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Ethnobotanical Survey of Medicinal Plants Used in the Treatment of Skin Infections in Ogun and Oyo States, Nigeria

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Abstract:

Background: Medicinal plants have historically provided a rich source of natural compounds with therapeutic properties that can help in the management of different health conditions. Every part of the plant is utilized, from leaves and flowers to roots and bark; and then prepared in various forms such as teas, poultices, ointments, or tinctures, depending on the ailment being treated. Due to its accessibility and affordability compared to conventional medications, there is a growing interest in alternative medicine in Africa. This study explored the medicinal plants commonly used in the treatment of skin infections in Ogun and Oyo States, Nigeria.

Methods: As an ethnobotanical survey of herb sellers and traditional healers, data were collected from 200 participants using structured questionnaires. Data on the plants characteristics was analyzed using Relative Frequency of Citation (RFC) and Use Value (UV) indices. Descriptive statistics were used to analyze the demographic information of the respondents.

Results: 73 (36.5%) of the study participants were male and 127 (63.5%) females. The mean age of respondents was 45.6 ± 8.5 years. A total of 27 plant species from 19 families were identified, mostly represented by the *Asteraceae* family. *Acanthus montany, Ageratu conyzoides,* and *Vernonia amygdalina* were mostly used for treating skin infections like wounds, eczema, and rashes. Leaves (43.6%) were the most dominant plant part used to treat skin infections, followed by seeds (15.4%). The plants with the highest Relative Frequency Citation (RFC) were Ageratum conyzoides (0.14), Acanthus montany (0.11), Vernonia amygdalina (0.08), Abrus precatorius (0.07). The major mode of administration was direct application on the skin and the major method of preparation was boiling.

Conclusion: This study uncovered the usage of plant species and their richness in managing skin infections in the study areas, especially the plant family of *Asteraceae*. The leaves of plants are the most prevalent part of plants used for treating skin infection in Ogun and Oyo States. The study provides baseline information for future biological efficacy testing and possible isolation of biologically active compounds for managing/treating skin infections.

Key Words: Ethnobotanical survey, medicinal plants, skin infection, alternative medicine, herbs in Nigeria.

Introduction:

The skin is the body's outer covering that protects the body from light, injury, and infection. It is the body's

largest organ and it regulates the body temperature, and stores water, and fat, including vitamin D [1]. A common and frequently dangerous issue that affects people of all ages and socioeconomic backgrounds is skin infection. Numerous microbes, including bacteria, viruses, and fungi, are capable of causing skin infections. A variety of complications, including sepsis, organ failure, and even death, can result from skin infections, which can range in severity from minor to life-threatening.

Traditional medicine has long been a part of the culture of the people in Africa, and local knowledge of medicinal plants is a source of fresh insights for contemporary pharmaceutical science [2]. In many underdeveloped nations, community members depend on their indigenous flora for healing various ailments. This is generally related to the expensive cost and restricted access to healthcare services [3].

Medicinal plants have historically provided a rich source of natural compounds with various pharmacological activities. Some plant extracts may offer therapeutic benefits for skin diseases through their anti-inflammatory, antimicrobial, or wound-healing properties [4]. Bitter leaf, for instance, contains alkaloids, flavonoids, terpenoids, and tannins, which have antimicrobial and anti-inflammatory properties.

Medicinal plants have been used for centuries in traditional medicine to treat various ailments and diseases [5]. These plants possess bioactive compounds that have therapeutic properties and can help in the management of different health conditions. Bioactive compounds found in medicinal plants can include alkaloids, flavonoids, terpenoids, and phenolic compounds, among others. Each of these compounds has specific effects on the human body and can target different physiological processes [6].

For example, some medicinal plants have been found to have anti-inflammatory properties, which can help reduce pain and swelling. Others have antimicrobial properties, making them effective against bacteria, viruses, and fungi. Some plants even have antioxidant properties, which can help protect the body against oxidative stress and damage caused by free radicals [7].

