

Ethnobotanical field survey of medicinal plants used by traditional medicine practitioners to manage HIV/AIDS opportunistic infections and their prophylaxis in Keffi Metropolis, Nigeria

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ABSTRACT

Acquired immunodeficiency syndrome (AIDS) is a set of symptoms and infections that are life threatening and result from damage to the human immune system. Problems such as drug half- lives viral reservoirs, drug resistance (treatment failure), high drug dosage, toxic side effects and drug costs from the use of highly active antiretroviral therapy (HAART), have led to a significant crisis in the management of HIV/AIDS that led to the use of ethnomedicines by HIV-infected persons to manage AIDS-related opportunistic infections. In spite of the belief on plants to manage HIV/AIDS in Keffi, there have been no first hand studies to document the specific plant species used by traditional medicine practitioners to manage HIV/AIDS-related opportunistic infections and their prophylaxis. In this study, an ethnobotanical field survey was conducted to document the methods of preparation and administration of traditional medicine used to manage different HIV/AIDS opportunistic infections and their prophylaxis in Keffi Metropolis, Nigeria. The results showed that a total of 30 species of ethno- medicinal plants belonging to 15 families distributed in 23 genera. The most commonly used families were Anacardiaceae (10%), Euphorbiaceae (6.7%), Fabaceae (26.7%), Malvaceae (10%), Meliaceae(6.7%) and Moraceae (6.7%) which were used to treat conditions such as diarrhoea, dysentery, gonorrhoea, fever, skin infections, oral candidiasis, weakness, cough, vaginal candidiasis, tuberculosis, thrush, malaria, meningitis, abdominal pain, headache, shingles, sexually transmitted diseases and difficulty swallowing. The plant parts used were barks (35.9%), roots (30.8%), leaves (20.5%), seeds (10.2%) and nut (2.6%). The habits of the plant used were (66.7%) trees; (30%) shrubs; and (3.3%) herbs. Further research is also needed to survey more plants in this area and isolate the plants' bio- active chemical compounds for drug developments.

Key words: Ethnobotany, Traditional medicine Practitioners, HIV/AIDS, Keffi, Nigeria

INTRODUCTION

Acquired immunodeficiency syndrome (AIDS) is a set of symptoms and infections that are life threatening and result from damage to the human immune system [1]. It is caused by the human immunodeficiency virus (HIV) which belongs to the family of Retroviridae (single- stranded RNA virus) and subfamily of lentiviruses capable of producing reverse transcriptase by means of which DNA is synthesized using their viral RNA as a template and incorporated into the genome of infected cells. It was first identified in 1981. It is the leading cause of death in sub-Saharan Africa and the fourth biggest killer worldwide [2]. It is now 27 years since the first case of AIDS was reported in 1986 in Nigeria. According to recent reports from the National Agency for the Control of AIDS (NACA) in Nigeria, for the twenty seven year period dated 1986 till December 2011, that AIDS was reported in Nigeria, 3,459,363 people now live with HIV and estimated 1,449,166 require ARV. 388,864 new infections occurred in the year ended 2011 and records show 217,148, AIDS related deaths [3].

Highly active antiretroviral therapy (HAART) which is often called the drug "cocktail" or triple therapy is a potent way of holding back viral duplication and development of HIV and has led to decrease in the total burden of HIV/AIDS patients and a considerable decrease in the death rate of the infected, an increase in the life span of

HIV/AIDS patients, and an improvement in quality of life (QoL) of these patients [4,5,6]. Issues such as, drug half-lives viral reservoirs, drug resistance (treatment failure), high drug dosage, toxic side effects and drug costs, have led to a significant crisis in the management of HIV/AIDS, particularly in developing nations, where there is the greatest need [7,8,9]. It has turned out to be that HAART does not present an absolute answer to the challenge. As a result, supplementary and different anti-HIV curative strategies immediately need to be explored [10]. Nature has been a source of medicinal agents for thousands of years and an impressive number of modern drugs have been isolated from herbal plants, a lot of these isolations were centred on the uses of the agents in traditional medicine [11]. Usually, people with HIV/AIDS use folk medicine for these subsequent motives: to enhance their body's defence, to heal signs, symptoms and indications, to enhance their life span and to decrease side effects associated with treatments [12,13]. WHO has estimated that at least 80% of the population globally relies on traditional medicine to meet their primary health care needs [14,15] and People living in rural areas depend on plant drug methods for primary health care [16]. More than half of the population living in North-central Nigeria depend on traditional folk medicines as it is characterised by cheap, affordable, reachable, available and accessible, in the economic sense and socially.

The objectives of this study were to collect comprehensive data from traditional medicine practitioners (TMP) on medicinal plants commonly used for HIV/AIDS treatment and to document the methods of preparation and administration of traditional medicine in Keffi Metropolis, Nigeria

MATERIALS AND METHODS

Study Site

The survey was conducted in different distinct areas of Keffi. Sample of the plants were collected and transported to the Faculty of Natural and Applied Sciences at Nasarawa State University, Keffi for identification.

Identification of medicinal plants

Identification of the collected plants specimens was done in the Plant Science and Biotechnology Unit of the Department of Biological Science at Nasarawa State University, Keffi, Nigeria. Voucher specimens were deposited in the Plant Science and Biotechnology Herbarium of Nasarawa State University, Keffi, Nigeria.

