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ETHNOBOTANICAL SURVEY AND DIFFERENTIAL UTILIZATION OF INDIGENOUS TREES BY COMMUNITIES AROUND SELECTED NON-FORMALLY PROTECTED AREAS IN BENUE STATE, NIGERIA

*** Adaje Patience Onyeche[1], Shomkegh Simon Alyegba[2], Ikyaagba Emmanuel Tertsea[1], Jadot Catherine[3], Verinumbe Ioryisa[1]**

[1] *Department of Social and Environmental Forestry, Joseph Sarwuan Tarka University Makurdi Benue State Nigeria.*

[2] *Centre for Innovation in Procurement, Environment and Social Standard, Federal University of Agriculture, Makurdi, Nigeria.*

[3] *Elemental Solutions Caribbean, United States of America*

Corresponding Author: +234 703 055 8030 | adajepat@gmail.com | ORCID: https://orcid.org/0000-0002-1134-6870

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Abstract

This study explored the ethnobotanical uses of indigenous trees and other utilization of indigenous trees in Benue State of Nigeria, focusing on the Akweya, Tiv, and Igede communities in the Otukpo, Kwande, and Oju Local Government Areas, respectively. Data were collected using semi-structured interviews, snowball sampling design and focus group discussion. This study records the traditional knowledge and practices associated with tree species in three non-formally protected areas from 54 respondents. A total of 82 tree species from 70 genera and 42 families were identified. Among these, 40 species were utilized as medicinal to treat 48 human ailments, categorized into 12 distinct groups. The primary uses of the tree's species include charcoal production, firewood, medicinal purposes, and construction of poles. Notably, Sixty-two percent and 62% of respondents indicated a preference for traditional medical services, indicating their continued cultural relevance. Wooden poles were the predominant building material in 98% of dwellings, and wild foods derived from these trees played a crucial role in ensuring food security, particularly during drought periods. Leaves and bark were the most frequently used plant parts in traditional medicine, while wood, branches, and entire plants served various other purposes. Despite the increasing scarcity of natural forests, local populations continue to rely heavily on these indigenous and exotic trees for their livelihoods. This study reveals the urgent need for sustainable management and conservation strategies to protect these valuable resources, ensuring their continued availability for rural communities. The findings provide a baseline for future research and conservation efforts aimed at preserving species richness and promoting sustainable use.

Keywords: Benue State, Nigeria, Ethnobotany, Indigenous trees, Medicinal plants, Traditional knowledge.

INTRODUCTION

For centuries, people have turned to traditional medicine, including the use of plants, to meet their healthcare needs (WHO, 2019; Ram *et al.,* 2004). This practice, known as ethnobotany, is the studies of the relationships between people and plants, focusing on how different cultures use plants for various purposes, including medicine, food, and rituals (Rahman *et al.,* 2019). Ethnobotanical surveys are crucial for understanding the social-cultural and economic factors influencing ideas and actions concerning health and illness (Lawal *et al*., 2010). In many parts of the world, especially in rural areas, traditional medicine remains an integral part of primary

healthcare, often due to its accessibility, affordability, and cultural relevance (Maroyi, 2013).

In Nigeria, like many other African countries, there is a long-standing tradition of using medicinal plants for treating various ailments (Adeyelu, 2020). The country's rich biodiversity and diverse cultural heritage have contributed to a wealth of indigenous knowledge about the therapeutic properties of plants. This knowledge is often passed down through generations, maintaining its relevance in the healthcare practices of many communities (Ssenku *et al*., 2022). For instance, studies in Katsina, Kebbi, Kwara, Sokoto states.and Oyo states have revealed the use of medicinal plants for managing diverse health conditions, including respiratory infections (Odebunmi *et al*., 2022; Abubakar *et al*., 2022).

