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Ethno- Medicinal Survey of Plants Used For the Management of *Diabetes Mellitus* in Kaduna Metropolis, Kaduna State

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Abstract
The study was carried out to survey ethno-medicinal plants used for the management of diabetes in Kaduna metropolis of Kaduna State. Primary data was used in the study and generated through the use of structured questionnaires. Two-stage sampling techniques were used to selects 60 respondents from four communities in Kaduna metropolis (Tudun wada, Kawo, Mando and Kaduna Central Market). Data were analysed using descriptive statistics. Result reveals that majority of the respondents (78.4%) were male and 48.3% within the age of 41-50 years. Many of the respondents (43.1%) have secondary education and 48.3% traders, civil servants, while 17.2% each were artisans and farmers. From the study, several plants belonging to different families were identified for the management of diabetes. Majority of the respondents (8.74%) used *Azadirachta indica*, 6.64% made use of *Venonia amygdalina*, 6.29% *Mangifera indica*, 5.9% *Citrus auriantum* and *Zingibe officinale*, and 4.9% *Allium sativa* for the management of diabetes. Other plants identified include; *Psidium guajava*, *Allium cepa*, *Annacadium occidentale*, *Adansonia digitata*, and *Cocciana indica*. From the study, different plants parts were identified in relation to the management of diabetes, they include; bark, stems, leaves and roots. The study therefore shows that different plants species were used for the treatment of diabetes. However, present knowledge on medicinal use of these plants needs further scientific investigation to confirm their medicinal efficacy in terms of the gradation and dosage. It is recommended that research be intensified in terms of the corresponding dosage in the phyto-remedy of diabetes and other ailments. Also, there should be coordination between government agencies and herbal organizations to enhance proper utilization of the medicinal plant resources.

Keywords: Ethno- Medicinal, Plants, Management, Diabetes Mellitus

Introduction

Ethnobotany involves the study of how communities of a particular region make use of indigenous plants in the region for food, clothing and medicine (Ajaiyeoba *et al,* 2006). Ethnobotany was defined by Kim (2007) as the study of how people of particular cultures and regions make use of the plants in their local environments. These uses may include food, medicines, fuel, shelter, in many cultures, and for religious ceremonies. The aim of ethnobotany is to document, describe and explain complex relationships between cultures and use of plants for food, clothing, currency, ritual, medicine, cosmetics etc across human societies (Acharya and Shrivastava, 2008). Ethnomedicine is a subfield of Ethnobotany that deals with the study of traditional medicines, especially, for those whose practice and knowledge has been orally passed down from generation to generation (Acharya and Shrivastava, 2008). Ethno-medicinal survey is very important in the continuous search for natural plant products as medicines (Ogbole *et al*., 2010), and remain one of the most successful criteria in finding new therapeutic agents by Pharmaceutical industries (Cox and Balick, 1994). Plants are significant sources of medicines used in the treatment of various categories of human diseases. The importance of medicinal plants, and the contribution of phytomedicine to the well-being of a significant number of the world's population, has attracted interest from a variety of disciplines (Prosper-Cabral *et al.*, 2007).

Plants have traditionally been used by Nigerians

because they are gotten from natural products, environmentally friendly, easily available, cheap and curative than many synthetic medicines imported into the country today. Matins (2013) reported that with the uncertainties of some orthodox medicines, herbal remedies have become a reasonable alternative of beneficial and efficient use compared to conventional modern medicines. There are considerable economic benefits in the development of indigenous medicines and the use of medicinal plants for the treatment of various diseases without exclusion to diabetes. *Diabetes mellitus* has been identified as the most common endocrine disorder that currently affects 200 million people of the world's population (Wais *et al*., 2012). 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). It 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), and is associated with reduced quality of life and increased risk factors for mortality and morbidity (Upendra-Rao *et al.,* 2000). This disease usually affects individuals over 40 years of age and it's often begins with high blood sugar and frequent urination (Tedong, 2006). Increased consumption of calory-rich diet, obesity and sedentary life style of this age group could cause 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. Akinkingbe *et al*. (1997) reported that not less than 1.05 million Nigerians were likely to be diabetic with only about 225,000 knowing about their condition, and with just about 198,000 receiving treatment. The high cost of available conventional diabetes drugs and their toxic side effects, resistance, coupled with conflicting efficacy in the recurrent immune compromised patients have made diabetes remain a major and continuous burden for researchers (Marx 2002). Hence, it becomes imperative to finding an effective trado-phyto-medicine with no side effects in order to proffer a solution towards healing and control of the spread. Hence, the intention of this study was to collect and document such knowledge of plants species used for the treatment before such rich heritage are lost. However, the present work is aimed at achieving the following objectives:

Methodology

Study area

The study was carried out in Kaduna metropolis consisting of Kaduna-North, Kaduna-South, part of Chikun and Igabi Local Government Areas of Kaduna State. Kaduna is located between 10°36' 33.5484" N and 7°25' 46.2144" E of the prime meridian. The state shares boundary with Abuja, the Federal Capital Territory to the Southern part. The climate varies from the North on to the Southern part of the state. The mean annual temperature varies between 24^{0}C and 25^{0}C, length of rain varies from 150days to 190days with an annual rainfall ranging between 1500mm and 2000mm North and South respectively. Relative humidity ranges between 20% and 40% in July, and vegetation divided into the northern guniea savannah in the North and southern guinea savannah in the South.

Data Collection

Primary data was used for the study. The data was collected with the use of a structured questionnaire. The questionnaires were administered to the respondents by personal interviews and responses recorded.

Sampling Techniques

Two-stage sampling technique was employed in the selection of sample communities in Kaduna Metropolis. In the first stage, purposive selection of four (4) communities was based on the concentration of the trado-medical practitioners. The communities are Tudun wada, Kawo, Mando and Kaduna Central Market. The second stage involved random sampling of fifteen (15) herbal medical practitioners in each of the selected communities, making a total of sixty (60) respondents.

Method of Data Analysis

Simple descriptive statistics was used for the analysis of information retrieved from the herbal practitioners on the ethno-medicinal remedy of diabetes in the study area. The simple descriptive statistics used include; mean percentage, frequency distribution table, chart, etc.

Results and Discussion

Socio- Economic Characteristics of the Respondents

Table 1 describes the socio-economic characteristics of the respondents. The study reveals that 72.4% of the respondents are males, while 27.6% were females. The reason for the high number of male respondents in the surveyed population could be that they were usually closer to their parents and inherited the trait than their female counterparts this accessing more knowledge of the use of ethno-medicinal plants than the females. Sequel to this, ethno-medicinal knowledge was normally transferred from parents to their off-springs. This is common practice with most descents Africans who prefer to pass on their inheritance to the male children. This is with no exemption with the knowledge acquisition in ethno-medicinal methods of healing diabetes. Age distribution of the respondents reveals that many (48.3%) are between ages of 41-50 years, followed by 31-40 years representing 41.4% of the respondents in the selected population. About 6.9% of the respondents were between the ages of 20-30 years, while 3.4% were aged between 51-60 years old. Age parameter in the study was observed to influence their level of experience relating to ethno- medicinal management of diabetes in the study area. We can deduce from the study that age plays a significant role with the level of experience in the management and treatment of diabetes. Many of the respondents (43.1%) had secondary school education, 22.4% primary school,

20.7% tertiary institution and only 13.8% had no form of formal education. This means that majority of the herbal practitioners are literate, though with a low educational level, this was not a determinant for their knowledge of the use of plants for managing diabetes. This may be true since majority learnt by experience and inheritance from their parents and old relatives. Four major occupations identified with the trado- medical practitioners in the study area include: civil servants, artisans and farmers (17.2% each), and traders (48.3%). This implies that majority of such traders have the requisite experience in the preparation of the medicine for sale, while supporting a major part of their livelihood through the sale of phyto- medicine.