Respondents/informants

With the main interest of collecting information about the traditional medicines used in the management of HIV/AIDS opportunistic infections and their prophylaxis, indigenous people residing in the study area were surveyed. Traditional healers having sound knowledge of plants in medicine were consulted during the period of January 2013 – April 2013. The ethno-medicinal data were collected using questionnaire, dialogues and conversations in their native dialect.

Traditional medicines used for the management of HIV/AIDS opportunistic infections and their prophylaxis was gathered from the traditional doctors, aged men and knowledgeable persons practicing native medicines. The age of the respondents ranged from 50–85 years and all the respondents were male. Before interviewing any respondent, the objectives of the study, methods and the plans for use of the data that were to be generated from the interviews was explained by the researcher. Verbal consent to conduct the interviews was sought from every respondent before the interview and was allowed in each circumstance. During the conversations, data on the local names of plants, plant parts methods of preparation of remedy, administration and dosages used to treat various opportunistic infections related to HIV/AIDS were recorded. Traditional healers were compensated before they agreed to share their knowledge, or even be used as lead during the quest to collect plant specimen. Folk healers were used as lead during the quest to collect plant voucher specimens which were later transported to the Department of Biochemistry and Molecular Biology, Nasarawa State University, Keffi, Nigeria.

Money was given to traditional healers based on the statement made by Anthropologist Darrell Posey who asserts that:

“Indigenous people who provide information must be compensated as an issue of development. He repeats that monetary compensation is used to reserve the land, the community, and their traditions. Without compensation, the knowledge and acquaintance of native cultures will be lost because cultures themselves are in danger of extinction unless they can acquire the financial means to retain control of their divine doom”.

Medicinal plants used in the management of HIV/AIDS opportunistic infections are enumerated in Table 1. The botanicals are arranged in alphabetical order of their scientific names, family, habit, plant parts used and frequency of citation.

TABLE I: Botanicals that are used to treat HIV/AIDS opportunistic infections in Keffi local government, Nasarawa state, Nigeria

Family	C. N.	Common name	Botanical name	Local name	Plant part used	Disease conditions treated	Method of application	Habit
Anacardiaceae	09BM	Mango	<i>Mangifera indica</i> Lam.	Màngwàrò (H)/ mangoroo-hi (F)	Bark	Oral candidiasis	Infusion	Tree
	15BM	African grape	<i>Lannea microcarpa</i> Engl. & K.Klaue	Fààrúú (H)/ faruhi (F)	Bark	Malaria	Infusion	Tree
	07BM	cashew	<i>Anacardium occidentale</i> L.	Kànjùù (H)	Leave, root, bark	Skin infection, dysentery, diarrhoea, thrush, shingles	Infusion	Tree
Annonaceae	04BM	African custard-apple	<i>Annona senegalensis</i> Pers.	Gwándàndààjì (H)/ dukuu-hi (F)	Root	Difficulty swallowing	Infusion	Shrub
