

Ethnomedicinal survey of plants used in the treatment of skin-related ailments in the Northern Delta State of Nigeria

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Abstract. *Enebeli-ekwutoziam KC, Aruah CB, Ogbonna BO, Eze UJ, Egedeye-fubura FS, Nwankwo CF, Oliseyenum IN, Udoha NW, Afuye TN, Asogwa GN, Chinweokwu KA, Anenih FO, Iyamu JE, Oboti ID, Nwaizu N, Ajabor JI, Ozadibe OY, Otunla RA, Francis OB, Orji CM. 2021. Ethnomedicinal survey of plants used to treat skin-related ailments in the Northern Delta State of Nigeria. Asian J Ethnobiol 4: 76-85.* An ethnomedicinal survey of plants used to treat skin-related ailments was conducted to document information on the common plant resources employed in the ethnomedicinal practices of the indigenous people of the Northern Delta State of Nigeria. A total number of 100 respondents were selected from the Northern Delta State of Nigeria. The herbalists were mostly males (61%). The respondents comprised two age groups, i.e. <40 (30%), and >40 (70%). The respondents were 30 herbal drug dealers, 46 herbalists, and 24 community elders. Semi-structured questionnaires were used to obtain data through personal interviews with the respondents. 51 plant species belonging to 29 families of flowering plants were revealed as useful in the treatment and management of Skin diseases/parasites, boils, wounds, cuts, sores, pimples, inflammation, aftershave bumps, abscess, and bleeding. Asteraceae (8.75) and Fabaceae (8.2) showed the best consensus among respondents on reported species and families. The highest values of relative citation frequencies were reported for *Citrus limon* and *Ricinus communis* with 0.24 each. On the other hand, the highest value of fidelity level was reported for *Elaeis guineensis* (99). Herbs were the most dominant life form found in the study (45%). Females (52%) have higher knowledge of medicinal plants and their application than males (48%). Leaf was the most commonly used plant part (44%) in preparing herbal remedies. A decoction was the most common method of herbal drug preparation (33.96%). Herbal recipes used by the locals to treat skin-related ailments contain some active ingredients, some of which have been scientifically proven and others still undergoing clinical validation. This justifies their ethnomedicinal uses as a remedy for skin ailments. High levels of medicinal plant diversity and ethnomedicinal knowledge exist in the area. Therefore conservation studies should be carried out on the plants reported in this survey for sustainability.

Keywords: Ethnobotany, ethnomedicine, herbal drugs, Northern Delta State, Nigeria

Abbreviations: AB: Abscess and Boils, BDU: Bioresources Development Centre Herbarium, FL: Fidelity Level, FV: Familial Use Value, PIAB: Pimples, Inflammations, and Aftershave Bumps, RC: Consensus between respondents, RFC: Relative Frequency of Citation, RU: Reported Use Value, SDP: Skin Disease and Parasite, UV: Use Value, WCS: Wounds, Cuts, and Sores

INTRODUCTION

Tropical regions have over 400,000 species of flowering plants which possess medicinal properties (Akpulu et al. 1994). The diversity of these plants, and their affordability and easier accessibility, led to the increased practice of ethnomedicine compared to orthodox medicine (WHO 2002; Ariwaodo et al. 2012). This has led to investigations for their possible use as a drug for adequate provision and affordable health care to humankind. Medicinal plants are widely known for historical and cultural reasons (Alade and Ajibesin, 2017). Studies have been conducted on medicinal plants for their

potentials in alleviating health problems. Several intensive studies are currently being undertaken on plant-origin drugs because plants are sources of newer alternatives with lesser side effects (Alade et al., 2018).

As d WHO (1978) defines traditional medicine as the knowledge and practical application of plants inexplicably to prevent and cure physical, mental, or social diseases. It exclusively depends on practices, experience, and observations handed down from generation to generation, either verbally or written.

People across the continents, including Africa and most notably West Africa, since ancient times, have relied on plants as sources of remedies for the treatment of many

diseases (Abd El-Ghani 2016). Hostellmann and Marston (2002) reported conventional drugs are expensive in developing countries, especially in West Africa, and more than 80% of the populace rely on ethnomedicinal plants as remedies. Medicinal plants have been employed in therapeutic practices for hundreds of years before the evolution of modern scientific medicine and scarcely have adequately documented evidence of adverse effects (Iyamah and Idu 2015, Okigbo and Mmeka 2006).

Orthodox medicine is not widespread in developing countries, and the provision of healthcare has been made possible by these indigenous alternatives (Okujagu 2005, pers. Com. (personal communication). Herbal drugs have become popular because they have fewer side effects, are higher tolerant, cheap, and are widely accepted. Herbal drugs have successfully treated many diseases that defy treatments using orthodox medicines. Studies have been conducted on several plants' ability to treat various ailments (Malik et al. 2019).

