoL, 2009). Lesotho is a small landlocked independent country which is completely surrounded by its only neighbour, South Africa.

Study Design

The study was based on a cross sectional descriptive and qualitative questionnaire, which was distributed to HIV-positive people at two district hospitals in Lesotho.

Study Population and Sample Size

The target population was 80,190 and 68,850 HIV-positive people in Maseru and Leribe districts of Lesotho, respectively. The sample size was calculated according to the survey guidelines recommended by the WHO (Raosoft, 2004). Assuming a target population of 80,190 and 68,850 HIV-positive people in Maseru and Leribe districts of Lesotho, an error of margin of 5% at 95% confidence interval and a minimum response rate of 50%, the minimum sample size required was 377 (Raosoft, 2004).

Data Collection

Data were collected between the 6th of March and 20th of May 2015 using a semi-structured questionnaire designed by the researchers and pilot-tested with 10 participants who were not included in the final data collection. The questionnaire was translated and each participant completed it in vernacular language (*Sotho*). Out of 400 questionnaires distributed to HIV positive patients who attended their ART appointments during the time of data collection at the two hospitals included in the study, 389 questionnaires were returned with data acceptable for analysis.

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Statistical Analysis

Data was cleaned and checked for completeness. The participants' socio-demographic and clinical variables were summarized using frequency tables in Stata version 13 statistical software. Data variables for medicinal herbs used, frequency of use, uses by the participants, parts of plants used and the method of preparation were also tabulated. In addition, uses of the medicinal herbs as recorded in literature were also compiled.

Ethical Consideration Related to Data Collection

The research proposal was submitted and approved by the institutional ethical review board of the Faculty of Health Sciences at the National University of Lesotho and the Ethics Committee at the Ministry of Health of Lesotho. Permission to conduct the study was also sought and granted by the relevant authorities at St Joseph's and Motebang hospitals. The participants were provided with information on the background of the study. The participants were also informed that their participation was voluntary and that they could decline to answer certain questions, including that they could withdraw their participation at any time. In addition, confidentiality of their information was also assured. Subsequently, each respondent signed a written consent form before data collection.

Results

Socio-Demographic and Clinical Characteristics of the Participants

A total of 389 participants were interviewed. Their ages ranged between 18 and 75 years, (Mean=43 years±11.6). Figure 1 presents the socio-demographic characteristics of the participants.

Concerning the marital statuses of the participants; 201 (51.7%, n=389) participants were married, while 96 (24.7%) were widowed. Notably, 54 (13.9%) participants were never married, 27 (6.9%) participants were separated, 7 (1.8%) participants were divorced and 4 (1.0%) had cohabitation