Arecaceae	21BM	Coconut palm	<i>Cocos nucifera</i> L.	Kwáákwwàràttàágàrà (H)/	Seed	Oral candidiasis	Rubbing	Tree
Bignoniaceae	01BM	tulip tree	<i>Stereospermum kunthianum</i> Cham.	Jirí (H)/ golombi (F)	Leave	Sexually transmitted diseases	Infusion	Shrub
Combretaceae	17BM	chewstick tree	<i>Anogeissus leiocarpus</i> (DC.) Guill & Perr.	Márkéé (H)/ kojo-li(F)	Bark	Tuberculosis	Infusion	Tree
	12BM		<i>Terminalia reticulata</i> Retz.	Báushè (H)/ òòd-I (F)	Root	Dysentery, diarrhoea	Infusion	
Euphorbiaceae	05BM	physic nut	<i>Jatropha curcas</i> L.	Bìttádàzúgúú (H)/ magalee-hi (F)	Root	Gonorrhoea	Infusion	Shrub
	26BM	African locust beans	<i>Bridelia ferruginea</i> Benth.	Kisni (H)/ maree-hi (F)	Root, bark	Dysentery	Infusion	Shrub
Fabaceae	02BM	Septic weed	<i>Senna occidentalis</i> (L.) Link	Ráidòdré (H)/ tabsahi (F)	Leave, root	Skin infection, weakness, fever, Gonorrhoea	Rubbing, infusion	Shrub
	18BM	Peanut/ groundnut	<i>Arachis hypogaea</i> L.	Gyàdàá (H)/ mbiriu (F)	Nut			
	03BM	Egyptian Mimosa	<i>Acacia nilotica</i> (L.) Willd. ex Delile	Bàgààrúúwáá (H)/ gawdi (F)	Seed	Diarrhoea	Infusion	Herb
	24BM	coral tree/ Flame trees	<i>Erythrina senegalensis</i> DC.	Jinjiriya (H)/ beedoo-hi (F)	Leave	Oral candidiasis	Infusion	Tree
	29BM	Camel's foot	<i>Piliostigma reticulatum</i> (DC.) Hochst.	Kárgóó (H)/ barkee-hi (F)	Bark	Weakness, fever	Infusion	Tree
	06BM	African Teak	<i>Pterocarpus erinaceus</i> Poir.	Shààjíní (H)/ mbanuhi (F)	Bark	Gonorrhoea	Infusion	Tree
	23BM	Tamarind	<i>Tamarindus indica</i> L.	Tsáámíyáá (H)/ jatami (F)	Leave	Diarrhoea	Infusion	Tree
	08BM	empty locust pods	<i>Parkia biglobosa</i> (Jacq.) R. Br. ex G. Don	Màákúbà (H)/ naree-hi (F)	Root, bark	cough Dysentery	Infusion	Tree
Lythraceae	14BM	henna	<i>Lawsonia inermis</i> L.	Lállè(H)/ nalli (F)	Root	Vaginal candidiasis	Infusion	Shrub
Malvaceae	22BM	silk-cotton tree	<i>Ceiba pentandra</i> (L.) Gaertn	Riimì (H)/ bantaa-hi (F)	Bark	Dysentery	Infusion	Tree
	10BM	Baobab	<i>Adansonia digitata</i> L.	Kúúkà (H)/ 6okki (F)	Seed	Cough	Maceration	Tree
	11BM	Sleepy Morning	<i>Waltheria indica</i> L.	Hànkúfáá (H)/ kafaffi (H)	Leave	Skin infection	Infusion	Shrub
Meliaceae	20BM	Mahogany	<i>Khaya senegalensis</i> (Desr.) A. Juss.	Máààcúí(H)/ dáalee-hi (F)	Root	Weakness, fever	Infusion	Tree
	28BM	Neem	<i>Azadirachta indica</i> A. Juss.	Dóógónyááròd (H)/ ganyi (F)	Bark	Meningitis	Infusion	Tree
Moraceae	13BM	bark-cloth fig	<i>Ficus thonningii</i> Blume	Céédíyáá (H)/ biskee-hi (F)	Leave	Weakness, fever	Infusion	Tree
	25BM	Ficus tree	<i>Ficus polita</i> L.	Dúrùmfí (H)/ durmihi (F)	Bark, root	cough, abdominal pains and diarrhea	Infusion	Trees, shrubs
Moringaceae	30BM	horseradish tree	<i>Moringa oleifera</i> Lam.	Zóógálé (H)/ gaware (F)	Bark	Gonorrhoea	Infusion	Tree
Phyllanthaceae	27BM	small red-heart	<i>Hymenocardia acida</i> Tul.	Jányáàrò (H)/ yawasotoje (F)	Root	Tuberculosis	Infusion	Shrub
Polygalaceae	16BM	Violet tree	<i>Securidaca longepedunculata</i> Fresen	Sányáá (H)/ aalali (F)	Leave, root, bark	Headache, Vaginal candidiasis, Gonorrhoea	Inhalation, infusion	Tree
Sapotaceae	19BM	Shea tree	<i>Vitellaria paradoxa</i> C.F. Gaertn.	Kádèé (H)/ karee-hi (F)	Bark, seed nut (outer pulp)	Diarrhoea, skin infection	Infusion, rubbing	Tree