Benue State, located in the North Central region of Nigeria, is home to a variety of ethnic groups, each with its own unique traditions and knowledge regarding the use of medicinal plant. The state's diverse ecological zones, ranging from savannah to forests, provide a habitat for a wide array of plant species, many of which are used in traditional medicine (Shomkegh *et al*., 2016). Similar ethnobotanical surveys in Jos have documented the use of medicinal plants for treating various ailments, emphasizing the need for conservation and sustainable use (Falemara *et al*., 2021).

With the increasing modernization and globalization, there is a risk of losing this valuable indigenous knowledge. The younger generation's shift towards urban lifestyles and modern medicine has led to a decline in the transmission of traditional knowledge (Mekoa, I. (2018). This is compounded by the lack of policy support for the conservation of trees and traditional knowledge in unprotected landscapes. Although ethnobotanical studies have been conducted in parts of Nigeria, few have addressed the differential utilization of indigenous trees across ethnic communities or within ecologically sensitive yet unprotected areas. Moreover, deforestation, agricultural expansion, and other human activities are threatening the natural habitats of many medicinal plants, further endangering this knowledge (Awoke *et al*., 2024). Studies in Plateau State have revealed the gap in knowledge transfer between generations, emphasizing the need for proactive measures to preserve traditional healing practices (Falemara *et al*.,2021).

Documenting and preserving this indigenous knowledge are crucial for several reasons. Firstly, it ensures that the traditional healthcare practices of local communities are recognized and maintained (Adeniran and Akindele, 2024). Secondly, it provides a basis for further scientific research to validate the efficacy and safety of traditional medicinal plants (Abubakar *et al*., 2022). Such research can lead to the development of new drugs and therapies, benefiting both local and global communities. For example, ethnobotanical surveys in Ogbomosho have identified plants used for treating COVID-19-related ailments, highlighting the potential for discovering new treatments (Odebunmi *et al*., 2022).

Moreover, the sustainable use of medicinal plants can contribute to biodiversity conservation and environmental protection. By promoting the cultivation and sustainable harvesting of these plants, we can reduce the pressure on natural habitats and ensure the continued availability of these resources for future generations (Cunningham, 2020; Dogara *et al*., 2024). This study focuses on the ethnobotanical survey and differential utilization of indigenous trees by communities around selected non-formally protected areas in Benue State.

The primary objective is to document the medicinal uses and traditional utilization of tree species by the local people of Akweya, Tiv, and Igede in Otukpo, Kwande, and Oju Local Government Areas, respectively. By doing so, this study aims to contribute to the preservation of indigenous knowledge and promote the sustainable use of medicinal plants in the region.

MATERIALS AND METHODS

Study Area

The study was conducted in three communities around Non-Formally Protected Areas within three different Local Government Areas of Benue State, each of which represented three ethnic group within Benue state. The selected Local Government Areas were Kwande, Oju and Otukpo Local Government Areas. Kwande LGA is predominantly inhabited by the Tiv people, Oju LGA is predominantly inhabited by the Igede people while Otukpo LGA is predominantly inhabited by the Idoma and Akweya people. Benue State is in the north central of Nigeria located at longitude 7° 47' and 10° 0' East. Latitude 6° 25' and 8° 8' North; (Hangeior *et al*., 2024), occupying a landmass of 34,059 square kilometers. The climate of Benue State is made up of distinct seasons, wet occurs between April and October and dry seasons occurs between November and March. Benue State is home to a wide range of plants including herbs, shrubs, and trees with an annual rainfall of 100 to 200mm and the mean annual temperature ranges from 21 to 37^{o}C.

Sampling Design

This study adopted a purposive sampling method in the selection of the three Local Government Areas (LGAs) based on the predominant ethnic groups. A simple random sampling technique was used to select one community each from the three LGAs (Anwase in Kwande LGA, Onyiye in Oju LGA and Akwete-Akpa in Otukpo LGA). This was based on nearness to a Non-Formally Protected Area (Anwase, Ipinu Igede and Okotobo NFPA respectively).