Since historical times, plant resources of Nigeria have been alternative sources of drugs though there have been challenges of poor documentation (Gbile and Adesina 1986). Significant challenges experienced with sustainable management of these plant resources include over-exploitation of plant species growing in the wild, anthropogenic activities, and poor conservation programs (Wambebe 1998).

The skin is the largest sense organ and is crucial in ensuring health and well-being (Mowobi et al., 2016). It is the first defense layer of the human body and is structured in three layers- epidermis, dermis, and hypodermis, with each layer interfacing with the environment and performing a specialized function towards its well-being (Tabassum and Hamdani 2014; Malik et al. 2019). General functions of the skin are a defense against pathogenic organisms, prevention of excess loss of water, thermoregulation, irritability, storage of fats and lipids, vitamin D synthesis from ultraviolet rays, preservation of folic acids, insulation, protection of delicate internal organs, excretion, absorption of oxygen and drug. Plants which possess dermatological properties and serve as antidotes to various skin troubles such as wounds, cuts, sores, abscesses, bleeding, acne, and inflammation are essential to humans (Malik et al. 2019). Diseases associated with the skin are a common universal occurrence but most notably in tropical regions of the world. All age groups experience their harmful effects and gender, whether newly born or elderly (Grice et al. 2009; Pappas 2009). Despite their universal occurrence, skin diseases are a significant concern in rural areas of developing countries in tropical regions of the world (Mowobi et al., 2016). Skin diseases are classified as non-contagious and contagious diseases, and their causal organisms are bacteria, fungi, viruses, and parasites (Malik et al., 2019). This study aims at documenting information on the typical plant resources used to treat skin diseases by the indigenous people of Northern Delta State of Nigeria as they have not been previously reported.

MATERIALS AND METHODS

Study area

North Delta is one of the districts in the Northern Delta State of Nigeria. It comprises nine councils, i.e., Aniocha North, Aniocha South, Ika North East, Ika South, Ndokwa East, Ndokwa West, Oshimilli South, Oshimilli North, and Ukwuani (Figure 1). The area is popularly called Anioma, meaning "good land." It is located west of Niger-Delta of southern Nigeria, the third-largest wetland globally (Umoh 2008), with Africa's largest river delta and mangrove ecosystem (Ajonina et al. 2008). It lies at 6°11'40"N and 6°25'41"E with an elevation of 154 meters above sea level (Anioma Delta State Nigeria 2012). The climatic type is humid sub-equatorial with tropical lowland rainforest, freshwater swamp, estuarine and marine mangrove swamps, and aquatic ecosystems (Izah 2018). The mean annual rainfall ranges from 3000 mm to 4000 mm, and the average monthly temperature of 27°C. A wet season extends from July to September and a dry season from December to February (Olaekan and Gordon 2011). The spoken languages are various dialects of the Ibo language.

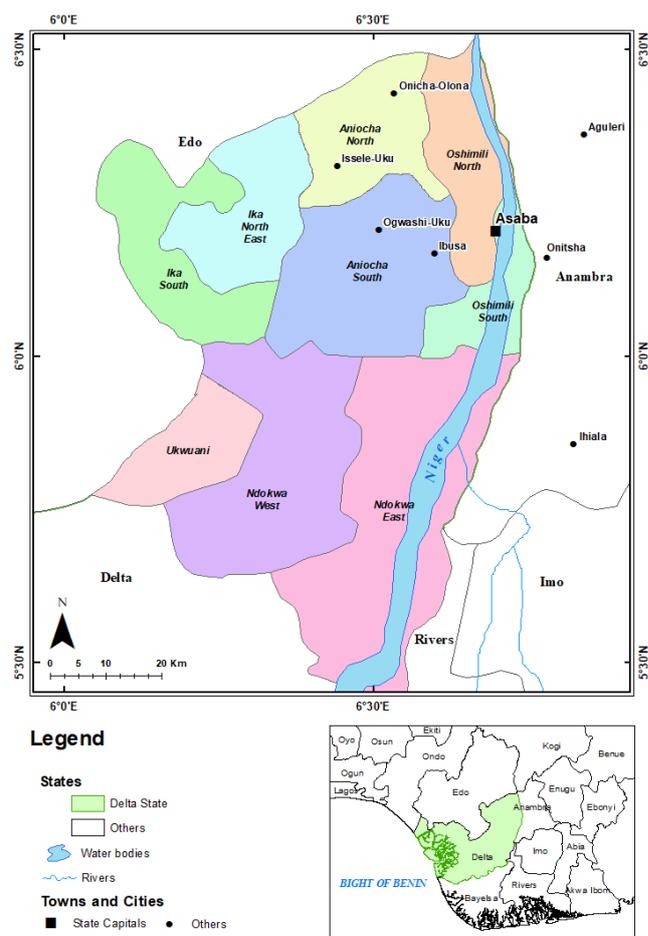


Figure 1. Map of North Delta District, Delta State, Nigeria

Table 1. Demographic data of informants on ethnomedicinal plant species

Respondents	Herbal drug dealers	Herbalist	Community elders	Total interviewed persons
Male (<40)	5	11	-	16
Male (>40)	6	17	9	32
Female (<40)	8	6	-	14
Female (>40)	11	12	15	38
Total interviews	30	46	24	100
Percentage (%) males	36	61	38	48
Percentage (%) females	63	39	63	52

