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ETHNOBOTANICAL SURVEY OF MEDICINAL PLANTS USED FOR THE TREATMENT OF DIABETES MELLITUS IN EKITI SOUTH SENATORIAL DISTRICT, NIGERIA.

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ABSTRACT: *Diabetes mellitus (DM) is a common deadly disease that affects mankind in both the poor and developed countries of the world. It is rather unfortunate that the number of people suffering from this disease particularly in Nigeria is on the increase. An ethnobotanical survey was conducted to document medicinal plants commonly used for the treatment of DM by the inhabitants of Ekiti South Senatorial Districts of Ekiti State, Nigeria. The study revealed that 30 plant species belonging to 12 families were cited by the respondents as being used in the area for the treatment of DM. Mangifera indica and Alstonia boonei of the families Anacadiaceae and Apocynaceae respectively, were repeatedly mentioned as the two mostly used plants for the treatment of DM in the study area. About 53.33% of the plants cited were reported as being rare, thus further studies on their conservation strategies were suggested.*

KEYWORDS: Diabetes mellitus, medicinal plants, Indigenous knowledge, Ekiti South Senatorial District.

INTRODUCTION

Diabetes mellitus (DM) is a human metabolic disorder caused by the destruction of insulin producing β cells in the pancreas- type I diabetes and or reduction in the sensitivity of the body muscles and liver cells to insulin action- type II diabetes. (Oyedemi *et al*., 2009; Zimmet, 2002). The disease often develops when the body can no longer produce enough insulin to compensate for the impaired ability to use insulin (Larsson *et al*., 1998;). DM is characterized by disturbances in carbohydrate, protein and lipid metabolism resulting to chronic blood glucose (sugar) that could lead to severe complications (Rang *et al*., 1991). Patient with high blood sugar usually experience frequent urination. They are also prone to thirst and hunger (Tedong, 2006). Other symptoms of DM include; numbness, loss of sensation and coordination, imbalance and feet pains.

DM disease usually affects individuals over 40 years of age. Increased consumption of calory-rich diet, obesity and sedentary life style of this age group was said to be responsible for the great increase in the number of people suffering from this disease worldwide (WHO 1980). According to Marx (2002), the frequency of diabetics may escalate, with a major effect on the population of developing nations due to the inadequate intervention measures against the disease. With the over 150 million people suffering from DM worldwide and the projected increase to 300 million or more by 2025 (Moller and Filler,1991), there is a need to look inward and proffer drastic measure to control the spread of the disease. Unfortunately, Africa and Asia are reported as regions with conditions where diabetics could rise above the predicted level (ADA 1997).

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Data from the World Health Organization (WHO) indicated that Nigeria has the greatest number of people living with diabetes in Africa (Wild *et al*., 2004). Surprisingly, the disease is not limited to the rural communities alone. Its prevalence varies from 0.65% in rural Mangu of northern Nigeria to 11% in Lagos, an urban city in Southern Nigeria (Akinkingbe *et al*., 1997). The authors also reported that not less than 1.05 million Nigerians were likely to be diabetic with only about 225,000 knowing about their condition, and just about 198,000 receiving treatment. Their report also indicated that the prevalence of the disease in Nigeria tend to increase in both male and female adult after the age of 45 years.

It is gratifying that the use of medicinal plants in addressing the health needs of African population is now being supported by a range of stakeholders including policy maker and researchers (Koduru *et al*., 2007). The World Health Organisation recommended the search for medicinal plants that are effective and beneficial for the treatment of DM (WHO 1985). Natural plant products have been found to be potential sources of novel molecules for the treatment of diabetes (Farnsworth, 1994; Marles and Farnsworth, 1995), hence herbal medicines continue to play very important role in diabetic therapy, most especially in the developing nations where most people are resource-poor and with little or no access to modern treatment (Ajaiyeoba *et al*., 2006).

The increase in demand for the use of plant based medicines to treat DM could be as a result of the side effect associated with the use of orthodox drugs such as insulin and oral hypoglycemic agents (Marles and Farnsworth, 1994). More so, plant derived products with anti-diabetic and other medicinal potential are reported to be readily available, effective and affordable (Marles and Farnsworth, 1995; Olanipekun and Kayode, 2014). The rate at which the vegetation is getting depleted is very high in this part of the world. It is therefore necessary to document the precious knowledge about these medicinal plants used in the treatment of DM. No record of such documentation is available for Ekiti State, Nigeria. This study is therefore, aimed at documenting the medicinal plants used for the treatment of DM in Ekiti South Senatorial District of Ekiti State, Nigeria.

