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RESEARCH ARTICLE

Ethnobotanical survey of medicinal plants used in the traditional treatment of viral infections in Jos, Plateau state, Nigeria

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Abstract: An ethnobotanical survey was conducted covering the three Jos North, Jos South and Jos East local government areas that makeup Jos in Plateau State - Nigeria, on plants used in treatment of viral infections through direct interview of Traditional Medicine Practitioners, Herbalist, Herb sellers and some indigenes/residents, using structured questionnaire supported with tape recorder and digital camera. The viral infections include common cold, measles, chickenpox, rabies, bird flu, hepatitis and HIV. The study was aimed at collection and documentation of medicinal plants used in the treatment of viral infections, within Jos. A total of 64 medicinal plants species, represented by 62 genera from 39 families were obtained from the ethnobotanical survey. The recipes for the treatment of the viral infections were also reported. . The stem bark was the most commonly used plant used part in the treatment of viral infection with estimated value of 23.6%, followed by leaves (20.8%). Other plant parts used include roots, flower, fruits, rhizomes, seeds and in some cases the whole plant. the present findings, has revealed and documented medicinal plants used in treatment of viral infections in Jos, Plateau state, Nigeria for the first time. This information will be beneficial in public health, research and providing lead to plants that can be useful in antiviral drug discovery.

Keywords: anti-viral; ethnobotanical survey; medicinal plants; Nigeria; traditional medicine.

Introduction

Survey and documentation of a country's or community's natural resources is an important prerequisite for proper utilization of its raw materials. Full knowledge of various plants is necessary, so as to enhance proper utilization (Choudhary *et al*., 2008). Viral infection is one of the world's most transmissible diseases; this is because it is almost always followed by a secondary bacterial infection. However available antiviral agents and vaccines have shown good results (WHO, 1983). The high cost of available antiviral drugs and their toxic side effects, viral resistance coupled with viral latency and conflicting efficacy in recurrent infection in immunocompromised patients has made viral disease a major and continous public health burden (Ngono Ngare *et al*., 2011). There is the need for discovery of new antiviral compounds from plants that are safe, effective, which overcomes resistance and is also less toxic (Ngono Ngare *et al*., 2011). Recent studies showing antiviral potential of plant extract against viral strains resistant to conventional antiviral agents, has challenged modern drug discovery practices, and stimulated renewed interest in the exploration of medicinal plants with antiviral constituents (Mukhtar *et al*., 2008). Indigenous people have long history and expertise in the use of medicinal plants, but information on these plants and their uses is mainly passed from one generation to the other orally and even to date is poorly documented (Gurib-Fakim, 2006). The lack of an organized documentation for medicinal plant knowledge may also contribute to the loss of medicinal plant knowledge, particularly for plants that are neglected or non-preferred

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(Musa *et al*., 2011). Like every communities in the developing nations, the people of Jos in Plateau state, Nigeria depend on medicinal plants to meet their domestic and health needs. Majority of rural communities depend on traditional medicine, while most urban settlements depend mainly on orthodox medicine probably due to civilization. There is also the problem of holding information on use of plants as secrets due to distrust of researchers by traditional medicines practitioners because of previous bad experiences, and the desire to pass down information to offspring and/or, family members alone (Sofowora, 2008) , and avoidance of competition in the practice. Eventually these people get older and dies, resulting into lost of vital information. . The present study is aimed at collection and documentation of medicinal plants used in the treatment of viral infections within Jos, Plateau State, Nigeria, that can serve as a starting point for discovery of new antiviral agent.

Methods and materials

Study area

The study areas consist of Jos North, Jos South and Jos East Local government areas of Plateau state Nigeria. The areas consist of residents that are civil servants, farmers and traders. The area is a plateau that lies between latitudes 8^0 22´ and 10^0 24´ North and longitudes 8^0 32´ and 10^0 38´ East. Thus, Plateau State which derives its name from the Jos Plateau is located right in the centre of Nigeria-North central zone. The Jos – Plateau is the Upper part, and the Northern highland area of Plateau State, with a near temperate type. Weather conditions are warm during the rainy season (April-October) and cold during the Harmattan period (December-February). The mean annual temperatures in the state range between 20^0 and 25^0 centigrade, while the mean annual rainfall figures range from 131.75cm in the Northern part to 146cm in the Southern part.

