



Ethnobotanical Survey of Plants Used for the Treatment and Management of Sexually Transmitted Infections in Ibadan, Nigeria

I.T. Gbadamosi and A. Egunyomi

Research

Abstract

In Nigeria, the prevalence of sexually transmitted infections (STIs) is fueled by low socioeconomic status and literacy levels. Although phytomedicine is part of Nigerian culture, the use of herbs in STIs has become accentuated by low income status of people, inadequate health care delivery system, and the resistance of pathogenic organisms to orthodox drugs. A survey of medicinal plants used in the treatment of STIs was conducted with a goal of preserving indigenous knowledge and providing a list of plants for future research for potential drug production. A questionnaire-guided survey of three Local Government Areas (LGAs) of Ibadan, Nigeria, was randomly conducted on 300 respondents who were knowledgeable in ethnomedicine for information on their prescriptions for the treatment of STIs. Based on the responses obtained, 52 prescriptions or formulations were recorded for gonorrhea, candidiasis, vaginitis, syphilis, HIV/AIDS, and STI-associated skin infections. The study newly revealed the use of leaves of *Ageratum conyzoides* (L.) L. and *Nicotiana tabacum* L. in the management and treatment of HIV/AIDS. Findings of the present ethnobotanical survey will be beneficial in general health care, ecological control, forest conservation, biotechnology research, and in providing leads to medicinal plants from which potential new drugs may be developed.

Introduction

Sexually transmitted infections (STIs) are illnesses that have a high probability of transmission between humans by means of human sexual behavior, including vaginal intercourse, oral sex, and anal sex. Apart from penis, vagina, and cervix, common contact areas also include lips, oropharynx, anus, and rectum, and together with adjacent skin areas; they are increasingly becoming sites of infec-

tion due to varied sexual practices (Arya *et al.* 1980). STIs are classified according to the type of causative organisms, which could be bacterial, fungal, viral, protozoal, or of parasitic origin (Neugebauer 1983). As the occurrence of STIs continues to increase dramatically worldwide, they are now critical global and national health priorities. This is because of the devastating impact on women and infants and the interrelationships with HIV/AIDS. STIs can lead to infertility, tubal pregnancy, cervical cancer, low birth weight, congenital/prenatal infections, other chronic conditions such as neurosyphilis, and increased risk of HIV infection (Juarez *et al.* 2008, UNAIDS/WHO 2002).

STIs constitute a public health problem worldwide especially in sub-Saharan Africa where 70% of HIV/AIDS infected persons live (UNAIDS 2000). The HIV/AIDS epidemic in Nigeria is fueled by the low socioeconomic status of people, low literacy levels, high rates of sexually transmitted infections in vulnerable groups, and a general lack of perceived risk (UNAIDS 2004). The prevalence of STIs in Nigeria has been attributed to social factors such as edu-

Correspondence

Idayat Titilayo Gbadamosi and A. Egunyomi, Department of Botany, University of Ibadan, Ibadan, NIGERIA.
gita4me2004@yahoo.com

Ethnobotany Research & Applications 12:659-669 (2014)

Published: 15 December 2014

www.ethnobotanyjournal.org/vol12/i1547-3465-12-659.pdf

ational status, socioeconomic status, marital status, type of family, and religion (Sánchez *et al.* 1996). Adebowale *et al.* (2013) reported that a single-year prevalence of STIs among female youths in Nigeria was 2.1%, and socio-demographic factors such as age, education, wealth index, marital status, shared toilet, residence, contraceptive use, and total life-time number of sexual partners were found to be associated risk factors for contracting STIs.

Available data show that STIs constitute great medical, social, and economic problems in Nigeria. Gonorrhoea is the most prevalent sexually transmitted disease (STD) in Nigeria as reported by Ogunbanjo (1989). He reported the prevalence of *Neisseria gonorrhoeae* (Zopf 1885) Trevisan 1885 to be 44.4% in Zaria and 80% in Ibadan. Okonko *et al.* (2012) reported the prevalence of STIs among attendees of Lead City University Medical Centre, Ibadan. Out of the 200 samples examined, 97.5% were infected with various etiologic agents, and 2.5% had growth of *Staphylococcus aureus* Rosenbach 1884. In these patients, *Candida albicans* (C.P.Robin) Berkhout 1923 comprised the highest percentage of infections (81.5%), followed by *Gardnerella vaginalis* (Gardner and Dukes 1955) Greenwood and Picket 1980 (bacterial vaginosis; 11.5%), *Trichomonas vaginalis* (Donné 1836) (2.0%), *Treponema pallidum* (Schaudinn and Hoffmann 1905) Schaudinn 1905 (syphilis; 1.5%), and *Neisseria gonorrhoeae* (1.0%). However, *Chlamydia trachomatis* (Busacca 1935) Rake 1957, HBsAg, HCV, and HIV were not detected. The prevalent rate of infections was inversely associated with increase in age, sexual activity, and marital status. In a study on the pattern of STIs among commercial sex workers (CSWs) in Ibadan, Bakare *et al.* (2002) reported that vaginal candidiasis was the most common STI in both CSWs (n = 169) and the control group (n = 136). The frequencies of HIV infection was 34.3%, non-specific vaginosis 24.9%, trichomoniasis 21.9%, and gonorrhoea and genital ulcers had 16% each. Other important conditions were tinea cruris 18.9%, scabies 7.7%, genital warts 6.5%, and 4.1% of them had syphilis sero-positivity. HIV positivity was significantly higher in CSWs than the control subjects (P < 0.001).

