Medicinal Plants Used Traditionally in the Management of Diabetes: Ethno-medicinal Survey across Northwestern Nigeria

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Abstract: Diabetes mellitus is a chronic metabolic disorder characterized by hyperglycemia caused either by insulin deficiency, insulin resistance or both. The prevalence of diabetes and the cost of treatment are very high in Nigeria. To conduct a survey on medicinal plants used traditionally in the management of diabetes across the Northwestern Nigeria. A semi-structured questionnaire comprising of three sections was self-administered during the survey. Section A comprised of demographic information, section B the description of the medicinal plants, and section C professional experience of the respondents. Total of 196 respondents interviewed including 90 traditional medicine practitioners (TMPs), 47 herbalists, and 59 herb sellers. Majority of them were Hausa males and aged between 41-50 years. Most of the participants (85%) obtained their knowledge through inheritance with few (15%) received formal education. Total of 86 different medical plants with various claims in the treatment of diabetes were documented. These include 31 from Kano state, 19 form Katsina state, and 36 from Kaduna state. The most frequently reported medicinal plants were *Anisopus mannii*, *Leptadenia hastata*, *Vernonia amygdalina*, *Moringa oleifera*, *Eleusine coracana*, *Balanite aegyptiaca*, and *Tamarindus indica*. These were obtained from *Combretaceae*, *Moraceae*, *Euphorbiaceae*, *Aristolochiaceae*, *Fabaceae*, and *Solanaceae* families. Data obtained from this study indicated that a number of medicinal plants with various claims in the management of diabetes are available in the Northwestern Nigeria. This suggested that these medicinal plants can be source of bioactive molecules for drug development.

Keywords: Ethno-botany, Traditional, Herbalist, Medicinal, Plants, Diabetes.

Introduction

Traditional medicine practice (TMP) is described by the World Health Organization (WHO) as an occupation which involves the collection of knowledge, skills, and practices based on the theories, beliefs, and experiences of indigenous people on the use of medicinal plants. This practice is usually transmitted from one generation to another. In addition, it is linked to the culture of the people, tradition, religious and personal belief (Hudtohan and Zhang., 2022; Jalal and Bahaulddin, 2022; Adhikari and Paul, 2018). Generally, the practice of TM involves the use of plants, animals, or minerals for the prevention, diagnosis, and treatment of diseases, or for use in maintenance of wellbeing. Initially TM is confined to local people, but it is now upgraded, and practiced alongside western medicine (Tewari, 2020; Vecchiato, 2019; Ozioma and Chinwe, 2019).

Worldwide TM is popularly known as complementary or alternative medicine. Countries with an advanced TMP include China, India, and a number of African countries (Tewari, 2020; Vecchiato, 2019; Ozioma and Chinwe, 2019). Consequently, the most popular TMP across the globe include Chinese medicine, European traditional medicine, Korean traditional medicine, African traditional medicine, Siddha medicine, Unani, Ayurveda, Iranian traditional medicine, and Islamic medieval medicine (Emiliano et al., 2022; Jalal and Bahaulddin, 2022; Adhikari and Paul, 2018). Typical examples of herbal medicines include the herbs, herbal materials, herbal preparations, and finished herbal products that contain either plants parts alone or in combination of other natural products (Tewari, 2020; Vecchiato, 2019; Ozioma and Chinwe, 2019).

Ethno-botany is the study of the relationship between indigenous people and their floral environment. It involves the knowledge of cultivation, classification, and of use of plants as medicine, food, or shelter (Balick and Cox 2020; Hoffman B and Gallaher, 2007). This field is multidisciplinary with several sub-branches such as ethnoforestry, ethnoecology, ethnotaxonomy, ethnopharmacology, ethnomedicine, ethnogynaecology, ethnopadiatrics, and ethnotoxicology. Ethno-botany has significantly contributed to drug discovery from medicinal plants (Ishtiaq et al., 2022; Leonti, 2022; Tresina et al., 2022; Agrawal, 2018; Popović et al., 2016; Heinrich, 2000). Overall, ethno-medicinal survey forms the basic foundation of understanding of medicinal plants and their pharmacological activities. And the knowledge acquired during ethno-medicinal survey marked the beginning of modern science of drug discovery from medicinal plants (Saraçi and Damo, 2021; Petran et al., 2020; Picking et al., 2015).

A number of ethno-medicinal surveys have been conducted on medicinal plants used traditionally in the management of diabetes across the northwestern Nigeria (Odoh et al 2023; Ogunkalu et al., 2022; Abubakar et al., 2021; Abubakar et al., 2017; Shinkafi et al., 2015). Knowing that diabetes is a very common disease in Nigeria, this survey was expanded to cover three states and reported the most robust data on the use of medicinal plants traditionally in the treatment of diabetes across Northwestern Nigeria.

Materials and Methods

Study Population

This study was conducted among the population of TMPs, herbalists, and herb sellers across Kano, Katsina and Kaduna states.

Study Area

i. Kano State: Is located in the north-western region of Nigeria. It shares border with Katsina state to the north, Bauchi state to the south, Jigawa state to the east and Kaduna state to the west (Figure 1). Kano State is located between Latitude 130º N and 110º S, and Longitude 80º W and 100º E. It also has a mean height of about 472 m above sea level and covers 20,131 km² (Abubakar et al., 2023). In addition, the state has a total of 44

FUW Trends in Science & Technology Journal, www.ftstjournal.com
e-ISSN: 24085162; p-ISSN: 20485170; April, 2025: Vol. 10 No. 1 pp. 238 – 248

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local government areas with total population of 18.08 million (Abubakar et al., 2022). The TMPs, herbalists, and herb sellers are found in large numbers in Kurmi market; Sabon Gari market; Abubakar Rimi market; Hajj Camp Traditional Medicine Trade Fair; and few other locations dispersed within residential areas.
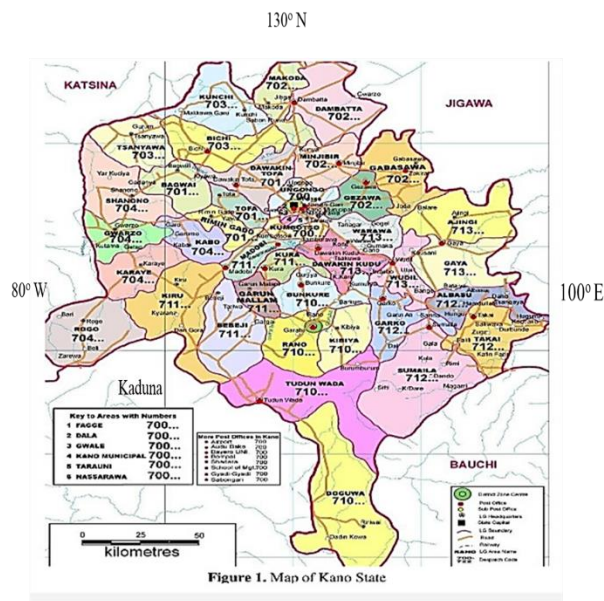