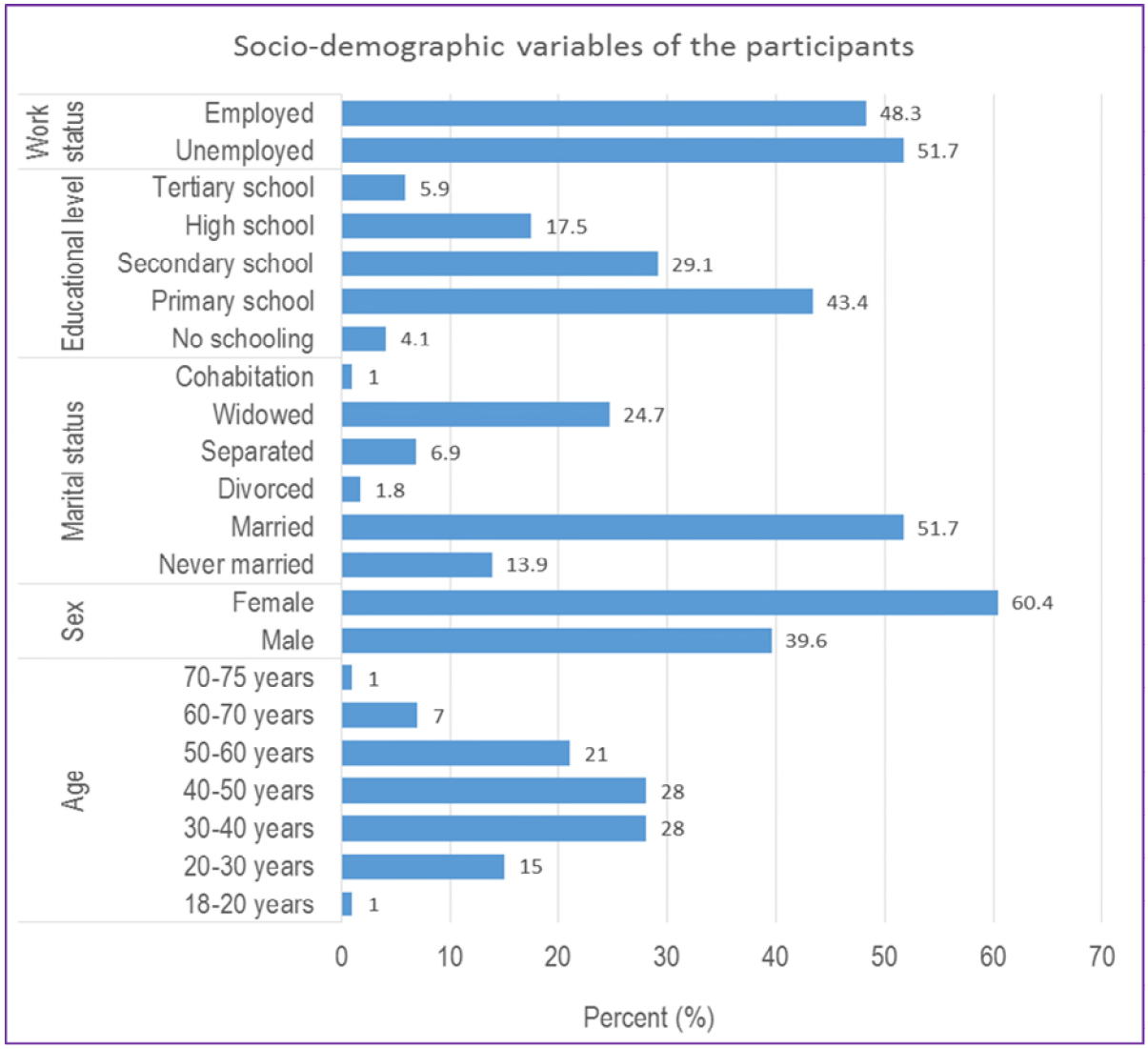

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Figure 1: Socio-demographic characteristics of the participants (N=389)

With regard to gender, there were more female (60.4%) than male (39.6%) HIV-positive participants. Out of the 389 participants, 169 (43.4%) had primary education as their highest level of education, while 16 (4.1%) had no formal education. Only 23 (5.9%) participants had tertiary education. Regarding work status, 201 (51.7%) participants were unemployed, while 44 (11.3%) were self-employed.

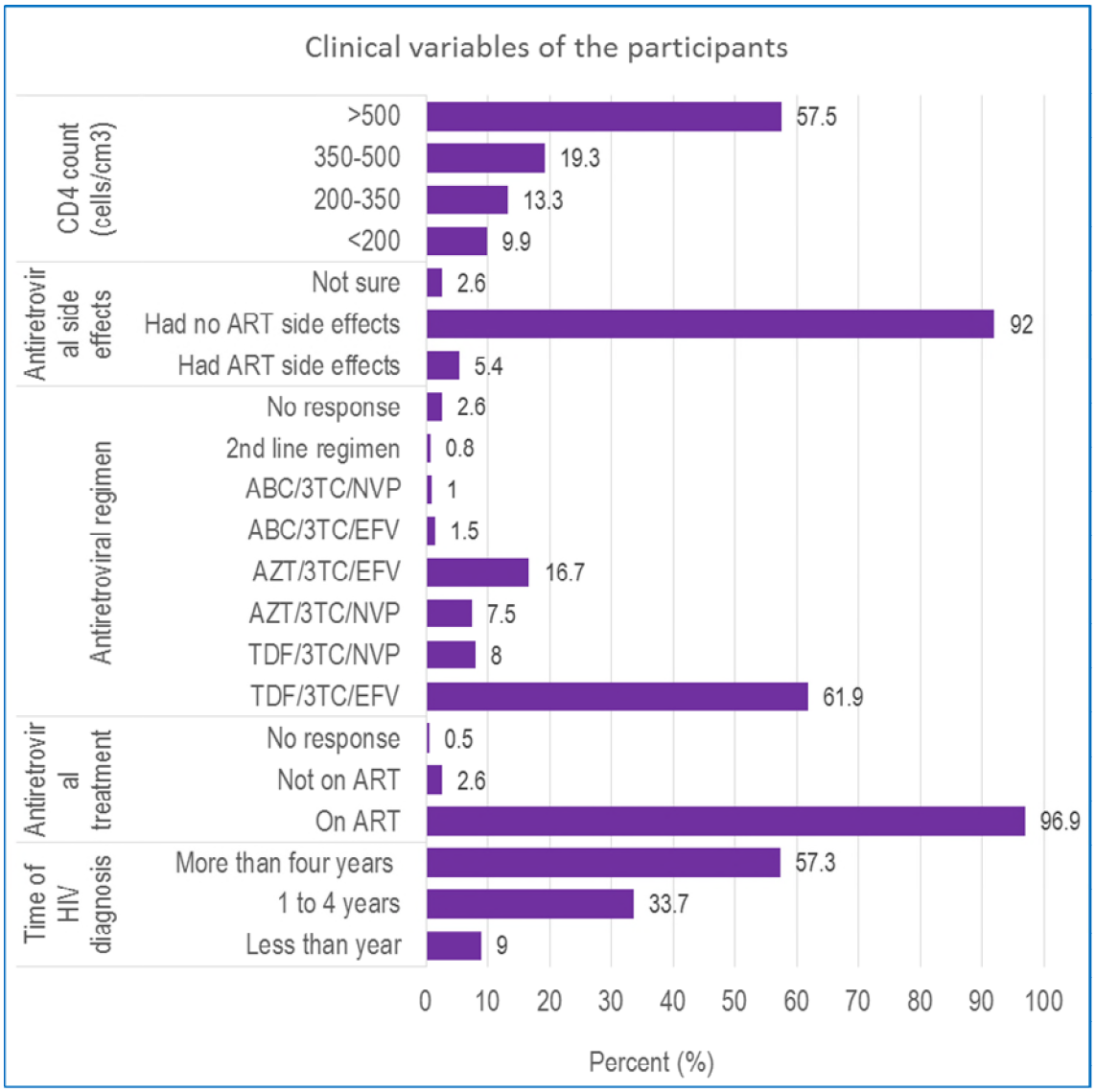

Figure 2: Clinical variables of the participants (N=389)