The significant effectiveness of medicinal plants in the treatment of STIs has been reported by previous authors. Allabi *et al.* (2012) studied the *in vivo* antiviral, immunologic, and clinical effects and the safety of a supposedly anti-HIV phytotherapy, code-named R019, used for the treatment of HIV/AIDS. They concluded that immunological, anti-viral, and clinical status of patients improved under R019 treatment, and a good safety profile was observed for this compound. Further studies would be required to optimize its efficacy and to define its appropriateness for the treatment of HIV disease. The extracts of *Ageratum conyzoides* (L.) L., *Aristolochia bracteolata* Lam., *Zapoteca portoricensis* (Jacq.) H.M.Hern., *Curculigo pilosa* (Schumacher & Thonn.) Engl., *Gladiolus daleonii* Van Geel, *Gongronema latifolium* Benth., *Momordica*

charantia L., *Plumbago zeylanica* L., *Senna alata* (L.) Roxb., and *Securidaca longipedunculata* Fresen. showed significant therapeutic effect against vulvovaginal candidiasis in Ibadan, Nigeria (Gbadamosi 2008). Ajibesin *et al.* (2011) studied medicinal plants used for treating sexually transmitted diseases in the Niger Delta Region of Nigeria. They reported 36 plant species representing 26 families used against STIs including gonorrhoea and syphilis.

Ibadan indigenes are Yoruba-speaking people of southwestern Nigeria. The use of botanicals for the prevention and treatment of ailments and diseases is part of their custom and tradition. The trado-medicinal knowledge could be inherited (transmission from generation to generation within the extended family system), learned in traditional religion (herbalist), or acquired as a trader (herb-sellers). The dependency on herbs for treatment of diseases has been associated with availability of a diversity of medicinal plants in the lowland rain forest vegetation, presumed efficacy of herbal remedies in regimens with low side effects, and affordability. The documentation and preservation of the indigenous knowledge of Yoruba traditional medicine (YTM) becomes imperative due to loss of plant varieties via deforestation, loss of indigenous knowledge due to erosion of cultural practices, and the limitations of orthodox drugs (side effects and resistance of microorganisms to antibiotics). Herbal remedies used in traditional folk medicine provide an interesting and still largely unexplored source for creation and development of potentially new drugs (Lindequist *et al.* 2005). This is essential now because with the current rate of destruction of tropical forest habitats, plant scientists may have little time to survey the plant kingdom for useful or leading compounds (Igoli *et al.* 2005). In addition to the destruction of the forests, the erosion of tribal cultures is also a threat to herbal practices (Levetin & McMahon 2003).

This study, therefore, investigated the indigenous knowledge of treatment of STIs in Ibadan, Nigeria, with the aim of preserving declining traditional knowledge and providing a list of plants for future research, with the hope that the study of the bioactivity of these plants could lead to the discovery of novel broad spectrum natural products.

Materials and Methods

Study areas

The study was conducted in Ibadan (Figure 1), the capital city of Oyo State. Ibadan is located in southwestern Nigeria, 128 km inland northeast of Lagos and 530 km southwest of Abuja, the federal capital. It has a population of 2,338,659 according to the 2006 census and is the largest Nigerian metropolitan geographical area (3080 km²) (FRNOG 2007). The city has a tropical wet and dry climate, with a lengthy wet season and relatively constant temperatures throughout the course of the year. Ibadan



Figure 1. Study Local Government Areas (Ido, Akinyele, and Oluyole) in Ibadan, Oyo State, Nigeria. The greater Ibadan area is divided into multiple Local Government Areas in southern Oyo State as indicated by dashed lines.

has a mean total rainfall of 1420 mm, mean maximum temperature of 26°C (minimum 21°C), and a relative humidity of 75%. The city is delimited with coordinates 7°23'47"N and 3°55'0"E and lies about 48 km inside the northern boundary of lowland rain forest zone of western Nigeria. The principal inhabitants of the city are the Yoruba Muslims; others are Christians and Yoruba traditional religion devotees. There are 11 Local Governments Areas (LGAs) in Ibadan metropolitan consisting of five urban local governments in the city (Ibadan North, Ibadan North-East, Ibadan North-West, Ibadan South-East, Ibadan South-West) and six semi-urban local governments (Akinyele, Egbeda, Ido, Lagelu, Ona-ara, Oluyole). The LGAs are the third tiers of government in Nigeria (Tomori 2008). The three LGAs covered by this study (Akinyele, Ido, and Oluyole) are parts of the extended city area (Figure 1). The survey was conducted in the extended city areas of Ibadan to capture the rural and urban populace, sample communities that are close to farms and gardens, and to locate the elderly people with knowledge of traditional medicine.

