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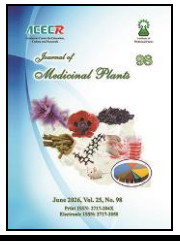

Research Article

Ethnobotanical assessment of traditional knowledge and use of medicinal plants for cough management in Ogun and Oyo states, Nigeria

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ABSTRACT

Background: Many medicinal plants contain natural chemicals that have therapeutic effects for the management and treatment of coughs. In many rural communities in Nigeria, reliance on traditional medicine for the management of respiratory conditions is common. **Objective:** This study aimed to investigate locally available medicinal plants used by herbalists for the treatment of cough in Ogun and Oyo states, southwestern Nigeria. **Methods:** An ethnobotanical survey was conducted among 200 participants, mainly traditional healers and herblists, selected from major markets in Ogun and Oyo states. Structured questionnaires were used to collect demographic data and plant characteristics. Demographic data were summarized using descriptive statistics, while relative frequency of citation (RFC), and use value (UV) indices were used to analyze plant characteristics. **Results:** The mean age of the 200 study participants was 46.0 ± 9 years of which 36.5 % (73) were male and 63.5 % (127) were female. A total of 25 plant species from 20 families were identified for cough treatment. The most commonly used species were *Anacadium occidentale* (RFC = 0.21), *Garcinia kola* (RFC = 0.18), and *Cola acuminata* (RFC = 0.18). *Adansonia digitata* recorded the highest UV of 0.04. Leaves (36 %), bark (17 %), and stem (17 %) were the most commonly used plant parts. Concoction (32 %), decoction (20 %) and maceration (20 %) were the main preparation methods, while oral administration (100 %) was the most common mode of consumption. **Conclusion:** This study provided insight into indigenous knowledge of herbal cough remedies in southwestern Nigeria.

1. Introduction

Cough is a common symptom of respiratory disorders and can be classified as acute or chronic. Acute cough is the leading reason for referral to primary care services or consultation. However, chronic cough is one of the most common manifestations of respiratory disorders. Exacerbation of asthma symptoms, rib fractures,

Abbreviations: CPHI, Center for Population Health Initiative; FC, Frequency of Citation; LASU, Lagos State University; RFC, Relative Frequency of Citation; TASUED, Tai Solarin University of Education; UV, Use-Value; UWE, University of the West of England.

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syncope, dyspnea and pneumothorax are some of the severe morbidities associated with chronic cough [1]. Respiratory disorders impact millions globally across all age groups, resulting in significant morbidity and mortality, especially among children under five years old [2]. Antitussive drugs inhibit or alleviate coughing and are useful in managing many respiratory problems.

Natural medicine has historically been integral to African culture. In fact, indigenous knowledge of medicinal plants offers valuable insights for modern pharmacological science [3]. In numerous developing countries, community people rely on their native plants for the treatment of various maladies. This is typically associated with the high cost and limited access to healthcare services [1].

The revitalization of interest in traditional medicine and the utilization of medicinal plants as alternative or complementary therapies, is because plant-based medicines are seen as having decreased negative effects because of their origin from natural sources [4]. Bioactive elements like alkaloids, flavonoids, terpenoids, and phenolic compounds, are some of the bioactive chemicals with medicinal qualities found in these plants. They can assist in managing various health concerns and influencing the various physiological systems [5].

Certain herbs are recognized for their antitussive qualities, which makes them targets for investigation to determine their efficacy in cough management. For instance, certain plants possess mucilage, known to build shielding layers in the throat and may alleviate coughing [6]. Various components of the plant, such as the bark, flowers, leaves and the roots, can be used in extracting therapeutic chemicals. These chemicals are subsequently formulated in various forms like teas, poultices, ointments, or tinctures, depending on the specific ailment being addressed [6]. Besides their attributes, medicinal herbs are frequently more accessible and economical than conventional pharmaceuticals [4].

In many local communities, inhabitants employed certain medicinal plants to manage cough, hypertension, rheumatism and dermatological issues. Studies have shown that plants in these areas exhibited diverse therapeutic attributes for respiratory ailments, throat infections, joint discomfort, and hypertension [7]. Modern medicine has also recognized the efficacy of these plant-based therapies. Numerous pharmaceutical medications have been created by isolating and synthesizing the active components derived from medicinal plants often used by the traditional healers and herb sellers [8].