Field survey

Visits were made to the study area between September and December 2019. An ethnomedicinal survey was carried out with the aim of documentation plants used in the treatment of skin-related ailments. Free prior informed consent of the informants was obtained before the study commenced. Informants were 46 renowned herbalists, 30 herbal drug dealers, and 24 elders. Interviews were conducted with the informants using a semi-structured questionnaire and a local-language interpreter. Information such as local names, therapeutic use, plant part used, mode of preparation was collected (Huntington 2000). Medicinal plants reported in the survey were collected, identified using Trees of Nigeria (Keay 1989), Flora of Nigeria, and West Africa (Hutchinson and Dalziel 1954, 1958, 1968). The identified plants were pressed and deposited at the Bioresources Development Centre Herbarium (BDU), Ubulu-Uku, Delta State.

Data analysis

Data obtained from the study were analyzed using Statistical Package for Social Science (SPSS) Version 23 and Microsoft Office Excel 2016. Ethnomedicinal data were analyzed using the Relative Citation Frequency (RFC), Fidelity Level (FL), Familia Use Value (FV), and Use Value (UV). Socio-demographic data of the respondents were analyzed using a simple descriptive statistical method and reported in a summary of frequency and percentages.

Relative frequency of citation (RFC)

Calculations were made for the local importance of each plant species based on the relative frequency of citation (Tardio et al. 2006). The RFC was calculated as follows: the number of those mentioned using the species (Fc) divided by the total number of respondents (N).

$$RFC = Fc/N$$

Fidelity level (FL)

Fidelity level was calculated following Alexiades and Sheldon (1996) for the most frequently reported diseases as:

$$FL (\%) = N_p / N$$

Where:

N_p : number of informants that claim a plant used to treat a particular disease.

N: number of informants that use the plant as medicine in treating any disease.

Familial use-value (FV)

The importance of a family is measured by its familial use-value (Letsela et al., 2003). This was determined by summation the number of species mentioned under each family across all the uses categories.

Use value per plant part (UV)

Use value per plant part was calculated following Hoffman and Gallaher (2007):

$$Use\ value\ (UV) = \sum RU_{(plant\ part)/ns}$$

Where:

RU: total number of use categories for each plant part

NS: total number of informants interviewed

Consensus between authors on cited species and families

Consensus between authors on cited species was calculated following Molaes and Ladio (2009):

$$\text{Number of species} \times 100 / \text{Number of respondents}$$

A lower value gives a better consensus than a higher value.

RESULTS AND DISCUSSION

Socio-demographic information of respondents

A total number of 100 respondents were selected from the Northern Delta State of Nigeria. The respondents comprised two age groups, i.e. <40 (30%), and >40 (70%). The respondents were 30 herbal drug dealers, 46 herbalists, and 24 community elders. The herbalists were mostly males (61%) than females (39%). In contrast, the herbal drug dealers and community elders comprised mostly females (63% each, respectively), while males comprised 36% herbal dealers and 38% community elders (Table 1).

Skin treatment plants

The survey revealed the indigenous knowledge of plants used to treat skin-related ailments and various skin diseases in the Northern Delta State of Nigeria. 51 plant species distributed among 29 families were reported as plants used to manage skin-related ailments (Table 2). Herbs (45%) were the main growth habit, followed by shrubs and trees (27.5% each), respectively (Figure 2).

Categorization of skin diseases

Relative frequency of citation (RFC)

The highest RFC values for species were reported for *C. limon* and *R. communis* (0.24 each), *A. precatorius*, *C. Papaya*, and *C. aurantifolia* (0.22 each), *A. melegueta*, *A. cordifolia*, and *M. indica* (0.21 each), and *A. montanus*, and *E. guineensis* (0.20 each) respectively (Table 2).

Fidelity Level (FL)

The highest FL values were reported for *E. guineensis* (99), *E. hirta* (97), *C. limon*, *C. nucifera*, and *T. superba* (96 each), *D. arborea* (95), *T. fruticosum* (93), and *B. nitida* (92) respectively (Table 2).

Frequency of family occurrence

A total of 29 families were reported in this study. Fabaceae and Asteraceae had the highest number of species (8 each), Euphorbiaceae (5) and Araceae (4) (see Figure 3).

Familia use value

Fabaceae and Asteraceae were the essential families having the highest domestic use value of 7 and a consensus between respondents of 8.2 and 8.75 (Figure 3).

Frequency of plant preparation

In the study area, decoction (33.96%) was the most common method of plant preparation used in herbal remedies, followed by infusion (16.03%), poultice (15%), juice extracts (13.2%), mastication, and macerations (4.71% each), baths and remedies (3.7%), aromatherapy (3.7%), tinctures (1.8%), powdered, compresses and syrups each having 0.94% (Figure 4).