In addition to their properties, medicinal plants are often more accessible and affordable compared to conventional medications. They are also considered to have fewer side effects, as they are derived from natural sources. This has led to a renewed interest in traditional medicine and the use of medicinal plants as alternative or complementary treatments [8].

Studies have revealed that indigenous communities utilize medicinal plant species frequently for the treatment of hypertension, cough, skin problems, and rheumatism. Furthermore, the plants in this region were found to have versatile medicinal properties against respiratory disorders, throat infections, joint pain, and hypertension [9].

Each plant holds its unique healing properties and is carefully selected based on its specific benefits. From leaves and flowers to roots and bark, every part of the plant is utilized to extract medicinal compounds. These compounds are then prepared in various forms such as teas, poultices, ointments, or tinctures, depending on the ailment being treated [10].

The effectiveness of these plant-based remedies has been acknowledged by modern medicine as well. Many pharmaceutical drugs have been developed by isolating and synthesizing the active compounds found in medicinal plants used by these communities [11].

As modern healthcare systems become more aware of the importance of traditional knowledge, efforts are being made to integrate traditional plant-based medicine into mainstream healthcare practices. This recognition not only benefits the tribal and ethnic communities but also contributes to the overall diversity and inclusivity of medical practices worldwide [12].

Several research gaps remain in Nigeria despite the rising interest and effort in documenting plant resources with therapeutic significance. Aside from the socio-cultural uniqueness and inherent dynamics associated with the understanding of local and Indigenous use of medicines among local communities, it is important to note that some plant species have been neglected, and extensive documentation is still necessary to prevent the loss of valuable indigenous knowledge associated with plant resources in local communities [3]. Hence, this study investigated the plant species utilized for the treatment of skin infections.

This study aims to investigate medicinal plants used for the treatment of skin infections in Ogun and Oyo states. The following were the primary objectives of the study:

- To document plants that are traditionally used to treat skin infections.
- To determine the part of the plant used for the treatment of skin infections.
- To determine the method of preparation and route of administration of the plant used for the treatment of infections.

Materials and Methods:

Study Area:

The study was conducted in two Southwest States, namely Ogun and Oyo. The area lies between longitude 3.927070° E, Latitude 6.817546° N for Ogun State, and Longitude 3.855090° E, Latitude 7.303034° N for Oyo State. The survey was carried out at Oke Aje Market and New Market in Ijebu Ode, Kuto Market, and Itoku Market in Abeokuta, Ogun State. Bodija Market, Bode Market, Ojaoba Market and Araromi Market in Ibadan, Oyo state.

Study Population and Sampling Techniques:

The Population of the study comprised herb sellers in Ogun and Oyo States, Southwest Nigeria. A total of 200 herb sellers were randomly selected in both Ogun State and Oyo State, for this study.

Data Collection:

A structured questionnaire was used to collect information on plants and plant parts used for the treatment of skin infections. The Questionnaire was made up of three Sections: A, B, and C. Section A contained the demographic information of herb sellers. Section B contained plant and plant parts used for skin Infection. Section C contained the method of preparation and mode of administration of the plants. The local names (in the Yoruba language) were obtained from the respondents, followed by the scientific identification of plants and then the verification of the currently accepted names of all plants identified on the "World Flora Online" (www.worldfloraonline.org) and the global directory of Public Herbaria (https://sweetgum.nybg.org/science).

Statistical Analysis:

The demographic information of the respondents was analyzed using descriptive statistics, while the information gathered on the plants was subjected to Relative Frequency Citation (RFC) and Use-Value (UV) according to Afolayan, Sulaimon & Okunade [13].

Relative frequency of citation (RFC) was calculated using the formula

RFC= FC/N..... Equation 1

where FC (frequency of citation) was the number of informants who mentioned the use of the species and N was the total number of informants that participated in the survey. This index estimated the local importance of each species.