Ethnobotanical survey

Three hundred people living in Akinyele, Ido, and Oluyole LGAs were questioned using a questionnaire-guided technique (Sofowora 1993). The respondents were randomly selected in the three areas (100 per area) based on traditional knowledge of management of STIs and readiness to divulge information. The random selection of respondents included elderly individuals, local medicine men or herbalists, herb-sellers, **alfas**, pastors, and others who claimed to have effective prescriptions or formulations for management and treatment of STIs. Informed consent was obtained prior to every interview. The respondents were 60% male, and the interview was conducted in Yoruba language. Methods employed in recording data included photographs and structured interviews (Sofowora 1993). The local names, parts of plant used, ailment treated, method of preparation, and mode of uses were recorded.

Plants with acclaimed therapeutic values in the treatment of STIs were identified at the University of Ibadan Herbar-

ium (UIH), and voucher specimens were deposited there. The demographical information of respondents, frequency of plants in prescriptions, uses of various plant parts, and types of plant habits are expressed in percentages (Tongco 2007).

Results

Demographic profile

Table 1 presents the demographics of the individuals participating in this study.

Medicinal plants

A total of 65 species of plants belonging to 38 families were reported as remedies for the treatment and management of STIs (Table 2). *Citrullus lanatus* (Thunb.) Matsum. & Nakai was the most frequently used plant, and families Fabaceae and Apocynaceae had the highest number of plants (5; 10%) used in prescriptions.

Table 1. Demographic profile of respondents in Ibadan, Nigeria.

Profile	Characteristics	Number of respondents	%
Gender	Male	180	60
	Female	120	40
Age categories	30–39 years	60	20
	40–80 years	240	80
Marital status	Single	45	15
	Married	255	85
Literacy level	Literate	135	45
	Semi-literate	45	15
	Illiterate	120	40
Religion	Muslim	150	50
	Christian	96	32
	Traditionalist	54	18

Table 2. Profile of plants used traditionally in treatment and management of sexually transmitted infections in Ibadan, Nigeria. **Freq** = frequency in prescriptions. Highest priority plants are indicated in blue.

Plant names			Plant habit	Plant part(s)	Freq
Scientific	Family	Vernacular			
<i>Aerva lanata</i> (L.) Juss. ex Schult.	Amaranthaceae	Efunle	Herb	Leaf	1 (2%)
<i>Aframomum melegueta</i> K.Schum.	Zingiberaceae	Atare	Tree	Seed	2 (4%)
<i>Ageratum conyzoides</i> (L.) L.	Asteraceae	Imi-esu	Herb	Leaf	5 (10%)
<i>Allium ascalonicum</i> L.	Amaryllidaceae	Alubosa-elewe	Herb	Leaf	1 (2%)
<i>Allium cepa</i> L.	Amaryllidaceae	Isu-alubosa	Herb	Bulb	1 (2%)
<i>Allium sativum</i> L.	Amaryllidaceae	Ayuu	Herb	Bulb	2 (4%)
<i>Alstonia boonei</i> De Wild.	Apocynaceae	Ahun	Tree	Bark	1 (2%)
<i>Ananas comosus</i> (L.) Merr.	Bromeliaceae	Ope oyinbo	Herb	Fruit	2 (4%)
<i>Anthocleista nobilis</i> G.Don	Gentianaceae	Sapo	Tree	Root	1 (2%)
<i>Aristolochia bracteolata</i> Lam.	Aristolochiaceae	Akogun	Herb	Root	4 (8%)
<i>Carica papaya</i> L.	Caricaceae	Ibepe	Tree	Leaf	1 (2%)
<i>Chassalia kolly</i> (Schumach.) Hepper	Rubiaceae	Isepe agbe	Shrub	Root	1 (2%)
<i>Cissampelos mucronata</i> A.Rich.	Menispermaceae	Jenjoko	Herb	Leaf	1 (2%)
<i>Cissus populnea</i> Guill. & Perr.	Vitaceae	Ogbolo	Shrub	Root	1 (2%)
<i>Citrullus lanatus</i> (Thunb.) Matsum. & Nakai	Cucurbitaceae	Baara	Herb	Fruit	5 (10%)
<i>Citrus medica</i> L.	Rutaceae	Osanwewe	Shrub	Fruit	2 (4%)
<i>Corchorus olitorius</i> L.	Malvaceae	Ooyo	Herb	Leaf	1 (2%)
<i>Crinum jagus</i> (J.Thomps.) Dandy	Amaryllidaceae	Ogede-odo	Herb	Bulb	1 (2%)
<i>Croton penduliflorus</i> Hutch.	Euphorbiaceae	Aworoso	Shrub	Seed	2 (4%)
<i>Croton zambesicus</i> Müll.Arg.	Euphorbiaceae	Ajekofole	Shrub	Root	1 (2%)
<i>Curculigo pilosa</i> (Schumach. & Thonn.) Engl.	Hypoxidaceae	Epakun	Shrub	Rhizome	3 (6%)