Reported use value per plant part

Leaf (44%) was the most commonly used plant part in the preparation of herbal remedies for skin-related ailments; this was followed by stem/stem-bark and root (16.29% each), seed (7.4%), fruit (5.92%), and whole plant (3.7%). Others were scarcely used (Table 3).

Discussion

The study was carried out to document the ethnomedicinal plant species used to cure skin diseases among the indigenous people of the Northern Delta State of Nigeria. It was observed that the rural parts of the study area were mainly dependent on medicinal plants for the treatment of skin diseases and other diseases. This agrees with earlier reports of Malik et al. (2019) on the dependence of 84% of the rural population on herbal medicines. In the present study, 51 medicinal plant species distributed across 29 families were reported to treat skin-related ailments by herbal drug dealers, herbalists, and community elders. Asteraceae (8.75) and Fabaceae (8.2) showed the best consensus between respondents on reported species and families (Figure 2.). Other value families were Euphorbiaceae (10) and Araceae (16). Asteraceae and Fabaceae have been earlier reported as the most commonly used family in ethnomedicinal practices in southern Nigeria (Alade et al. 2018; Iyama and Idu 2015).

Data from 100 randomly selected male and female respondents in the study area consisted of 30 herbal drug dealers, 46 herbalists, and 24 community elders. Herbalists (46%) were the most consulted on the herbal drugs for skin diseases and ailments. However, the results showed females (52%) have higher knowledge of medicinal plants and their application than males (48%). This agrees with earlier reports by Iyamah and Idu (2015). The respondents above 40 years (70%) were more than those below 40 years

(30%). This indicates that the older generations are more knowledgeable on ethnomedicinal plants species. Oladunmoye and Kehinde (2011) have reported similar findings on elders having a higher knowledge of the use of plants as medicines.

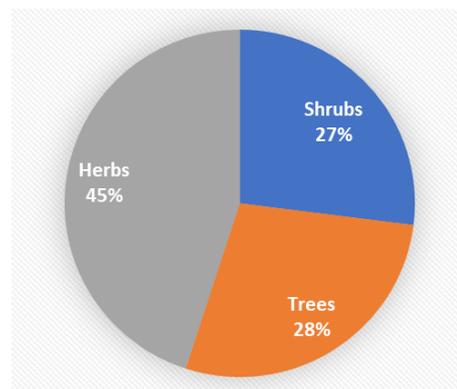


Figure 2. Growth habit of reported ethnomedicinal species

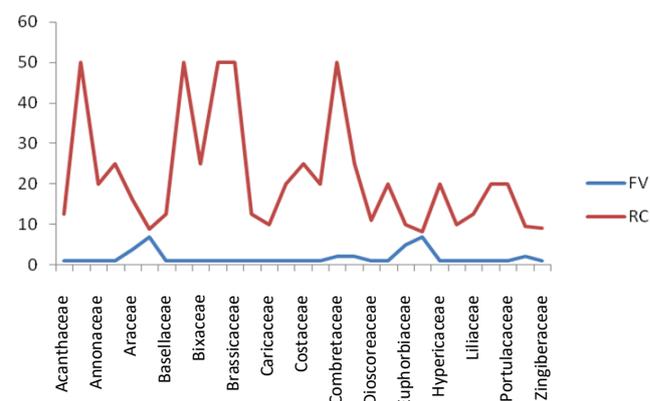


Figure 3. Familial use-value and consensus among respondents on reported species and family

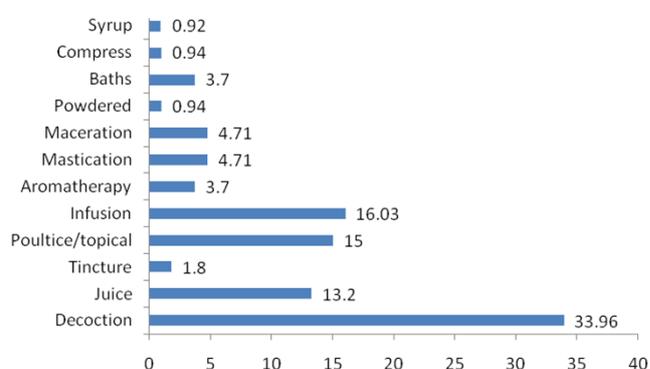


Figure 4. Method of preparation of plants used in the treatment of Skin related ailments

Table 2. Ethnomedicinal plants used in the treatment of Skin related ailments in Northern Delta State, Nigeria