The Use-Value (UV) was used to underscore the relative importance of the species known locally, and it was calculated using equation 2

$UV = U_i / N$ ..... Equation 2

Where U is the number of 'uses' mentioned by each informant for a given plant and N is the total number of informants.

Results:

Table 1 shows the demographic information of the respondents. Out of 200 respondents, 69% of respondent were herb sellers, 14% were traditional healers and 17% were others. 127 respondents (63.5%) were females while 73 respondents representing 36.5% were males. It was recorded that 1.5% fell within the age range of 21-30 years, 5% were of 31-40 years, 38% were of 41-50 years, 53.5% were of 51-60 years, 1 % were of 61-70 years, 1 % fell in the range of 71 and above years. 26.5 % learned from their parent, 30 % learned it from a skilled individual, 12 % learned it through personal development, and 31.5 % learned it from other means.

Parameter	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

Table 1: Demographic information of the respondents.

Table 2 shows the medicinal plants used for the treatment of skin disease in Ogun and Oyo states, Nigeria. A total of 27 plants were mentioned as medicinal plants used for skin infections in the study area. The Relative Frequency Citation (RFC) for all plant species recorded in the study area ranged from 0.01-0.14. The most frequently mentioned plants were *Ageratum conyzoides* (0.14), *Acanthus montany* (0.11), *Vernonia amygdalina* (0.08), *Abrus precatorius* (0.07).

S/N	Family	Scientific name	Local name	Common name	Plant Part Used for Skin Infection	Duration of Treating Skin Infection	Type of Skin Infection	Frequency	RFC	UV
1	Acanthaceae	*Acanthus montany*	Ahon-ekun, Irunmu arugbo	Bear's breeches	Stem, Bark	2-5 days	Wounds and skin diseases	21	0.11	0.01
2	Apocynaceae	*Funtumia Africana*	akọ irẹ́	rubber tree	Whole Plant	3-7 days	Wound, jaundice	5	0.03	0.02
3	Apocynaceae	*Rauvolfia vomitoria*	Asofeyewe	Serpent wood, serpent snake, and swizzle stick	Leaf		Skin infection	6	0.03	0.05
4	Asteraceae	*Emilia sonchifolia*	ọ̀dndúún odò	Scarlet tassel	Leaf	2-4 days	Skin troubles, abscesses and bruises	4	0.02	0.02
5	Asteraceae	*Ageratum conyzoides*	Imi-esu	billygoat-weed	Whole plant	3-5 days	Skin infection	29	0.14	0.01
6	Asteraceae	*Aspilia Africana*	Yunyun	wild sunflower	Leaf, flower	3-5 days	Skin rashes, cleaning sores, corneal opacities	7	0.04	0.02
7	Asteraceae	*Vernonia amygdalina*	Ewuro	Bitter leaf	Leaf	3-5 days	Ringworm, rashes, measles, chicken pox and Eczema	15	0.08	0.01
8	Boraginales	*Heliotropium indicum*	Agogo igun	Indian turnsole	Juice		Stings and boils of scorpions and insect bites	11	0.06	0.03
9	Capparaceae	*Cleome ciliate*	Ekiye	fringed spider flower	Leaf, seeds	3-7 days	Wounds, Skin infection	5	0.03	0.01
10	Caricaceae	*Carica papaya* Linn.	Ibepe	Pawpaw	Leaf, sap, fruit	2-7 days	Wound, eczema	3	0.02	0.02
11	Crassulaceae	*Bryophyllum pinnatum*	Abamoda	miracle leaf, life plant and never die.	Leaf	2-5 days	Boil, wound, sore or cut,	12	0.06	0.02
12	Euphorbiaceae	*Jatropha curcas*	Botuje, Lapalapa funfun, Iyalode	Barbados nut	leaf	3-7 days	Boils	8	0.04	0.02
13	Euphorbiaceae	*Ricinus communis Linn.*	Ilara, Ilarum/iru	Castor bean	Leaf, root, and seed	3-7 days	Skin infection	3	0.02	0.03
14	Euphorbiaceae	*Acalypha wilkesiana Muell Arg.*	Jinwinini,	Red Acalypha	Leaf	3-5 days	Skin infection	11	0.06	0.02

Table 2: Profile of plant claimed by the respondent for the treatment of Skin Infection.