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Plant names			Plant habit	Plant part(s)	Freq
Scientific	Family	Vernacular			
<i>Erythrophleum suaveolens</i> (Guill. & Perr.) Brenan	Fabaceae	Obo	Tree	Bark	1 (2%)
<i>Euphorbia lateriflora</i> Schum. & Thonn.	Euphorbiaceae	Enu opiri	Shrub	Stem	2 (4%)
<i>Ficus exasperata</i> Vahl	Moraceae	Ipin	Tree	Leaf	1 (2%)
<i>Ficus thonningii</i> Blume	Moraceae	Roro odan	Tree	Leaf	1 (2%)
<i>Garcinia kola</i> Heckel	Clusiaceae	Orogbo	Tree	Bark	2 (4%)
<i>Gladiolus dalenii</i> Van Geel	Iridaceae	Baka	Herb	Corm	3 (6%)
<i>Glyphaea brevis</i> (Spreng.) Monach.	Malvaceae	Atori	Shrub	Leaf, root	2 (4%)
<i>Gongronema latifolium</i> Benth.	Apocynaceae	Madunmaro	Shrub	Root	2 (4%)
<i>Harungana madagascariensis</i> Lam. ex Poir.	Hypericaceae	Amuje	Tree	Bark	2 (4%)
<i>Jatropha curcas</i> L.	Euphorbiaceae	Botuje	Shrub	Bark	1 (2%)
<i>Kigelia africana</i> (Lam.) Benth.	Bignoniaceae	Pandoro	Tree	Bark	1 (2%)
<i>Lagenaria breviflora</i> (Benth.) Roberty	Cucurbitaceae	Tagiri	Herb	Fruit	1 (2%)
<i>Lophira alata</i> Banks ex C.F.Gaertn.	Ochnaceae	Pahan	Tree	Bark	1 (2%)
<i>Mangifera indica</i> L.	Anacardiaceae	Mangoro	Tree	Bark	1 (2%)
<i>Momordica cabraei</i> (Cogn.) C.Jeffrey	Cucurbitaceae	Ahara	Tree	Leaf	1 (2%)
<i>Momordica charantia</i> L.	Cucurbitaceae	Ejinrin	Herb	Leaf	3 (6%)
<i>Mondia whitei</i> (Hook.f.) Skeels	Apocynaceae	Isirigun	Shrub	Root	2 (4%)
<i>Morinda lucida</i> Benth.	Rubiaceae	Oruwo	Tree	Leaf	1 (2%)
<i>Moringa oleifera</i> Lam.	Moringaceae	Idagba molye	Tree	Root	3 (6%)
<i>Musa acuminata</i> × <i>balbisiana</i> Colla		Agbagba	Herb	Unripe fruit	2 (4%)
		Ogede wewe	Herb	Fruit	1 (2%)
<i>Nicotiana tabacum</i> L.	Solanaceae	Taba	Herb	Leaf	2 (4%)
<i>Ocimum gratissimum</i> L.	Lamiaceae	Efirin	Shrub	Leaf	3 (6%)
<i>Olax subscorpioides</i> Oliv.	Olacaceae	Ifon	Tree	Bark	1 (2%)
<i>Parinari excelsa</i> Sabine	Chrysobalanaceae	Yinrinyin nla	Herb	Leaf	1 (2%)
<i>Parkia biglobosa</i> (Jacq.) R.Br. ex G.Don.	Fabaceae	Irugba	Tree	Fruit	1 (2%)
<i>Periploca nigrescens</i> Afzel.	Apocynaceae	Ogbo	Shrub	Leaf	1 (2%)
<i>Piper guineense</i> Schumach. & Thonn.	Piperaceae	Iyere	Shrub	Seed	2 (4%)
<i>Plumbago zeylanica</i> L.	Plumbaginaceae	Inabiri	Shrub	Root	4 (8%)
<i>Pseudocedrela kotschyi</i> (Schweinf.) Harms	Meliaceae	Emi gbegiri	Tree	Leaf, bark	1 (2%)
<i>Sarcocephalus latifolius</i> (Sm.) E.A.Bruce	Rubiaceae	Egbesi	Tree	Bark	1 (2%)
<i>Securidaca longipedunculata</i> Fresen.	Polygalaceae	Ipeta	Tree	Root	4 (8%)
<i>Senna alata</i> (L.) Roxb.	Fabaceae	Asunwon	Shrub	Leaf	4 (8%)
<i>Sorghum bicolor</i> (L.) Moench	Poaceae	Oka-baba	Shrub	Seed	1 (2%)
<i>Spondias mombin</i> L.	Anacardiaceae	Iyeye	Tree	Leaf	1 (2%)
<i>Strophanthus hispidus</i> DC.	Apocynaceae	Sagere	Herb	Root	1 (2%)
<i>Tamarindus indica</i> L.	Fabaceae	Ajagbon	Tree	Leaf	1 (2%)
<i>Terminalia catappa</i> L.	Combretaceae	Furutu	Tree	Bark	1 (2%)