Knowledge of application and storage of diabetes herbal medicine

The knowledge of application and storage of diabetes herbal remedies is presented in Table 2. The dosage based on the gradation was taken with the means of tea spoon and glass-cup etc. About 12.1% of the respondents specified the use of the tea-spoon, while 87.9% indicated the use of glass-cup. Although, the gradation depends on the types of phyto-medicine, solvent used and the personal characteristics of the respondents. The dosage in terms of number(s) of time per intake per day required for the identified species was determined with least respondents stating once per day (5.2%), those that specified twice per day represented 29.3% of the respondents, and thrice per day 65.5%. Hence, we deduce that the management of diabetes requires consistency in the intake of its medication. The curative periods for the ailment were also reviewed from the respondents and were classified as; more than two weeks representing (74.1%), and 12.1% between 1-2 weeks. We deduce that a lot of time could be taken for herbal plants to cure diabetes on the long run. The storage methods for prepared herbs used in the treatment of diabetes was assessed, 79.3% perceived that the liquid extract from the identified plants could best be packaged in air-tight bottle or rubber and preserved in refrigerators, while 20.7% perceived that the dried blended or prepared powdered herbs could be wrapped and packaged in paper and preserved in cool dry environment. Expiration period of the diabetes herbal remedy is usually less than one month according to 53.4% of the respondents, while 27.6% specified between 1-2 months, 13.8% between 2-4 months, it was also observed that the shelf-life of the herbs used for the treatment of diabetes is short. However, a proper storage is required to enhance its effectiveness for a longer period. The factors affecting the storage of the diabetes herbal remedy include; rainfall, which represents 10.3% according to the respondents, 50.9% identified temperature, 27.6% as humidity.

Problems/Constraints associated with the production and administration of herbs used for the management of diabetes

The problems associated with the collection and administrations of herbal medicine used in the management of diabetes in the study area are presented in Table 3. Source of herbs showed that 48.3% of the respondents obtained most of their herbs from the natural forest, 8.6% from home garden and 6.9% from government reserve. Based on the survey, it was deduced that the forest plays host to a lot of practitioners due to the abundances and diversity of plant species availability in natural forest and are sufficiently sourced by the practitioners. Spencer (1998) and Manikandan *et al*. (2011) reports that sacred groves are one of the means of conserving biodiversity and thus play an important role in protecting native species, giant trees, lianas, shrubs and it is a treasure house of threatened and medicinal plants. It also acts as a gene bank for economic species and laboratory for environmentalists. Scientific reports also confirm the fact that sacred groves protect a variety of flora and fauna (Ray and Ramachandra, 2010). Various traditional approaches to conservation of nature require a belief system which includes a number of prescriptions and proscriptions for restrained resource use (Gadgil and Berkes, 1991). Those sourced from the home garden (8.6%) was lower when compared to the forest (48.3%). This was due to lack of space (land) to grow the plant species, therefore domestication should be encouraged in this regard**.** The problems faced by practitioners during the collection of herb include; scarcity (32.8%), over harvesting (25.9%), competition (13.8%), fire (8.6%), high cost of harvest (12.1%) and extinction (6.9%). It was observed that majority of the respondents perceived scarcity of medicinal plant species as the major problem faced in the collections of herbs in the study area. This could result from over harvesting and concentration of people (practitioners) on the cheap source of the materials either from the natural forest or elsewhere. Since the forest is in the wild. The pressure on the natural resource is beyond its resilience and as such leads to the scarcity of herbs. The problems of administration of herbs are presented in Table 4. The identified problems include; dosage and gradation representing (50%), marketing and patronage problem (24.1%), low enforcement agents (19.0%), while problems associated with the scientific basis for the medicine represents 5.2% and others 1.7%. Graduation and dosage are expressed in terms of the variability of potency of the constituent's mixture, different body system, genetic make-up and the extent of the ailment which cannot be regulated by the practitioners; hence, there was no standard method of measurements. On the basis of law enforcement, these practitioners ought to register under one or some of these health organizations as the human life is valuable and irreplaceable and as such the need for a coordinated supervision and inspection from reputable bodies to regulate their activities. The components of ethno-medicine have long been ignored for its chemical composition, dosage and toxicity of the plants used in ethno-medicine which are not clearly defined. It was based on this opinion that a lack of standardization, precision on dosage and quality control was seen as a main disadvantage of traditional medicine. This result is supported by Thillaivanan and Samraj (2014), WHO (2005) and Sahoo *et al*. (2008). Some suggested means of enhancing the availability of the herbs (Table 3)

which includes domestication (22.4%), cultivation with agric crops (13.8%), protection in their natural environment (12.1%) and cultivation in home garden (10.3%).