Figure 2 presents clinical variables of the participants. In total, 377 (96.9%, n=389) were on antiretroviral drugs while 10 (2.6%) were not on treatment. The most common first-line regimen was tenofovir/lamivudine/efavirenz which had 241 (61.9%) participants. Only three (0.8%) participants were on second line regimens. In total, 21 (5.4%) reported that they had experienced some side effects from antiretroviral drugs. When median CD4 counts were considered, 36 (9.9%, n=389) participants had CD4<200 cells/mm^3 while 48 (13.3%) had CD4 levels between 200 and 350 cells/mm^3.

Medicinal Herb Usage by the Participants

Figure 3 presents medicinal herb usage by the participants. Out of 389 participants, 242 (62.2%) conceded that they used medicinal herbs rarely while 30 (7.7%) participants reported that they used medicinal herbs frequently. In total, 69.9% had used medicinal herbs at least once. 117 (30.1%) reported that they had never used medicinal herbs. Out of the 272 who reported that they had used medicinal herbs at least once, only 210 (77.2%) disclosed the identity of herbs they had used.

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Medicinal Herbs Used and the Associated Information

Table 1 presents the medicinal herbs used by the participants and the associated information, including the proportion of the participants using the herbs, parts of plants used and the methods of preparation. Out of the 210 participants who disclosed the identity of the medicinal herbs they used, 44 (21.0%) reported that they had used *Allium sativum* (Garlic) while 30 (14.3%) had used *Dicoma anomala* (*Hloenya*). Twenty (9.5%) participants reported that they had used *Aloe striatula* (*Seholobe*) while 18 (8.6%) had used *Xysmalobium undulatum* (*Poho tšehla*). Notably, 33 (15.7%) participants reported that they had used unidentified herbal concoctions.

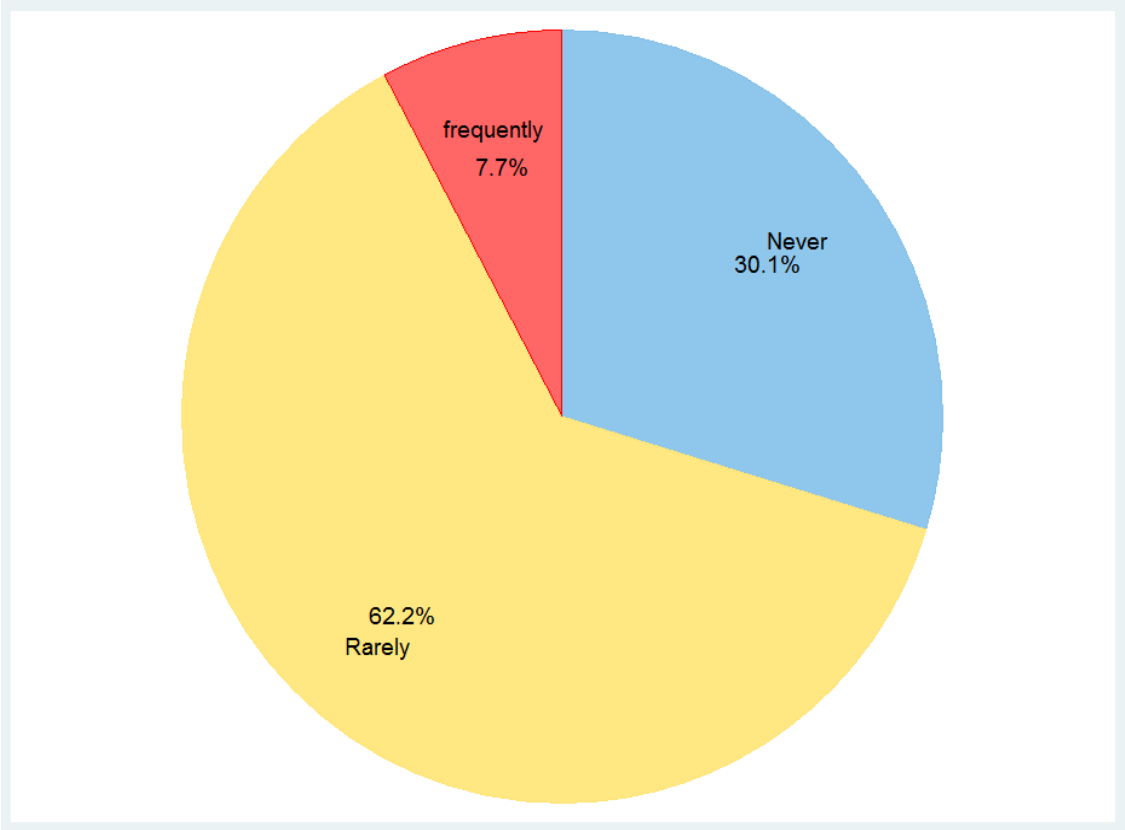

Figure 3: Frequency of medicinal herb usage by the HIV-positive participants (N=389)