H= Hausa local name

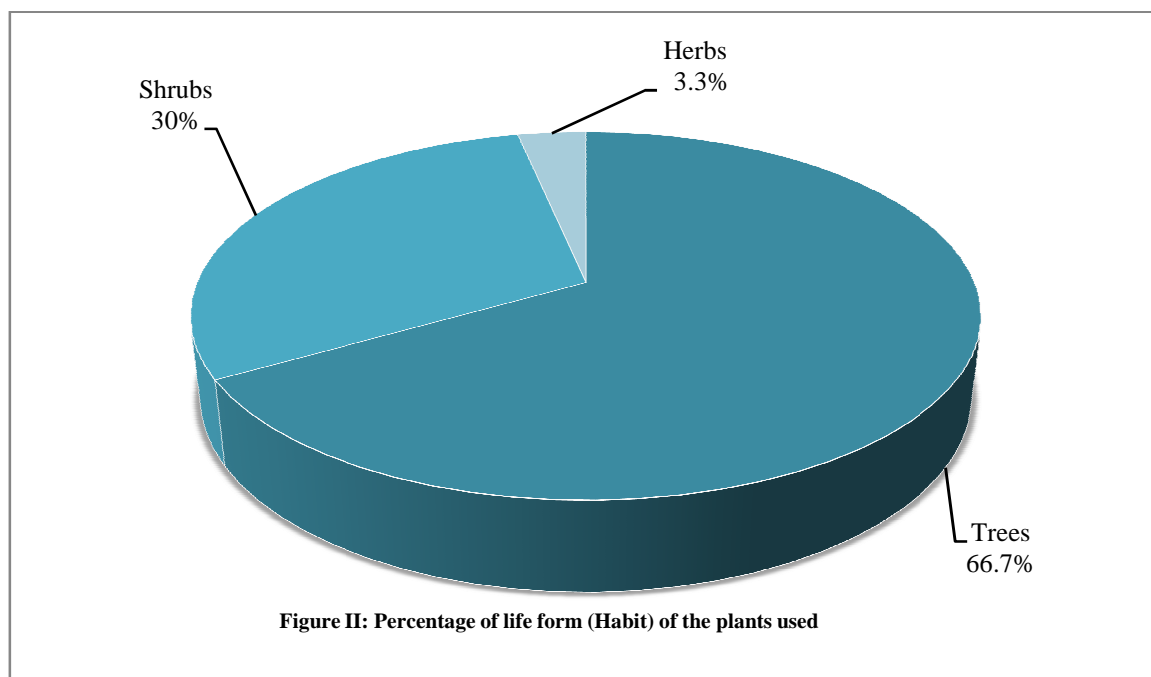
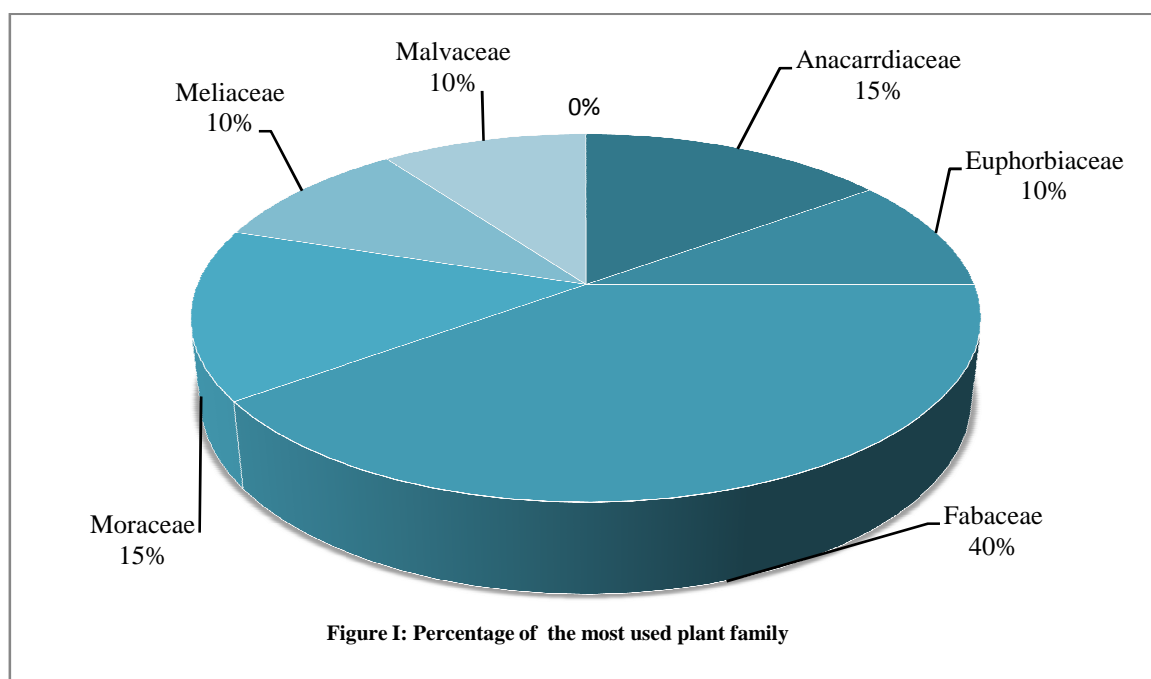
F= Fulani (Fulfulde) local name