Identification and classification of Plants species in the management of diabetes in the study area

Table 4 presents the identified trees species used in the management of diabetes in the study area. Forty nine (49) plants species were identified and utilized in the management of diabetes in the study area. Each identified species occupied different frequency which makes their percentages dissimilar as exemplified in the table. *Azadirachta indica* which belong to the family of Meliaceae represent the major species (8.74%) of the plants used in the management of diabetes in the study area. This was followed by *Venonia amigdalina* (6.64%), and *Mangifera indica* (6.29%). Other plants identified for the management of this ailment include;*Allium sativum* and *Allium cepa* which belongs to the family Amaryllidaceae (4.90% and 2.45% respectively). *Citrus auriatum* and *Murraya koinigii* belongs to the family Rutaceae represents 5.94% and 2.45% respectively, *Zingiber officinale* (5.94%), *Cocciana indica* and *Aframomum melegueta* (0.70% each). *Cucumis sativas, Citrusllus vulgaris* and *Cocciana indica* all belong to the family of Cucurbitaceae representing 1.40%, 1.05% and 2.45% respectively.

Pakia biglobosa, Acacia nilotoca and *Acacia Senegal* belongs to the family Fabaceae represent 1.75%, 1.05%and 1.40% of the surveyed plants species used for the management of diabetes. *Moringa oliefera* is a species under the family of morigaceae and represents 3.15% of the plants species used for the management of this ailment in the study area. In addition, *Azadirachta indica* belongs to the family Meliacea with *Khaya senegalensis* also representing 1.75% of the population. *Habiscus canabinus* and *Adasonia digitata* represents 1.5% and 3.15% of the plants surveyed for the management of diabetes in Kaduna metropolis**.** Other plants identified and discussed in terms of their percentage representation in the study area are shown in Table 4, they include: *Annona sensgalensis* and *Annona squamosa* both belong to the family Annonaceae, were identified by 1.40% and 1.05% of the respondents for the management of *diabetes mellitus* (DM). *Vitex doniana* (African black plum) belongs to the family Vernenaceae and account for 1.40% of the plants identified by the respondents for the management of diabetes. Other plants species identified in the study include; *Daucas carota, Hypoxis hemerocauidia, Virteleria paradosa, Anisopus mannii, Anacadium occidentale, Junlan regia, Pillostigma reticulentum* and others as found in the table. We deduce from the result that phyto-medicine play significant role in the treatment of diabetes in the study area. The result agrees with report of Ajaiyeoba *et al*. (2006) that herbal medicine is known to play an important role in diabetic therapy, particularly in the developing countries where most people have limited resources and do not have access to modern treatment.

Identified plants, parts used, method of preparation, utilization, administration and dosage

Table 5 presents the plants parts used in the management of diabetes, methods of utilization, administration and dosage for phyto-remediation of diabetes. All the plant species identified are presented alongside their methods of preparation and administration for management of diabetes. Several methods of preparation were accounted for, they include; boiling, squeezing, pounding into powder, soaking in water and alcohol, cooking, grinding etc. The methods of preparation identified differs with the type of plant species and the plant part used. Moreover, the parts of plants used for the remediation of this disease were determined concomitantly based on their methods of preparation. The plants parts used include; bark and leaves for *Azadirachta indicia*, leaves of *Vernonia amigdalina* which was squeezed and drank orally with a full glass cup twice per day. *Allium sativum* commonly known as Gallic, the bulb parts was pounded and the extract was drank at one tea spoon twice per day. Though, this was dependent on the age, physiological stage and the intensity of the illness. *Citrus aurantium* commonly known as Bitter orange, with the ripe fruit squeezed, with the juice extracted and taken at a glass cup (shot) twice per day. Though, this was normally mixed with honey. *Mangifera indica* (Mango), the bark and leaves can be boiled and drank at one glass cup thrice per day. *Zingiber officinale* roots could also be prepared by boiling and its method of administration was reported as drinking with a dosage of one glass cup twice per day. *Cocciana indica* (Little guard), the fruit and seed being soaked in water for one day with the dosage also dependent on the factors earlier mentioned such as, age, physiological development and intensity of the illness or ailment. *Murraya koenigii* and *Allium cepa* commonly known as curry and onion respectively, can be cooked as condiment and serve very effective. *Moringa oliefera* is consumed by boiling the leaves or squeezing the leaves. The extract is very effective when taken rightly at a recommended dosage of one cup twice daily after boiling, while the extract of its squeezed leaves could be taken with a Tea spoon thrice/ day. *Khaya senegalensis*, *Viterleria paradoxa*, *Musa spp*, *Vitex doniana*, *Pakia biglobosa* and *Anacadium occidentale* can be prepared by boiling their roots, bark and leaves and drank with a full glass cup thrice daily for *Khaya senegalensis* and *Moringa oliefera*, while for others, twice daily. The same pattern of preparation and administration can be applied to species such as; *Artrocapus cummunis* (Roots), *Fiscus spp* (Leaves), *Millicia excelsa* (Bark) by grinding to powder form, *Crinum arantum* (Bulb) by boiling and grinding, *Sesanum indicum* (Bark) boiling, *Acacia sensga* (Bark) boiling, *Caralluma retrospiciences* (Leaves), *Aframomum melegueta* (Seeds) by pounding and boiling once daily. *Aristiolocria ringens* (Roots) prepared by boiling, *Zea mays* (Leaves) can be boiled and taken one glass cup thrice per day, while that of *Asclepias syriaca* commonly known as Milkweed (leaves) are also used in