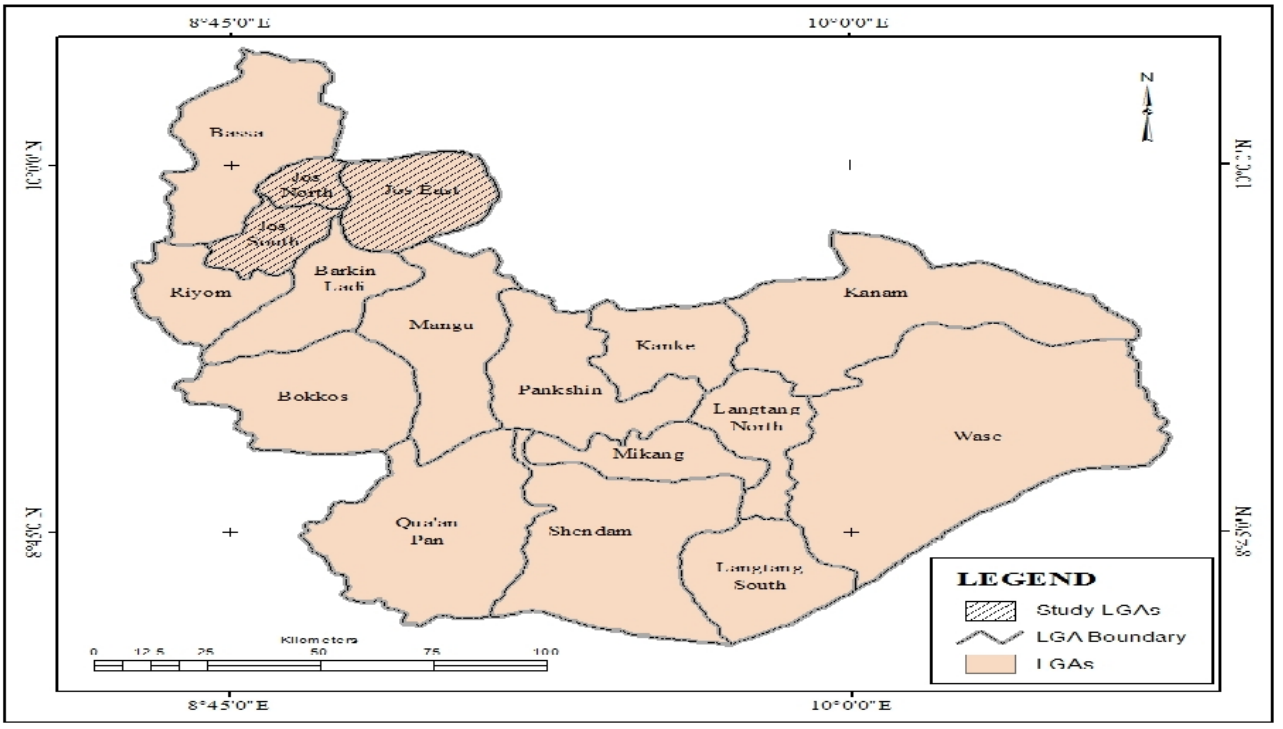

Figure 1: Map of Plateau, State showing study Areas [Source: Geographic Information Systems (GIS) Laboratory, Department of Geography and Planning, University of Jos (2011)]

Collection and Documentation of information on medicinal plants

The sample population comprises mainly of Traditional Medicine practitioner or Traditional healers and herb sellers, a few individuals with claims of medicinal plant knowledge according to the methods of Sofowora (2008). At least 10 individual was the target per LGAs. The sam-

pling technique employed for this survey research was snowball sampling or referral sampling. A list of the common viral diseases was made, and enquiry was made of their treatment. These viral infections include common cold, measles, chickenpox, rabies, bird flu, hepatitis and HIV/ AIDS respectively. The data for this study were obtained by direct interview with the respondents from September 2011 to March 2012. Informed consent was obtained orally from each of the respondent, before an interview. Since most of the respondents were not educated, oral interview was adopted to obtain the relevant ethno medicinal data. Each respondent was visited two to three times in order to verify the authenticity of the data obtained, and to gather additional information not mentioned during a previous visit. Any discrepancy between information obtained at different visit on a particular ailment and plant used in its treatment, makes the information unreliable and hence, rejected.