Plant names			Plant habit	Plant part(s)	Freq
Scientific	Family	Vernacular			
<i>Terminalia schimperiana</i> Hochst. ex Engl. & Diels	Combretaceae	Idi	Tree	Bark	2 (4%)
<i>Theobroma cacao</i> L.	Malvaceae	Koko	Shrub	Bark	2 (4%)
<i>Vernonia amygdalina</i> Delile	Asteraceae	Ewuro	Shrub	Leaf, root	4 (8%)
<i>Xylopia aethiopica</i> (Dunal) A.Rich.	Annonaceae	Eeru Alamo	Tree	Fruit	3 (6%)
<i>Zapoteca portoricensis</i> (Jacq.) H.M.Hern.	Fabaceae	Tude	Shrub	Root	3 (6%)
<i>Zingiber officinale</i> Roscoe	Zingiberaceae	Atale	Herb	Rhizome	1 (2%)
Unknown species		Teyo		Root	2 (4%)

Priority medicinal plant species identified have higher frequencies in prescriptions (Table 2). These plants were *C. lanatus*, *A. conyzoides*, *A. bracteolata*, *C. pilosa*, *G. daleonii*, *M. charantia*, *P. zeylanica*, *S. alata*, *S. longipedunculata*, *Vernonia amygdalina* Delile, *Ocimum gratissimum* L., and *Xylopia aethiopica* (Dunal) A.Rich.

The use of various plant-parts in prescriptions is presented in Figure 2. Leaves are most commonly used being found in 32% of prescriptions. Figure 3 shows the habits of plants used for the treatment of STIs. Furthermore, the respondents disclosed that medicinal plants are either purchased from local markets or collected from near-by forests for use.