Ethnobotanical Data Collection

The ethnobotanical data were collected through using a structured interview, semi-structured interview, and Focus Group Discussion (FGD). Two FGD were held in each community comprising 7 to 12 group members who were majorly farmers, traditional medicine practitioners and herbalists. Personal interview were also conducted by snowball following recommendations from others that were interviewed based on their knowledge and practices in study areas. A checklist of all recorded Tree species of medicinal uses were recorded in their local names, then scientific name using references and other uses of trees, local names, parts used, disease treated, mode of preparation and administration.

RESULTS AND DISCUSSION

Results

Socio-demographic Characteristics of Respondents in Benue State Nigeria

Table 1a presents the socio-demographic characteristics of respondents in the study area. A total of 54 respondents were surveyed across three communities with Akwete-Akpa (31.5%), Anwase (35.2%), and Oyiye (33.3%). Most respondents were male (88.9%), with farming (98.1%) being the predominant occupation, and only a small fraction identifying as herbalists (1.9%). The age distribution was fairly even, with 20.4% in the 36–50 age group, while Christianity (96.3%) was the dominant religious affiliation, with 3.7% practicing traditional religion.

Table 1a: Socio-demographic Characteristics of Respondents in Benue State, Nigeria

Characters	Category	Frequency	Percentage (%)
Community	Akwete-Akpa	17	31.5
	Anwase	19	35.2
	Oyiye	18	33.3
Local Government Area	Kwande	19	35.2
	Oju	18	33.3
	Otukpo	17	31.5
Gender	Female	6	11.1
	Male	48	88.9
Age	20 – 35	8	14.8
	36 – 50	11	20.4
	50 – 70	2	3.7
	>70	8	14.8
Occupation	Farmer	53	98.1
	Herbalist	1	1.9
Religion	Christianity	52	96.3
	Traditionalist	2	3.7

Common Medicinal Tree Species and Their Local Names in Benue State Nigeria

Table 1b shows the 49 medicinal tree species utilized across the Tiv, Idoma, Igede, and Akweya ethnic groups,including their scientific names, plant families, and local names of these species, reflecting the rich cultural diversity and traditional knowledge inherent in the region. Notably, families such as Fabaceae, Combretaceae, and Rubiaceae were the most dominant recorded species, a trend commonly observed in tropical ethnomedicinal studies due to their high diversity and pharmacological potential. These families are well known for containing species with a wide range of bioactive compounds used in treating ailments such as infections, inflammations, and gastrointestinal disorders

Table 1b: Common Medicinal Tree species and their Local Names in Benue State Nigeria.

S/N	Scientific Name	Family	Tiv	Idoma	Igede	Akweya
1	*Bombax costatum*	Bombacaceae	Genger	Egbe, Okpokpo	-	Afu, Okpokpo
2	*Ficus sur*	Moraceae	Tur	Okoklodu	Obwu	Igbandru, Inwu
3	*Prosopis africana*	Mimosoideae	Gbaaye	Okpehe	Oyeke, Uga	Okpeye
4	*Parkia biglobosa*	Mimosoideae	Nune	Eklinyi	Ojinya, Ojini	Iwiwim, Iwiwimem
5	*Afzelia africana*	Fabaceae	Yiase	Ukpo	Igbe	Ablefu
6	*Vitellaria paradoxa*	Sapotaceae	Chamegh	Okume	-	Ekume
7	*Daniellia oliveri*	Fabaceae	Chiha	Aha, Agba	Ukpila, Ukpala	Eha, Imoyila
8	*Khaya senegalensis*	Meliaceae	Haa	Opi	Upi	Imokwu
9	*Pterocarpus erinaceus*	Leguminosae	Tsakombo, Ngaji	Ache	Oreawe	Anagatogyi
10	*Cissus pulponea*	Vitaceae	Ager	Okoho	Odada	Ingbefu
11	*Vitex doniana*	Verbenaceae	Hulugh	Udu	Utu, Okelidu	Iwu
12	*Detarium microcarpum*	Fabaceae	Agalien	Akplata, Ofo	Elo, Okatakpokpo	-
13	*Cola nitida*	Sterculiaceae	Gor	Enme, Ngolo	Ugoro	Enme
14	*Dacryodes edulis*	Burseraceae	Mzembe	Odda	Ujwo	Ibe
15	*Annona senegalensis*	Annonaceae	Hur	Ikpokpo, Uwu	Unwu	Ikpokpo
16	*Terminalia avicenniodes*	Combretaceae	Kuegh	Okwo	-	Ohma, Ohuma
17	*Tamarindus indica*	Fabaceae	Tsamiya	Tsamiya	-	-
18	*Crossopteryx febrifuga*	Rubiaceae	Ikwar	Ampuple	Ucho onyoloiri	Ogoglo
19	*Quassia undulata*	Simaroubaceae	Gbur	Ikpleiokpa, Odonbra	Ufofo	Eyo, Oye