Table 3 shows the method of preparation and mode of administration of plants used for the treatment of skin infections in Ogun and Oyo states, Nigeria. The common mode of administration was direct application on the skin.

S/N	Scientific name of Plant for Skin disease	Method of Preparation	Mode of Administration	Other Medicinal Uses
1.	*Abrus precatorius*	Grind the root and apply the poultice on the affected skin area. Also, crushed seeds can be taken orally	Orally or directly applied to the skin	Treat tetanus, prevent rabies
2.	*Acanthus montany (T.* And *erson)*	Wood bark is crushed and soaked in alcohol, and the extract is applied to wounds and skin	Directly applied to the skin	Asthma
3.	*Acalypha wilkesiana Muell Arg.*	Boil and drink red *Acalypha wilkesiana* leaves or bathe with it to treat skin infections	Orally or Bathing	Pain, fever, ulcer
4.	*Ageratum conyzoides*	The plant is macerated and applied to the affected skin area.	Directly applied to the skin	Dysentery, diarrhea
5.	*Aloe barbadensis* Miller	Mix *Aloe vera* leaf juice, quill eggs, *Citrus limon* fruit juice, and native soap for bathing, Apply *Aloe vera* leaf gel on the skin after shaving	Bathing with, directly applied to the skin	Cold, Flu
6.	*Allium sativum L.*	The juice is mixed with lotions for skin conditioning.	Directly applied to the skin	Treatment of Wounds, malaria, diabetes, kidney, and liver problems
7.	*Aspilia africana*	The flower is squeezed	Directly applied to the skin	Headache Stomach ache, gastric ulcer, bleeding
8.	*Azadirachta indica* A. Juss.	*Azadirachta indica* seed oil is rubbed on the body as an insect-repellent	Directly applied to the skin	Malaria, Fever, skin disease, dental disorder
9.	*Bryophyllum pinnatum* (Lam.) Oken	Crush the leaf and apply the juice on the wound surface	Directly applied to the skin	Diabetes, diuresis, dissolving kidney stone
10.	*Carica papaya* Linn.	Apply the sap from unripe *Carica papaya* fruit topically to treat eczema.	Direct application, Placing on the wound surface	Treatment of stomach pain, bacterial infection and inflammation
		Roasted leaf pulp of *Carica papaya* is placed on the wound for healing		
11.	*Citrus limon (L.)* Burm.f. (pro.sp.)	Mix equal quantities of Limon juice and holy basil, and keep it under the sun till becomes thick	Directly applied to the skin	Treatment of scurvy, sore throats, fever, rheumatism, high blood pressure and chest pain
12.	*Cleome ciliate*	Seeds are crushed and the poultice is applied to the affected area. The macerated leaves after boiled are taken orally	Orally, directly applied to the skin	Laxative, Anthelmintic,
13.	*Emilia sonchifolia* L.	Crushed leaves will be pressed	cover the wound or bruised surfaces	Treatment of fever, sore throat, diarrhea and antidote for snake bite
14.	*Ficus asperifolia Miq*	Applied as poultice to the skin itches	Directly applied to the skin	To treat stomach pain, bacterial infection, and inflammation
15.	*Funtumia Africana*	Whole plant is boiled and taken orally.	Orally. Directly applied to the skin	Treatment of fever, malaria, cancer
		Also, the crushed leaves are applied to the affected skin area		
16.	*Heliotropium indicum*	Boil with *Ocimum gratissimum*	Orally	treat rheumatism, ulcer, venereal disease, fever, sore throat, and sores in the rectum
17.	*Hibiscus asper*	The leaf is boiled and taken orally	Orally	Potent sedative, anti-inflammatory, anti-depressive and anti-anemic
18.	*Jatropha curcas*	Boil the leaves with water.	Place the hot leave on the affected area of the skin	Treatment of bacterial and fungal infection or febrile disease
19.	*Macrolobium macrophyllum*	Squeeze the leave	place the Squeezed leave on the affected area of the skin	Treatment of shortness of breath, cough
20.	*Musa nana J. de Loureiro*	Grind *Musa nana* fruit peel (omimi) with *Senna alata* leaves and mix with native soap for bathing	Bathing	Treatment and prevention of cancer, ulcers, diarrhea, hemorrhoids, diabetes