Plant collection, Identification and Authentication

The plant species mentioned during the interview were collected by the respondent or the person who normally prepares the remedies, so as to avoid collection of the wrong plant (Sofowora, 2008). Most of the plants were collected fresh, photographs of collected plant species were also made, so as to enhance their identification. The plants species obtained from the survey were identified using keys and description given in the Flora of west Tropical Africa (Hutchison and Dalziel, 1963) and the "Woody Plant of Ghana" (Irvine, 1961) at College of Forestry, Herbarium Unit, Jos, by Mr Azila and Dr Jemilat Ibrahim of the herbarium unit at the National Institute of Pharmaceutical Research and Development (NIPRD), Abuja. The identity of the plant was authenticated at the herbarium unit in the Department of Biological Sciences, Ahmadu Bello University, Zaria, Nigeria by the Taxonomist of the unit. Some were also authenticated at the Forestry herbarium Ibadan. Voucher numbers were obtained for each specimen.

Data analysis

The data gathered during the ethnobotanical survey were analyzed by extracting information from data available, so as to give a summary description of the subject. Descriptive statistical tools such as tables and multiple bar charts were used.

Results

Medicinal plants used in the treatment of viral infections in Jos, Plateau State

A total of 64 medicinal plants species, represented by 62 genera were obtained from 39 families. Table 1 gives a concise information on the medicinal plant species, their families, plant part used, medicinal use and there vernacular names in Hausa, Igbo, Yoruba and others.

Table 1: Medicinal plants used in the treatment of viral infections in Jos, Plateau state.

Family	Scientific Name	Local Name	Plant Part Used	Form of preparation	Mode of administration	Voucher Number	Medicinal Use
Agavaceae	*Sansevieria liberica* Geromes Labroy	Mooda (H)	Stem Bark	Decoction	Internal and external	ABU 1821	Hepatitis
Amaranthaceae	*Aerva lanata* (L.) Juss. ex Schult.	Efun (Y)	Leaves	Decoction	Internal	ABU 70736	Common cold
Amaryllidaceae	*Crinum giganteum* Andr.	Gadaali (H)	Whole plant	Infusion	Internal	ABU 1408	Hepatitis
Anacardiaceae	*Magnifera indica* Linn.	Mangoro (H)	Stem Bark	Decoction	Internal	ABU 1944	Hepatitis
Anonnaceae	*Annona senegalensis* Pers.	Gwanda daji (H)	Leaves	Decoction	Internal	ABU 90012	Measles
	Xylopia aethiopica (Dun.)A. Rich.	Eruje (Y)	Stem Bark	Decoction	Internal	FHI 108075	Hepatitis, HIV
	Enantia chloranta	Awopa(Y)	Stem Bark	Decoction and powder	Internal and external	FHI 101821	Hepatitis
Apocyanaceae	*Landophia owarienses* P.Beauv.	Ciwoo (H)Ree (B)	Stem Bark	Decoction	Internal	ABU 1225	Hepatitis
	Alstonia boonei de Wild	Awun (Ahun) (Y)	Stem Bark	Decoction	Internal	FHI 103096	Hepatitis
	Carissa edulis (Forssk.) Vahl.	Lemun tsutsu(H)	Root	Decoction	Internal	ABU 900086	HIV
Asteraceae	*Vernonia amygdalina* Del.	Shawaka(H)	Leaves	Maceration	Internal and external	ABU 595	Chickenpox Hepatitis Rabies Measles