Plant name	Voucher numbers	Family	Local name	Common name	Habit	Therapeutic usage	Parts used	Method of preparation	Relative frequency of citation (RFC). RFC = FC/N (N = 100)	Fidelity level (FL)
<i>Abrus precatorius</i> L.	BDU 106	Fabaceae	Anyannun	Crab's eye, Bead tree	Herb	Skin disease	Leaves	Decoction	0.22	73
<i>Acalypha fimbriata</i> (Schum & Thonn) Forsk	BDU 91	Euphorbiaceae	Agukwu	Copper leaves	Herb	Skin disease, boils	Leaves, twig	Juice, decoction	0.08	68
<i>Acanthus montanus</i> (Nees) T. Anders	BDU 10	Acanthaceae	Inyiny ogwu	False thistle	Herb	Boils, wounds	Leaves, roots	Decoction, tincture, poultice	0.20	70
<i>Adenostemma mauritianum</i> DC.	BDU 03	Asteraceae	Oshosho	-	Herb	Measles	Leaves	Infusion	0.03	60
<i>Afromomum melegueta</i> Roscoe K. Schum	BDU 31	Zingiberaceae	Ose-oji	Alligator pepper, grains of paradise, guinea grains	Herb	Smallpox, chickenpox, measles	Leaves, seeds, stem-bark	Decoction, aromatherapy, mastication, macerations in <i>Momordica charantia</i> and <i>Sorghum arundinaceum</i>	0.21	78
<i>Ageratum conyzoides</i> L.	BDU 184	Asteraceae	Ula njula, urata njele	Goat weed	Herb	Wounds, skin diseases	Leaves	Infusion, juice extract	0.16	84
<i>Alchornea cordifolia</i> (Schum & Thonn.) Mull.-Arg.	BDU 53	Euphorbiaceae	Ubebe	Christmas bush	Shrub	Wounds, ringworm	Leaves, stem-bark, root epidermis	Decoction, juice, mastication, maceration,	0.21	76
<i>Aloe vera</i> (L.) Burm. f	BDU 16	Liliaceae		Barbados Aloe	Shrub	Wounds, skin infections	Leaves	Decoction	0.05	71
<i>Anthonotha macrophylla</i> P. Beauv	BDU 79	Fabaceae	Ububa-ikpa	-	Tree	Skin infections	Leaves, stem-bark, roots, gum exudates	Decoction, infusions, poultices	0.04	75
<i>Artemisia dracunculus</i> L.	BDU 25	Asteraceae	Nshegbuawom	Tarragon	Herb	Skin disease, cuts	Leaves	Decoction, infusion	0.13	50
<i>Aspilia Africana</i> (Pers.) C.D Adams	BDU 66	Asteraceae	Oranjila	Hemorrhage plant	Herb	Wound clotting	Leaves	Juice extract	0.11	90
<i>Baphia nitida</i> Lodd.	BDU 95	Fabaceae	Ufie	African sandalwood, camwood	Tree	Boil	Leaves, twig, stem-bark, roots	Mastication, poultice	0.09	92
<i>Baphia pubescens</i> Hook.F	BDU 45	Fabaceae	Obenetete	Benin - camwood	Shrub	Wounds, ringworm,	Leaves, stem-bark, roots	Decoction, infusion	0.02	50
<i>Basella alba</i> L.	BDU 33	Basellaceae	Ukasi Kongo	Ceylon spinach	Herb	Boils	Whole plant	Infusion	0.05	71
<i>Bixa orellana</i> L.	BDU 12	Bixaceae	Ufie, Uhie	Annatto	Shrub	Scrapes, burns	Leaves, fruits, seeds	Decoction	0.04	75