the same pattern like *Zea mays* but its dosage is twice daily. The usage and methods of administration of other plants species identified for the phyto-management of diabetes as reported in Table 5 infer that various products are being prepared from plants for the treatment and management of diabetics. Meanwhile, their methods of preparation may be dissimilar.

Conclusion

The study revealed that different plants species are used for the treatment of diabetes. However, present knowledge on medicinal uses of these plants needs further scientific investigation to confirm their medicinal efficacy in terms of the gradation and dosage. It was observed from this study that majority of the traditional healer (practitioners) of diabetes got their knowledge through inheritance from their parents and the elderly in their communities, hence, have little or virtually no modification added to the old and crude methods in the preparation and administration of these herbs. There was high pressure on the forest plants with high medicinal values. Thus there is decisive need for the cultivation and conservation of all these species. Research should therefore, be intensified upon in terms of the corresponding dosage in the phyto-remedy of diabetes and other deadly ailments. Gradation must be ascertained for the ethno-medicinal management of diabetes and other ailments depending on the gravity, age group of affected individuals and their physiological status. There should be coordination between government agencies and the herbal organizations in the rural communities to enhance proper utilization of the medicinal plant resources. Also, there is need for government intervention in the area of sensitization and financial assistance such as grants and low interest loan to support the poor trado-medical practitioners to upgrade their local method of preparation, packaging, storage and administration of their medicines to modern methods as applicable in the developed world.

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Table 1: Socio- Economic Characteristics of the Respondents

Variables	Frequency	Percentage (%)
Gender		
Male	42	72.4
Female	16	27.6
Age Group		
20-30	4	6.9
31-40	24	41.4
41-50	28	48.3
51-60	2	3.4
Educational Status		
Non formal education	8	13.8
Primary education	13	22.4
Secondary education	25	43.1
Tertiary education	12	20.7
Major occupation		
Civil servant	10	17.2
Artisan	10	17.2
Trader	28	48.3
Farmer	10	17.2
Religion		
Christian	25	43.1
Muslim	31	53.4
Traditionalist	2	3.4
Total	**58**	**100**

Source: Field survey, 2018

Table 2: Knowledge of the management of Diabetes using Herbal plants

Variables	Frequency	Percentage (%)
Means for drinking		
Tea spoon	7	12.1
Glass cup	51	87.9
Gradation per Day		
Once per day	3	5.2
Twice per day	17	29.3
Thrice per day	38	65.5
Duration of curing the ailment		
2 Days	1	1.7
2-5 Days	2	3.4
1 Week	5	8.6
1-2 weeks	7	12.1
2 week and above	43	74.1
Storage methods		
Wrapped in paper	12	20.7
Keep in bottle	46	79.3
Expiration period		
Less than 1 month	31	53.4
1-2 months	16	27.6
2-4 months	8	13.8
5-7 month	2	3.4
11 and above month	1	1.7
Factors affecting storage		
Rainfall	6	10.3
Temperature	33	56.9
Wind	3	5.2
Humidity	16	27.6
Total	58	100

Source: Field survey, 2018

Table 3: Problems associated with the production and administration of herbs used for the management of diabetes

Variables	Frequency	Percentage (%)
Source of the herbs		
Home garden	5	8.6
Own farm land	21	36.2
From the forest	28	48.3
From government reserve area	4	6.9
Problems of collection		
Competition	8	13.8
Over harvesting	15	25.9
Fire	5	8.6
Extinction	4	6.9
Scarcity	19	32.8
High cost of harvest	7	12.1
Problems of administration		
Law enforcement agent	11	19.0
Problem Graduation and dosage	29	50.0
Problem Scientific basis for medicine	3	5.2
Marketing and patronage	14	24.1
Specify others	1	1.7
Means of enhancing the availability of the herbs.		
Domestication	28	48.3
Protection in their natural environment	7	12.1
Cultivation in home garden	15	25.9
Cultivation with Agricultural crops	8	13.8
Total	58	100