Boraginaceae	*Heliotropium ovalifolium* Forssk.	Shaanikasani(H)	Root	Powder	Internal	ABU 2037	HIV
Burseraceae	*Boswellia dalzielli* Hutch.	Ararabi(H)	Leaves and Stem bark	Decoction and powder	Internal and external	ABU 1314	Rabies Chickenpox Hepatitis HIV
Caesalpiniaceae	*Piliostigma thonningii*(Schum.)	Kargo (H)	Leaves and fruits	Decoction	Internal	ABU 1132	Measles
	Cassia singuena (Del.)Lock.	Runfu(H)	Flowery tops	Decoction and powder	Internal and external	ABU 6855	Measles Hepatitis Chickenpox
	Deuterium microcarpum(Guill and Sperr.)	Tawra(H)	Stem Bark	Decoction	Internal	ABU 551	Hepatitis
Caricaceae	*Carica papaya* Linn.	gwanda (H)	Leaves	Decoction	Internal and External	ABU 005	Measles
Chenopodiaceae	*Chenopodium ambrosiodes* Linn.	kwalinsan (B)	Whole plant	Cold infusion	Internal and External	ABU 1921	Measles
Cochlospermaceae	*Cochlospermum planchoni* Hook.f.ex.Planch	Rawaya (H)	Root	Decoction	Internal	ABU 900011	Hepatitis HIV
Combretaceae	*Anogeissus leiocarpus(*DC.)Guill. & Perr.	Marke (H)	Stem Bark and leaves	Decoction	Internal	ABU 900389	Common cold
	Terminalia Avicennoides .)Guill. & Perr. Fl. Seneg. Tent.	Baushe(H)	Stem Bark	Decoction	Internal	ABU 900309	Common cold
	Guiera senegalensis J.F.Gmel	Sabara(H)	Leaves	Decoction	Internal and external	ABU 900165	Chickenpox
Curcubitaceae	*Cucumis metuliferus* E. Mey	Buurar-zaakii(H)	Fruits	Maceration	Internal	ABU 3232	Bird flu
	Adenopus breviflorus Benth.	Tagiri (Y)	Fruit	Maceration	Internal	FHI 107945	Measles
Ebenaceae	*Diospyros mespiliformis* Hochst.ex.A.DC.	Kanya (H)	Bark	Decoction	Internal	ABU 901431	HIV
Euphorbiaceae	*Jatropha curcas* Linn.	Biydazogu (H)	Leaves and root/	Decoction or powder	Internal	ABU 1911	Hepatitis HIV
	Manihot esculenta Linn.	Rogo (H)	Leaves	Decoction	Internal	ABU 2347	Measles
Fabaceae	*Dialium guinese* Willd.	Tsamiyar biri (H)	Leaves	Decoction	Internal and External	ABU 3792	Measles Chickenpox
	Erythrina senegalensis DC	Minjirya (H)	Bark	Decoction	Internal	ABU 7721	HIV Hepatitis
	Abrus precaturius L.	Idon zakara (H) Chakala (J)	Whole plant/	Decoction	Internal	ABU 1496	Common cold
	Tamarindus indica L.	Tsamiya (H)	Leaves	Decoction	Internal	ABU 900265	Measles
	Acacia sieberiana DC.	Farar kaya (H)	Root (H)	Decoction	Internal	ABU 90032	Hepatitis
Guttiferae	*Garcinia kola* Heckel	Orogbo (Y)	Fruit/nut		Internal	ABU 1614	Common cold
Lamiaceae	*Ocimum gratissimum* Linn.	Efirin (Y)	Leaves	Maceration	Internal and external	ABU 661	Measles
Liliaceae	*Allium sativum* Linn.	Tafarnuwa (H)	Bulb	Decoction	Internal	ABU 423	Common cold
Lorathaceae	*Tapinanthus dodoneifolius* (DC.) Danser.	Kauchi(H)	Stem bark	Decoction	Internal	ABU 6517	Hepatitis
Malvaceae	*Hibiscus rostellatus* Guill. & Perr.	Dakwan (B) maratum (A)	Whole plant	Powder and decoction	Internal	ABU 1774	Rabies Hepatitis HIV
Meliaceae	*Khaya grandifolia*	Oganwo (Y)	Stem Bark	Decoction	Internal and external	ABU 900181	Chickenpox Rabies
	Azadirachta Indica A. Juss.	Dogon yaro (H)	Stem Bark	Decoction	Internal	ABU 900151	Hepatitis
Mimosaceae	*Parkia biglobosa* (Jacq.) R.Br	Dorowa (H)	Stem Bark, leaves	Decoction	Internal and external	ABU 2846	Chickenpox Measles Hepatitis
Moraceae	*Ficus thonningii* Blume	Chediya(H)	Stem Bark	Decoction	Internal	ABU 651	HIV
	Ficus vallis chodae Delile	Ogunro (Y)	Stem Bark	Decoction	Internal	ABU 547	HIV, Chickenpox
	Ficus sycomorus L.	Baore (H)	Root	Decoction	Internal	ABU 1942	Hepatitis
Moringaceae	*Moringa oleifera* Lam.	Zogallagandi(H)	Root	Decoction	Internal	ABU 571	Hepatitis
Myrtaceae	*Syzygium guineense* Wall.	Malmo (H)	Root	Decoction	Internal	ABU 900295	Hepatitis
	Psidium guajava L.	Guaaba (H)	Leaves	Decoction	Internal and external	ABU 2846	Measles
Olacaceae	*Ximenia americana* L.	Tsaada (H)	Root/	Decoction	Internal	ABU 1612	Hepatitis
Ochnanceae	*Lophira lanceolata* Tiegh. ex Keay	Jan magani (H)	Roots	Decoction	Internal	ABU 900121	Measles
Poaceae	*Sorgum guineense* Staph.	Doro (H) okababa (Y)	Seeds, stem	Decoction	Internal	ABU 8501	Measles Hepatitis
Polygalaceae	*Securidaca longeponduculata* Fers.	Sanya (H)	Leaves Whole plant Root	Powder and Decoction	Internal	ABU 900141	Common cold Measles HIV
Rubiaceae	*Pavetta crissipe* K. Schum.	Rubatari (H)	Leaves	Decoction	Internal	ABU 904	Common cold