Figure 1. Map of Kano State, Nigeria (Source: Abubakar et al., 2023).

ii. Katsina State: Is located in the north-western region of Nigeria. Katsina state shares border with Niger Republic to the north, Kaduna state to the south, Kano and Jigawa states to the east and Zamfara state to the west (Figure 2) (Abubakar et al., 2023). Katsina state is located between Latitude 11°08′N and 13°22′N, and Longitude 6°52′E and 9°20′E. It also has a mean height of about 503m above sea level and covers 23,938 km². In addition, the state has a total of 34 local government areas with total population of 7,831, 319 million (Abubakar et al., 2023). The TMPs, herbalists, and herb sellers are found in large numbers in the major markets, including Katsina Central market, Chake market, 'Yar kutungu market, Central mosque, and Makera Jabiri location.
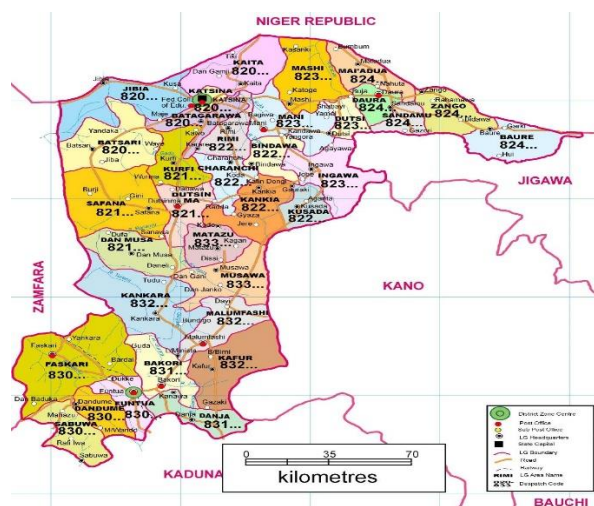

Figure 2. Map of Katsina state, Nigeria (Abubakar et al., 2023).

iii. Kaduna State: Is located in the north-western region of Nigeria. Kaduna state shares border with Kano and Katsina state to the north, Federal Capital Abuja and Nasarawa state to the south, Plateau state to the east, Niger and Zamfara states to the west (Figure 3) (Abubakar et al., 2023). Kaduna state is located between Latitude 10º 38'N and 10º 25' N, and Longitude 7º 22'E and 7º 32 E. It also has a mean height of about 645 m above sea level and covers 45,061 km². In addition, the state has a total of 23 local government areas with total population of 10,578,000 million (Abubakar et al., 2023). The TMP, herbalists, and herb sellers are found in large numbers in the major markets, including Kasuwar Barci market, Kawo market, Sabon Tasha market, Kabala costain market, Badarawa market, Kakuri market and Zaria city market.
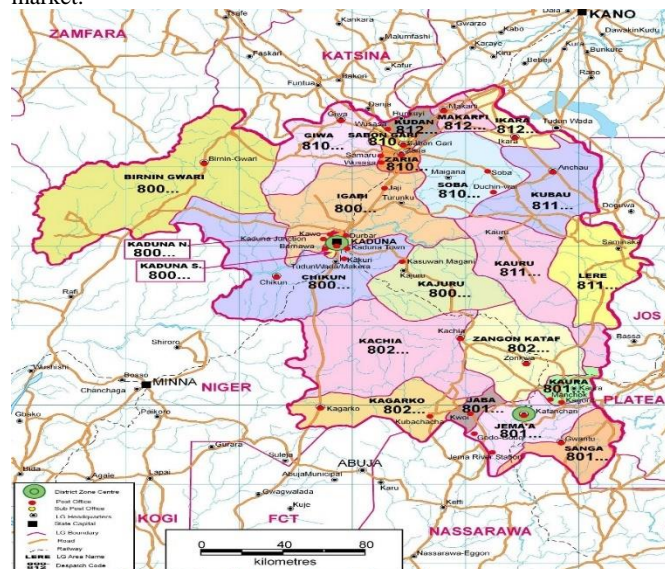

Figure 3. Map of Kaduna State, Nigeria (Abubakar et al., 2023).

Study design

A cross sectional survey was conducted among the population of TMPs, herbalists, and herb sellers. The study was conducted using a semi-structured questionnaire adopted, and validated from an earlier study (Shehu et al., 2014).

Ethical approval

Ethical clearance was obtained from the ethical committee of the College of Health Sciences, Bayero University, Kano. **Ref No: BUK/CHS/REC/116.**

Questionnaire

The survey tool used was a semi-structured questionnaire comprising of three sections. Section A was demographic information, section B was about the description of the medicinal plants. Section C comprised of professional experience of the respondents.

Data collection

The data was collected by self-administering the questionnaire to the TMPs, herbalists and herb sellers.

Data analysis

Descriptive statistics carried out and the result was presented as frequencies and percentages. This is analysis done using the Statistical Package for Social Sciences (SPSS®), version 26.0.

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e-ISSN: 24085162; p-ISSN: 20485170; April, 2025: Vol. 10 No. 1 pp. 238 – 248

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Variable	Category	Kano (n=90) N (%)	Katsina (n=47) N (%)	Kaduna (n=59) N (%)
Type of Practice	TMPs	51 (57)	25 (53)	41 (69)
	Herbalists	28 (31)	16 (34)	13 (22)
	Herb sellers	11 (12)	6 (13)	5 (19)
Gender	Male	74 (82)	37 (79)	40 (68)
	Female	16 (18)	10 (19)	19 (32)
Age (years)	Less than 31	12 (13)	4 (9)	7 (12)
	31-40	21 (23)	10 (21)	18 (30)
	41-50	45 (50)	23 (49)	20 (34)
	> 50 years	12 (14)	10 (21)	14 (24)
Tribe	Hausa	55 (61)	33 (70)	40 (68)
	Yoruba	26 (29)	8 (17)	12 (20)
	Igbo	3 (3)	2 (4)	3 (5)
	Others	6 (7)	4 (9)	4 (7)
Religion	Islam	84 (93)	42 (89)	41 (69)
	Christianity	6 (7)	5 (11)	18 (31)
Nationality	Nigerian	86 (96)	45 (96)	55 (93)
	Non-Nigerian	4 (4)	2 (4)	4 (7)