21.	*Nauclea latifolia*	Grind with oil, pepper, salt and pork meat	Orally	fever, pain, dental caries, septic mouth, malaria, dysentery, diarrhea, and diseases of the central nervous system such as epilepsy
22.	*Ocimum gratissimum*	Boil with *Heliotropium indicum*	Orally	diabetes, cancer, inflammation, anemia, diarrhoea, pains, and fungal and bacterial infections
23.	*Psidium guajava* L	Crushed guava leaf or boiled leaves. Infusion of *Psidium guajava* flowers is applied topically on wounds for healing	Directly applied to the skin	Treatment of cough
24.	*Rauvolfia vomitoria*	Prepare as decoction with *Nauclea latifolia, salt. Pepper and Pork meat*	Orally	diarrhea, jaundice, venereal disease, rheumatism, snake bites, colic, and fever, to calm people with anxiety or epilepsy, and to lower blood pressure.
25.	*Ricinus communis Linn*	Apply castor oil on the affected area to relieve skin infection	Directly applied to the skin	Arthritis, chronic headache. Constipation, chronic backache, menstrual cramps, insomnia
26.	*Sida acuta Burm.f*	Boil the leave	Directly applied to the skin	Treatment of male sexual dysfunction
27.	*Vernonia amygdalina*	Grind with black soap or mix with alcohol	Directly applied to the skin/ Bathing	treatment of diabetes, fever reduction

Table 3: *Method of Preparation and Mode of Administration of the Plants used for Skin disease.*

Figure 1 shows the plant parts used for the preparation of remedies for skin infection. A total of 11 plant parts were mentioned for skin infection across the study areas. The percentage for all plant parts recorded in this study ranged from 3 – 43. The most frequently mentioned plant parts were Leaves (44%), Seeds (15%), Roots (8%), and Fruits (8%).