	Mitracarpus scaber	Googamassu (H)	Leaves	Decoction	Internal	ABU 70701	Measles
	Nauclea latifolia Sm.	Egbesi (Y)	Stem bark	Decoction	Internal	ABU 005	Chickenpox, Hepatitis
	Spermococe verticellata	Karyangarma (H)	Whole plant	Decoction	Internal	ABU 672	Chickenpox
	Oldenlandia gorensis DC	Raatsa-hanji (H)	Whole plant	Decoction	Internal and external	ABU 9558	Chickenpox
Rutaceae	*Citrus aurantifolia*	Lemun sami(H)	Leaves	Decoction and powder	Internal	ABU 1440	Measles Hepatitis
Sapotaceae	*Vitellaria paradoxa* C.F. Gaertn	Ori (Y), Kadanya (H)	Nuts	Cream	External	FHI90709	Common cold
			Stem Bark	Decoction	Internal		Chickenpox
Scrobulariaceae	*Striga hermontheca* (Del.) Benth.	Kujiji (H)	Seeds and leaves	Decoction	Internal	ABU 1058	Common cold
Solanaceae	*Solanum nodiflorum* Jacq.	Guota kaji (H)	Fruits	Maceration	Internal	ABU 1664	Bird flu
	Nicotiana tabacum L.	Taba (H)	Leaves	Decoction	Internal	ABU 1611	Chickenpox
Verbenaceae	*Vitex chrysocarpa* Planch. ex Benth.	Magani kaji(H)	Leaves	Maceration	Internal		Bird flu
Zingiberaceae	*Zingiber officinale* Roscoe.	Chitta(H) Atale (Y)	Rhizomes	Decoction	Internal	ABU 2261	Common cold
	Aframomum melegueta K. Schum.	Atare (Y)	Leaves and seeds	Decoction	Internal	FHI 108004	Common cold

Key: H: Hausa; Y: Yoruba; B: Berom; A: Anaguta

Distribution of informant's age

The age distribution of informants showed that most of the informants encountered during the survey are within the age range 40-49 and 50-59. This is shown on Fig 2.

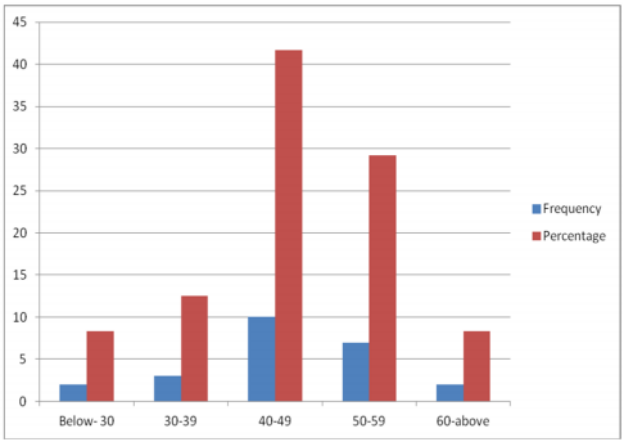

Figure 2: Distribution of informant's age.