Table 1: Medicinal herbs used, frequency of use, uses by the participants, uses in literature, parts used and methods of preparation

Vernacular/ common name	**Botanical name & (family)***	**Frequency (%) (N=210)**	**Use by participant**	**Use in literature**	**Parts used**	**Preparation**
Lesoko	*Alepidea cordifolia* B. E. van Wyk (Apiaceae)	7 (3.3)	Boost immunity	Chest and head colds (Moteetee & Van Wyk, 2011)	Roots	Dry, crush & cook
Garlic	*Allium sativum* L. (Alliaceae)	44 (21)	General wellbeing, boost immunity	Antimicrobial, *Candida albicans* (Motsei et al., 2003); Contains antioxidants for protection against chronic diseases, antiviral, antitumor (Craig, 1999)	Bulbs	Cut into pieces & cook
Konofolo	*Allium spp.* (Alliaceae)	4 (1.9)	Boost immunity	Anticancer (Craig, 1999)	Leaves	Cut into pieces & cook
Lekhala la Quthing	*Aloe ferox* Mill. (Aloaceae)	6 (2.8)	Boost immunity, abdominal pains, rashes	Sexually transmitted infections especially genital herpes (Kambizi, Goosen, Taylor, & Afolayan, 2007); Laxative, anti-inflammatory, immunostimulants, antiseptic, wound and burn healing, antiulcer, Tantitumor, antidiabetes (Loots, van der Westhuizen, & Botes, 2007); Conjunctivitis, other eye ailments,	Leaves	Extract juice & mix with water

				internal parasites, infertility in men and women (Grace, Simmonds, Smith, & Van Wyk, 2008)		
Seholobe	*Aloe striatula* Haw. (Aloaceae)	20 (9.5)	Abdominal discomforts and pains	Diarrhoea, purgative (Bisi-Johnson et al., 2011); Cleansing the system (Nortjé & Albertyn, 2015)	Leaves	Dry & immerse in water
Lengana	*Artemisia afra* Jacq. (Asteraceae)	2 (1)	Colds & flues	Coughs, colds, loss of appetite, gastric derangements, colic, fever, purgative (Liu (Liu, Van der Kooy, & Verpoorte, 2009); Oesophageal candidiasis (Otang, Grierson, & Ndip, 2012); Perfume smallpox, stomach-aches (Asres et al., 2001); Boost immunityer (Lubbe, Seibert, Klimkait, & Van der Kooy, 2012); Tuberculosis, excessive cough, flu (Lawal, Grierson, & Afolayan, 2014)	Leaves	Cook fresh leaves
Beetroot	*Beta vulgaris* L. (Amaranthaceae)	3 (1.4)	Boost immunity	Fights against HIV and AIDS (Bishop, 2012)	Roots	Cook the roots
Motšetse	*Cussonia paniculata* Eckl. & Zeyh. (Araliaceae)	1 (0.5)	Boost immunity, loss of appetite	Intestinal ulcers, indigestion, heartburn (Moteetee & Van Wyk, 2011)	Roots	Dry, crush & cook
Hloenya	*Dicoma anomala* Sond. (Asteraceae)	30 (14.3)	Abdominal discomforts and aches	Colds, fever, stomach ailments (Van Wyk, 2011)	Roots	Dry, crush & mix with water
Sehalahala sa matlaka	*Eriocephalus punctulatus* DC. (Asteraceae)	3 (1.4)	Abdominal pains	Colds, diarrhoea, diabetes, blood pressure (Moteetee & Van Wyk, 2011)	Leaves	Dry & cook
Bloukomo	*Eucalyptus spp.* (Myrtaceae)	1 (0.5)	Colds & flues	Decongestants of upper respiratory tract in common cold, inflamed mucous membranes of the throat (Dixit, Rohilla, & Singh, 2012); Headache, colds, flu, catarrh (Ziblim, Timothy, & Deo-Anyi, 2013)	Leaves	Cook fresh leaves
Khoara	*Geranium caffrum* Eckl. & Zeyh. (Geraniaceae)	1 (0.5)	Diarrhoea	No recorded use (Moffett, 2010)	Roots	Dry, crush & cook
Qobo	*Gunnera perpensa* L. (Gunneraceae)	2 (1)	Boost immunity	Gonorrhoea, syphilis (Buwa & Van Staden, 2006)	Whole plant	Cook the plant
Phatea ngaka	*Helichrysum caespititium* (DC.) Sond. (Asteraceae)	2 (1)	Colds, boost immunity	Against aches and pains (van Wyk & Gericke, 2000); Treatment of cough, flu and common cold, antimicrobial activity (Dekker, Fourie, Snyckers, & Van der Schyf, 1983)	Whole plant	Cook the plant
Seletjane	*Hermannia depressa* N.E.Br. (Sterculiaceae)	1 (0.5)	Boost immunity	Antimicrobial activity, diarrhoea, stomach ache, cough (Reid, Jäger, Light, Mulholland, & Van Staden, 2005); Anthelminthic activity, gastrointestinal larval infections (Molefe, Tsotetsi, Ashafa, & Thekisoe, 2013)	Roots	Dry, crush & cook
Moli (African potato)	*Hypoxis hemerocallidea* Fisch., C.A.Mey. & Avé-Lall. (Hypoxidaceae)	8 (3.8)	Boost immunity	Opportunistic infections, diabetes, sores, blood pressure, intestinal worms, constipation, cleans blood vessels, improves appetite, boost immunity (Omoruyi, Bradley, & Afolayan, 2012)	Roots	Dry, crush & cook
Setima-mollo	*Pentanisia prunelloides* Walp. (Rubiaceae)	1 (0.5)	Fever	Relieving burning pain of boils, reduce fever (Moteetee & Van Wyk, 2011)	Roots	Dry, crush & cook
Chilli Pepper	*Piper spp.* (Piperaceae).	1 (0.5)	Boost immunity	Anticancer, antifungal (Nakatani, Inatani, Ohta, & Nishioka, 1986)	Pods	Crush & mix with water or cook
Spinach	*Spinacia oleracea* L.	2 (1)	Boost immunity	Vitamin A deficiency, boost immunitying, iron deficiency in HIV positive people	Leaves	Cook fresh leaves