The significance of traditional knowledge and therapeutic usage of medicinal plants is gaining increasing recognition and leading to initiatives that seek to incorporate traditional plant-based medicine into conventional healthcare practices. This enhances the broader variety and inclusivity of global medical practices [9].

The indigenous medicinal practices are socio-culturally distinctive and intrinsically dynamic. However, research gaps exist in Nigeria in terms of interest and efforts to catalog plant resources having medicinal significance. It is crucial to acknowledge that certain plant species have been overlooked by scholars, and it calls for comprehensive documentation to avert the erosion of invaluable indigenous knowledge relating to plant resources within local communities [1]. This study therefore aimed to document the medicinal plants used for cough management in Ogun and Oyo states, Nigeria. Specifically, it

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identified the plant species used, their specific parts, and the methods of preparation and administration.

2. Materials and methods

2.1. Study area

This study was conducted in the southwestern Nigerian states of Ogun and Oyo. The study areas were located approximately between latitudes 6.82° N and 7.30° N and longitudes 3.86° E and 3.93° E, for Ogun and Oyo States respectively. Four locations were used in each state. Ogun State: Itoku and Kuto markets in Abeokuta, and the New Market and Oke Aje Market in Ijebu Ode. Oyo State: Bode, Bodija, Araromi and Ojaoba Markets in Ibadan, Oyo state.

2.2. Study population and sampling

We used a simple random sampling technique to identify and recruit 200 participants from a total of 270 traditional healers and herb sellers located in both Ogun and Oyo States, Southwest Nigeria. We prepared a sampling frame of all the 270 herb dealers across the two states, assigned unique identification numbers to each of them, and then selected the 200 participants through a computer-generated random number process.

2.3. Data collection

Information on the names of various medicinal plant, common parts used for cough management, preparation method and mode of consumption was collected through a three-part structured questionnaire. Demographic information of the respondents was recorded in section A of the questionnaire. Details of the plant and plant parts used for cough treatment were documented in section B, while the method of preparation and mode of administration were described in section C. The respondents provided the local names (which are Yoruba names) of the plants. The plants were then scientifically identified and their most recent and accepted nomenclatures were verified through the World Catalogue of Common Medicinal Plants (https://sweetgum.nybg.org/science) and World Flora Online (www.worldfloraonline.org). There is no recognized herbarium in the two states where this study was done. However, voucher specimens were prepared for deposition at the University of Ibadan Herbarium (UCI) for future reference.

2.4. Statistical analysis

We used the descriptive statistics to analyze and present demographic information of respondents and employed the Relative Frequency Citation (RFC) and Use-Value (UV) to analyze the plants' information, in line with previous study by Afolayan, Sulaimon & Okunade [10].

Two equations were used to calculate the RFC and UV of the medicinal plants as follows:

$$RFC = \frac{FC}{N} \qquad \text{Equation 1}$$

RFC in equation-1 helped us to estimate the importance of all the plant species. FC (frequency of citation) represented the number of respondents that cited the use of each species, while N represented the total number of study participants.

$$UV = \frac{Ui}{N} \qquad \text{Equation 2}$$

UV in equation-2 was used to highlight the local knowledge of the comparative importance of each plant species. U represented the number of distinct uses of each species identified by the respondents, while N represented the total number of study participants.

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3. Results

From Table 1 below, 200 respondents participated in this study, comprised of herb sellers (69 %), traditional healers (14 %) and other community elders and farmers (17 %) with rich knowledge of local plants. 63 % (n = 127) and 36.5 % (n = 73) of the respondents were females and males respectively. Majority of study participants were within the age bracket of 51 – 60 years at 53.5 %, followed by participants aged 41 – 50 years (38 %). Those aged 21 – 30 years and greater than 61 years represented 1.5 % and 1 % of the respondents respectively. Regarding the source of their knowledge of herbs, 26.5 % of respondents acquired the knowledge from their parents, 30% from skilled individuals, 12 % from personal development and 31.5 % from a combination of other sources.