Results and Discussion

Demographic Information

During the ethno-medicinal survey total of 196 participants were interviewed. These includes 90 from Kano state, 47 from Katsina state, and 59 from Kaduna state. The respondents from Kano state include 51 (57%) TMPs, 28 (31%) herbalists, and 11 (12%) herb sellers. In Katsina state 25 (53%) were TMPs, 16 (34%) herbalists, and 6 (13%) herb sellers. In Kaduna state include 41 (69%) TMPs, 13 (22%) herbalists, and 5 (19%) herb sellers. Also, the majority of the participants from Kano state 74 (82%) males, and 16 (18%) females. In Katsina state, 37 (79%) were males, and 10 (21%) were females. In Kaduna state 40 (68%) were males, and 19 (32%) females. Participants from Kano state 12 (13%) were less than 31 years, 21 (23%) aged 31-40, 45 (50%) aged 41-50, and 12 (14%) aged above 50 years. In Katsina state, 4 (9%) aged less than 31 years, 10 (21%) aged 31-40, 23 (49%) aged 41-50, and 10 (21%) aged above 50 years. In Kaduna state, 7(12%) aged less than 31 years, 18 (30%) aged 31-40, 20(34%) aged 41-50, and 14 (24%) aged above 50 years. In addition, among the participants from Kano state, 55 (61%) were Hausa tribe, 26 (29%) Yoruba, 3 (3%) Igbo, and then 6 (7%) others. In Katsina state, 33 (70%) were Hausa, 8 (17%) Yoruba, 2 (4%) Igbo, and then 4 (9%) others. Also in Kaduna state, 40 (68%) were Hausa, 8 (20%) Yoruba, 3 (5%) Igbo, and then 4 (7%) others. In Kano state 84 (93%) of the participants were Muslims, and 6 (7%) Christians, in Katsina state 42 (89%) were Muslims and 5 (11%) Christians, and Kaduna state 41 (69%) were Muslims and 18 (31%) Christians (Table 1).

Table 1: Demography of respondents

In Kano state, markets surveyed include Kurmi market, Abubakar Rimi market Sabon Gari market, Hajj Camp Trade Fair, and others. In Katsina state, the markets visited include Katsina Central market, Chake market, 'Yar kutungu market, Central Mosque area, and Makera Jabiri. In Kaduna state, locations surveyed include Kasuwan Barci market, Kawo market, Kakuri market, Zaria city market Sabon Tasha, Kabala costain, and Badarawa. The number of respondents obtained from each market were described below, (Table 2).

State	Kano (n=90)	Katsina (n=47)	Kaduna (n=59)
Location	Kurmi Market	Katsina Central Market	Kasuwar Barci Market
	Abubakar Rimi Market	Central Mosque Market	Kakuri Market
	Sabon Gari Market	Makera Jabiri Market	Zaria City Market
	Hajj Camp Trade Fair	Chake Market	Kawo Market
	Others	Others	Kabala Costain Market

Table 2: Respondent based on locations visited in each state

Professional Experience of the Respondents

During the survey most of the participants from Kano state got their knowledge of TM through inheritance 65 (72%), inheritance plus formal training 12 (13%), training alone 9 (10%) and divination 4 (5%). In Katsina state, 31 (66%) inherited the practice, inheritance plus formal training 8 (17%), training alone 6 (13%), and divination 2 (4%). In Kaduna state, 40 (68%) inherited the practice, inheritance plus formal training 10 (17%), training alone 7 (12%), and divination 2 (3%). The primary sources of medicinal plants in Kano was forest 64 (71%), home gardens 9 (10%), and 17 (19%) purchased from markets. In Katsina 32 (68%) were obtained from forest, 10 (21%) from home gardens, and only 5(11%) purchased from markets. In Kaduna state, 37 (63%) of the medicinal plants were from forest, 13 (22%) from home gardens, and 9 (15%) purchased from markets. In Kano state, Majority 68 (75%) stated that their medicine has no side effect, however 15 (17%) reported nausea and vomiting. In Katsina state 32 (68%) mentioned no side effects, but 9 (19%) mentioned nausea and vomiting. Lastly, in Kaduna state 40 (68%) revealed no side effects, while 14 (24%) mentioned nausea and vomiting. The method of preparation of the medicinal plants used in Kano include decoction 61 (68%), maceration 17 (19%), and infusion 12 (13%). Also, Katsina state employed decoction 36(77%), maceration 7(15%), and infusion 4(8%). Kaduna state participants used decoction 38 (64%), maceration 13 (22%), and infusion 8 (14%) (Table 3).

Table 3: Professional experience of respondents

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e-ISSN: 24085162; p-ISSN: 20485170; April, 2025: Vol. 10 No. 1 pp. 238 – 248

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State		Kano (n=90)	Katsina (n = 47)	Kaduna (n= 59)
Variables	**Specification**	**N (%)**	**N (%)**	**N (%)**
Frequency of treatment	Regular	81 (90)	43 (91)	54 (92)
	Irregular	9 (10)	4 (9)	5 (8)
Duration of treatment (days)	2-3	7 (8)	5 (11)	12 (20)
	4-5	21 (23)	8 (17)	10 (17)
	6-14	62 (69)	34 (72)	37 (63)
Other treatment apart from herbs	Divination/incantation	4 (4)	3 (6)	5 (8)
	None	86 (96)	44 (94)	54 (92)
Source of knowledge	Ancestral	65 (72)	31 (66)	40 (68)
	Training	9 (10)	6 (13)	7(12)
	Ancestral/Training	12 (13)	8 (17)	10 (17)
	Divination	4 (5)	2 (4)	2 (3)
Availability of plant/ plant parts	Forest	64 (71)	32 (68)	37 (63)
	Home garden	9 (10)	10 (21)	13 (22)
	Market	17 (19)	5 (11)	9 (15)
Accompanied side effects	Nausea/vomiting	15 (17)	9 (19)	14 (24)
	Others	7 (8)	6 (13)	5 (8)
	None	68 (75)	32 (68)	40 (68)
Accompanied verbal instructions	Yes	90 (100)	47 (100)	59 (100)
Method of Preparations	Decoction	61 (68)	36 (77)	38 (64)
	Maceration	17 (19)	7 (15)	13 (22)
	Infusion	12 (13)	4 (8)	8 (14)

Medicinal Plants Reported from each State

During the ethno-medicinal survey total of 86 different medicinal plants with various claims in the management of diabetes were documented. These include 31 from Kano state (Table, 4), 19 from Katsina, (Table, 5), and 36 from Kaduna state (Table, 6). The most frequently reported medicinal plants from Kano state include *Anisopus mannii* 23(16%), *Leptadenia hastate* 14 (10%), *Vernonia amygdalina* 12 (9%), *Moringa oleifera* 8 (6%), *Eleusine coracana* 6 (4%), and *Tamarindus indica* 5 (4%). In Katsina state, the highest mentioned medicinal plants were *Anisopus mannii* 14 (22%), *Leptadenia hastate* 8 (13%), *Moringa oleifera* 7 (11%), *Vernonia amygdalina* 6 (10%), and *Mormordica balsamina* 3 (5%) (Table, 5). In Kaduna state, commonly reported medicinal plants were *Anisopus mannii* 16 (17%), *Balanite aegyptiaca* 6 (6%), *Leptadenia hastate* 8 (8%) *Moringa oleifera* 6 (6%), *Vernonia amygdalina* 6 (6%), and *Eleusine coracana* 5 (5%) (Table, 6).