Medicinal plant parts used in treating viral infections

The various plant parts utilized are represented on shown on Table 2.

Table 2 above shows that stem bark was the most used part with estimated value of 23.6%, followed by leaves (20.8%) and roots (12.5%) respectively. Other parts are used, but not as frequent as the stem bark, leaves and roots.

Sources of information

The sources of information in the study are Traditional Medicine Practitioners, Herbalist, Herb sellers, indigenes and residents. Herbalist and Traditional Medicine Practitioners were the major source of information, while the herb sellers, indigenes and residents gave less information as presented by Fig 3.

Table 2: Medicinal plant part documented during the survey.

Part used	Frequency	% Occurrence
Bulb	1	1.4
Flower	1	1.4
Fruits	7	9.7
Leaves	15	20.8
Leaves, fruit	1	1.4
Leaves, root	1	1.4
Leaves, stem bark	3	4.2
Leaves, seeds	2	2.8
Leaves, whole plant	1	1.4
Rhizome	1	1.4
Root	9	12.5
Root, whole plant	1	1.4
Seeds	2	2.8
Seed, root	1	1.4
Stem bark	17	23.6
Whole plant	7	9.7
Total	72	100.0

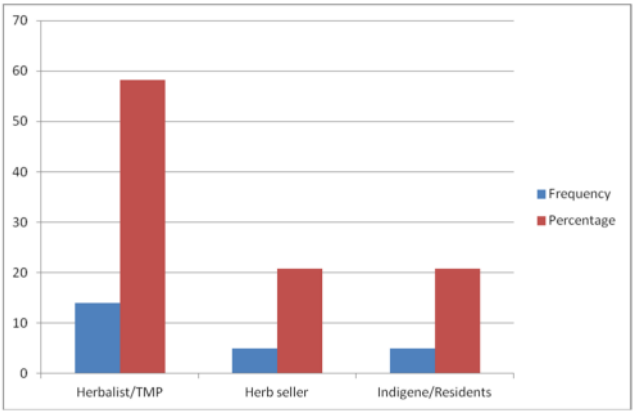

Figure 3: Sources of information.

Table 3: List of Plants frequently mentioned in the treatment of a Particular Viral Infection by two or more informants.

Viral Infection	Scientific Name of Plant	No. of Informants
Common cold	*Anogeisus leioparus*	8(50%)
	Pavetta crissipes	7(44%)
	Striga hermontheca	5(31%)
	Allium sativum	4(25%)
	Abrus precatorus	4(25%)
Measles	*Vernonia amygdalina*	2(13%)
	Chennepodium ambrosiodes	2(13%)
	Manihot esculenta	2(13%)
Chickenpox	*Vernonia amygdalina*	2(13%)
Birdflu	*Cucumis metuliferus*	3(19%)
	Solanum nigrum	7(44%)
Rabies	*Boswellia dalzielii*	3(19%)
Hepatitis	*Jatropha curcas*	2(13%)
	Boswellia dalzielii	2(13%)
	Enantia chlorantha	3(19%)
HIV	*Moringa oleifera*	4(25%)

The number of informant is a function of 16 plant species
Formula: Number of informants divided by total number of species multiply by 100

Table 3 above shows that some of the medicinal plants discovered during the survey are more popular in viral infection therapy than others. This confirms the authenticity of information gathered and also the importance of such plants. Hence, informant's consensus revealed that, *Anogeisus leioparus* used in the treatment of common cold is the most popular plant, cited by 8 informants (50%), followed by *Pavetta crissipes* and *Solanum nigrum* use d in the treatment of common cold and bird flu respectively, mentioned by 7 informants (44%). The next plant is *Striga hermontheca* cited by 5 informants (31%). *Allium sativum* and *Abrus precatorus* used in the treatment of common cold and *Moringa oleifera* used to treat HIV are the next, mentioned by 4 informants (25%)

Discussion and Conclusion

Medicinal plants used in treating viral infection in Jos- Plateau state

In the ethno botanical survey conducted in Jos-Plateau, a number of 64 medicinal plants from 39 families and their uses in treating some common viral infections were reported as shown by table 1. This demonstrates the depth of the knowledge of the people of Jos- Plateau on medicinal plants and their uses. These plants were said to be effective in the treatment of the seven (7) common viral infections mentioned earlier. This study has shown that different areas in different part of the world demonstrate the existence of considerable amount of indigenous ethno medicinal knowledge (Tesfaye and Zemede, 2009).