Table 1. Demographic information of the respondents

Variables	Categories	Frequency	Percentage
Gender	Male	73	36.5
	Female	127	63.5
Age	21 – 30	3	1.5
	31-40	10	5
	41-50	76	38
	51 – 60	107	53.5
	61-70	2	1
	71 and above	2	1
Occupation	Herb seller	138	69
	Traditional Healer	28	14
	Other	34	17
Year of Experience	0-10 years	64	32
	11-20 years	26	13
	21-30 years	76	38
	31 years and above	34	17
How did you learn your Occupation	Parent Occupation	53	26.5
	Trained by a Skilled Personnel	60	30
	Personal Development	24	12
	Others	63	31.5

There was a total of 25 medicinal plants used for management of cough in Ogun and Oyo state as listed in Table 2 below. For all the 25 plant species identified in this study, the RFC was between 0.01 – 0.21. Medicinal plants with the highest frequency of citation were *Anacadium occidentale* L. (0.21), *Garcinia kola* Heckel (0.18), *Cola acuminata* (P. Beauv.) Schott & Endl. (0.18) and *Allium ascalonicum* L. (0.08).

The parts of medicinal plants used for the preparation of cough remedies are shown in Figure 1 below. 10 plant parts were identified as useful for the preparation of cough remedies in both Ogun and Oyo states. Leaves were the most frequently used part (33 %), followed by bark (20 %), stem (15 %), and fruit (10 %).

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Table 2. Profile of plants claimed by the respondents for the treatment of cough

S/N	Family	Scientific name	Local name	Common name	Plant Part Used for Cough
1	Anacardiacardiaceae	*Anacadium occidentale* L.	Kasu	Cashew	Leaves, fruit, stem, Bark
2	Amaryllidaceae	*Allium ascalonicum* L.	Alubosa elewe	Shallot	Whole plant
3	Amaryllidaceae	*Allium sativum* L.	Ayu	Garlic	Bulb
4	Amaryllidaceae	*Crinum jagus*	Ogede odo	Christopher's lily	Shoot, roots
5	Apocynaceae	*Alstonia boonei* (J. Thomps) Dandy	Ahun	God's tree	Stem, bark, leaves
6	Apocynaceae	*Calotropis procera* (Aiton) Dryand.	Bomu-Bomu	Apple of Sodom	Leaves
7	Arecaceae	*Elaeis guineensis* Jacq.	Ope	Oil palm	Roots
8	Asparagaceae	*Sansevieria liberica* (Gerome & Labroy) Byng & Christenth.	ola-koriko	Snake Plant	root
9	Clusiaceae	*Garcinia kola* Heckel	Orogbo	Bitter kola	Fruit
10	Convolvulaceae	*Ipomoea batatas* (L.) Lam.	Anomo, Odunkun	Sweet potato	Leave
11	Costacea	*Costus afer* Ker Gawl	Tete-egun	Ginger lily, bush cane	Stem
12	Fabaceae	*Abrus precatorius* L.	Omisinmisin, ojuologbo	Jequirity bean, Crab's eyes	Leaves
13	Leguminosae	*Erythrina senegalensis* DC.	ologun sheshe	Coral Flower, parrot tree	Bark
14	Liliaceae	*Aloe barbadensis* Mill.	Aloe vera	Aloe vera	Latex
15	Lythraceae	*Lawsonia inermis* L.	Laali	Henna	Leaves
16	Malvaceae	*Adansonia digitata* L.	ose, oske	Baobab. Magic tree, chemist tree	Seeds
17	Malvaceae	*Hibiscus sabdariffa* L.	Amukan	Roselle, red sorrel, zobo	Leaves
18	Malvaceae	*Cola acuminata* (P. Beauv.) Schott & Endl.	obi abata	Kola nut	Fruit
19	Meliaceae	*Azadirachta indica* A. Juss.	Dogoyaro	Neem	Leaves, stem, bark, fruit
20	Moraceae	*Ficus exasperata* Vahl	Ewe-epin	Sandpaper leaf	Leaves, stem, bark, roots
21	Myrtaceae	*Psidium guajava* L.	Gilofa	Guava	Leaves
22	Phyllanthaceae	*Bridelia Feruguinea* Benth.	Ira	Bridlia	Bark, Stem
23	Sapotaceae	*Chrysophyllum albidum* G. Don	Agbalumo	Star apple	Leaves, seeds
24	Solanaceae	*Datura stramonium* L.	Apikan	Green thorn-apple	Leave
25	Zingiberaceae	*Aframomum melegueta* (Roscoe) K. Schum.	Ataare	Grain of paradise	Seeds, leaves