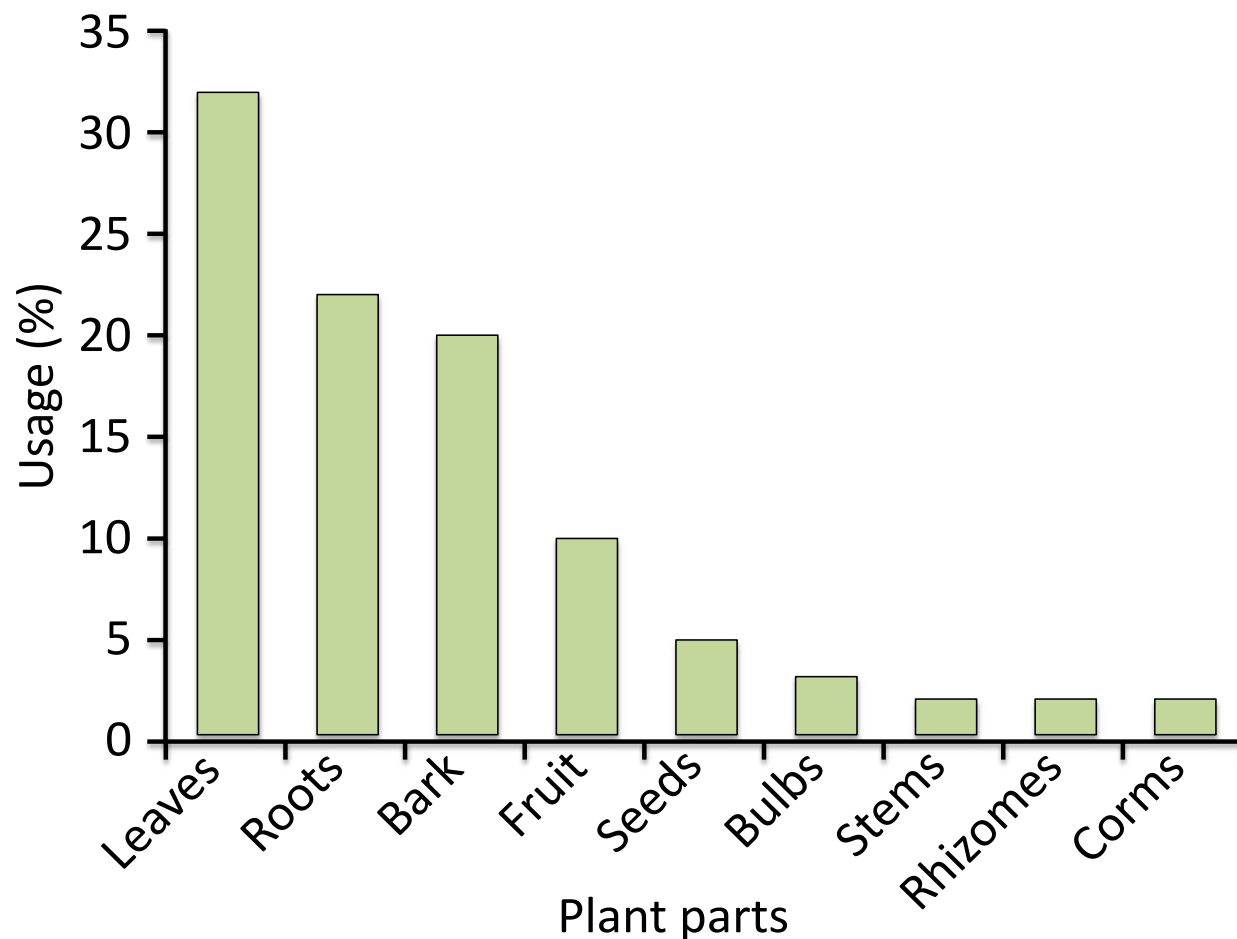


Figure 2. Percentage of plant parts used in prescriptions for sexually transmitted infections in Ibadan, Nigeria.

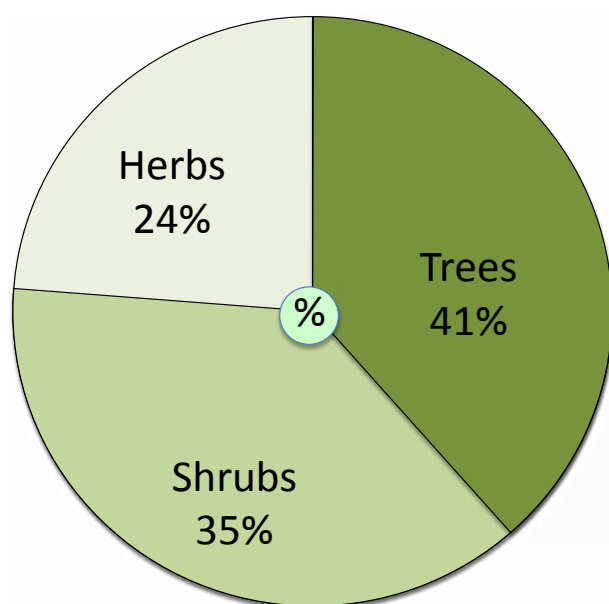


Figure 3. Percentage of plant habits of plants used in prescriptions for sexually transmitted infections in Ibadan, Nigeria.

Diseases treated

Fifty-two prescriptions or formulations were recorded for gonorrhoea, candidiasis, syphilis, vaginitis, and HIV/AIDS (Table 3). Gonorrhoea was the most frequently mentioned STI in this study and HIV/AIDS the least. *Citrullus lanatus*, *Ananas comosus* (L.) Merr., *C. pilosa*, *A. bracteolata*, *G. dalenii*, *O. gratissimum*, *V. amygdalina*, and *A. conyzoides* are all used in the treatment of gonorrhoea. A combination of *C. lanatus* and *Lagenaria breviflora* (Benth.) Roberty fruit juice was reported to be very effective in the management of syphilis. Furthermore, the present study has revealed that *A. conyzoides* and *N. tabacum* are being used in the treatment and management of HIV/AIDS.

STI-associated skin infections are treated by combining plant materials with black soap as base. Two hundred grams of the plant materials are pounded with 1 kg of black soap. A small quantity of the prepared herbal soap is then used to wash the area of infection two times daily. The herbal soaps are prepared from any of the following five recipes: (i) fresh *S. alata* and *A. conyzoides* leaves; (ii) fresh *M. charantia* leaves; (iii) fresh peels of *Euphorbia lateriflora* Schum. & Thonn. stem; (iv) fresh *Allium sativum*

Table 3. Some indigenous prescriptions for the treatment of sexually transmitted infections in Ibadan, Nigeria. A tot is 4–5 tablespoonfuls. **Pap** is a traditional ground corn polenta or porridge.