Source: Field survey, 2018

Table 4: Identification and classification of Plants species in the management of diabetes in the study area

Scientific Name	Family Name	Common Name	Hausa Name	Frequency	Percentage (%)
Azadirachta indica	Maliaceae	Neem	Dogon yaro	25	8.74
Khaya senengalensis	Maliaceae	Khaya	Madaci	5	1.75
Allium sativum	Amaryllidaceae	Galic	Tafarnuwa	14	4.90
Allium cepa	Amaryllidaceae	Onion	Albassa	7	2.44
Crinum ornatum	Amaryllidaceae	Crimum	Albasan kura	1	0.35
Cola acuminate	Malvaceae	Cola nut	Goro	11	3.85
Hibiscus canabinus	Malvaceae	Kenaf	Rama	3	1.05
Adansonia digitata	Malvaceae	Baobab	Kuka	9	3.15
Pillostigma reticuletum	Malvaceae	Pterospermum	Kalgo	3	1.05
Mangifera indica	Anacardiaceae	Mango	Mangoroo	18	6.30
Anacadium ocidentale	Anacardiaceae	Cashew	Kanjuu	3	1.05
Acacia nilotica	Fabaceae	Acacia	Bugaruwa	5	1.75
Acacia Senegal	Fabaceae	Gum acacia	Dukwaraa	4	1.40
Pakia Biglobosa	Fabaceae	Locust tree	Doruwa	3	1.05
Annona Senegalensis	Annonaceae	Africa apple	Gwandar daji	4	1.40
Anonna squamosa	Annonaceae	Apple	Toffa	3	1.05
Cucumis savivas	Cucurbitaceae	Cucumber	Kokumba	4	1.40
Citrusllus vulgaris	Cucurbitaceae	Water melon	Kankana	3	1.05
Cocciana indica	Cucurbitaceae	Little guard	Bimba	7	2.4
Fiscus sp	Moraceae	Jarwa	Jarwa	3	1.05
Artocarpus communis	Moraceae	Bread Fruits	Bara	4	1.40
Fiscus bengalensis	Moraceae	Bayan tree	Bayan	3	1.05
Milicia excels	Moraceae	African teak	Iroko	4	1.40
Anisopus mannii	Apocynaceae	Dogbane	Kasha zaki	2	0.70
Asclepias syriaca	Apocynaceae	Milkweed	-	1	0.35
Caralluma retriospicins	Apocynaceae	Moure	Ekuwa	4	1.40
Zingiber officinale	Zingibaraceae	Ginger	Citta	17	5.94
Curcuma longe	Zingibaraceae	Turmeric	Majina	2	0.70
Aframomun melegueta	Zingibaraceae	Alligator pepper	Barkono/cita	2	0.70
Citrus aurantium	Rutaceae	Bitter orange	Lemun tsami	17	5.94
Murraya koenigii	Rutaceae	Curry	Kori	7	2.44
Sesamum indicum	Pedalliaceae	Sesame seed	Noni	1	0.35
Cyperus esculentus	Cyperaceae	Nut grass	Bakar	2	0.70
Zea mays	Poaceae	Maize	Masra	2	0.70
Aristolochia ringens	Arsitolochiaceae	Dutchman pipe	-	2	0.70
Ocimum basilicum	Lamuaceae	Basil	-	8	2.80
Vernonia amygdalina	Asteraceae	Bitter leaf	Shuwakaa	19	6.64
Psidum guajava	Myrtaceae	Guava	Gwaba	4	1.40
Carica papaya	Caricaceae	Pawpaw	Gwanda	5	1.75
Moringa oleifera	Moringaceae	Moringa	Zaugale	9	3.15
Aleo barbedensis	Asphodelacea	Aleo vera	Aleo vera	6	2.10
Vitex dominana	Verbenaceae	Black plum	Dunya	4	1.40
Daucas carota	Apiaceae	Carrot	Karoti	5	1.75
Musa sp	Musaceae	Banana	Ayaba	5	1.75
Hypoxis hemerocavidia	Hypoxidaceae	Africa potato	-	3	1.05
Vitelleria paradoxa	Sapotaceae	Shea butter	Kadanya	5	1.75
Junglans regia	Jungladaceae	Walnut	-	2	0.70
Terminalia macroptera	Combretaceae	Kwandari	Kalangon daji	3	1.05
Panex ginseng	Araliaceae	Ginseng	-	3	1.05
			Total	**286**	**100%**