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Table 2. Profile of plants claimed by the respondents for the treatment of cough (Continued)

S/N	Family	Duration of Treating Cough	Type of Cough	Frequency	RFC	UV
1	Anacardiacardiaceae	1-7 Days	Asthma Tuberculosis	42	0.21	0.01
2	Amaryllidaceae	2-5 Days	Asthma, cough	15	0.08	0.01
3	Amaryllidaceae	2-5 Days	Asthma, cough, tuberculosis	8	0.04	0.03
4	Amaryllidaceae	2-7 days	Asthma, Cough, Tuberculosis	2	0.01	0.01
5	Apocynaceae	3-7 days	Coughs including bloody cough (tuberculosis)	7	0.04	0.03
6	Apocynaceae	5-7 Days	Tuberculosis and Asthma	10	0.05	0.02
7	Arecaceae	4-7 days	Asthma, bronchitis, chest pain, tuberculosis	2	0.01	0.03
8	Asparagaceae	3-5 days	Cough	5	0.03	0.03
9	Clusiaceae	2-7 Days	Asthma, Coughs including bloody cough (tuberculosis)	35	0.18	0.02
10	Convolvulaceae	3-5 days	Asthma	2	0.01	0.03
11	Costacea	2-5days	cough	3	0.02	0.02
12	Fabaceae	3-5 days	Asthma, Bronchitis, cough, tuberculosis	4	0.02	0.02
13	Leguminosae	5-7 days	bronchial infections, coughs,	5	0.03	0.03
14	Liliaceae	4-7 days	Asthma	2	0.01	0.02
15	Lythraceae	3-7 days	Asthma		0.02	0.01
16	Malvaceae	5-7 days	mild asthma,	4	0.02	0.04
17	Malvaceae	3-7 days	Cough	2	0.01	0.02
18	Malvaceae	2-3 days	Cough, Asthma	36	0.18	0.02
19	Meliaceae	3-7 days	Tuberculosis	7	0.04	0.02
20	Moraceae	5-7 days	Coughs including bloody cough (tuberculosis)	3	0.02	0.01
21	Myrtaceae	2-4 days	Tuberculosis	6	0.03	0.01
22	Phyllanthaceae	2-5 days	Asthma, Whooping cough	8	0.04	0.03
23	Sapotaceae	2-7 days	Asthma	5	0.03	0.02
24	Solanaceae	3-7 days	Asthma	6	0.03	0.01
25	Zingiberaceae	2-7 days	Asthma, Cough, bronchitis, expectorant	10	0.05	0.02