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e-ISSN: 24085162; p-ISSN: 20485170; April, 2025: Vol. 10 No. 1 pp. 238 – 248

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Table 4: Medicinal plants commonly used in management of diabetes in Kano state.

S/N	Botanical Names	Local Names	Family	Part	Traditional Claim	N (%)
1	*Anthocleista djalonensis* A.Chev.	*Kwari* (Hausa), *Shapo* (Yoruba), Uvuru (Igbo)	Loganiaceae	Stem Bark	Antidiabetic	3(2.1)
2	*Aloe vera* (L.) Burm.f	*Alo bera* (Hausa), *Ahon-erin* (Yoruba),(Igbo)	Liliaceae	Whole	Reduce Blood sugar	3(2.1)
3	*Amaranthus viridis* Linn.	Zaaƙii banza (Hausa), (Yoruba), Agukwu (Igbo)	Amaranthaceae	Whole	Antidiabetic	4(2.9)
4	*Anisopus mannii* N.E.Br.	*Kashe zaqi, Sakayau* (Hausa),	Apocynaceae	Whole	Decrease Blood sugar	23(16.4)
5	*Anogeissus leiocarpus* (DC) Guill and Perr.	*Marke* (Hausa), Ayin (Yoruba), *Atara* (Igbo),	Combretaceae	Stem Bark	Antidiabetic	2(1.2)
6	*Cassia* singueana Del.	*Ruunhu* (Hausa), Rumbu (Kanuri),	Leguminosae	Stem bark	Lower Blood sugar c	3(2.1)
7	*Carica papaya* (Linn.)	*Gwanda* (Hausa), Ibepe ibepe (Yoruba) Okworo (Igbo)	Caricaceae	Leaf	Antidiabetic	4(2.9)
8	*Carpolobia lutea* G. Don	(Hausa) *Egbo,Oshunshun* (Yoruba), *Agba, Angalagala* (Igbo)	Polygalaceae	Leaf	Antidiabetic	2(1.2)
9	*Cissampelos owariensis* (P.Beauv. ex DC.)	*Juudan qasa* (Hausa),*Ewe jokoje* (Yoruba),	Menispermaceae	Leaf	Antidiabetic	1(0/7)
10	*Citrullus lanatus* (Thunb.) Mats. and Nakai	*Guna* (Hausa)*, Baara* (Yoruba), Egwusi (Igbo)	Cucurbitaceae	Fruit	Lower Blood sugar	4(2.9)
11	*Combretum micranthum* G.Don	*Geza* (Hausa), Okan (Yoruba), Obi-agwu (Igbo)	Combretaceae	Leaf	Antidiabetic	4(2.9)
12	*Curculigo pilosa (Schum& Thonn) Engl.*	*Doyar Kurege* (Hausa), *Epakun (Yoruba)*	Hypoxidaceae	Tuber	Antidiabetic	3(2.1)
13	*Elaeis guineensis* J. Gaertn.	*Kwakwan Manja* (Hausa), Obu-*otoyo* (Yoruba), Oduko (Igbo)	<u>Arecaceae</u>	Fruit	Lower Blood sugar	2(1.2)
14	*Eleusine coracana* (Linn.) Gaertn.	Tamba (Hausa), (Yoruba), Oka tamba (Igbo)	Poaceae	Seed	Antidiabetic	6(4.3)
15	*Gongronema latifolium* Benth.	*Madunmaro* (Hausa), *Arokeke* (Yoruba), *Utazi* (Igbo)	Apocynacea	Leaf	Reduce blood sugar	2(1.2)
16	*Hibiscus sabdariffa* L.	*Rama* (Hausa) Ishapa (Yoruba), (Karasu'; Kanuri)	Malvaceae	Leaf	Antidiabetic	4(2.9)
17	*Jatropha curcas* L.	*Biniidazuguu* (Hausa), Bulu olu (Igbo), Botuje (Yoruba)	Euphorbiaceae	Leaf	Decreased blood glucose	2(1.2)
18	*Khaya senegalensis (Desv.) A.Juss.*	*Madaci* (Hausa) *Oganwo* (Yoruba), Ono (Igbo)	Meliaceae	Stem bark	Decrease blood glucose	1(0/7)
19	*Lagerstroemia speciosa* (L.) Pers	*Abere* (Yoruba*), Okpĺú (*Idoma)	Lythraceae	Leaf	Decrease blood glucose	5(3.6)
20	*Leptadenia hastate (*Pers.) Decne	*Yaadiya* (Hausa), Isanaje (Igbo), Iran-aji (Yoruba)	Asclepiadaceae	Leaf	Antidiabetic	14(10)
21	*Mangifera indica* L.	*Mangwaro* (Hausa), *Mango* (Yoruba), *Mongo*(Igbo)	Anacardiaceae	Leaf	Decreased blood glucose	3(2.1)
22	*Moringa oleifera* Lam.	*Zogale* (Hausa), *Ewe Igbale* (Yoruba), *Okwe* oyibo (Igbo),	Moringaceae	Leaf	Decreased blood glucose	8 (5.7)
23	*Mormordica balsamina* L.	*Garaafunii* (Hausa*), Akban ndene* (Igbo), *Ejirin* (Yoruba)	Curcubitaceae	Leaf/Whole	Reduce blood sugar	3(2.1)

24	*Piliostigma thonningii* (Schumach.) Milne-Rech.	*Kalgo* (Hausa), *Abefe* (Yoruba), *Okpoatu* (Igbo)	Leguminoseae	Stem bark	Lower Blood Glucose	5(3.6)
25	*Rauwolfia vomitoria* Afzel.	*Wada* (Hausa), *Asofeyeje* (Yoruba), *Akanta* (Igbo)	Apocynaceae	Stem bark	Reduce Blood Sugar	4(2.9)
26	*Securidaca longepedunculata* Fresen	*Sanyaa/ Uwar maguna* (Hausa), *Ipeta* (Yoruba), *Ezeogwu* (Igbo)	Polygalaceae	Leaf	Lower blood sugar	3(2.1)
27	*Syzygium aromaticum* Linn.	*Kanunfaari* (Hausa), *Konofuru* (Yoruba), *Osasagbogbo* (Igbo)	Myrtaceae	seed	Reduce Blood Sugar	1(0/7)
28	*Tamarindus indica* L.	*Tsamiya* (Hausa), *Ajagbon* (Yoruba), *Icheku oyibo* (Igbo)	Leguminosae	Fruit	Lower Blood Glucose	5(3.6)
29	*Tetrapleura tetraptera(Schum. and Thonn.) Taub.*	*Aidan* (Yoruba), *Kpokrikpo* (Igbo),	Leguminosae	Stem bark	Lower Blood Glucose	2(1.2)
30	*Vernonia amygdalina* Delile.	*Shuwaka/*(Hausa), *Ewuro* (Yoruba), Onugbu (Igbo)	Compositae	Leaf	Antidiabetic	12 (8.6)
31	*Xylopia aethiopicum* (<u>Dunal</u>) <u>A. Rich</u>	*Eru Alamo,Eru-awonka* (Yoruba), African guinea pepper, Ethiopian pepper	Annonaceae	Fruit	Antidiabetic	2(1.2)

Table 5: Medicinal plants commonly used in management of diabetes in Katsina state.