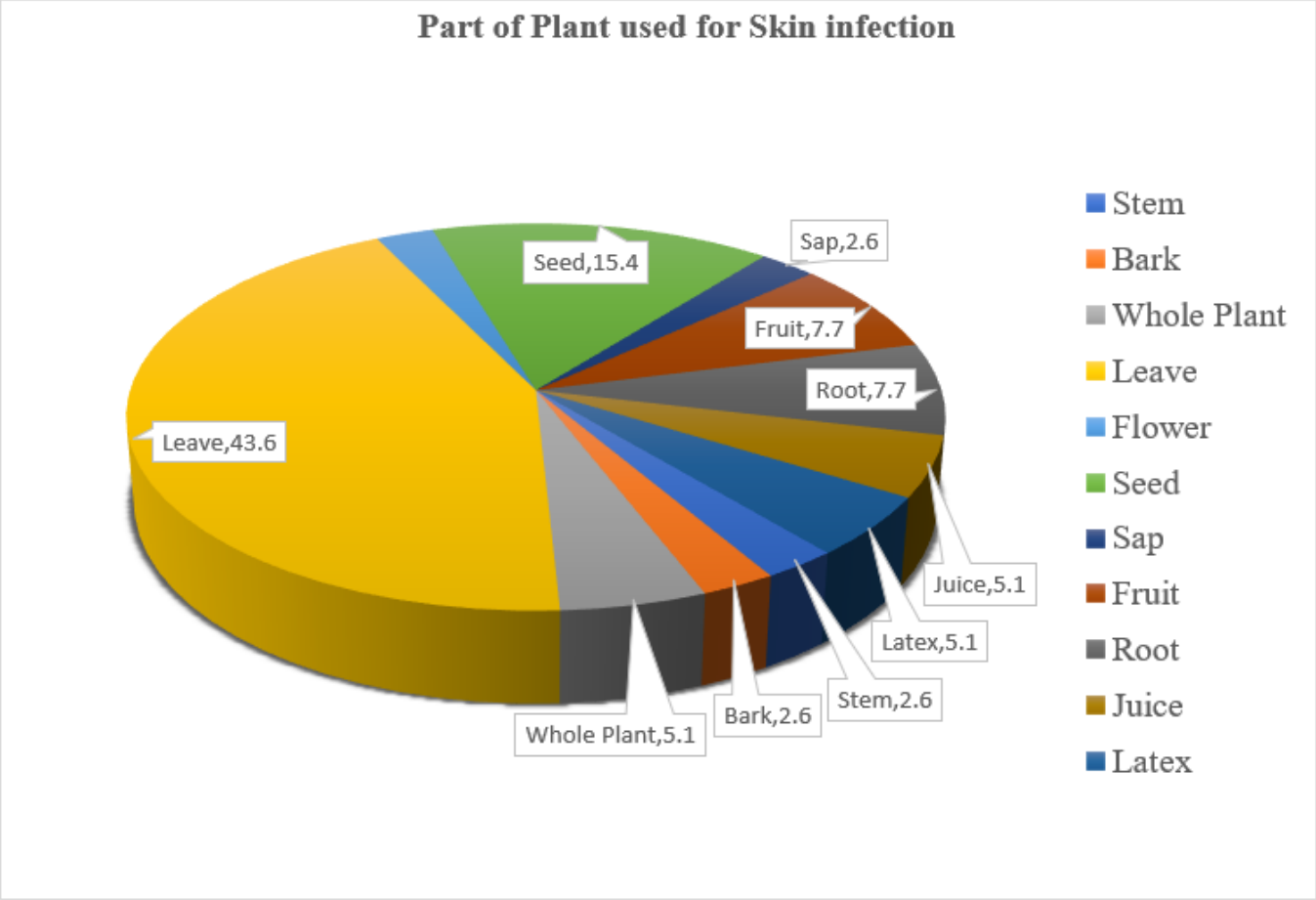

Figure 1: *Percentage of the plant parts used in preparation of remedies for Skin infection.*

Discussion:

Plants have been used for centuries in traditional medicine to treat various ailments, including skin infections. 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 and antimycotic agents that are urgently needed in less developed areas [14].

A Large number of respondents in this study are between 51-60 years. This agrees with the study of Lawal *et al.,* [3] whose finding showed that traditional healers and sellers were between the age group of 51 – 60 years. This suggests that indigenous knowledge of skin-related diseases and experience are an important factor in the successful practice of integrative medicine. Majority (38%) of study participants claimed 21 -30 years' experience in the use of herbs. There is need to transfer this knowledge from older generation to younger especially in the study areas. Only 26.5% of respondents learnt their trade from their parents as part of inheritance or oral tradition, lower than 40% reported in Ilorin [15]. However, more participants (30%) acquired the knowledge through training by skilled and experienced personal in this study area than in Ilorin (24%) [15].

It was also observed that a larger percentage of the respondents were females. This could be an indication that females are more into herbal medicine than their male counterparts. This is consistent with the study of Enebeli-Ekwutoziam, *et al.,* [16] in which 52 respondents were females out of 100 herb sellers in the Northern Delta State of Nigeria. Similarly, more women (60%) than men (40%) were involved in selling herbs in an ethnopharmacological survey of medicinal plants conducted in Ilorin, North-Central, Nigeria [15]. In many rural communities, women are involved in farming and may have contributed to stronger interest and knowledge of herbs. Again, due to poverty or lack of modern healthcare facilities, being mostly at home with the children, women tend to seek alternative medicinal remedies for their children, if they took ill. Understanding the uses of some plants have helped them save cost and catered for minor illnesses, including skin infections.