	(Chenopodiaceae)			(Amin, Bhat, & Gulleria, 2012)		
Bobatsi	*Urtica urens* Bert. ex Steud. (Urticaceae)	11 (5.2)	Boost immunity	Anti-inflammatory (Obioha & Pont'so, 2012)	Leaves	Immerse in water & crush
Poho tšehla	*Xysmalobium undulatum* R.Br. (Asclepiadaceae)	18 (8.6)	Boost immunity	Diarrhoea, stomach cramps, colic, abscesses and wounds (Vermaak, Enslin, Idowu, & Viljoen, 2014)	Roots	Dry, crush & cook
Unidentified medicinal herbs	-	33 (15.7)	-	-	Liquid con-coctions	-

*Medicinal herbs are arranged in alphabetical order of botanical names; (-) denotes missing information; Authorities of plant taxa and families were obtained from The International Plant Names Index (2014).

Figure 4 presents the frequency of the reasons cited for using medicinal herbs by the participants. Of all the reasons cited for using medicinal herbs by the participants, boosting the immune system and treating gastrointestinal (GIT) problems had the highest frequencies of 32.0% and 28%, respectively. Treating opportunistic infections had the least frequency (5%). However, 8.0% used the herbs for unspecified conditions while 1.0% did not indicate any reason for using the herbs.

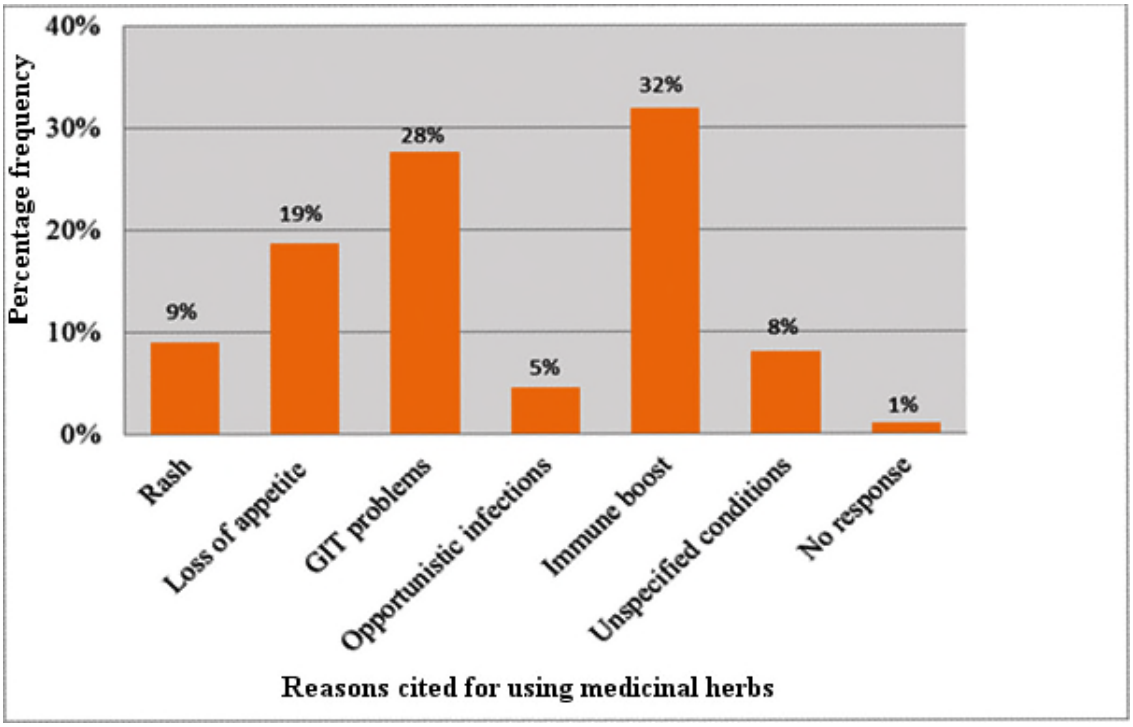

Figure 4: Percentage frequency of the reasons cited for using medicinal herbs by the participants (N=179)

Discussion

About 69.9% of HIV-positive people in this population have used medicinal herbs concurrently with antiretroviral drugs at least once in their lives. Out of the 69.9%, 7.7% conceded that they frequently used medicinal herbs concurrently with antiretroviral treatment. It is important to note that some participants may not have disclosed their use of medicinal herbs. According to Petzer and Mngqundaniso (2008), up to 70% of people living with HIV do not disclose to the health professionals when they use complementary and alternative therapies. Therefore, this study highlights the level of popularity of medicinal herbs among HIV positive people in Lesotho.