Recipes, dosage regimen and route of administration

Decoction and maceration are the most common mode of preparation. Oral route is the major route of administration, followed by a combination of both oral and external route of administration, depending on the type of viral infection been treated. This finding is in agreement with studies by Hunde *et al*, (2004) and Musa *et al*, (2011) which also revealed that oral ingestion is the most frequently used route of administration in traditional medicine.

Like most studies in ethno botany, it was observed during this study that the TMP s usually has no knowledge of the strength of their remedies, dosing depends on each practitioner (Tesfaye and Zemede, 2009). This lack of standardization and precision in dosage is seen as one of the main disadvantage of traditional medicine (Sofowora, 2008).

Distribution of informant's age

The study revealed that most knowledge on herbal remedies is handled by members of the community between the age range of 40-49 and 50-59, as shown on Fig. 2. This indicates that there is a wide gap of ethnomedicinal knowledge between the elderly and the younger generation. The majority of the informants are middle aged and elders who said that they had learned about medicinal plants during their childhoods and the knowledge had been orally passed down from family members, particularly grandparents and parents. Most of the adults reported that they learned about medicinal plants when trailing with their parents or grandparents to gather remedies in the forest when they were young. This situation seems to be the same in many parts of the world (Musa *et al*., 2011, Bussmann and Sharon, 2006). Cultural changes as a result of westernization and modernization (Voeks and Leony, 2004) has contributed in

making the younger generation undermine our traditional values (Giday *et al*., 2003). Since traditional medicine remains the most popular medicine in solving health problems in the developing world. It is important to publicize medicinal plant knowledge within the young generation to raise awareness of and appreciation for their traditional values and for the conservation and sustainable use of the plants as well as to keep the traditional medical knowledge left in their community alive.

Medicinal plants used in treating viral infection

Table 2 shows that stem bark was most commonly used part in the treatment of viral infection than other plant parts in the study area. This was followed by the use of leaves, roots, fruits, whole plant, while seeds, bulb, flower and rhizomes were least used. This is similar to a study by Murthy (2012), in which stem bark ranked highest part used, followed by leaves and then the other parts.

Sources of information

Figure 3 shows that Traditional Medicine Practitioners (TMP) and Herbalist gave the highest response, while herb sellers and indigenes/residents showed little response. This was due to availability and willingness of the TMPs and Herbalists to share their knowledge. Some of the herb sellers were resistant, while the residents and indigenes had little knowledge on traditional medicine.

Plants frequently mentioned in treatment of a particular viral infection by two or more informants

The frequently mentioned plants in the treatment of a particular viral infection are shown on Table 3. Sixteen (16) plants were identified and grouped according to the different viral infections. The fact that some of the plants are having similar uses in different LGAs surveyed indicates their pharmacological effectiveness (Oladumoye and Kehinde, 2011). It also confirms the authenticity of the information gathered during the study.

In conclusion, this ethnobotanical study has revealed that there is high knowledge and use of medicinal plants in Jos, plateau state. Through this study medicinal plant with the potential to treat or prevent viral infections were documented. The information from this study can serve as a guide for the discovery of new antiviral agents from plants.

Recommendation

There is need for ethnobotanical survey in every state of the nation on medicinal plants used in treatment of viral infection. In order to preserve knowledge on medicinal plants and to update existing information. Most of the medicinal plants used in plateau state are from the wild, there is need to encourage and enforce cultivation of medicinal plants, so as reduce exploitation of plants growing in the wild, otherwise, extinction of useful medicinal plants. Traditional medicine is relatively cheap, its raw materials are readily available, it is a potential source of new drugs and of course, a source of cheap starting products for the synthesis of known drugs. Hence, the sale and use of medicinal preparations should be encouraged and supported by the government. Since viral infection is one of the world most transmissible diseases , there is need for both private and public organizations to invest in researches that will lead discovery of new antiviral compounds that is safe, effective and less toxic, particularly from plants. The information on medicinal plants gathered during this study is based on claims by the TMP. Hence, researchers need to carry out investigations on these plants, so as to ascertain the claims.

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