S/N	Scientific Name	Family	Tiv	Idoma	Igede	Akweya
						enje
20	*Piliostigma thonningii*	Cercidoideae	Gbiankpande/ Nyihar	Obakpanya, Ogbligbo	Omepa, Onmepa	Anjikpam enje, Igbana
21	*Cochlospermum tinctorium*	Bixaceae	Kpavande	Ukpatafolo	Abrokwo	-
22	*Nauclea latifolia*	Rubiaceae	Hoikura	-	-	-
23	*Stereospermum kunthianum*	Bignoniaceae	Umanatumba	Ibanba, Odebenonu	Ugbenya	Ogwiji kla imora
24	*Burkea africana*	Leguminosae	Gbagbongom	Okachi	Okachi opupu	Okachi oriri
25	*Tephrosia vogelii*	Fabaceae	Kuha	Oha	-	Oha
26	*Strychnos spinosa*	Loganiaceae	Maku	Akpluke, Ikpankele	Ogbucho	Ikpokpogi, Afruma
27	*Anthocleista djalonensis*	Gentianaceae	Kokoso	Odrobu, Odlobu	Urugba	Aka'a oriri, Ikro
28	*Aframomum angustifolium*	Zingiberaceae	-	Andra, Andra ikete	Ogbaichuo, Udu	Adindra
29	*Diospyros mespiliformis*	Ebenaceae	Maa-il, Kuhwe kya	Ogbaklitu, Unyiloko	-	Awuna
30	*Bridelia ferruginea*	Phyllanthaceae	Ikpine, Kpine	Ede	Ora	Oro
31	*Uapaca togoensis*	Euphorbiaceae	Asase	Apo	-	Apo
32	*Anogeissus leiocarpus*	Combretaceae	Maaki	Otra	-	Ontra
33	*Cassia nodosa*	Leguminosae	Lyemen	Obayila	-	Imunyi
34	*Tetrapleura tetraptera*	Fabaceae	Okwakwa	Okwakwa	-	Imumu eka
35	*Baphia nitida*	Fabaceae	Kpagh	-	-	Oturukpa
36	*Vitex doniana*	Verbenaceae	Hulugh	Udo	Utu	Iwu
37	*Cissus populnea*	Amplidanceae	Huer	Okoho	Odada	Ingbefu
38	*Lonchocarpus laxiflorus*	Fabaceae	-	Okachi/Udebenonu	Uhia, Obile	Okachi opupu

S/N	Scientific Name	Family	Tiv	Idoma	Igede	Akweya
39	*Morinda lucida*	Rubiaceae	Akinde nor	Ogble	Ufu ogile, Ogle	Ogiri, Efra
40	*Mitragyna inermis*	Rubiaceae	Sohonor	Ochuche	Orerewa	Imungwu inwu
41	*Terminalia avicennioides*	Combretaceae	Kuegh	Okwo	-	Ohma
42	*Annona senegalensis*	Annonaceae	Ahur, Hur	Okpokpo/Uwo	Unwu	Ikpokpo
43	*Nauclea latifolia*	Rubiaceae	-	Oya	-	-
44	*Chromolaena odorata*	Asteraceae	Bokpai	Anagbagwu	Unagwugwu	Anagwagwa
45	*Diospyros mespiliformis*	Ebenaceae	Iyou	Egbakluito	-	Awuna
46	*Adansonia digitata*	Malvaceae	-	-	-	-
47	*Daniellia oliveri*	Fabaceae	Chancha	Aha	Ukpila	Eha
48	*Newbouldia laevis*	Bignoniaceae	-	Ogirishi	Ogirisi	Ogiriche
49	*Moringa oleifera*	Moringaceae	Jegelegede	Ikerekechi	Owowo	Enduru