S/N	Botanical Names	Local Names	Family	Part	Traditional Claim	N (%)
1	*Anisopus mannii* N.E.Br	*Kashe zaqi, Sakayau* (Hausa)	Apocynaceae	Whole	Lower Blood sugar	14(22.2)
2	*Artemesia annua* L.	*Tazargade* (Hausa)	Asteraceae	Leaf	Antidiabetic	2(3.2)
3	*Balanite aegyptiaca* Del.	*Aduwa* (Hausa), (Badure), *Dubakara* (Fulani), Dawagara (Kanuri)	Balanitaceae	Stem Bark	Antidiabetic	2(3.2)
4	*Citrus aurantium* L	*Lemon Tsami* (Hausa) *Osan ganinganin* (Yoruba), *Oloma oyibo* (Igbo)	Rutace*a*	Fruit	Antidiabetic	1(1.6)
5	*Eleusine coracana* (Linn.) Gaertn.	Tamba (Hausa), (Yoruba), *Oka tamba* (Igbo)	Poceae	Seed	Antidiabetic	4(6.3)
6	*Eugenea caryophyllus*	*Kanunfaari* (Hausa),	Myrtaceae	Seed	Antidiabetic	1(1.6)
7	*Ficus thonningii Blume*	*Chediya (*Hausa*), Odan* (Yoruba),	Moraceae	Stem bark	Decreased blood sugar	2(3.2)
8	*Leptadenia hastate (*Pers.) Decne	*Yaadiya* (Hausa*), Isanaje* (Igbo), *Iran-aji* (Yoruba)	Asclepiadaceae	Leaf	Antidiabetic	8(12.7)
9	*Mangifera indica* L	*Mangwaro* (Hausa), *Mango* (Yoruba), *Mongo* (Igbo)	Anacardiaceae	Leaf	Decreased blood glucose	1(1.6)
10	*Mormordica balsamina* L.	*Garaafunii* (Hausa), *Akban ndene* (Igbo), *Ejirin* (Yoruba)	Curcubitaceae	Leaf/Whole	Reduce blood sugar	3(4.8)
11	*Moringa oleifera* Lam.	*Zogale* (Hausa), *Ewe* (Yoruba), *Okweolu* (Igbo)	Moringaceae	Leaf/Seed	Lower blood sugar	7(11.1)
12	*Ricinus communis* Linn.	*Zurman* (Hausa), *Laraa* (Yoruba), *Ogilisi* (Igbo)	Euphorbiceae	Leaf/Seed	Reduce Blood Glucose	2(3.2)
13	*Senna occidentalis* L.	*Majamfari a* (Hausa), *Akorere* (Yoruba), *Akidi Agbara* (Igbo)	Fabaceae	Leaf/Root	Antidiabetic	1(1.6)
14	*Senna tora*	*Tafasa* (Hausa)		Leaf/Root	Antidiabetic	2(3.2)
15	Solanum aethiopicum L.	*Gauta(Hausa),Igbagba(Yoruba), Anara(Igbo)*	Solanaceae	Fruit	Lower Blood	2(3.2)

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S/N	Botanical Names	Local Names	Family	Part used	Traditional Claim	N (%)
16	*Triticum aestivum* Linn.	*Alkama* (Hausa), *Alkamar*(Fulani),Laama *(*Kanuri *)*	Poaceae	Seed	Sugar Antidiabetic	1(1.6)
17	*Vernonia amygdalina* Delile.	*Shuwaka/ chusar-doki* (Hausa), *Ewuro* (Yoruba), *Onugbu* (Igbo)	Asteraceae	Leaf	Antidiabetic	6(9.5)
18	*Vigna subterranea L. Verdc*	*Gurjiyaa* (Hausa), *Epa-Roro* (Yoruba), *Okpa* (Igbo)	Leguminosae	Seed	Antidiabetic	2(3.2)
19	*Zingiber officiale*Roscoe	*Citta* (Hausa), *Atale* (Yoruba), *Jinga* (Igbo)	Zingiberaceae	Rhizome	Lower Blood Sugar	2(3.2)

Table 6: Medicinal plants commonly used in management of diabetes in Kaduna state.

S/N	Botanical Names	Local Names	Family	Part used	Traditional Claim	N (%)
1.	*Acacia nilotica(Lam.) Willd.*	*Bagaaruwaa* (Hausa), *Baani* (Yoruba), *Booni* (Igbo)	Mimosaceae	Fruit	Antidiabetic	2(2.1)
2.	*Adansonia digitata* L.	*Kuuka* (Hausa), Ose (Yoruba), Oyili-akpu (Igbo)	Malvaceae	Stem bark/leaf	Antidiabetic	1(1)
3.	*Anisopus mannii* N.E.Br	*Kashe zaqi, Sakayau* (Hausa)	Apocynaceae	Whole	Reduce blood sugar	16(16.5)
4.	*Angerantum conyzoides* Linn.	*Ahenhen* (Hausa), *Imi esu* (Yoruba), *Ula ujula* (Igbo)	Asteraceae	Whole	Reduce blood sugar	2(2.1)
5.	*Aristolochia albida* Duch.	*Duuman duutse* (H), *Gaďahuka* (Fulfulde),*Paran funfun* (Yoruba)	Aristolochiaceae	Leaf	Antidiabetic	1(1)
6.	*Artemesia annua* L.	*Tazargade* (Hausa)	Asteraceae	Leaf	Antidiabetic	3(3.1)
7.	*Balanite aegyptiaca* Del.	*Aduwa* (Hausa), *Budare* (Yoruba), *Ngwu-awusa;* (Igbo)	Balanitaceae	Stem Bark	Antidiabetic	6(6.2)
8.	*Borassus aethiopum* Mart.	*Muruuci* (Hausa), *Agbonolodu)* (Yoruba), *Ubiri* (Igbos)	Aracaceae	Fruit	Antidiabetic	1(1)
9.	*Bryophyllum pinnatum*	*Abamoda* (Hausa), *Abamodo* (Yoruba) *nkwonkwu* (Igbo)	Crassulaceae	Leaf	Antidiabetic	1(1)
10.	*Cassia* singueana Del.	*Ruunhu* (Hausa*), Rumbu* (Kanuri),	Leguminosae	Stem bark	Antidiabetic	2(2.1)
11.	*Celosia argentea var. crista*	*Rimi*(Hausa*), Soko Yokoto* (Yoruba)	Amaranthaceae	Leaf	Lower blood sugar	2(2.1)
12.	*Cocos nucifera (Linn)*	*Kwakwa* (Hausa*), Agbon* (Yoruba) *Aku-beke* (Igbo)	Arecaceae;	Fruit	Lower blood sugar	2(2.1)
13.	*Combretum micranthum* G.Don	*Geza* (Hausa), *Okan* (Yoruba), Obi-agwu (Igbo)	Combretaceae	Leaf	Antidiabetic	2(2.1)
14.	*Cucurbita moschata* (Duch Ex. Lam.) Duch and Poir	*Kabewa* (Hausa), *Apala* (Yoruba), *Ukọrọ* (Igbo)	Cucurbitaceae		Lower blood sugar	1(1)
15.	*Eleusine coracana* (Linn.) Gaertn.	*Tamba* (Hausa), (Yoruba), *Oka tamba* (Igbo)	Poceae	Seed	Antidiabetic	5(5.2)
16.	*Erythrina senegalensis* DC.	*Minjirya* (Hausa)	Leguminosae	Stem bark	Decrease blood glucose	2(2.1)
17.	*Eucalyptus globus* Labill	*Turare* (Hausa),*Nkwu-ishi* (Igbo):	Myrtaceae		Antidiabetic	1(1)
18.	*Hunteria umbellata* (K. Schum.) Hallier f.	*Lema* (Hausa), *Abeere* (Yoruba), *nkpokir*i (Igbo)	Apocynacea	Fruit/seed	Lower blood sugar	2(2.1)
19.	*Hyphaene thebaica* (Linn.) Mart.	*Goriba* (Hausa), *djerid* (Fulani)	Arecaceae	Fruit	Antidiabetic	1(1)