This study has revealed a total of 27 plants from 19 families as part of the medicinal plants used for the treatment of skin infections in across the two states. Many of the plants were also reported by Oyedemi, *et al.,* [17] in their study of 61 medicinal plant species belonging to 26 families for the treatment of skin infection and Oral Infection. According to the study, 27 of them were used in the management of oral infections, twenty-six plants used for the management of skin infection while eight plants were used in the management of both infections. The use of a particular plant for the same purpose by different persons across different locations, can be a validation of its potency for the diseases it is used to treat.

The respondents reported diverse plant parts such as stem, bark, whole plant, leave, flower, seed, sap, fruit, root, juice, and latex being utilized for managing skin infection in the study areas. However, leaves were the major plant part used as a skin infection remedy. This is similar to the findings of Falana, et al., [15], Enebeli-Ekwutoziam, *et al.,* [16] and Shoshan, et al., [18]. who reported leaves as the main plant part used to treat skin-related ailments in the Northern Delta State and in Ogun State of Nigeria, respectively. Leaves of plants are usually associated with high bioactive compounds like essential oils, flavonoids, and alkaloids, which have healing effects on a wide range of skin infections. However, this contrasts with barks being reported as the major plant part used for skin infection remedy in a study carried out in Ibadan metropolis by Lawal, et al., [19].

The major mode of administration in this study was direct application on the skin, which is consistent with Falana, et al., [15]; but contrary to oral administration reported by Lawal, et al., [19], and Odebunmi, et al., [20]. It is noteworthy that the nature of the disease and method of herbal preparation, greatly influences the mode of administration of herbal remedies. The major method of preparation was boiling or decoction in agreement with reports by Lawal, et al., [19], but markedly different from 51% of study participants' report of crushing to extract juice in the study by Falana, et al., [15]. This is probably due to the nature of skin infection, as herbal remedies intended for treating open wounds or eczema are more likely to be crushed to extract the juice. The potency of herbal mixtures can be directly impacted by the method of preparation and administration.

Conclusion:

This study has documented the medicinal plants commonly used for the treatment of skin infections by herb sellers in Ogun and Oyo states, helping to digitize

folkloric information on the medicinal plants. These plants listed have been reported by the respondents to be safe when used as herbs. Plants are more affordable than drugs, and many plants are readily available and can be grown or purchased at a low cost.

Thus, in the face of growing unaffordable modern drugs, the current findings on the medicinal uses of plant species for skin infection provide baseline information for future biological efficacy testing and possible isolation of biologically active compounds for managing/treating skin infections.

Recommendations for Future Studies:

Plants are often considered to be more natural and less harmful than synthetic drugs. However, herbs should be used in their correct dosage and under the guidance of a qualified healthcare professional. Here are some recommendations:

- Further ethnobotanical surveys should be expanded to include other geopolitical zones in Nigeria to see if there will be similarities or disparities in the results.
- Phytochemical constituents of those plants reported in this study should be subjected to a more detailed phytochemical analysis.
- Clinical trials should be conducted to assess the plants like ***Ageratum conyzoides*** and ***Vernonia amygdalina***, for their efficacy in the treatment of skin infections.

Ethical Considerations:

The objectives of the study, participant rights, anonymity, and confidentiality, were explained to the study participants. Participation was voluntary and informed consent was verbally obtained from all participants before their inclusion in the study. Cultural sensitivity was given priority attention, and respecting indigenous knowledge and traditional practices was upheld.

Acknowledgment:

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List of Abbreviations:

RFC: Relative Frequency of Citation, **FC:** Frequency of citation, **UV:** Use-Value

Conflict of Interests:

All authors declared that there is no conflict of interest related to this study.

Data Availability:

Upon reasonable requests, the study data from survey questionnaires, and the detailed plant species information, can be made available by the corresponding author.

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