MATERIALS AND METHODS

Study Area

This survey was carried out in Ekiti South Senatorial District, one of the three senatorial districts in Ekiti State. This Senatorial district is made up of five local government areas with a total population of about 921,000. Ekiti State is located in the South-Western part of Nigeria in the tropical humid region. The state is known for its bi-modal pattern of rainfall with raining lasting for nine months while the dry season last for three months. The entire state particularly the senatorial district is surrounded by hills with beautiful landscape. The majority of people living in the study area belong to the Yoruba ethnic group. However, there are other tribes like Hausa, Ebira, Igbo and Fulani. Their major occupation is farming. The people of the study area use herbal medication either singly or in combination with orthodox medicines for the treatment of several diseases. The belief of the majority who are rural dwellers is that, herbal medicines are the only medicines that can heal people completely from their diseases. This justifies the use of plants for the treatment of common diseases such as DM.

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Collection of information

The study was carried out from November, 2014 to June, 2015 using general conversation and well-structured questionnaire. The questionnaires were completed by each of the 60 respondents (comprising of traditional medical practitioners, herb sellers and farmers) selected from 5 local government areas of the senatorial district. In each local government, twelve (12) respondents were randomly selected and the objective of the study was explained to them in Yoruba, the local language. Interviews were designed to obtain data on the plant species used to treat DM, abundance status part(s) of the plants used, methods of preparation, dosage, effectiveness and adverse effects of the plant materials. Field observations were made on the morphological features and habitat of each medicinal plant species in the field with the help of rural dwellers who are farmers. The information received was built on trust with clear understanding of the aim of the survey. Based on ethnobotanical information provided by the respondents, voucher specimens of the reported anti-diabetic plants were collected for identification at the Ekiti state University, Ado-Ekiti Faculty herbarium.

RESULTS AND DISCUSSION

The socio-economic characteristics of the inhabitant of people living in the study area revealed that out of 60 respondents that were interviewed, 40 were male while 20 were female (Table 1). The respondents were of different ages, where by 53.3 % were ages between 31-40 years, 30 % were between 41-50 years, while 10 % were between 20-30 years. Ages 61 and above had the least of 6.7%.Majority of the respondents were literate (70%) while the rest (30 %) were illiterates. A total number of 30 botanicals belonging to 21 families were cited by the traditional medical practitioners, herb sellers and farmers as being used in the district for the treatment of Diabetes mellitus (DM) as indicated in Table 2. Members of the family Fabaceae had the highest number of four plant species, followed by Apocynaceae and Meliaceae with three species each. However, Poaceae, Euphorbiaceae and Anacadiaceae had two species each, while other families had one species each. *Mangifera indica* and *Alstonia boonei* were frequently mentioned as the two mostly used plants for the treatment of DM by the respondents in the study area.

Incidentally, *Mangifera indica* was one of the two plants also ranked to be the highest based on informant consensus in a similar study earlier conducted by Etuk *et al*. (2010) in the North-western region of Nigeria. Plant species like; *Alstonia boonei*, *Anthocleista nobilis*, *Azardiracta indica*, *Lawsonia inermis*, *Rauwolfia vomitoria* and *Syzgium aromaticum* had also been cited as some of the plants used for the treatment of DM in some other regions of Nigeria (Etuk *et al*., 2010; Mustafa *et al*., 2014), .India (Modak *et al*., 2007), and Morocco (Jouad *et al*., 2001; Tahraoui *et al*., 2007). This validates the belief of people in the efficacy of these botanicals in the treatment of DM. However, 23 species (76.67%) of the plants reported in this study have not been reported before in Nigeria for the treatment of this disease.

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Table 1. Socio-economic characteristics of the respondents living in the study areas.

Number of Respondents	Ages (Years)	Sex		Educational Status	
		Females	Males	Literates	Illiterates
6	20-30	2(33.3)*	4 (66.6)	4 (66.6)	2 (33.3)
32	31-40	24 (75)	8 (25)	24 (75)	8 (25)
18	41-60	10 (55.5)	8 (44.4)	12 (66.6)	6 (33.3)
4	61 and above	4 (100)	0 (0)	2 (50)	2 (50)
Total: 60		40(66.6)	20 (33.3)	42 (70)	18 (30)

*Data in brackets represent the percentage of the respective corresponding values

Table 2. Checklist of Botanicals used in the Management of diabetes mellitus in Ekiti South Senatorial District, Nigeria.