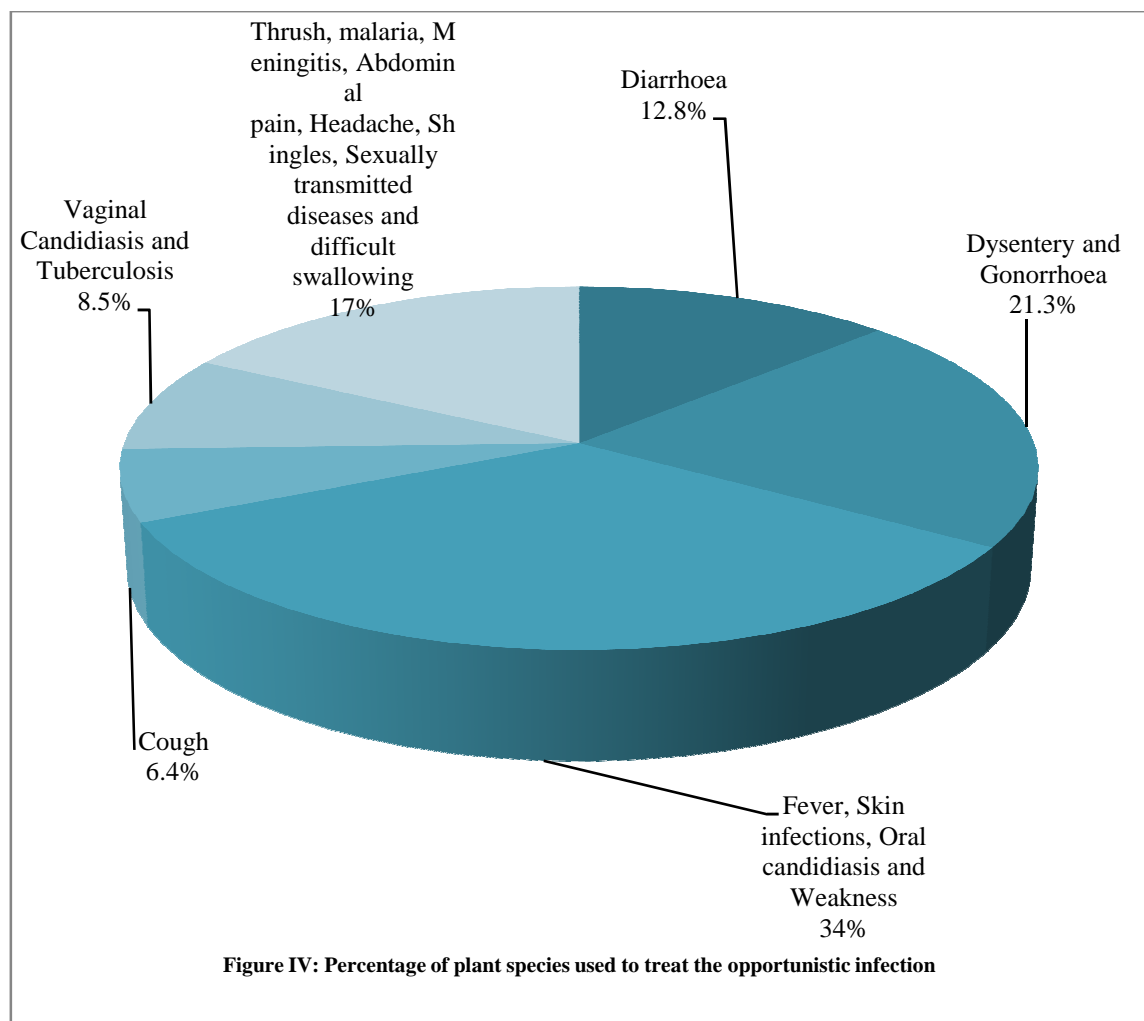
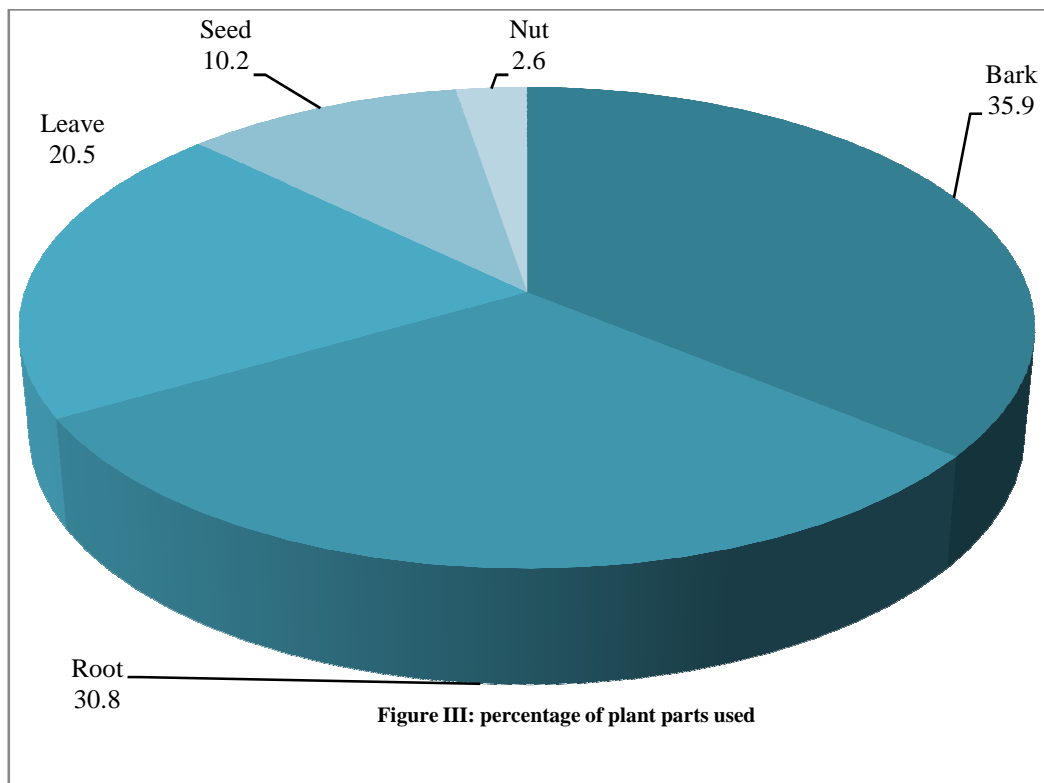
C. N. = Collection number