<i>Brassica oleracea</i> L.	BDU34	Brassicaceae	Ogbeagu	Wild cabbage	Herb	Wound	Leaves	Juice, Poultices	0.03	75
<i>Caladium bicolor</i> (Aiton) Vent.	BDU 20	Araceae	Honya	Heart of Jesus	Herb	Skin diseases, wound	Corm	Poultice	0.03	50
<i>Carica papaya</i> L.	BDU 146	Caricaceae	Okpurukwa	Papaya, papaw	Tree	Eczema, after-shave bumps	Leaves, fruit (ripe and unripe), seeds	Decoction, infusion, macerations in <i>Ocimum gratissimum</i> , <i>Garcinia kola</i> seed	0.22	76
<i>Carpolobia lutea</i> G. Don	BDU 28	Polygonaceae	Agba, Angalagala	Cattle stick	Shrub	Wounds	Leaves, root bark, roots	Decoction	0.01	50
<i>Citrullus colocynthis</i> (L.) Schrad	BDU 31	Cucurbitaceae	Eliliegusi/ogili, Egusi	Bitter apple	Herb	Skin disease	Leaves, fruits, seed	Decoction, powder mixed with palm oil	0.16	84
<i>Citrus aurantifolia</i> (Christm) Swing.	BDU 11	Rutaceae	Oroma nkirisi	Lime	Tree	Ringworm, eczema,	Fruit juice	Aromatherapy, baths, decoction, infusion,	0.22	78
<i>Citrus limon</i> (L.) Burm. f.	BDU 60	Rutaceae	Lemonu	Lemon	Tree	Spots, scabs, wounds scars, insect bites	Fruit juice	Decoction, tincture, infusion	0.24	96
<i>Cocos nucifera</i>	BDU 76	Araceae	Aku oyinbo	Coconut	Tree	Skin diseases	Stem-bark, roots, fruits	Decoction	0.13	90
<i>Colocasia esculenta</i> (L.) Schott	BDU 131	Araceae	Ede	Cocoyam, taro	Herb	Insects bites, sore	Whole plant	Decoction, juice extract	0.02	50
<i>Combretum racemosum</i> P.Beauv.	BDU 87	Combretaceae	Alagame	Christmas rose	Shrub	Skin disease	Leaves	Juice extract	0.03	50
<i>Costus lucanusianus</i> Braun &Schum	BDU 19	Costaceae	Opete, Okpete	Bush cane	Herb	Measles,	Stem-bark	Baths, compresses, decoction	0.16	80
<i>Cucurbita maxima</i> Duch.	BDU 198	Cucurbitaceae	Ugboghoru	Pumpkin	Herb	Skin disease	Leaves	Juice extract	0.10	60
<i>Dacryoides edulis</i> (D.Don) Lam.	BDU129	Burseraceae	Ube	Native pear	Tree	Skin parasites/disease	Leaves, stem resins, fruit	Decoction	0.18	95
<i>Dioscorea rotundata</i> Poir	BDU 98	Dioscoreaceae	Ji	White yam, West African yam	Herb	Burns, skin disease	Leaves	Infusion	0.01	75
<i>Distemonanthus benthamianus</i> Baill.	BDU 62	Fabaceae	Oguafo	African satinwood	Tree	Skin disease, boils,	Stem-bark	Decoction with <i>Pterocarpus Erinaceus</i> , mastication poultice	0.03	66
<i>Dracaena arborea</i> (Wild.)	BDU 30	Dracaenaceae	Odo	African dragon tree	Tree	Boils	Leaves, Stem-bark	Infusion, poultice	0.09	95
<i>Elaeis guineensis</i> Jacq.	BDU 01	Araceae	Nkwu, Akwu	Oil palm	Tree	Skin troubles	Oil, unripe kernel, leaves	Aromatherapy, decoction, mastication, syrups	0.20	99
<i>Emilia coccinea</i> (Sims) G. Don.	BDU 247	Asteraceae	Ntiene	Tassel flower	Herb	Measles, skin diseases, sores	Leaves	Juice extract	0.06	88
<i>Euphorbia hirta</i> Linn.	BDU 189	Euphorbiaceae	Ogwu asma, Ahihia ugwa	Garden spurge, spurge weed	Herb	Eczema	Leaves	Decoction, topical application, aromatherapy	0.10	97
<i>Harungana madagascariensis</i> Lam ex Poir	BDU 116	Hypericaceae	Otori	Dragon's blood tree	Tree	Skin diseases- itches and leprous spots	Plant sap, leaves, stem-bark	Decoction, topical application	0.12	80

<i>Heliotropium Indicum</i> L	BDU110	Boraginaceae	Azu	Heliotrope, cock's comb	Herb	Sting, insect bites, boils	Leaves, whole plant	Decoction, Infusion	0.01	50
<i>Irvingia gabonensis</i> (Aubry-LeComte ex O'Rorke) Bail.	BDU 189	Irvingiaceae	Agbono	West African bush mango	Tree	Skin disease	Leaves, stem-bark, seeds	Decoction, infusion, Poultice	0.09	86
<i>Kalanchoe pinnata</i> (Lam.) Pers. (syn. <i>Bryophyllum pinnatum</i>)	BDU 169	Crassulaceae	Oda opue	Resurrection plant	Herb	Boils	Leaves, roots	Decoction, juice extract	0.11	80
<i>Mangifera indica</i> Linn.	BDU 170	Anacardiaceae	Mangoro	Mango	Tree	Skin disease	Leaves, stem, bark, and fruit	Baths, decoction, maceration	0.21	60
<i>Manihot esculenta</i> Crantz	BDU 172	Euphorbiaceae	Akpu, Ugboro, Jiaphu	Cassava	Shrub	Wound healing	Leaves, premature roots	Leaf juice extract, root decoction	0.08	75
<i>Newbouldia laevis</i> (Beauv.) Seeman ex Bureau	BDU 399	Bignoniaceae	Oke-ogirishi	Smooth Newbouldia, Tree of life, Fertility tree	Shrub	Septic wounds, bleeding, skin disease	Leaves, stembark, roots	Decoction, infusion, topical application of leaf juice, poultices	0.16	71
<i>Palisota hirsuta</i> (Thumb.)K. Schum.	BDU 350	Commelinaceae	Ikpere aturu	Palisota	Herb	Boils	Leaves, stem	Decoction, infusion, poultices	0.06	77
<i>Ricinus communis</i> L.	BDU 386	Euphorbiaceae	Ogiri	Castor bean	Shrub	Skin disease	Leaves, seeds	Decoction, juice, syrup, topical application	0.24	80
<i>Rauvolfia vomitoria</i> Afzel	BDU 262	Apocynaceae	Akanta	Serpent wood, Swizzle stick	Shrub	Skin disease, smallpox,	Leaves, roots	Decoction, infusion	0.16	80
<i>Senna alata</i> (L.) Roxb.	BDU 377	Fabaceae	Ogala	Candle bush, ringworm bush	Shrub	Eczema, ringworm, abscess, skin disease, bleeding	Leaves, roots	Infusion, juice extract poultices	0.11	50
<i>Senna occidentalis</i> (L.) Link.	BDU 101	Fabaceae	Akidi agbara	Negro coffee, coffee senna	Shrub	Abscess, skin diseases, inflammation, bleeding	Leaves, roots	Infusion, poultices	0.05	88
<i>Talinum fruticosum</i> (L.) Juss.	BDU 79	Talinaceae	Mgbolodi	Waterleaf, Ceylon spinach	Herb	Boils, measles	Leaves	Juice extract, decoction	0.12	93
<i>Terminalia superba</i> Engl.& Diels	BDU 308	Combretaceae	Edo ocha	Shingle wood, Yellow pine	Tree	Skin diseases	Leaves, stem, roots	Decoction, baths, and remedies	0.13	96
<i>Tridax procumbens</i> L.	BDU 347	Asteraceae	Mbuli	Tridax	Herb	Skin diseases	Leaves	Decoction, infusion	0.11	82
<i>Uvaria chamae</i> P. Beauv	BDU 316	Annonaceae	Mmimi-ohia	Cluster pear	Shrub	Boils, wound	Leaves, stem-bark, roots	Decoction	0.04	85
<i>Vernonia amygdalina</i> L.	BDU 265	Asteraceae	Onugbu	Bitter leaf	Shrub	Measles, smallpox, chickenpox	Leaves, leaf sap, root epidermis	Leaf juice is used as decoction, tincture, maceration, and as poultices made with crude chalk	0.22	80