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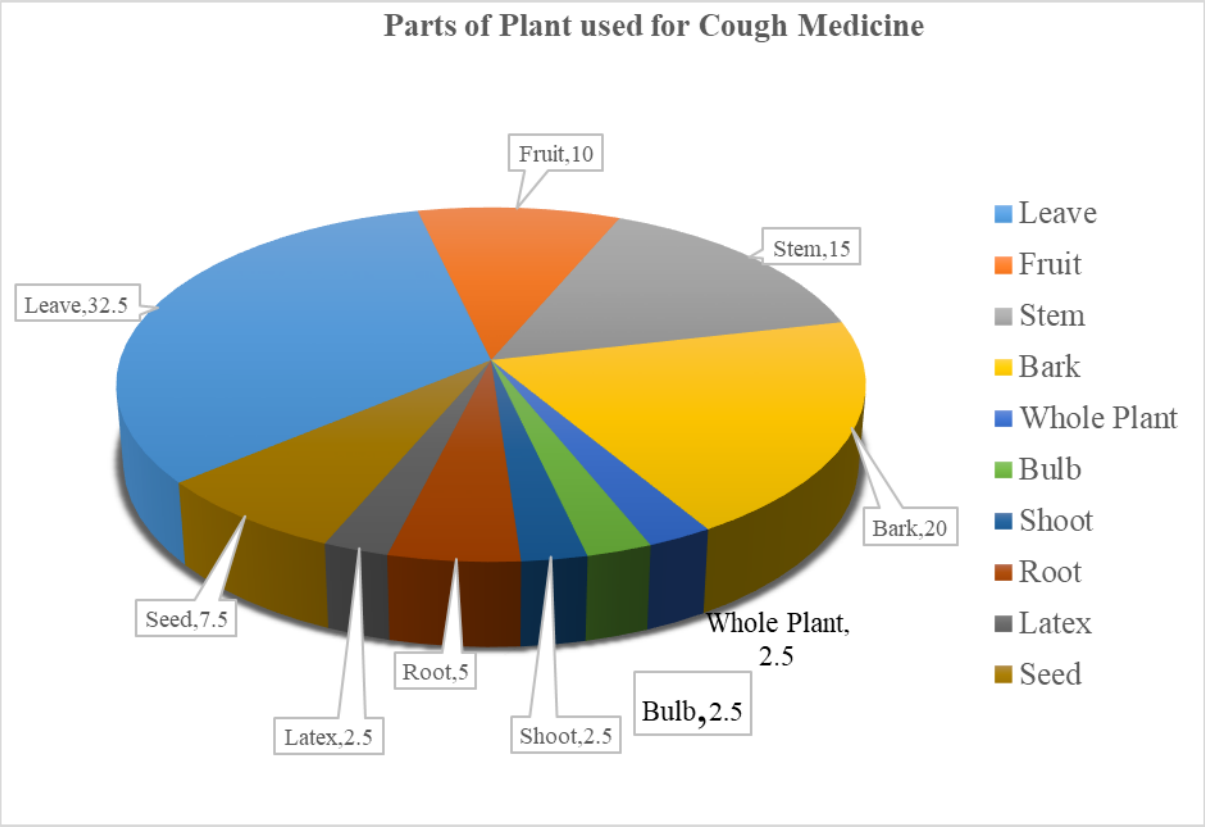

Figure 1. Percentage of the Plant Parts Used in the Preparation for Cough

The methods of preparation and mode of administration of plant-based medications for cough management in the study areas are displayed in Table 3. The most common methods from Table 3 were concoction (28 %), decoction (24 %) and maceration (20 %); and all remedies were administered orally.

Table 3. Method of preparation and mode of administration of the plant used for cough

S/N	Scientific name of Plant for Cough	Method of Preparation	Mode of Administration	Other Medicinal Uses
1	*Abrus precatorius* L.	Decoction	Oral	Treat Tetanus. Preventing rabies, Fever
2	*Adansonia digitata* Linn.	Seeds are soaked in water and taken orally	Oral	Urinary tract disorders, as a diaphoretic for fevers, as an anti-inflammatory, fatigue, dysentery, kidney and bladder diseases
3	*Aframomum melegueta* K. Schum.	Concoction	Oral	Stomachache, Diarrhea, measles, leprosy
4	*Allium ascalonicum* L.	Concoction	Oral	Skin disease, wound
5	*Allium sativum* L.	Concoction	Oral	Treatment of Wound, malaria, diabetes, kidney and liver problem
6	*Alstonia boonei* De Wild	Maceration	Oral	Treatment of Malaria, Fever, Insomnia, chronic diarrhea, rheumatic pain

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Table 3. Method of preparation and mode of administration of the plant used for cough (Continued)