Frequency and Percentage Occurrence of Medicinal Tree Species Families in Benue State Nigeria

Table 1c presents the frequency and percentage occurrence of medicinal tree species families in the study area. The most represented families were Fabaceae (18.4%), Rubiaceae (10.2%), and Combretaceae (6.1%). The table highlights the diverse botanical composition of medicinal plants, with 28 different families represented.

Table 1c: Frequency and Percentage Occurrence of Medicinal Tree Species Families in Benue State, Nigeria

S/N	Family	Frequency	Percentage
1	Amplidanceae	1	2.0
2	Annonaceae	2	4.1
3	Asteraceae	1	2.0
4	Bignoniaceae	2	4.1
5	Bixaceae	1	2.0

S/N	Family	Frequency	Percentage
6	Bombacaceae	1	2.0
7	Burseraceae	1	2.0
8	Cercidoideae	1	2.0
9	Combretaceae	3	6.1
10	Ebenaceae	2	4.1
11	Euphorbiaceae	1	2.0
12	Fabaceae	9	18.4
13	Gentianaceae	1	2.0
14	Leguminosae	3	6.1
15	Loganiaceae	1	2.0
16	Malvaceae	1	2.0
17	Meliaceae	1	2.0
18	Mimosoideae	2	4.1
19	Moraceae	1	2.0
20	Moringaceae	1	2.0
21	Phyllanthaceae	1	2.0
22	Rubiaceae	5	10.2
23	Sapotaceae	1	2.0
24	Simaroubaceae	1	2.0
25	Sterculiaceae	1	2.0
26	Verbenaceae	2	4.1
27	Vitaceae	1	2.0
28	Zingiberaceae	1	2.0

Identification of Trees Used for Medicine, Ailment and Parts Used, Preparation and Administration in Benue State

Table 2 details the specific uses of various tree species for medicinal purposes. It includes information on the ailment treated, the tree species used, the parts used, and the mode of preparation and administration. For example, *Ficus sur* is used to treat malaria, with the leaves being mashed, boiled, and drunk on an empty stomach. The table provides detailed insights into the traditional medical practices and knowledge of the local communities.

Table 2: Identification of Medicinal Trees Used for Treating Ailments, Parts Used, and Methods of Preparation and Administration in Benue State, Nigeria

S/N	Ailment	Tree Species Used	Parts Used	Mode of Preparation and Administration
1	Malaria	*Ficus sur*	Leaves	Leaves mashed and boiled, consumed on an empty stomach.
		Lonchocarpus laxiflorus	Leaves	Leaves boiled.
		Morinda lucida	Leaves	Leaves used.
		Adansonia digitata	Leaves	Leaves mashed, boiled in water, and drunk when warm.
		Parkia biglobosa	Leaves and Barks	Leaves mashed or bark boiled and drunk.
2	Typhoid/Fever	*Tamarindus indica*	Fruit	Fruit infusion in water, juice consumed.
		Annona senegalensis	Leaves, roots, and bark	Boiled and consumed.
3	Bleeding	*Chromolaena odorata*	Leaves	Leaves squeezed and rubbed on bleeding parts.
4	Stomach-ache	*Diospyros mespiliformis*	Leaves and roots	Root back peeled, pounded, molded, dried, and boiled when needed, or roots washed and boiled with leaves.
		Khaya senegalensis	Bark	Bark infused in water for over a day and drunk.
		Annona senegalensis	Leaves	Leaves boiled.
		Piliostigma thonningii	Barks	Barks boiled.
5	Toothache	*Vitellaria paradoxa*	Bark	Bark crushed and applied to the tooth.
		Tamarindus indica	Bark	Bark crushed and applied to the affected tooth.
		Anogeissus	Bark	Bark boiled, placed in mouth for a few minutes, then removed.