Table 5: Identified plants, parts used, method of preparation, utilization, administration and dosage

Botanical Name	Family Name	Common Name	Hausa Name	Parts Used	Method of Preparation	Route of Administr-ation	Method of Administration	Dossage/Quantity	Dosage /Day
Azadirachta indica	**Meliaceae**	**Neem**	**Dogon yaro**	Bark & leaves	Boiling	Oral	Drinking	Glass Cup	Thrice/day
Vernonia amigdalina	**ASteraceae**	**Bitter leaf**	**Shiwaka**	Leaves & stem	Squeezing	Oral	Drinking	Glass Cup	Twice/day
Allium sativum	**Amaryllidaceae**	**Gallic**	**Tafarnuwa**	Bulb	Pounding into powder	Oral	Drinking	Glass Cup/ Tea spoon	Twice/day
Citrus aurantium	**Anacadiaceae**	**Bitter orange**	**Lemun tsami**	Fruits	Squeezing	Oral	Drinking	Glass Cup	Thrice/day
Mangefera indica	**Rutaceae**	**Mango**	**Mangoro**	Bark & leaves	Boiling/soaking	Oral	Drinking	Glass Cup	Thrice/day
Zingiber officinale	**Zingiberaceae**	**Ginger**	**Citta**	Root	Boiling with water	Oral	Drinking	Glass Cup	Twice/day
Cola accuminata	**Malvaceae**	**Cola nut**	**Goro**	Fruits	_	Oral	Chewing	One fruit	Once/day
Cacciana indica	**Cucurbitaceae**	**Little gourd**	**Bimba**	Fruits & seed	Soaking in water	Oral	Drinking	Glass Cup	Twice/day
Murraya koenigii	**Rutaceae**	**Curry**	**Kori**	Leaves	Cooked	Oral	Eating	_	_
Allium cepa	**Amaryllidceae**	**Onion**	**Albassa**	Bulb	Cooked	Oral	Eating	_	_
Carica papaya	**Caricaceae**	**Pawpaw**	**Gwanda**	Leaves &bark	Boiling/soaking	Oral	Drinking	Glass Cup	Twice/day
Annona senegalensis	**Annonoceae**	**African apple**	**Gwandar daji**	Bark	Boiling	Oral	Drinking	Glass Cup	Thrice/day
Psidium guajava	**Myrtaceae**	**Guava**	**Gwaba**	Bark	Soaking in water	Oral	Drinking	Glass Cup	Twice/day
Ocimum basilicum	**Lamiaceae**	**Basil**	_	Bark	Soaking in water	Oral	Drinking	Glass Cup	Twice/day
Cucumis sativas	**Cucurbitaceae**	**Cucumber**	**Kokumba**	Fruits	_	Oral	Eating	_	One fruit/day
Acacia nilotica	**Fabaceae**	**Acacia**	**Bugaruwa**	Bark	Granding	Oral	Drinking	Tea spoon	Thrice/day
Adansonia digitata	**Malvaceae**	**Baobab**	**Kuka**	Bark	Soaking in water	Oral	Drinking	Glass Cup	Twice/day
Daucas carota	**Apiaceae**	**Carrot**	**Karas**	Fruits	_	Oral	Eating	_	Two fruits/day
Aleo barbedensis	**Asphodelaceae**	**Aloe Vera**	_	Leaves	Squeezing	Oral	Drinking	Glass Cup	Thrice/day
Moringa oleifera	**Moringaceae**	**Moringa**	**Zaugale**	Leaves	Granding/ Boiling	Oral	Drinking	Tea spoon	Thrice/day
Khaya	**Maliaceae**	**Khaya**	**Madaci**	Bark &		Oral	Eating &	Tea spoon	Twice/day