The study identified 20 plant species belonging to 16 families that were reportedly used by the participants. Asteraceae was the most common plant family used by the participants. However, the effects of most of these plants on antiretroviral drugs are not known.

In terms of plant species, *Allium sativum* and *Dicoma anomala* were cited as the most common (21.0% and 14.3%, respectively) medicinal herbs used in this population. A study in Kenya which reported similar results found that more than 25% of HIV-positive people used *Allium sativum* (Nagata et al., 2011). The current study also concurs with Langlois-Klassen et al. (2007) who reported that *Allium sativum* is one of the most common medicinal herb used by HIV-positive people in sub-Saharan Africa.

Allium sativum (Garlic) is known to pharmacokinetically reduce the serum concentration of protease inhibitors (PIs) such as saquinavir and indinavir (Langlois-Klassen et al., 2007; Nagata et al., 2011). *Dicoma anomala* has been reported as an inhibitor of

cytochrome-P enzymes, including CYP1A2, CYP2C9, CYP2C19, CYP2D6, and CYP3A4 (Müller & Kanfer, 2011). This implies that *Dicoma anomala* may interact with drugs that use these cytochrome-P enzymatic pathways.

Roots were the most common parts of medicinal plants used by the participants in this study. Use of plant roots destroys plants and may result in some plants becoming extinct (Bhat, Kumar, & Bussmann, 2013). There is need to increase the awareness about the conservation of these plants, particularly among the people who are responsible for harvesting the plants.

With respect to the reasons for use of medicinal herbs, 32% of the participants in this study cited boosting the immune system as the main reason for using medicinal herbs. It is possible that some traditional healers and dealers in the medicinal herbs may take advantage of the demand for the herbs and sell unsafe herbs to unsuspecting clients. Therefore, users of medicinal herbs in this population need to be made aware about toxicity of some of the plants and their interaction with antiretroviral drugs.

It is important to note that most of the medicinal plants used by HIV-positive people in this study were found to be used to treat other conditions in the literature. However, in some cases, the uses cited by the participants did not concur with the literature. On one hand, this may indicate the diversity of uses of medicinal plants in different societies. On the other hand, it may imply that herbalists may be selling fraudulent medicinal herbs or wrongly prescribing them to unsuspecting clients.

The efficacy and safety of most of the medicinal plants used by HIV-positive people was not known. This highlights the need to incorporate information on the possible dangers of using medicinal herbs whose safety is not known into the counselling protocols of HIV positive patients in Lesotho and other countries. Several limitations might have affected this study, including reluctance by some participants to disclose the medicinal herbs they used. The other limitation is that this study could not establish the effect of medicinal herbs on antiretroviral treatment outcomes. However, the plants identified in this study can be a useful resource to researchers who may want to study the effects of these medicinal herbs on antiretroviral treatment outcomes.

Conclusion

A considerable proportion (69.9%) of HIV-positive people use medicinal herbs in this population and 7.7% use them frequently. Of the 20 plant species belonging to 16 families reportedly used in this study, Asteraceae was the most common family. *Allium sativum* and *Dicoma anomala* were the most commonly used medicinal herbs in this population. Boosting the immune system and treating gastrointestinal ailments were the most commonly reported reasons for using medicinal herbs.

HIV counselling protocols in Lesotho should emphasize the dangers of using medicinal herbs whose safety and compatibility with antiretroviral drugs is not known. The efficacy and toxicity profiles of the medicinal plants identified in this study need to be investigated. Furthermore, the effects of these plants on antiretroviral treatment outcomes including herb-drug interactions need to be explored.