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No.	Species	Local names	Family	Part used	Use	Count
20.	*Jatropha curcas* L.	*Biniidazuguu* (Hausa), Botuje (Yoruba), Bulu olu (Igbo)	Euphorbiaceae	Leaf	Decreased blood glucose	2(2.1)
21.	*Lagerstroemia speciosa* (L.) Pers	*Abere* (Yoruba), *ọkpị́ú* (Idoma)	Lythraceae	Leaf	Decrease blood glucose	3(3.1)
22.	*Leptadenia hastate (*Pers.) Decne	*Yaadiya* (Hausa), *Isanaje* (Igbo), *Iran-aji* (Yoruba)	Asclepiadaceae	Leaf	Antidiabetic	8(8.2)
23.	*Lawsonia inermis* L.	*Lalle* (Hausa*), Laali* (Yoruba)	Lythraceae	Leaf	Decrease blood sugar	1(1)
24.	*Moringa oleifera* Lam.	*Zogale* (Hausa), *Ewe* (Yoruba), *Okweolu* (Igbo)	Combretaceae	Leaf/seed	Lower blood sugar	6(6.2)
25.	*Nauclea latifolia* (Smith) Bruce	*Tuwonbiri* (Hausa), *Egbesi* (Yoruba), *Uburu*-ilu (Igbo).	Rubiaceae	Leaf	Antidiabetic	1(1)
26.	*Phragmites australis* (Cav.)Trin. ex Steud.	*Bushara, Wutsiyar Giwa* (Hausa), *Ifu* (Yoruba)	Poaceae	Rhizome	Reduce blood sugar	1(1)
27.	*Sclerocarya birrea* (A Rich) Hochst.	*Danya* (Hausa), *Eedere* (Fulani), *Kamaa* (Kanuri)	Anacardiaceae	Stem bark	Antidiabetic	1(1)
28.	*Securidaca longepedunculata* Fres.	*Sanyaa/ Uwar maguna* (Hausa), *Ipeta* (Yoruba), *Ezeogwu* (Igbo)	Polygalaceae	Leaf	Lower blood sugar	2(2.1)
29.	*Senna tora* (L.) Roxb.	*Tafasa* (Hausa), *Asuwon-* (Yoruba), *Sigbu-muo* (Igbo),	Fabaceae	Leaf	Decrease blood glucose	3(3.1)
30.	*Solanum americanum* Mill.	*Gautan Kaaji* (Hausa), *Ogunmo*(Yoruba*) Ewa* (Igbo),	Solanaceae	Fruit	Antidiabetic	2(2.1)
31.	*Strychnos spinosa* (Lam.)	*Kokiya* (Hausa), *Atako* (Yoruba), *Angboroko* (Igbo)	Curcubitaceae	Leaf	Decrease blood glucose	1(1)
32.	*Syzygium guineense* (Willd.) DC	*Malmoo* (Hausa) *Adere* (Yoruba), *Ori* (Igbo),	Myrtaceae	Stem bark	Lower blood sugar	1(1)
33.	*Tamarindus indica* L	*Tsamiya* (Hausa), *Ajagbon* (Yoruba), *Icheku oyibo* (Igbo)	Leguminosae	Fruit	Antidiabetic	2(2.1)
34.	*Vernonia amygdalina* Delile	*Shuwaka/* (Hausa), *Ewuro* (Yoruba), *Olugbu* (Igbo)	Compositae	Leaf	Antidiabetic	6(6.2)
35.	*Ximenia americana* L.	*Tsaada* (Hausa), *Kabbule* (Fulfulde), *Igo* (Yoruba)	Olaceae	Fruit	Lower Blood Glucose	1(1)
36.	*Ziziphus mauritiana* Lam.	*Magarya* (Hausa), *Jaabe* (Fulfulde), *Eekannase adie* (Yoruba)	Anacardiaceae	Stem Bark	Antidiabetic	3(3.1)

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Families of Plants Reported from Each State

In Kano state, the most mentioned plants' families were *Combretaceae* 4 (12%), *Moraceae* 4 (12%), *Euphorbiaceae* 3 (9%), and *Fabaceae* 3 (9%). In Katsina state, families frequently reported include *Aristolochiaceae* 2 (11%), *Fabaceae* 3 (16%), *Solanaceae* 2 (11%). In Kaduna state, the most commonly documented families include *Euphorbiaceae* 2 (13%), and *Moraceae* 2 (13%), (Table 7).