Botanical Name	Family	Local Name (Yoruba)	Common Name
Alstonia boonei De.Wild	Apocynaceae	Awun	Stool wood
Anthocleista djalonensis A. Chev	Loganiaceae	Sapo	Cabbage tree
Aristolochia ringens Vahl	Aristochiaceae	Akogun	Pelican flower
Azadirachta indica A. Juss	Meliaceae	Dongoyaro	Neem
Bambusa vulgaris Schrad.ex J.C.Wendl	Poaceae	Opaarun	Bamboo
Cajanus canjan L.	Fabaceae	Otiili	Pigeon pea
Cassia alata (L) Millsp	Fabaceae	Asuwon	Ringworm bush
Cassia sieberiana DC.	Fabaceae	Arindantoro	Africa Laburnum
Citrus limon L.	Rutaceae	Osanganyin	Lemon
Cocos nucifera L.	Arecaceae	Agbon	Coconut
Detarium microcarpon Guill & Perr	Legunminaceae	Arira	Tallow tree (Oliver)
Entandrophragma utile Dawe & Sprague	Meliaceae	opepe	African cedar
Euphorbia lateriflora Schumach & Thonn	Euphorbiaceae	Enu opire	Milk cultivars
Ficus capensis Thunb	Moraceae	Opoto	Sycamore tree
Gongrolema latifolium Benth	Asclepiadaceae	Madunmaro	Amaranth globe
Heliotropium indicum L.	Boranginaceae	Atapari Obuko	Indian heliotrope
Khaya ivorensis A.Chev.	Meliaceae	Oganwo	Lagos Mahogany
Lannea welwitchii (Hiern) Engl	Anacardiaceae	Ekudan	False Marula
Lagenaria breviflora (Benth. Roberty	Cucurbitaceae	Tagiri	Wild Colocynth
Lawsonia inermis L.	Lythraceae	Laali	Henna tree
Mangefera indica L.	Anacardiaceae	Mangoro	Mango
Phyllanthus niruri L.	Euphorbiaceae	Eyinbisowo	Phyllanthus plant
Picralima nitida Durand & Hook	Apocynaceae	Abeere	Picralima

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Rauwolfia vomitoria Afzeli	Apocynaceae	Asofeyeje	Swizzle stick
Sida acuta Burk	Malvaceae	Isekutu	Horn bean
Sphenocentrum jollyanum Pierre	Menispemaceae	Akerejupon	Locus bean
Syzygium aromaticuum L.	Myrtaceae	Kanafuru	Clove
Tetracera alnifolia Wild	Dilleniaceae	Opon	Ware vine
Teterapleura tetraptera (Schumach. & Thonn) Taub	Fabeceae	Asuwon	Ring worm bush
Uvaria afzelii Sc. Elliot	Annonaceae	Gbogbonise	Scott Elliot

From the information gathered from this study, various parts of these plants were reported to be used in the preparation of herbal medicine for the treatment of DM (Table 3). However, leaves form the greater part used (31.25%), followed by the stem bark (28.13%), roots (18.75%), stems (9.37%), fruits (9.37%) and flowers (3.13%). This conformed to the work of Caraballo *et al.* (2004) conducted in Cameroon, where they reported that the leaves were most frequently used plant part by local inhabitants. This could be because leaves contain reasonable amount of secondary metabolites that have the potential of targeting the disease causing organisms or regulating defects in body cells or tissues. The different methods of preparation and administration of the plants used to treat DM. indicated that 19 plants species were prepared by decoction method, meaning boiling of the plants in water to extract the active component for drinking, 6 plants species were air dried and pulverized, fruits of 1 plant species squeezed out while 4 of the plants species were prepared by infusion. The plants were found to be used singly, although there were situations where two different parts of the plant species are used together. According to the respondents, extracts from these plants are taken orally and daily as long as the ailment goes away depending on its severity.

Table 3. List of the identified botanicals, their abundance status, methods of preparation and administration used to treat Diabetes mellitus in Ekiti South Senatorial District, Nigeria.