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References

1. African Technology Policy Studies. (2013). Analysis of Traditional Healers in Lesotho: Implications on Intellectual Property Systems. [Pitso Masupha, Lefa Thamae, Mofihli Phaqane], ATPS Working paper 68.
2. Amin, T., Bhat, S. V., & Gulleria, S. (2012). Role of Functional Foods and Micronutrients in Reducing HIV Progression. *Indian Horticulture Journal*, *2*(3and4), 94-97.
3. Asres, K., Bucar, F., Kartnig, T., Witvrouw, M., Pannecouque, C., & De Clercq, E. (2001). Antiviral activity against human immunodeficiency virus type 1 (HIV-1) and type 2 (HIV-2) of ethnobotanically selected Ethiopian medicinal plants. *Phytotherapy Research*, *15*(1), 62-69.
4. Bhat, J. A., Kumar, M., & Bussmann, R. W. (2013). Ecological status and traditional knowledge of medicinal plants in Kedarnath Wildlife Sanctuary of Garhwal Himalaya, India. *J. Ethnobiol. Ethnomed.*, *9*, 1. doi: 10.1186/1746-4269-9-1
5. Bishop, K. M. (2012). Anglo American media representations, traditional medicine, and HIV/AIDS in South Africa: from muti killings to garlic cures. *GeoJournal*, *77*(4), 571-581.
6. Bisi-Johnson, M. A., Obi, C. L., Hattori, T., Oshima, Y., Li, S., Kambizi, L., . . . Vasaikar, S. D. (2011). Evaluation of the antibacterial and anticancer activities of some South African medicinal plants. *BMC Complement Altern Med*, *11*(1), 14.
7. Buwa, L., & Van Staden, J. (2006). Antibacterial and antifungal activity of traditional medicinal plants used against venereal diseases in South Africa. *J Ethnopharmacol*, *103*(1), 139-142.
8. Chen, X.-W., B Sneed, K., Pan, S.-Y., Cao, C., R Kanwar, J., Chew, H., & Zhou, S.-F. (2012). Herb-drug interactions and mechanistic and clinical considerations. *Current drug metabolism*, *13*(5), 640-651.
9. Craig, W. J. (1999). Health-promoting properties of common herbs. *The American journal of clinical nutrition*, *70*(3), 491s-499s.
10. Dekker, T. G., Fourie, T. G., Snyckers, F. O., & Van der Schyf, C. J. (1983). Studies of South African medicinal plants. Part 2. Caespitin: A new phloroglucinol derivative with antimicrobial properties from *Helichrysum caespititium*. *S. Afr. J. Chem.*, *36*, 114-116.
11. Dilger, H., Burchardt, M., & van Dijk, R. (2010). Introduction—The redemptive moment: HIV treatments and the production of new religious spaces. *African journal of AIDS research*, *9*(4), 373-383.
12. Dixit, A., Rohilla, A., & Singh, V. (2012). Eucalyptus globulus: A New Perspective in Therapeutics. *International Journal of Pharmaceutical and Chemical Sciences*, 2277-5005.
13. GoL. (2009). *Lesotho Demographic and Health Survey 2009*. Maseru: Government of Lesotho.
14. Grace, O., Simmonds, M., Smith, G., & Van Wyk, A. (2008). Therapeutic uses of Aloe L.(Asphodelaceae) in southern Africa. *J Ethnopharmacol*, *119*(3), 604-614.
15. Hussain, S. (2011). Patient counseling about herbal-drug interactions. *African Journal of Traditional, Complementary and Alternative Medicines*, *8*(5S).
16. Kambizi, L., Goosen, B., Taylor, M., & Afolayan, A. (2007). Anti-viral effects of aqueous extracts of Aloe ferox and Withania somnifera on herpes simplex virus type 1 in cell culture: research in action. *South African Journal of Science*, *103*(9 & 10), 359-360.
17. Langlois-Klassen, D., Kipp, W., Jhangri, G. S., & Rubaale, T. (2007). Use of traditional herbal medicine by AIDS patients in Kabarole District, western Uganda. *Am J Trop Med Hyg*, *77*(4), 757-763.