S/N	Ailment	Tree Species Used	Parts Used	Mode of Preparation and Administration
		leicarpus		
6	Body Weakness	*Vitex doniana*	Barks and leaves	Bark and leaves pounded, soaked in water overnight, and drunk.
7	Cough	*Adansonia digitata*	Leaves	Young leaves dried, pounded, and added to local drinks.
		Terminalia avicennioides	Leaves	Tender leaves chewed and swallowed.
8	Skin Disease	*Dacryodes edulis*	Leaves	Leaves mashed, juice extracted and applied to affected areas.
9	Blood Clotting	*Pterocarpus erinaceus*	Leaves	Tender leaves squeezed and placed on wounds/cuts.
		Terminalia avicennioides	Root	Roots mashed and placed on cuts.

Other Uses of Tree Species in Benue State

Table 3 outlines the various other uses of tree species beyond medicinal purposes. These include the use of *Prosopis africana* and *Pterocarpus erinaceus* for fuel wood, *Khaya senegalensis* and *Prosopis africana* for charcoal production, and *Daniellia oliverii* and *Pterocarpus erinaceus* for furniture and musical instrument making. The table also shows the use of various tree species for food, such as *Irvingia gabonensis* and *Detarium microcarpum*, and for construction and building, such as *Khaya senegalensis* and *Daniella oliverii*.

Table 3: *Other* ***Uses of Tree Species in Benue State, Nigeria***

S/N	Scientific Name of Tree Species	Uses	Preparation/Utilization
		Fuelwood	
1	*Prosopis africana*		Branches cut down and used as firewood.
2	*Piliostigma thonningii*		Branches cut down and used as firewood.
3	*Pterocarpus erinaceus*		Branches cut down and used as firewood.
		Mortar and Pestle	
4	*Prosopis africana*		Logs processed into mortar and pestle.

S/N	Scientific Name of Tree Species	Uses	Preparation/Utilization
5	*Khaya senegalensis*		Logs processed into mortar and pestle.
		Charcoal Production	
6	*Khaya senegalensis*		Used for charcoal production.
7	*Prosopis africana*		Used for charcoal production.
8	*Afzelia africana*		Used for charcoal production.
9	*Anogeissus leiocarpus*		Used for charcoal production.
10	*Vitellaria paradoxa*		Used for charcoal production.
		Furniture and Musical Instruments	
11	*Daniellia oliveri*		Used in making tables, chairs, and beds.
12	*Pterocarpus erinaceus*		Used in making drums and furniture.
13	*Khaya senegalensis*		Used in making tables, chairs, and bed frames.
		Edible Fruits	
14	*Irvingia gabonensis*		Fruits are eaten.
15	*Dialium guineense*		Fruits are eaten.
16	*Adansonia digitata*		Fruits are eaten.
17	*Detarium microcarpum*		Fruits are eaten.
18	*Annona senegalensis*		Fruits are eaten.
19	*Borassus aethiopum*		Fruits planted, rhizome boiled and eaten.
20	*Vitex doniana*		Fruits are eaten.
		Food and Vegetables	
21	*Bombax costatum*		Flowers dried, pounded, and used in making soup.

S/N	Scientific Name of Tree Species	Uses	Preparation/Utilization
22	*Parkia biglobosa*		Seeds processed as condiments; fruit pulp eaten.
23	*Afzelia africana*		Fruits processed and used as a thickener in soup.
24	*Prosopis africana*		Seeds processed as condiments in food.
25	*Vitellaria paradoxa*		Seeds processed for edible oil and skin application.
26	*Daniellia oliveri*		Tender leaves eaten as vegetables.
27	*Irvingia gabonensis*		Seeds processed and used in soups.
28	*Detarium microcarpum*		Seeds ground and used in soups.
		Construction and Building	
29	*Khaya senegalensis*		Logs processed and used in construction.
30	*Daniellia oliveri*		Logs processed and used in construction.