Table 3. Use value (per plant part) of reported plants used in the treatment of skin-related ailments

Organs	Skin diseases/parasites	Boils	Wounds, cuts & sores	Scrapes & burns	Pimples, inflammation, aftershave bumps	Abscess & bleeding	Total usage (SDP+WCS+SB+PIAB+AB)	Reported use-value (\sum RU/ns)	Categorized reported use-value infraction
Leaf	28	8	16	2	3	3	60 (44%)	6	1.00
Twig	1	1	-	-	-	-	2 (1.48%)	2	0.33
Root	10	2	7	-	1	2	22 (16.29%)	5	0.83
Seed	6	1	-	1	2	-	10 (7.4%)	4	0.66
Fruit	6	-	-	1	1	-	8 (5.92%)	3	0.5
Stem/Stem-bark	12	4	4	-	1	1	22 (16.29%)	5	0.83
Gum exudates	1	-	-	-	-	-	1 (0.74%)	1	0.16
Whole plant	1	1	3	-	-	-	5 (3.7%)	3	0.5
Corm	1	-	1	-	-	-	2 (1.48%)	2	0.33
Stem resins	1	-	-	-	-	-	1 (0.74%)	1	0.16
Oil	-	1	-	-	-	-	1 (0.74%)	1	0.16
Sap	1	-	-	-	-	-	1 (0.74%)	1	0.16

Herbs were the most dominant life form used in the study (45%), while shrubs and trees were 27.5% each, respectively (Figure 2). Medicinal plants were readily sourced from the wild, forest, roads, side bushes, and farmlands. This agrees with earlier reports of Malik et al. (2019). It has been reported that the efficacy of herbal medicine and the wide varieties of medicinal preparations employed by herbal doctors and herbal users is dependent on the flora diversity of a given geographical area (Adjanohoun et al., 1991). Rural dwellers have shown a high dependence on natural vegetation for timber, food, fuel-wood, medicine, etc., mainly harvested from the wild without replacement practices (Adjanohoun et al. 1991; Malik et al. 2019).

Earlier researches have reported some of the listed plants in this study for other ethnomedicinal uses such as *Abrus precatorius* L. (Iyama and Idu 2015), *Acanthus montanus* (Nees) T.Anders (Akwaji et al. 2017; Alade et al. 2018), *Afromomum melegueta* Roscoe K. Schum (Iyama and Idu 2015; Alade et al. 2018), *Ageratum conyzoides* L. (Iyama and Idu 2015), *Alchornea cordifolia* (Ariwaodo et al. 2012; Akwaji et al. 2017), *Baphia nitida* Lodd. (Ajibesin et al. 2008, 2012; Ariwaodo et al. 2012; Alade et al. 2018), *Carica papaya* L. (Alade and Ajibesin 2017).

The study revealed plant parts like a leaf, twig, root/root epidermis, seed, fruit, stem/stem-bark, gum exudates, whole plant, and corm were used in herbal preparations in the study area (Table 3). However, the everyday use of leaf in the practice of herbal remedies has been reported by earlier studies of Asase et al. (2010), Nguta et al. (2010), Ighere et al. (2011), Olorunnisola et al. (2013), Traore et al. (2013), Iyama and Idu (2015), Alade et al. (2016), Treasure et al. (2020). The use of leaves may arise from accessible collection and ensuring the continued existence of plant species used in herbal medicine.