S/N	Scientific name of Plant for Cough	Method of Preparation	Mode of Administration	Other Medicinal Uses
7	*Anacadium occidentale* L.	Decoction	Oral	Treatment of Cardiovascular problems, Respiratory tract dysfunctions
8	*Aloe barbadensis* Mill.	Blend and drink leaf	Oral	Cold, Flu, Skin disease
9	*Azadirachta indica* A. Juss.	Concoction	Oral	Malaria, Fever, skin disease, dental disorder
10	*Bridelia Feruguinea* Benth	Maceration	Oral	Managing arthritis, dysentery, Diarrhea, skin disease, oral infection, bites
11	*Calotropis procera* (Aiton) W.T. Aiton	Herbal syrup	Oral	Antidote for snake bite, rheumatism, burn injuries, and body pain
12	*Chrysophyllum albidum* G.Don	Concoction	Oral	Malaria, Sleeping sickness and yellow fever
13	*Crinum jagus* (J.Thomps.) Dandy	Pounded	Oral	Fever, Wound
14	*Cola acuminata* (P. Beauv.) Schott & Endl.	Chewing	Oral	Ring worm, scabies, gonorrhea, dysentery
15	*Costus afer* Ker Gawl.	Decoction	Oral	Treat and manage diabetes, stomach ache, arthritis, gout
16	*Datura stramonium* L.	Maceration	Oral	Treatment of stomach and intestinal pain
17	*Elaeis guineensis* Jacq.	Concoction	Oral	Treatment of Gonorrhea, menorrhagia and abdominal pain
18	*Erythrina senegalensis* DC	Maceration	Oral	Malaria, wound, and body pain (examples: back pain, chest pain, abdominal pain etc.)
19	*Ficus exasperata* Vahl	Decoction	Oral	Treatment of inflammatory disorder
20	*Garcinia kola* Heckel	Concoction, Chewing	Oral	Diarrhea, hepatitis, Gonorrhea
21	*Hibiscus sabdariffa* L.	Decoction	Oral	toothache, boils, toothache, to ease childbirth
22	*Ipomoea batatas* (L.) Lam.	Decoction	Oral	Burn, catarrh, bug bites, fever, nausea
23	*Lawsonia inermis* L.	Pounded	Oral	Leprosy, skin disease
24	*Psidium guajava* L.	Maceration	Oral	Treatment of wound
25	*Sansevieria liberica* Gerome & Labroy	Chewing	Oral	Gonorrhea, ulcer, convulsion, ear-ache and toothache

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4. Discussion

This study calls attention to the continued critical relevance of traditional medicine in contemporary healthcare management. In resource-limited settings like rural and peri-urban areas of Ogun and Oyo States, Nigeria, herb sellers and traditional healers often serve as custodians of ethnomedicinal heritage for treating common ailments like cough. These plants offer a natural and potentially effective alternative to synthetic medications. Also, the investigation of these medicinal plants could lead to the discovery of new antitussive agents that are urgently needed in less developed areas [11].

In this study, a gendered role in herbal trade and traditional healing was observed, with women making 63.5 % of the respondents. This suggests that women often serve as primary caregivers and herbalists in many African societies, in alignment with the findings of Enebeli-Ekwutoziam et al., [12] in Delta State, Nigeria. In the above study, majority of herb sellers were female. This could be a deep-rooted cultural norm and practical health-seeking behaviours, given that women are often tasked with the responsibility of managing the health needs of their families.

In this study, indigenous knowledge was still preserved by older generations, as suggested by having most respondents (53.5 %) aged between 51 and 60 years. This agrees with the study of Lawal *et al.*, [1] whose finding showed that traditional healers and sellers are between 51-60 years of age. In Nigerian communities, ethnobotanical knowledge is mostly transferred through oral accounts. This makes it vulnerable to loss, especially due to modernization and lack of proper or systematic documentation [1, 13-15]. Familial transmission of knowledge and trade was reported by only 26.5 % of the respondents. This shows that there is a growing shift from strictly ancestral inheritance of knowledge to a more open and potentially diverse learning pathways. However, this may influence the consistency or efficacy of traditional practice in the long run.

For managing cough and related respiratory symptoms, this study identified 25 species from 20 families utilized, as a complement to modern medicine. This suggests the presence of a rich diversity of ethnomedicinal flora used in addressing health challenges locally. The adaptive strategies employed by indigenous people of Ogun and Oyo states is reflected in this biodiversity. For instance, the most frequently cited plants were *Anacardium occidentale* (cashew), *Garcinia kola* (bitter kola), and *Cola acuminata* (kola nut) (See Table 2). They were considered suitable for cough treatment probably because of their reported antimicrobial, anti-inflammatory, and bronchodilatory properties [16]. The ethnopharmacological relevance and potential for further pharmacological validation of these specific species has been affirmed by related studies in other regions of Nigeria and West Africa [1, 17].

A dominant use of the plant's leaf (36 %), bark (17 %), and stem (17 %) for the treatment of cough was found in this study. Consistent with global ethnobotanical literature, this can be alluded to their abundance, ease of harvest, and high concentration of bioactive constituents [18, 19].