Scientific Name	Part(s) used	Abundance status	Method of preparation	Mode of administration /dosage (orally)
Alstonia boonei De.Wild	Root	Common	Roots decoction	One teacup taken daily after meal
Anthocleista djalonensis A. Chev	Roots	Rare	Stems to powdery form	One teacup taken three times daily after meal
Aristolochia ringens Vahl	Stems	Rare	Stems decoction	One teacup taken three times daily after meal
Azadirachta indica A. Juss	Leaves and bark	common	Leaves and bark decoction	One teacup taken twice daily after meal
Bambusa vulgaris Schrad.ex J.C.Wendl	Leaves	Rare	Leave decoction	One teacup taken three times daily after meal
Cajanus canjan L.	Leaves	Rare	Leaves to powdery form	One teaspoonful taken with hot pap daily

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Cassia alata (L) Millsp	Stem bark	Rare	Leaves to powdery form	One teaspoonful taken with hot pap once daily
Cassia sieberiana DC.	Roots	Common	Roots decoction	One teacup taken once daily after meal
Citrus limon L.	Fruits	Common	Osanganyin	
Cocos nucifera L.	Stem bark	Abundant	Stem bark Decoction	Two teacups taken orally daily after meal
Detarium microcarpon Guill & Perr	Stem bark	Rare	Stem bark infusion	One teacup taken orally daily after meal
Entandrophragma utile Dawe & Sprague	Stem bark	Rare	Stem bark infusion	One teacup taken orally daily after meal
Euphorbia lateriflora Schumach & Thonn	Stems	Abundant	Stems infusion	One teacup taken orally daily after meal
Ficus capensis Thunb	Leaves	Common	Leaves decoction	
Gongrolema latifolium Benth	Stems	Common	Dried Stems bark pulverized.	One teaspoonful taken orally with hot pap. Once daily before meal
Heliotropium indicum L.	Leaves	Rare	Leaves decoction	Two teacups taken orally daily after meal
Khaya ivorensis A.Chev.	Stem bark	Rare	Stem bark to powdery form	Two spoonful taken orally with hot water daily
Lannea welwitchii (Hiern) Engl	Stem bark	Rare	Stem bark to powdery form	One teaspoonful taken orally with hot pap. Once daily before meal
Lagenaria breviflora (Benth. Roberty	Fruits	Common	Roots decoction	One teacup taken orally 3 times daily after meal
Lawsonia inermis L.	Leaves	Rare	Leaves decoction	Two teacups taken orally daily after meal
Mangefera indica L.	Leaves	Abundant	Bark to powdery form	One teaspoonful taken orally with hot pap. Once daily before meal
Phyllanthus niruri L.	Leaves	Rare	Leaves decoction	A teacups taken orally daily after meal
Picralima nitida Durand & Hook	Seeds	Rare	Seeds infusion	One teacup taken 3 times daily after meal
Rauwolfia vomitoria Afzeli	Stem bark	Common	Stem decoction	One teacup taken orally 3 times daily after meal
Sida acuta Burk	Stem	Common	Stems decoction	Two teacups taken orally daily after meal
Sphenocentrum jollyanum Pierre	Roots	Rare	Root decoction	One teacup taken orally once daily after meal
Syzygium aromaticuum L.	Flowers	Common	Flowers and leaves decoction	Tree teacups taken orally daily before or after meal

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Tetracera alnifolia Wild	Fruits	Common	Fruits decoction	A teacup taken once daily
Teterapleura tetraptera (Schumach. & Thonn) Taub	Fruits	Rare	Fruits and Leaves decoction	Two teacups taken orally daily after meal
Uvaria afzelii Sc. Elliot	Roots	Rare	Roots decoction	Two Teacups taken orally daily after meal

It is rather unfortunate that up to 53.33% of the species cited in the study were reported as rare, 36.67% as common and only 10% were reported as being abundant (Table 3). This implied that most of these plant species have become very difficult to collect. This reason for this is because their habitats have been disturbed due to human activities and exploitation for various uses. Therefore, the few that are available must be conserved and their knowledge documented before it is finally disappeared.

CONCLUSION

This study has been able to document the indigenous knowledge on the use of plants in treating Diabetes mellitus. It was revealed that the inhabitants of the Ekiti South senatorial district of Nigeria still relied on the use of plants as primary healthcare. However, the phytochemical characterization and pharmacological validation of these plants are to be carried out. More so, awareness regarding the conservation status of rare medicinal plants, domestication strategies as well as appropriate methods of exploitation is crucial for further studies to ensure a sustainable utilization and availability of these plants.

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