Herbal recipe and dosage	Method of preparation	Therapeutic indications
The fruit juices of <i>Citrullus lanatus</i> (Thunb.) Matsum. & Nakai and <i>Ananas comosus</i> (L.) Merr. are extracted together by pounding. 125 ml of the juice is taken once daily after a meal.	Juice	Gonorrhoea
A fruit of <i>C. lanatus</i> is peeled, cut into small pieces, and soaked in cold water (1000 ml), and 12 cubes of sugar are added to the preparation. 250 ml of the preparation is taken once daily after a meal.	Infusion	Gonorrhoea, vaginitis
The fruit juice of <i>C. lanatus</i> is extracted and mixed with dried and powdered rhizome of <i>Curculigo pilosa</i> (Schumach. & Thonn.) Engl. and corm of <i>Gladiolus dalenii</i> Van Geel. The preparation is dried thoroughly. One half-teaspoonful of the powder with pap is taken once daily after a meal.	Powder	Gonorrhoea, vulvovaginal candidiasis
The roots of <i>Aristolochia bracteolata</i> Lam., the rhizome of <i>C. pilosa</i> , and the corm of <i>G. dalenii</i> are washed, peeled, and cut into small pieces. The preparation is dried and powdered. One half-teaspoonful of the powder is taken with pap once daily after a meal.	Powder	Gonorrhoea
The leaf juices of <i>Ocimum gratissimum</i> L., <i>Vernonia amygdalina</i> Delile, and <i>Ageratum conyzoides</i> (L.) L. are extracted by squeezing equal quantities of the three plants in water. 250 ml of the preparation is taken once daily after a meal.	Juice	Gonorrhoea, vaginitis
A decoction of <i>Senna alata</i> (L.) Roxb. leaves is used to prepare food such as porridge. The preparation is taken as food.	Concoction	Gonorrhoea
The roots of <i>Terminalia schimperiana</i> Hochst. ex Engl. & Diels, <i>Oxalys subscorpioides</i> Oliv., and <i>Securidaca longipedunculata</i> Fresen. are boiled in water for 15 minutes. 250 ml of the extract is taken once daily after a meal.	Decoction	Candidiasis, vaginitis
The leaves of <i>Momordica charantia</i> L., <i>Morinda lucida</i> Benth., and <i>S. alata</i> are dried and powdered. A teaspoonful of the powder is taken with pap once daily after a meal.	Powder	Candidiasis, vaginitis

Herbal recipe and dosage	Method of preparation	Therapeutic indications
The roots of <i>A. bracteolata</i> and <i>Glyphaea brevis</i> (Spreng.) Monach. are boiled in water for 15 minutes. 250 ml of the extract is taken once daily after a meal.	Decoction	Gonorrhoea, vaginitis
The whole fruits of <i>C. lanatus</i> and <i>Lagenaria breviflora</i> (Benth.) Roberty are baked and the fruit juice extracted after baking. 2 tots of the juice are taken once daily after a meal.	Juice	Gonorrhoea, syphilis
One quarter-size of fresh fruits of <i>C. lanatus</i> and <i>L. breviflora</i> are soaked in a 2 L bottle of water with 200 g of <i>Sorghum bicolor</i> (L.) Moench seeds added to the preparation.	Infusion	Gonorrhoea, syphilis
Large quantity (3 kg) of whole plant of <i>A. conyzoides</i> is charred, and the powder is soaked in ethanol. One tot of the preparation is taken twice daily after meals.	Tincture	Syphilis, HIV/AIDS
The leaves of <i>Nicotiana tabacum</i> L. are soaked in cow bile. 2 tablespoonfuls of the extract are taken twice daily after meals.	Infusion	HIV/AIDS
The leaves of <i>M. charantia</i> and <i>V. amygdalina</i> are squeezed together in water. 250 ml of the extract is taken after a meal once daily.	Juice	Candidiasis, vaginitis
The roots of <i>Plumbago zeylanica</i> L. and bark of <i>Alstonia boonei</i> De Wild. are dried and powdered. One half-teaspoonful of the powder is taken with pap twice daily after meals.	Powder	Gonorrhoea, candidiasis
The dried stem (peel) of <i>Euphorbia lateriflora</i> Schum. & Thonn. is powdered. A teaspoonful is added to eggs, fried, and taken as remedy.	Concoction	Gonorrhoea, syphilis, candidiasis
The roots of <i>S. longipedunculata</i> , <i>A. bracteolata</i> , <i>P. zeylanica</i> , and <i>Theobroma cacao</i> L. are dried and powdered. One half-teaspoonful of the powder is taken with pap twice daily after meals.	Powder	Gonorrhoea, candidiasis
Roots of <i>Zapoteca portoricensis</i> (Jacq.) H.M.Hern., roots of <i>A. bracteolata</i> , stem of <i>Gongronema latifolium</i> Benth., and bark of <i>T. cacao</i> are soaked in alcohol. One tot of the extract is taken twice daily after meals.	Tincture	Candidiasis, vaginitis
<i>Plumbago zeylanica</i> roots and <i>Harungana madagascariensis</i> Lam. ex Poir. stem bark are extracted in alcohol. One tot of the extract is taken twice daily after meals.	Tincture	Candidiasis, vaginitis
Peels of <i>S. longipedunculata</i> root and the leaves <i>N. tabacum</i> are extracted in alcohol. One tot of the extract is taken twice daily after meals.	Tincture	Gonorrhoea, candidiasis

L. bulbs and *Allium ascalonicum* L. leaves; or (v) fresh peels of *S. longipedunculata* root.

Dosages of remedies

The preparation of powders from plant materials formed the most common method of preparation in prescriptions while the least common was concoctions. The preferences in preparation methods may depend on potency and shelf-life of remedies. The field study revealed that there were variations and differences in dosages of remedies. Stating dosages or metric measures was part of the culture of respondents encountered in this study. As an example, medications prepared with hot drinks or spirits are usually taken with a small glass-cup or **tot** which is 4–5 tablespoonfuls, whereas half to one teaspoonful of powder is administered once daily.