The predominant methods of preparation (concoction, decoction, and maceration) are standard across traditional medicine systems. The prevalence of decoction is a rational choice, as this method is particularly effective for extracting bioactive compounds from the hard plant parts (e.g., bark, roots) that were commonly used [19]. Given that respiratory ailments often require systemic treatments, it is

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logical that oral administration was the exclusively reported route. However, plants like *Cola acuminata* and *Sansevieria liberica* were administered by chewing. It suggests that some bioactive compounds may be more effective when extracted in the mouth, perhaps through enzymatic reactions with saliva.

There were a widespread recognition and consensus on the efficacy of *Anacardium occidentale*, *Garcinia kola*, and *Cola acuminata* as demonstrated by their high RFCs. *Adansonia digitata* recorded the highest UV of 0.04. Although it was not frequently cited like others, the high UV suggests that it has a broader range of applications which makes it highly valued. The use of RFC and UV metrics helped to validate community reliance on the plants as well as prioritizing species for further biochemical screening and drug development [17, 20-21].

The results of this study are consistent with that of previous ethnobotanical surveys conducted in Osun State, Southwest Nigeria [1]. 87 plant species used for cough management were documented in that study, which affirmed the therapeutic potential of plants like *Garcinia kola*, *Allium sativum*, and *Azadirachta indica.* A total of 25 medicinal plants were recorded in this study, which was considerably lower than the 87 species reported by Lawal et al. [1]. This variation may be due to the fact that Osun State has a stronger and more documented traditional herbal medicine history and distribution of cultural knowledge than Ogun and Oyo states [1, 22].

Clearly, this study shows that cultural acceptability, cost-effectiveness, and accessibility have positive influence on the sustained use of traditional remedies in southwest Nigeria. It also proves that herbal medicine continues to be a primary healthcare modality in rural communities. However, there is a danger of toxicity or subtherapeutic outcomes due to unregulated use or lack of dosage standardization. Without sustainable management, biodiversity could also be gravely threatened due to the overharvesting of some plant species. Community education on sustainable harvesting and cultivation of medicinal plants is highly advised to guarantee ecosystem balance and sustained availability of these medicinal plants. To enhance culturally sensitive healthcare delivery, it may be helpful to integrate pharmacovigilance mechanisms and ethnobotanical knowledge into public health policies at both national and subnational levels. This can contribute to bridging the gaps in the formal healthcare system and promote respectful collaboration between biomedical and traditional practitioners.

5. Conclusion

This study has shown that traditional medicinal practices are a fundamental component of the healthcare systems in Ogun and Oyo States. Through the systematic documentation of this knowledge, it has contributed to safeguarding the indigenous tradition of plant usage. This study also provides insights that set the stage for future biomedical research, including efforts towards the development of evidence-based herbal therapies for respiratory conditions.

We have identified a few limitations of this study. One of which is that user experiences and outcomes may have been inadvertently excluded due to the focus on predominantly herb sellers and traditional healers. Also, conducting laboratory analysis to verify phytochemical constituents or test antimicrobial activity of the identified medicinal plants, was beyond the scope of this study. Consequently, we would

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like to recommend that future research should focus on the pharmacological validation of the plants with high RFCs, assess the safety profiles of plants through toxicological evaluation, standardization of preparation and dosage and assessment of perceived efficacy through inclusion of patient-reported outcomes.

Ethical Considerations

This study was conducted in line with established ethical standards for human subject research. We sought ethical approval from the Institutional Review Board (IRB) of the Nigerian Institute of Medical Research (NIMR). The approval number was **IRB/26/003**. Also, we obtained endorsement from the Research Ethics Committee of Tai Solarin University of Education's Directorate of Education, Research and External Relations (DEER). Participation in this study was completely voluntary. So, we explained in detail the study objectives, rights of the participants, process for the anonymization of participants' personal identifying information, and our commitment to the principle of confidentiality. Verbal informed consent from all participants was obtained before they were enrolled on the study. During the study duration, we paid due attention to cultural sensitivity.

Author contributions

Original manuscript was drafted by OO and OGA. COO, CPKU and VO reviewed, edited and contributed equally to the finalization of the manuscript. All authors approved the submission and publication of this manuscript.

Conflicts of interest

All authors have declared no conflict of interest in relation to this study.

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