18. Lawal, I., Grierson, D., & Afolayan, A. (2014). Phytotherapeutic information on plants used for the treatment of tuberculosis in eastern cape province, South Africa. *Evidence-Based Complementary and Alternative Medicine, 2014*.
19. Lee, D. Y., Li, H., Lim, H. J., Lee, H. J., Jeon, R., & Ryu, J.-H. (2012). Anti-inflammatory activity of sulfur-containing compounds from garlic. *Journal of medicinal food, 15*(11), 992-999.
20. Liu, N., Van der Kooy, F., & Verpoorte, R. (2009). Artemisia afra: a potential flagship for African medicinal plants? *South African Journal of Botany, 75*(2), 185-195.
21. Loots, D. T., van der Westhuizen, F. H., & Botes, L. (2007). Aloe ferox leaf gel phytochemical content, antioxidant capacity, and possible health benefits. *Journal of agricultural and food chemistry, 55*(17), 6891-6896.
22. Lubbe, A., Seibert, I., Klimkait, T., & Van der Kooy, F. (2012). Ethnopharmacology in overdrive: the remarkable anti-HIV activity of Artemisia annua. *J Ethnopharmacol, 141*(3), 854-859.
23. Mills, E., Cooper, C., Seely, D., & Kanfer, I. (2005). African herbal medicines in the treatment of HIV: Hypoxis and Sutherlandia. An overview of evidence and pharmacology. *Nutr J, 4*(19), 10.1186.
24. Moffett, R. (2010). *Sesotho Plant and Animal Names and Plants Used by the Basotho*: SUN PRESS.
25. Molefe, N., Tsotetsi, A., Ashafa, A. O., & Thekisoe, O. (2013). In vitro anthelmintic activity of Cotyledon orbiculata, Hermannia depressa and Nicotiana glauca extracts against parasitic gastrointestinal nematodes of livestock. *J. Medic. Plants Res, 7*(9), 536-542.
26. Moteetee, A., & Van Wyk, B. (2011). The medical ethnobotany of Lesotho: a review. *Bothalia, 41*(1), 209-228.
27. Motsei, M., Lindsey, K., Van Staden, J., & Jäger, A. (2003). Screening of traditionally used South African plants for antifungal activity against Candida albicans. *J Ethnopharmacol, 86*(2), 235-241.
28. Müller, A. C., & Kanfer, I. (2011). Potential pharmacokinetic interactions between antiretrovirals and medicinal plants used as complementary and African traditional medicines. *Biopharmaceutics & drug disposition, 32*(8), 458-470.
29. Nagata, J. M., Jew, A. R., Kimeu, J. M., Salmen, C. R., Bukusi, E. A., & Cohen, C. R. (2011). Medical pluralism on Mfangano Island: use of medicinal plants among persons living with HIV/AIDS in Suba District, Kenya. *J Ethnopharmacol, 135*(2), 501-509.
30. Nakatani, N., Inatani, R., Ohta, H., & Nishioka, A. (1986). Chemical constituents of peppers (Piper spp.) and application to food preservation: naturally occurring antioxidative compounds. *Environ Health Perspect, 67*, 135-142.
31. Nathan, P. J. (2001). Hypericum perforatum (St John's Wort): a non-selective reuptake inhibitor? A review of the recent advances in its pharmacology. *Journal of Psychopharmacology, 15*(1), 47-54.
32. Nortjé, N., & Albertyn, R. (2015). The cultural language of pain: a South African study. *South African Family Practice, 57*(1), 24-27.
33. Obioha, E. E., & Pont'so, G. (2012). The Roles of the Elderly in Sotho Family System and Society of Lesotho, Southern Africa. *Anthropologist, 14*(3), 251-260.
34. Omoruyi, B., Bradley, G., & Afolayan, A. (2012). Ethnomedicinal survey of medicinal plants used for the management of HIV/AIDS infection among local communities of Nkonkobe Municipality, Eastern Cape, South Africa. *Journal of Medicinal Plants Research, 6*(19), 3603-3608.
35. Otang, W. M., Grierson, D. S., & Ndip, R. N. (2012). Phytochemical studies and antioxidant activity of two South African medicinal plants traditionally used for the management of opportunistic fungal infections in HIV/AIDS patients. *BMC Complement Altern Med, 12*(1), 43.
36. Peltzer, K., Friend-du Preez, N., Ramlagan, S., Fomundam, H., Anderson, J., & Chanetsa, L. (2011). Antiretrovirals and the use of traditional, complementary and alternative medicine by HIV patients in Kwazulu-Natal, South Africa: a longitudinal study. *African Journal of Traditional, Complementary and Alternative Medicines, 8*(4).
37. Petijová, L., Skyba, M., & Cellárová, E. (2012). Genotype-dependent response of St. John's wort (Hypericum perforatum L.) shoot tips to cryogenic treatment: effect of pre-culture conditions on post-thaw recovery. *Plant Omics, 5*(3), 291-297.
38. Petzer, K., & Mngqundaniso, N. (2008). Patients consulting traditional health practioners in the context of HIV/AIDS in urban areas in KwaZulu-Natal, South Africa. *African Journal of Traditional, Complementary and Alternative Medicines, 5*(4), 370-379.
39. Puoane, T. R., Hughes, G. D., Uwimana, J., Johnson, Q., & Folk, W. R. (2012). Why HIV positive patients on antiretroviral treatment and/or cotrimoxazole prophylaxis use traditional medicine: perceptions of health workers, traditional healers and patients: a study in two provinces of South Africa. *Afr J Tradit Complement Altern Med, 9*(4), 495-502.
40. Rafieian-Kopaei, M. (2011). Medicinal plants and the human needs. *J Biol, 35*, 635-639.
41. Reid, K., Jäger, A., Light, M., Mulholland, D., & Van Staden, J. (2005). Phytochemical and pharmacological screening of Sterculiaceae species and isolation of antibacterial compounds. *J Ethnopharmacol, 97*(2), 285-291.
42. The International Plant Names Index. (2014). The International Plant Names Index: A database of the names and associated basic bibliographical details of seed plants, ferns and lycophytes. Retrieved 24/03/2015, from http://www.ipni.org/
43. Van Wyk, B. E. (2011). The potential of South African plants in the development of new medicinal products. *South African Journal of Botany, 77*(4), 812-829.
44. van Wyk, B. E., & Gericke, N. (2000). *Peoples Plants: A Guide to Useful Plants of Southern Africa*. Pretoria: Briza Publications.
45. Vermaak, I., Enslin, G. M., Idowu, T. O., & Viljoen, A. M. (2014). Xysmalobium undulatum (uzara)–review of an antidiarrhoeal traditional medicine. *J Ethnopharmacol, 156*, 135-146.
46. Wasti, S. P., Randall, J., Simkhada, P., & van Teijlingen, E. (2011). In what way do Nepalese cultural factors affect adherence to antiretroviral treatment in Nepal? *Health Science Journal, 5*(1), 37-47.
47. WHO. (2014). *Global tuberculosis report 2014*. Geneva: WHO.
48. Wink, M., & Van Wyk, B.-E. (2004). Medicinal plants of the world: Timber Press New York.
49. Ziblim, I. A., Timothy, K. A., & Deo-Anyi, E. J. (2013). Exploitation and use of medicinal plants, Northern Region, Ghana. *Journal of Medicinal Plants Research, 7*(27), 1984-1993.