Discussion

Pattern of responses

The difference in religion was no limitation to traditional medicinal practice in Ibadan, as pastors and **alfas** participated actively and meaningfully in the survey. The wide age range means that information on indigenous knowledge was not exclusively preserved by elderly people. Furthermore, most of the respondents were married, which connotes that their family responsibilities might have influenced their knowledge of ethnomedicinal practice. The diversity of plants identified on the basis of information collected from respondents is an indication that the people are versatile in the use of medicinal plants and that the study sites are rich in species diversity. This finding confirms the observation of Kasperek (1997) that medicinal plants constitute the largest category of biodiversity used by people. The fact that 300 respondents in

the localities recognized plant species that were of medicinal importance for the treatment of STIs is not surprising. WHO (1991) reported that 80% of the world's population relies on herbs for primary health care needs. Since plants support 75% of the Nigerian population entirely or partly for primary health care in treatment and preventive purposes, indigenous knowledge of medicinal plants needs to be properly documented. According to Odetola and Bassir (1986) and Okogun (1994), plants are almost the exclusive source of drugs for the majority of the world's population.

Plant parts and forms

The importance of families Anacardiaceae and Euphorbiaceae in STIs regimen has been reported by previous authors (Ajibesin *et al.* 2011, Chinsebu & Hedimbi 2010). There may be need to explore these families for their bioactive constituents, as well as Fabaceae and Apocynaceae, the highest frequency families in this study. In addition, the use-value of plant parts has implications for conservation of the species diversity. The leaves are regenerative, and their use in recipes offers the advantage in sustainable use of biodiversity over root and whole plant. The prevalence of trees and shrubs in recipes is an indication that the people are conversant with the use of higher plants in prescriptions. Indeed higher plants have been described as the "sleeping giant" of drug development by Farnsworth and Morris (1976).

Relevance of previous literature to this study

It was observed that some of the plants recorded in this survey are well known in the management of STIs worldwide despite diversity of plants and cultures. Rahmatullah *et al.* (2011) studied the medicinal plants used by folk and tribal medicinal practitioners of Bangladesh for the treatment of gonorrhoea. Among a total of 96 plants from 54 families were *A. comosus*, *Jatropha curcas* L., *S. alata*, and *O. gratissimum*. The folk use of *S. alata* for the treatment of syphilis and gonorrhoea was also documented by Mollik *et al.* (2009) in Bangladesh. In a study on ethnotherapeutic management of STDs in Kenya, Njoroge and Bussmann (2009) recorded the use of *Musa acuminata* × *balbisiana* Colla in the management of gonorrhoea, and *Carica papaya* L. was listed for general STDs. Otang *et al.* (2012) in a survey of medicinal plants of South Africa, reported the use of *A. sativum*, *Zingiber officinale* Roscoe, and *Citrus limon* (L.) Osbeck in the treatment of opportunistic fungal infections in HIV/AIDS. Allabi *et al.* (2012) also reported the efficacy of natural products in the treatment of HIV/AIDS. In a study on the use of botanicals for the cure of STIs in Owo, Nigeria, Kayode *et al.* (2009) reported the use of 33 botanicals from 28 families. Of the 33 medicinal plants were *A. conyzoides*, *X. aethiopica*, *Sorghum bicolor* (L.) Moench, *M. acuminata* × *balbisiana*, *Ficus exasperata* Vahl, *Jatropha* spp., and *C. papaya*.

Globally, there is an ongoing research interest on survey of medicinal plants with therapeutic values in diseases due to the prevalence of infectious diseases and resistance to drugs in developing countries. Qureshi *et al.* (2006) documented 27 plant species used for the treatment of diseases in the Gilgit District and surrounding areas of northern Pakistan. Phondani *et al.* (2010) documented 86 plant species from 43 families used in the treatment of 37 ailments by Bhotiya tribal communities of Central Himalaya, India. In a survey of medicinal plants used for the management and treatment of skin diseases and related ailments, Ajibesin (2012) recorded 183 medicinal plant species from 59 families in Akwa Ibom State, Nigeria. The use of plant species for domestic needs in Himalayan region of Poonch valley in Pakistan was studied by Khan *et al.* (2010). The 169 plant species recorded in the study were majorly used for medicines and foods. Ariwado *et al.* (2012) surveyed the Asamagbe stream bank of the Forestry Research Institute of Nigeria (FRIN) in Ibadan, Nigeria, to assess the numerous medicinal plants present in the area. Ninety-eight plant species from 49 families were reported. The authors advocated the adoption of conservation practices for sustainable plant use within and outside the study area considering the ecological function of the stream bank and the local therapeutic values of the plants.

Implication of the findings

Findings of the present ethnobotanical survey will be beneficial in general health care, ecological control, forest conservation, biotechnology research, and providing leads to medicinal plants from which potential new drugs may be developed. The families Fabaceae and Apocynaceae should further be explored in STIs treatment. In addition, more recipes should be documented for the management and treatment of HIV/AIDS in Nigeria.

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