Table 7: Families of plants reported from each state and their frequency

| State | Kano | Katsina | Kaduna |
Family	N (%)	N (%)	N (%)
Anacardiaceae	1 (3)	-	-
Annonaceae	2 (6)	1(5)	1(7)
Aristolochiaceae	2 (6)	2(11)	-
Asclepiadaceae	2 (6)	-	1(7)
Asteraceae	2 (6)	1(5)	1(7)
Balanitaceae	1 (3)	-	-
Bignoniaceae	1 (3)	-	1(7)
Burseraceae	-	1 (5)	-
Caricaceae	1 (3)	-	-
Clusiaceae	1 (3)	-	-
Combretaceae	4(12)	-	1(7)
Convulvulaceae	1 (3)	1(5)	1(7)
Crassulaceae	-	1(5)	1(7)
Curcubitaceae	1 (3)	-	-
Cyperaceae	-	1(5)	-
Euphorbiaceae	3(9)	1(5)	2(13)
Fabaceae	3 (9)	3 (16)	-
Lamiaceae	2 (6)	-	1(7)
Lauraceae	1 (3)	-	-
Leguminoseae	2 (6)	1(5)	1(7)
Liliaceae	-	1(5)	-
Loranthaceae	-	1(5)	-
Lythraceae	1 (3)	-	-
Mimosoideae	1(3)	-	-
Moraceae	4 (12)	-	2(13)
Moringaceae	1 (3)	-	-
Orchnaceae	1(3)	-	-
Olacaceae	2 (6)	1(5)	-
Papilionoideae	1 (3)	-	-
Polygalaceae	1 (3)	1(5)	1(7)
Ranunculaceae	-	-	1(7)
Rhamnaceae	1 (3)	1(5)	-
Rubiaceae	1 (3)	-	1(7)
Sapotaceae	1 (3)	-	-
Solanaceae	1 (3)	2(11)	1(7)
Sterculiaceae	1(3)	-	-
Ulmaceae	1 (3)	-	-
Verbenaceae	1 (3)	1(5)	-
Zingeberaceae	1 (3)	1(5)	-
Zygophyllaceae	-	1(5)	-

Forms of Plants and Part Used from each State

The data obtained indicated that various plant parts used which include root, stem barks, bulbs, and whole plants. Among the 50 plants documented in Kano state 32 (64%) were trees, 14 (28%) shrubs, 3 (6%) creepers, and 1(2%) climbers. In Katsina state, 10 (44%) were trees, 7 (30%) shrubs, 4 (17%) creepers, and 2 (9%) climbers. Also, in Kaduna state 11 (65%) were trees, 5 (29%) shrubs, and 1 (6%) creepers, (Table 8).

Table 8: Forms of Plants and Part Used from each State

Plant forms of life	Plant parts used	Frequency (%)		
		Kano N (%)	Katsina N (%)	Kaduna N (%)
Tree	Root and Bark	32 (64%)	10(44%)	11(65%)
Shrub	Whole	14(28%)	7(30%)	5(29%)
Climber	Whole	1(2%)	2(9%)	--
Creeper	Bulbs	3(6%)	4(17%)	1(6%)

Discussion

Ethno-medicinal survey is a process of collating vital information on the use of medicinal plants through verbal interview with TMPs, herbalists and herb sellers. Data documented include names of the plants, time of collection, part of the plant used, method of preparation and administration. During this study several markets were visited in Kano, Katsina and Kaduna state where large population of TMPs, herbalist and herb sellers can be found. Due to the high population density, these types of traditional practitioners are well patronized to compliment the effort of the conventional primary healthcare hospitals. Similar locations were reported in other previous ethnomedicinal surveys (Abubakar et al 2023; Musa et al 2023; Ogunkalu et al., 2022; Negbenebor et al., 2017; Abubakar et al., 2017). The overall numbers of participants interviewed were 196 which comprised of 90 participants from Kano state, 47 from Katsina state, and 59 from Kaduna state. The majority of the respondents were males with fewer females. This suggested that men are more interested in the TMP than women which is probably due to the rigorous nature of the practice. Also, energy and bravery are needed to obtain, extract, and formulate the medicinal plants. Other ethno-medicinal surveys also reported similar findings (Ajao et al., 2023; Abubakar et al., 2021; Abubakar et al., 2017).

Information documented from this survey indicated that the majority of the participants during are within the age group of 41-50 years. This is an indication that elderly people have more experience about the sources and uses of TM. Similar age group was reported in other ethno-medicinal surveys (Ajao et al., 2023; Ogunkalu et al., 2022; Abubakar et al., 2017; Mustapha et al., 2014). Furthermore, majority of the participants interviewed got their knowledge of TM through inheritance; followed by those who combined inheritance and formal education. Few of these participants joined the TMP through training alone and or divination. The primary source of the medicinal plants used by the participants in the management of diabetes was forest, followed by farms lands, then purchased from markets, while

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few others cultivates the plants in their home gardens. This is similar to reports were published in other ethno-medicinal surveys (Yusuf-Babatunde and Solaja 2019; Ogunkalu et al., 2022). Furthermore, most of the respondents interviewed suggested that their medicine is natural product and has no side effects. It is common believe among local people that any medicine made from plant is safe. However, few of them reported the incidence of nausea and vomiting. Generally, the most common method used in the preparation of the medicinal plants was decoction followed by maceration, and infusion. Traditionally, medicinal plants are processed by soaking the dried and grounded plant material inside a pot, then heat is applied continuously with periodic stirring until completely extracted. This is comparable to the outcome of other ethno-medicinal surveys (Odoh et al., 2023; Ajao et al., 2023; Ajayi et al 2022).

During this survey 86 different medicinal plants with various claims in the management of diabetes were documented across the northwestern Nigeria. The most mentioned medicinal plants were *Anisopus mannii*, *Leptadenia hastata*, *Vernonia amygdalina*, *Moringa oleifera*, *Eleusine coracana*, *Balanite aegyptiaca*, and *Tamarindus indica*. These were reported from a number of families including *Combretaceae*, *Moraceae*, *Euphorbiaceae*, *Aristolochiaceae*, *Fabaceae*, and *Solanaceae*. Similar medicinal plants families were reported in other ethno-medicinal surveys (Odoh et al 2023; Ogunkalu et al., 2022; Abubakar et al., 2021; Abubakar et al., 2017; Shinkafi et al., 2015; Mustapha et al., 2014).

Conclusion

The ethno-medicinal survey team interacted with a total of 196 TMPs, herbalists, and herbs sellers across the Northwestern part of Nigeria. During which total of 86 different medicinal plants with various claims in the management of diabetes were documented. Vital information documented include appropriate season of plant collection, the time of collection, part of the pant use, method of preparation, and administration. Overall, the data obtained reveal the abundance of medicinal plants with various claims in the management of diabetes across Northwestern Nigeria. This suggested that these medicinal plants can be source of bioactive molecules for drug development.

References

1. Hudtohan, E.T. and Zhang, D., 2022. Traditional medicine and healthcare in the 21st century. *International Journal of Management and Education in Human Development*, *2*(02), 362-365.

2. Jalal, X. and Bahaulddin, J., 2022. Traditional Medicine-anthropological study. *Journal of Garmian University*, *9*(2), 35-49.

3. Adhikari, P.P. and Paul, S.B., 2018. History of Indian traditional medicine: a medical inheritance. *History*, *11*(1), 421.

4. Tewari, D., 2020. Traditional medicine an Indian Perspective: History and Outlook. European Journal of Molecular & Clinical Medicine, 7(7), 2826-2832.

5. Vecchiato, N.L., 2019. Traditional medicine. In The ecology of health and disease in Ethiopia (157-178). Routledge.

6. Ozioma, E.O.J. and Chinwe, O.A.N., 2019. Herbal medicines in African traditional medicine. In *Herbal medicine*. IntechOpen. 10, 191-214.