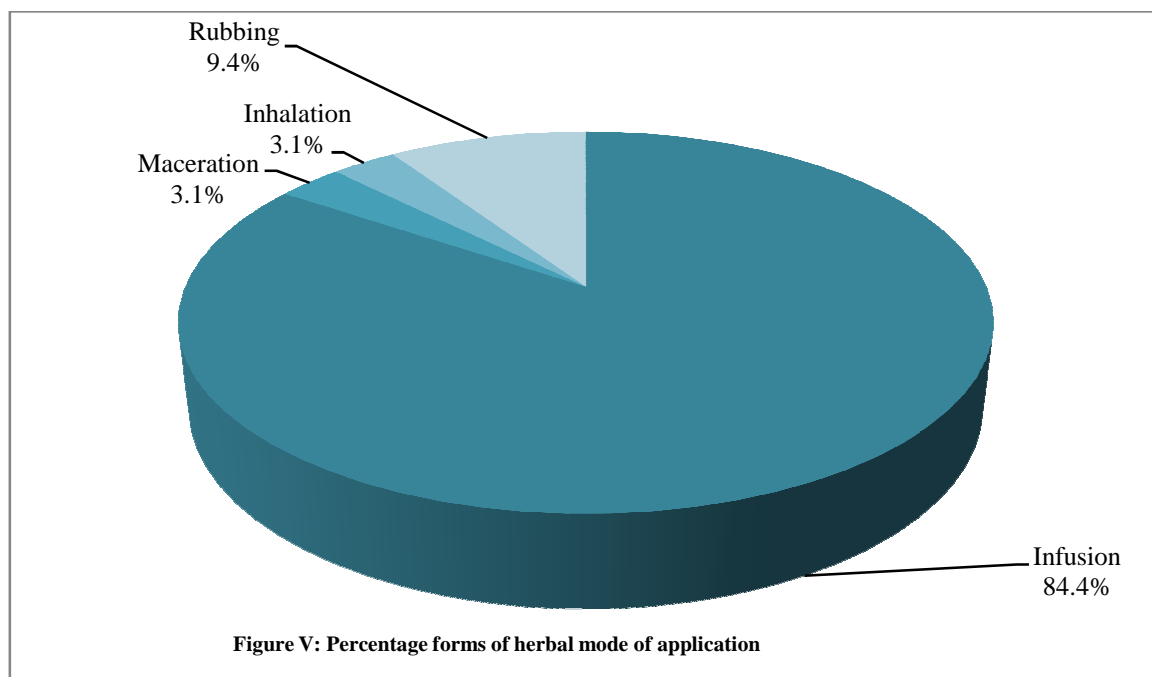
RESULTS

The results of the survey are presented in Table I and the families of the plants are arranged in alphabetical order. The present survey comprises 30 species of ethno- medicinal plants belonging to 15 families distributed in 23 genera used very commonly by traditional healers and elders of Keffi to treat HIV/AIDS opportunistic infections. The most commonly used families were Anacardiaceae (10%), Euphorbiaceae (6.7%), Fabaceae (26.7%), Malvaceae (10%), Meliaceae (6.7%) and Moraceae (6.7%) which are presented in figure I. The total of 30 medicinal plants used for the treatment of HIV/AIDS opportunistic infections, the percentage of habit of the plant used were (66.7%) trees; (30%) shrubs; and (3.3%) herbs respectively represented in Figure II. The plant parts used were barks (35.9%), roots

(30.8%), leaves (20.5%), seeds (10.2%) and nut (2.6%) as presented in Figure III. The number and the percentage proportions of 30 plant species treat as many as 18 various HIV/AIDS opportunistic infection. A maximum of 6 plants for diarrhoea (12.8%), 5 dysentery and gonorrhoea respectively (21.3%), 4 fever, skin infections, oral candidiasis and weakness respectively (34.0%), 3 for cough (6.4%), 2 for vaginal candidiasis and tuberculosis respectively (8.5%), 1 for thrush, malaria, meningitis, abdominal pain, headache, shingles, sexually transmitted diseases and difficulty swallowing respectively (17.0%) represented in figure IV. Several modes of application of herbal preparation to manage HIV/AIDS opportunistic infections are used either through poultice, maceration, decoction, rubbing, inhalation, burning, infusion etc. The most common mode of application in this study is infusion (84.4%), inhalation (3.1%), maceration (3.1%) and rubbing (9.4%) represented in Figure V.







DISCUSSION

The result of the field survey revealed that most used plant families were Anacardiaceae (10%), Euphorbiaceae (6.7%), Fabaceae (26.7%), Malvaceae (10%), Meliaceae (6.7%) and Moraceae (6.7%) which are presented in figure 1. Though the bio- active natural compounds (and their way of action) of the plants were mostly unidentified, it is probably that the plant families bio- active natural metabolites function against HIV/AIDS opportunistic infections. For instance, earlier studies reported that the family Fabaceae was a good source of Steroids, cinnamoyltriterpenes and triterpenes which aids in system defence and as serve as precursors for new compound synthesis [17]. Also, Togola and co- workers [18] reported the use of Fabaceae as antibacterial and antifungal infections (bilharzias, schistosomiasis, pneumonia etc).

In Namibia, Chinsebu and co- workers [19] reported that the Combretaceae, Mimosaceae, Anacardiaceae and Ebanaceae were mostly used to treat HIV/AIDS opportunistic infections. Families like Euphorbiaceae and Anacardiaceae, were predominantly used by traditional healers to manage HIV/AIDS opportunistic infections according to the field survey by Kisangau and colleague [20].

The family Euphorbiaceae is gifted with 2,2-diphenyl-1-picrylhydrazyl (DPPH), a biochemical compound that exhibits antioxidant activity by significantly scavenging radicals generation and tissue impairment [21] and Anacardiaceae contains tannins, triterpenes, and flavonoids that help treat diarrhoea, abdominal pains, dermal ulcers, and skin infection [22,23,24,25].

In this study, different parts of medicinal plants were used as medicine by the folk healers to manage HIV/AIDS opportunistic diseases. The most plant parts used were barks (35.9%), roots (30.8%), leaves (20.5%), seeds (10.2%) and nut (2.6) presented in Figure II.

Diarrhoea is one of the most frequent opportunistic infections during HIV/AIDS. My study documented 6 different plant species used to manage diarrhoea in keffi (Table I). Most of these plants have also been reported to treat chronic diarrhoea in other studies: *Anacardium occidentale* [26]; *Pterocarpus erinaceus* [27]; *Ficus spp* [28]. As far as my literature review is concerned, *Terminalia reticulate*, *Arachis hypogaea* and *Vitellaria paradoxa*, they are reported for the first time in the treatment of diarrhoea in this study.