Discussion

Socio-Demographic Characteristics of Respondents in Benue State, Nigeria

The socio-demographic profile of the respondents, as outlined in Table 1a, provides a vital context for understanding the ethnobotanical practices in Benue State. The observed predominance of male farmers is consistent with trends in ethnobotanical studies across rural Africa (Odewo *et al*., 2022). While ethnobotanical studies often report a higher number of male participants, this does not diminish the significant contributions of female knowledge holders. Research indicates that women frequently possess extensive knowledge of medicinal plants and play a crucial role in their use and conservation. For instance, a study in a Brazilian community found that women had a broader repertoire of plant knowledge compared to men. Additionally, the social networks among women were more connected, facilitating greater information sharing and contributing to the cohesion and maintenance of traditional ecological knowledge within the community,(Da Costa *et al*.,2021). The age distribution of respondents further emphasizes the role of experiential knowledge transmission, with older individuals possessing a richer understanding of local flora. As Sambe *et al*. (2024) highlight, the

consumption patterns of health products are linked to cultural beliefs and long-age traditions, particularly within a social context.

Common Medicinal Tree Species and Their Local Names in Benue State Nigeria

The documentation of 49 medicinal tree species and their local names contributes to the preservation of indigenous knowledge. Local names offer insights into the cultural significance and perceived properties of these plants. This catalog serves as a foundation for further research. The identification of 82 tree species, with 40 used for medicinal purposes, indicates a reliance on local plants for healthcare. This data is crucial for conservation efforts (Eze *et al*., 2024). As noted by Sambe *et al*. (2024), indigenous knowledge of medicinal plants is a valuable resource for health management.

Identified Medicinal Tree Species in Benue State, Nigeria

The dominance of Fabaceae, Rubiaceae, and Combretaceae families in Benue State's medicinal flora highlights their significant role in local traditional medicine. These families, recognized for their diverse bioactive compounds, are frequently utilized for therapeutic purposes, reflecting both their availability and perceived efficacy (Abdallah *et al*., 2020). Specifically, the predominance of Fabaceae, as supported by ethnobotanical studies across Nigeria, accentuates its importance in addressing a wide range of ailments and further corroborated by research indicating Fabaceae's prevalence in cancer treatment within northeastern Nigeria (Abubakar *et al.*, 2022). The ecological resilience of Fabaceae, characterized by rapid growth and adaptability to adverse conditions, contributes to its widespread presence and utilization. This resilience, coupled with the rich phytochemical profiles of these families, suggests a strong potential for pharmacological research and drug development (Sambe *et al*., 2024). The observed similarities in frequently used plant families, such as Fabaceae, Rubiaceae, and others like Solanaceae, Euphorbiaceae, Meliaceae, and Malvaceae, across different regions of Nigeria, as noted in studies from Ilorin (Adeniran and Akindele, 2024), highlight a consistent pattern in traditional medicinal practices. This consistency likely stems from the availability and diverse therapeutic properties of these plant families, reinforcing their importance in addressing common health concerns. In essence, the frequency and percentage occurrence of these medicinal tree species families in Benue State not only reflect their ecological adaptability and phytochemical richness but also revealed their key role in the region's traditional healthcare system.