7. Balick, M.J. and Cox, P.A., 2020. Plants, people, and culture: the science of ethnobotany. Garland Science, 228.

8. Hoffman, B. and Gallaher, T., 2007. Importance indices in ethnobotany. Ethnobotany Research and applications, 5, 201-218.

9. Ishtiaq, M., Khanum, H., Hussain, I., Parveen, A., Maqbool, M., Thind, S., Hussain, T., Azeem, M., Shabir, F. and Elansary, H.O., 2022. Ethnobotanical inventory and medicinal perspectives of herbal flora of Shiwalik mountainous range of District Bhimber, Azad Jammu and Kashmir, Pakistan. Plos one, 17(3), e0265028.

10. Leonti, M., 2022. The relevance of quantitative ethnobotanical indices for ethnopharmacology and ethnobotany. Journal of Ethnopharmacology, 288, 115008.

11. Popović, Z., Matić, R., Bojović, S., Stefanović, M. and Vidaković, V., 2016. Ethnobotany and herbal medicine in modern complementary and alternative medicine: An overview of publications in the field of I&C medicine 2001–2013. Journal of ethnopharmacology, 181, 182-192.

12. Tresina, P.S., Selvam, M.S., Rajesh, A., Doss, A. and Mohan, V.R., 2021. Natural products in drug discovery: approaches and development. Journal of Pharmaceutical Research International, 33, 93-110.

13. Agrawal, T., 2018. Ethnobotany of the Acacia senegal. World J Pharm Res, 7, 384-388.

14. Heinrich, M., 2000. Ethnobotany and its role in drug development. Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives, 14(7), 479-488.

15. Saraçi, A. and Damo, R., 2021. A historical overview of ethnobotanical data in Albania (1800s-1940s). Ethnobiology and Conservation, 10(2021), 1-23.

16. Petran, M., Dragos, D. and Gilca, M., 2020. Historical ethnobotanical review of medicinal plants used to treat children diseases in Romania (1860s–1970s). Journal of ethnobiology and ethnomedicine, 16 (15), 1-33.

17. Picking, D., Delgoda, R., Younger, N., Germosén-Robineau, L., Boulogne, I. and Mitchell, S., 2015.

FUW Trends in Science & Technology Journal, www.ftstjournal.com
e-ISSN: 24085162; p-ISSN: 20485170; April, 2025: Vol. 10 No. 1 pp. 238 – 248

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TRAMIL ethnomedicinal survey in Jamaica. Journal of Ethnopharmacology, 169, 314-327.

18. Odoh, U. E., Ezema, C., Osadebe, P. O., Uzor, P. F., Akunne, T. C., Ezugwu, C. O., ... & Chukwuemeka, U. C., 2023. Ethnosurvey of Medicinal Plants Used in Treatment of Diabetes by the People of Nsukka, South Eastern-Nigeria. *Journal of Advances in Medical and Pharmaceutical Sciences*, 25 (5), 7-23.

19. Ogunkalu, O.A., Adelani, D.O., Ariyo, O.C., Ogunsanwo, J.A. and Odeyale, A.C., 2022. Ethno-Medicinal Survey of Plants Used for the Management of Diabetes Mellitus in Kaduna Metropolis, Kaduna State. *Nigeria Agricultural Journal*, *53*(2), 262-273.

20. Abubakar, M., Abdullahi, H., Muhammad, Z.A., Hussein, A.M. and Lawal, A., 2021. Survey of Some Medicinal Plants Employed for Managing Diabetes Mellitus in Hadejia Town, Nigeria. *East African Journal of Health and Science*, *3*(1), 12-19.

21. Abubakar, U.S., Abdullahi, S., Ayuba, V., Kaigama, S., Halidu, U.S. and Ayuba, M.K., 2017. Medicinal plants used for the management of diabetes mellitus in Zaria, Kaduna state, Nigeria. *Journal of Pharmacy & Pharmacognosy Research*, *5*(3), 156-164.

22. Shinkafi, T.S., Bello, L., Hassan, S.W. and Ali, S., 2015. An ethnobotanical survey of antidiabetic plants used by Hausa–Fulani tribes in Sokoto, Northwest Nigeria. *Journal of ethnopharmacology*, *172*, 91-99.

23. Abubakar, A.R., Wada, A.S., Abdussalam, U.S., Sani, I.H., Huguma, M.A., Shuaibu, A.B., Nazifi, A.B., Malami, S. and Yaro, A.H., 2023. Ethnobotanical Survey of Medicinal Plants Used for the Treatment of Neuropsychiatric Disorders in Northwest Nigeria. FUW Trends in Science and Technology Journal, 8 (1), 158-169

24. Abubakar, A.R., Sani, I.H., Chiroma, S.S., Malami, S. and Yaro, A.H., 2022. Ethno-botanical survey of medicinal plants used traditionally in the treatment of mental disorders in Kano, Nigeria. *Tropical Journal of Pharmaceutical Research*, *21*(5), 1009-1017.

25. Shehu, A., Magaji, M.G., Yau, J. and Ahmed, A., 2017. Ethno-botanical survey of medicinal plants used for the management of depression by Hausa tribes of Kaduna State, Nigeria. *Journal of Medicinal Plants Research*, *11*(36), 562-567.

26. Musa, D.D., Oti, E.C., Buah, J.D., Hafiz, S.S. and Mohammed, R., 2022. Ethnobotanical Survey of Plants Used in Treatment of Diabetes by the Hausa-Fulani Tribals in Katsina State Nigeria. *Internal Journal Pure Applied. Sciences*, *31*, 68-80.

27. Negbenebor, H.E., Shehu, K., Mairami, F., Adeiza, Z., Nura, S. and Fagwalawa, L., 2017. Ethno botanical survey of medicinal plants used by Hausa people in the management of diabetes mellitus in Kano metropolis, northern Nigeria. *European Journal Medicinal Plants*, *18*(2), 1-10.

28. Ajao, A.A.N., Mukaila, Y.O. and Kenkpen, D.Y., 2023. An ethnobotanical study of medicinal plants used to treat and manage diabetes mellitus in Ede, Osun State Nigeria. Ethnobotany Research and Applications, 25, 1-18.

29. Yusuf-Babatunde, M.A., Solaja O. O., 2019. Ethnobotanical Survey of Medicinal Plants used in the Treatment of Diabetes Mellitus in Ogun State. FUOYE Journal of Pure and Applied Sciences (FJPAS), 4(1), 119-128.

30. Ajayi, T.O., Attah, A.F., Bafor, E.E. and Tokede, G.O., 2020. Ethnobotanical Survey of Medicinal Plants Used in the Management of Diabetes in Ibadan North-East and Ibadan South-East, Oyo State, Nigeria. African Journal Pharmaceutical Sciences. 2(2), 47-70.

FUW Trends in Science & Technology Journal, www.ftstjournal.com
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