Some of plant species used in the treatment of dysentery in keffi metropolis are *Anacardium occidentale*, *Terminalia reticulate*, *Bridelia ferruginea*, *Parkia biglobosa* and *Ceiba pentandra*. Somewhere else, it was reported that *Parkia biglobosa*, *Anacardium occidentale*, *Bridelia ferruginea*, *Jatropha curcas*, *Senna occidentalis* and *Moringa oleifera* has antimicrobial activity which can literally use in the treatment of dysentery and gonorrhoea [29,30,31].

Senna occidentalis, *Erythrina senegalensis*, *Ficus thonningii* and *Khaya senegalensis* treat all form of fever. These results were found with researchers [32,33,34,35].

Skin infections were treated with *Anacardium occidentale*, *Senna occidentalis*, *Waltheria indica*, *Vitellaria paradoxa*. This findings correspond with researcher in Brasil, India, Saramacca, southwestern Nigeria respectively where the same plants are used to treat the same infection [36,37,38,39].

Mangifera indica is reported for the first time in the treatment of oral candidiasis in this study.

Acacia nilotica was used to treat oral candidiasis according to Candice and co- workers [40] which correspond to the present study.

The effect of *Cocos nucifera* on candidiasis in this report was shown which correspond to the work in Ibadan Nigeria by Ogbolu and colleagues [41].

A number of plant species were used to treat weakness in Keffi Metropolis and they include: *Senna occidentalis*, *Erythrina senegalensis* and *Khaya senegalensis*.

The following plant species was used to treat cough in the present report: *Tamarindus indica*, *Adansonia digitata* and *Ficus polita*. *Tamarindus indica* was also used as ethno- medicine for diarrhoea, lotions and pustules, sores, boils, asthma and amenorrhea in India [42].

Vaginal candidiasis was treated with *Securidaca longepedunculata* and *Lawsonia inermis*. Studies elsewhere reports on the use of the leaves of *Lawsonia inermis* to treat poliomyelitis, measles among the Yoruba people of South-western Nigeria [43] and *Securidaca longepedunculata* an anti- candida activities [44].

Anogeissus leiocarpus and *Hymenocardia acida* is reported for the first time in the treatment of tuberculosis in this study.

Anacardium occidentale, *Azadirachta indica*, *Fiscus polita*, *Securidaca longependunculata*, *Stereospermum kunthianum*, *Annona senegalensis* reported for the first time in the treatment of shingles/thrush, malaria, meningitis, abdominal pain, headache, sexually transmitted diseases and difficulty swallowing respectively via this study.

The survey indicated that, the study area has ample of medicinal plants use in the treatment of many HIV/AIDS opportunistic infections. Earlier studies on traditional medicinal plants also revealed that the economically backward native and ethnic people of Keffi prefer folk medicine because of availability and low cost.

Though the use of ethno- medicine to manage HIV/AIDS opportunistic infections has newly achieved people's attention in Nigeria, but collaboration between the government and folk healers is becoming an issue of concern and worries. There is need for government to work with these people as they hold the key to a hidden knowledge which could save humanity. This will aids in finding a novel anti- HIV drug that is effective. This collaboration will also improve native skills and drugs development.

CONCLUSION

The ethno- medicinal information reported hold a key for future research to identify and isolate the plants bio- active chemical compounds that can be developed into drugs to manage HIV/AIDS. In this survey, 30 species of ethno-medicinal plants belonging to 15 families distributed in 23 genera used ethnomedicines for HIV/AIDS opportunistic infections in Keffi metropolis, Nigeria. These plants treated conditions such as diarrhoea, dysentery, gonorrhoea, fever, skin infections, oral candidiasis and weakness, cough, vaginal candidiasis, tuberculosis thrush, malaria, meningitis, abdominal pain, headache, shingles, sexually transmitted diseases and difficulty swallowing. Meanwhile folk healers harvest roots, barks and leave of these medicinal plants, there is needed to educate them about the forthcoming risk of constant unmaintainable over- exploitation of these plant parts. Further research is also needed to survey more plants in this area and isolate the plants' bio- active chemical compounds for drug developments.