New plant parts were preferred in herbal preparations for treating skin diseases and ailments. The reasons given by the respondents were the higher efficacies in treating skin diseases and ailments in contrast with dried plant parts. Iyama and Idu (2015) opined herbal remedies would have a reduced potency or completely lose their potency in

dried plant materials if active compounds in the plants are volatile.

Herbal drugs were usually prepared crudely without quality control and standard dosage and were drunk or topically applied three times daily until the patient was healed. Mowobi et al. (2016) reported herbal recipes were made from different parts of two or more plants species, including leaves, seeds, and stem-bark. A single plant may be used to treat one disease, and a single disease could be treated by combining more than one plant (Assefor et al., 2021). The decoction was the most common method of herbal drug preparation (Figure 4), and this agrees with earlier reports of Ogunmefun and Gbile (2012) and Treasure et al. (2020). It was made by boiling woody, rugged, and fibrous plant parts that have active water-soluble components in water for long periods of steeping overnight before use. Other commonly used methods of herbal drug preparation in the study area include infusion and poultice/topical application. Infusion is made by pouring boiling water over an herbal combination in a cup used for delicate herbs, leaves, and fresh, tender plants. The poultice was made from plant materials crushed or made into a paste mixed with crude chalk and applied directly on the affected part, usually rashes, sting, wounds, and fungal infections, or by pouring hot water over dried or fresh herbs to revive it. The wet plant was directly placed on the affected area of the skin or on a light napkin that was bound to the skin. Other less commonly used methods of herbal drug preparation in the study area include compress, tincture, herbal baths, aromatherapy, maceration, and juice extract. On the other hand, compresses were made by soaking a highly absorbent napkin in an already prepared decoction, infusion, or tincture, then placed on the infected area. The medicine was made by soaking plant materials whose active components could only be extracted using alcohol. The respondents reported tinctures having a higher shelf life, which varied with the concentration of the alcohol used in the herbal preparation. Herbal baths were usually prepared by placing herbs in water and bringing them to a boil. The herbs were strained, and the water was used for bathing the skin. Aromatherapy was prepared like

baths; the mixture was poured into a bucket rather than straining off the herbs. The patient is made to sit on a stool with a thick bucket thrown over the patient, allowing the skin to absorb the steam from the herbal preparation. Macerations of fresh or tender plant parts were prepared by soaking overnight, then straining the herb out and drinking the liquids. Interviewed respondents stated the medicinal components of these macerated tender plants might be degraded due to heating or alcoholic extraction. Juice extract was obtained by crushing the plant material, usually leaf, among the fingers and then squeezing it to get fresh juice directly applied to the patient's skin.

Medicinal plant species showing high potency are usually selected for further research and drug discovery using relative citation frequency. This is vital for assessing their phytochemical composition and proving their active components for subsequent application in the discovery of drugs (Malik et al., 2019). In this study, plant species with RFC values of 0.24-0.20 were accorded a high level of relative citation.

Plant species with high fidelity level values indicate the choice of respondents for their use in treating a specific disease. Plant species with 92% and above FL values were treated as highly significant ethnomedicinal plant species. The study reported the highest FL values for *E. guineensis* (99).

The use-value index quantifies the relative importance of plant parts used in herbal drug preparation. For this reason, use-value indices per plant amount above 40% were considered significant in this study. For reported use value per plant part in the treatment of skin diseases, leaf showed the highest total usage (60%), said use-value (6), and categorized use-value infraction (1.00). Respondents in the study revealed that the leaf was either crushed manually by hands to obtain leaf juice, which was applied directly to the infected area, pounded using a wooden mortar, and the crushed material applied directly on the skin as a poultice the chewed/masticated. These findings likely suggest the active components responsible for ameliorating skin diseases and ailments reside in the leaves of the studied plant.

In conclusion, this research is novel for the Northern Delta State of Nigeria. This study reveals a high level of biodiversity of medicinal plants and ethnomedicinal knowledge of the plants in the area. Most respondents indicated the source of their ability on ethnomedicinal plants as from the past generation usually handed through informal methods of communication. Nonetheless, the elders had a higher knowledge of herbal drug use, suggesting a lack of interest in ethnomedicine by the younger generation, potentially threatening the extinction of ethnomedicinal expertise in the future. Based on interviews conducted, 51 plant species belonging to 29 families have been potent in treating various skin-related ailments. Herbs were reported as the most dominant life forms, leaves were the most used plant part, and decoction was the most used method of herbal drug preparation. Many herbal recipes used by the locals to treat skin-related ailments contain some active ingredients, some of which have been scientifically proven and others still undergoing

clinical validation. This justifies their ethnomedicinal uses as a remedy for skin ailments and diseases. Conservation studies on the plants reported in this survey for sustainability should be carried out.

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