senegalensis				roots	Boiling		Drinking		
Vitelleria paradoxa	**Sapotaceae**	**Shea butter**	**Kadanya**	Bark	Boiling	Oral	Drinking	Glass Cup	Twice/day
Musa spp	**Musaceae**	**Banana**	**Ayaba**	Leaves	Boiling	Oral	Drinking	Glass Cup	Thrice/day
Vitex doniana	**Malvaceae**	**Black plum**	**Dunya**	Bark	Boiling	Oral	Drinking	Glass Cup	Twice/day
Pakia biglobosa	**Fabaceae**	**Locust tree**	**Dorowa**	Bark & Leaves	Boiling	Oral	Drinking	Glass Cup	Thrice/day
Anacadium occidentale	**Annacardiaceae**	**Cashew**	**Kanju**	Bark	Boiling	Oral	Drinking	Glass Cup	Twice/day
Anisopus mannii	**Apocynaceae**	**Dogbane**	**Kashe zaki**	Stem	Granding	Oral	Drinking	Glass Cup	Twice/day
Citrusllus vulgaris	**Cucurditaceae**	**Water melon**	**Kankana**	Fruits	_	Oral	Eating	_	One fruit/day
Hibiscus cannabinus	**Malvaceae**	**Kenaf**	**Rama**	Leaves	Boiling	Oral	Drinking	Glass Cup	Twice/day
Hypoxis hemerocavidia	**Hypoxidaceae**	**African potato**	_	Steem	Extract with water	Oral	Drinking	Glass Cup	Twice/day
Junglans regia	**Junglandaceae**	**Walnut**	_	Leaves & bark	Soaking in water	Oral	Drinking	Glass Cup	Thrice/day
Pillosptigma reticulentum	**Malvaceae**	**Pterospermum**	**Kalgo**	Leaves	Squeezing	Oral	Drinking	Glass Cup	Twice/day
Terminalia macroptera	**Combretaceae**	_	**Kalangon daji**	Bark	Granding	Oral	Drinking	Tea spoon	Twice/day
Panex ginseng	**Araliaceae**	**Ginseng**	_	Seed	Granding	Oral	Drinking	Tea spoon	Twice/day
Annona squamosa	**Annonaceae**	**Apple**	**Toffa**	Fruits &Leaves	Boiling	Oral	Drinking	Glass Cup	Thrice/day
Fiscus bangalensis	**Moraceae**	**Banyan tree**	_	Bark	Extract with water	Oral	Drinking	Glass Cup	Thrice/day
Artrocarpus cummunis	**Moraceae**	**Bread tree**	_	Roots	Boiling	Oral	Drinking	Glass Cup	Thrice/day
Fiscus spp	**Moraceae**	_	**Jarwa**	Leaves	Boiling	Oral	Drinking	Glass Cup	Twice/day
Milicia excels	**Moraceae**	**African teak**	_	Bark	Granding in to powder	Oral	Drinking	Tea spoon	Thrice/day
Cucurma longe	**Zingiberaceae**	**Turmeric**	**Majina**	Roots	Grinding & soaking in water	Oral	Drinking	Glass Cup	Thrice/day
Crinum ornatum	**Amaryllidaceae**	**Crinum**	**Albassan kura**	Bulb	Boiling & granding	Oral	Drinking	Glass Cup	Twice/day
Sasamum indicum	**Pedaliaceae**	**Sesame**	**Noni**	Bark	Boiling	Oral	Drinking	Glass Cup	Thrice/day
Cypenes esculentus	**Cyperaceae**	**Nut grass**	**Bakar**	Leaves	Squeezing	Oral	Drinking	Glass Cup	Thrice/day
Acacia Senegal	**Fabaceae**	**Gum acacia**	**Dukwaraa**	Bark	Boiling	Oral	Drinking	Glass Cup	Twice/day

Caralluma retrospiciences	**Apocynaceae**	**Maure**	_	Leaves	Boiling	Oral	Drinking	Glass Cup	Twice/day
Aframomum melegueta	**Zingiberaceae**	**Alligator pepper**	**Barkono/citta**	Seed & fruits	Pounding/boiling	Oral	Drinking	_	Once/day
Aristolochia ringens	**Aristolochiaceae**	**Gapping pipe**	_	Roots	Boiling	Oral	Drinking	Glass Cup	Once/day
Zea mays	**Poaceae**	**Maize**	**Masara**	Leaves	Boiling	Oral	Drinking	Glass Cup	Thrice/day
Asclepias syriaca	**Apocynaceae**	**Milk weed**	_	Leaves	Boiling	Oral	Drinking	Glass Cup	Twice/day

Source: Field survey, 2018