The result shows the significant role of medicinal plants in the healthcare practices of the studied communities. The predominance of leaves as the most utilized plant part, followed by bark, fruits, and roots, reflects a common trend in ethnobotanical studies (Al-Fatimi, 2019; Adeniran and Akindele, 2024). This preference can be attributed to the high concentration of bioactive compounds in leaves, resulting from their role in photosynthesis and metabolic activities (Tukur *et al*., 2024; Dauncey *et al*., 2016). The accessibility and ease of harvesting leaves, compared to other plant parts such as roots and bark, contribute to their widespread use (Lawal *et al*., 2010). From a conservation perspective, leaf harvesting minimizes the impact on plant regeneration, promoting sustainability. The diverse preparation methods, including decoction, infusion, powders, pastries, and ointments, demonstrate the practical knowledge and skills of traditional healers in extracting and administering remedies (Adeniran and

Akindele, 2024). These methods facilitate the effective delivery of bioactive compounds, contributing to the therapeutic efficacy of the preparations. The high utilization of medicinal plants, as reported by Sambe *et al*. (2024), where 83.9% of respondents rely on them for ailment treatment, shows their crucial role in local healthcare. This reliance is further supported by Adeniran *et al.* (2013), who emphasized the preventive role of medicinal plants in disease management. The observed patterns align with the findings of Origbo *et al*. (2023), indicating the medico-religious significance of leaves in treating various illnesses. These compounds, produced in response to environmental stressors, contribute to the medicinal properties of the plants. Scientific validation of these remedies is essential to harness their potential for drug development and to preserve this valuable cultural heritage (Balkrishna *et al*., 2024).

Other Uses of Tree Species in Benue State

The tree species in Benue State serve a multitude of purposes, reflecting their integral role in the socio-economic fabric of local communities. This multi-faceted utilization, however, poses a substantial threat to their sustainability. Predominantly, these trees are exploited for fuelwood, charcoal production, furniture manufacturing, food, and construction, indicating a heavy reliance that can lead to overexploitation (Adeniran and Akindele, 2024; Sambe *et al*., 2024). The consumption of fruits and seeds, while crucial for food security, renders these species particularly vulnerable to depletion. It is, therefore, imperative to implement sustainable practices that harmonize community needs with biodiversity conservation (Ononogbo *et al*., 2024). The necessity for conservation is accentuated by the primary drivers of plant species loss, including fire, deforestation, and agricultural expansion, all exacerbated by population growth. Sambe *et al*. (2024) advocate for governmental, non-governmental, and private sector involvement in conserving these species to ensure their sustainable utilization. The versatility of these tree species enhances their value, fostering greater appreciation and knowledge preservation within the community. Sustainable management and consumption of these species are vital for the community's subsistence, ensuring the continued availability of these resources.

CONCLUSION

The ethnobotanical survey in Benue State reveals a rich tapestry of indigenous knowledge regarding the use of local tree species for medicinal and other purposes. The study reveals the predominance of male farmers as key custodians of this knowledge, showing traditional gender roles and the close link between agriculture and healthcare in these communities. The diverse range of medicinal tree species, particularly those from the Fabaceae, Rubiaceae, and Combretaceae families, shows their importance in addressing various health ailments. The detailed documentation of plant parts used, techniques showcase the sophisticated understanding of local flora. However, the multifaceted utilization of these trees for fuelwood, charcoal, furniture, food, and construction poses a significant threat to their sustainability. To ensure the preservation of this valuable ethnobotanical knowledge and the conservation of these vital resources, a multi-pronged approach is necessary. Sustainable harvesting practices should be promoted, alongside the introduction of alternative energy sources and building materials to reduce pressure on local forests. Community-based conservation initiatives, involving both male and female knowledge holders,

should be strengthened to foster a sense of ownership and responsibility. Furthermore, scientific validation of traditional remedies is crucial for harnessing their potential for modern drug development, while respecting and preserving the cultural heritage associated with their use. International collaboration can provide technical and financial support for these efforts, facilitating the exchange of best practices and promoting sustainable development in the region. Governmental, non-governmental, and private sector involvement is essential to create effective policies and programs that balance the needs of local communities with the imperative of biodiversity conservation.

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Ethics approval and consent to participate

Permissions were provided by all participants in this study from local communities of Oyiye, Akwete-Akpa and Anwase.

Conflicting interests

The authors declare that they have no conflicting interests.

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