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REFERENCES

- [1] Wang J, Liang BY, *World Journal of AIDS*, **2011**, 1, 104- 109.
- [2] Vass A, *BMJ: British Medical Journal*, **2001**, 323, 1271.
- [3] NACA, **2012**, Federal Republic of Nigeria. Global AIDS Response Country Progress Report Nigeria (GARPR).
- [4] Hogg RS, Heath KV, Yip B, *et al.*, *The Journal of the American Medical Association*, **1998**, 279, 450- 454.
- [5] Mocroft A, Vella S, Benfield TL, *et al.*, *Lancet*, **1998**, 352, 1725- 1730.
- [6] Palella Jr AFJ, Delaney KM, Moorman AC, *et al.*, *The New England Journal of Medicine*, **1998**, 338, 853- 860.
- [7] Chou R, Huffman, LH, Fu R, *et al.*, *Annals of Internal Medicine*, **2005**, 143, 55- 73.
- [8] Hawkins T, *AIDS Patient Care and STDs*, **2006**, 20, 6- 18.
- [9] d'ArminioMonforte A, Lepri AC, Rezza G, *et al.*, *Aids*, **2000**, 14, 499- 507.
- [10] Park, IW, Han C, Song X, *et al.*, *BMC Complementary and Alter-native Medicine* **2009**, 9, 29.
- [11] Gurib-Fakim A, *Molecular Aspects of Medicine*, **2006**, 7, 1.
- [12] Liu JP, *Expert Opinion on Investigational Drugs*, **2007**, 16, 1355- 1364.
- [13] Wang J, Zou W, Liu Y, *Journal of Biomedical Science and Engineering*, **2010**, 3, 828- 831.
- [14] Bannerman, RH, *World Health Forum*, **1982**, 3, 8-13.
- [15] WHO, **2000**, General Guidelines for Methodologies on Research and Evaluation of Traditional Medicine, Geneva, Switzerland.
- [16] Mustapha AA, *Asian Journal of Plant Science and Research*, **2013**, 3(4), 109- 115.
- [17] ZafrulAzam ATM, Fatema Moni, Md. Hamid uzzaman, Mohammad Mehedi Masud and Choudhury Mahmood Hasan, *Research Journal of Phytochemistry*, **2013**, 7, 1- 9.
- [18] Togola A, Austarheim I, Theis A, Diallo D, Paulsen BS, *Journal of Ethnobiology and Ethnomedicine*, 2008, 4.
- [19] Chinsebu KC, Hedimbi M, *Journal of Ethnobiology and Ethnomedicine*, **2010**, 6, 25.
- [20] Kisangau DP, Lyaruu HVM, Hosea KM, Joseph CC, *Journal of Ethnobiology and Ethnomedicine*, **2007**, 3.
- [21] Koffuor GA, Amoateng P, *Journal of Pharmacology and Toxicology*, **2011**, 6, 624- 636.
- [22] Rwagabo PC, *Journal of Natural Product*, **1998**, 51, 966- 968.
- [23] Kokwaro JO, *Consumer Health*, **1997**, 20, 12.
- [24] Okoli AS, Okeke MI, Iroegbu CU, Ebo PU, *Phytotherapy Research*, **2002**, 16, 174- 179.
- [25] Repetto MG, Liesuy, SF, *Brazilian Journal of Med Biological Research*, **2002**, 35, 523- 534.
- [26] Omoboyowa DA, Fred O, Nwodo C, Joshua PE, *Journal of Natural Products*, **2013**, 6, 109- 117.
- [27] Ezeja IM, Ezeigbo II, Madubuike KG, Udeh NE, Ukwani IA, Akomas SC, Ifenkwe DC, *Asian Pacific Journal of Tropical Medicine*, **2012**, 5, 147- 150.
- [28] Patil VV, Bhangale SC, Chaudhari KP, Kakade RT, Thakare VM, Bonde CG, Patil VR, *Zhong Xi Yi Jie He XueBao*, **2012**: 10, 347- 352.
- [29] Millogo-Kone H, Guissou IP, Nacoulma O, Traore AS, *African journal of Traditional, Complementary and Alternative Medicine*, **2007**, 4, 392– 396.
- [30] Owoseni AA, Ayanbamiji TA, Ajayi YO, Ewegbenro B, Ikeoluwa B, *African Journal of Biotechnology*, **2010**, 9, 1031- 1036.
- [31] Ayepola OO, Ishola RO, *Advances in Medicine and Dental Science*, **2009**, 3, 1- 3.
- [32] Saidu AN, Aina EO, Mann A, Leje UI, *Australian Journal of Basic and Applied Sciences*, **2011**, 5, 1863-1867.
- [33] Doughari JH, *African Journal of Microbiology Research*, **2010**, 4, 1836- 1841.
- [34] Igoli JO, Tsenongo SN, Tor- anyiin TA, *International of Medicinal and Aromatic Plants*, **2011**, 1, 240- 244.
- [35] Ige OE, *Global Journal of Health Science*, **2011**, 3.
- [36] Gonçalves GMS, Gobbo J, *Brazilian Archives of Biology and Technology*, **2012**, 55.
- [37] Kumar S, Jenna PK, Sabnam S, Kumari M, Tripathy PK, *International Journal of Drug Development and Research*, **2012**: 4, 256- 264.
- [38] Ruysschaert S, van Andel T, Van de Putte K, Van Damme P, *Journal of Ethnopharmacology*, **2009**, 121, 148– 170.
- [39] Ayankunle AA, Kolawole OT, Adesokan AA, Akiibinu MO, *Journal of Pharmacology and Toxicology*, **2012**, 7, 298- 304.
- [40] Candice VW, Francien SB, Vanessa S, *International journal of Biomedical and Pharmaceutical Sciences*, **2009**, 3, 266- 30.
- [41] Ogbolu GS, Oni AA, Daini OA, Oloko AP, *Journal of Medicinal Food*, **2007**, 10, 384– 387.
- [42] Dabur R, Gupta A, Mandal TK, Singh DD, Bajpai V, Gurav AM, Lavekar GS, *African Journal of Traditional, Complementary and Alternative Medicines*, **2007**, 4, 313 – 318.
- [43] Oladunmoye MK, Kehinde FY, *African Journal of Microbiology Research*, **2011**, 5, 2991- 3004.
- [44] Deborah KBR, Matee MIN, Ngassapa OD, Joseph CC, Mbwapbo ZH, *BMC Complementary and Alternative Medicine*, **2006**, 6, 11.