



## Ethnopharmacological survey of medicinal plants used for the management of pediatric ailments in Kano State, Nigeria

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### Abstract

**Background and objectives:** The knowledge of traditional uses of plant species used in the management of pediatric diseases in Kano State is still intact with the traditional healers; thus, the present study was aimed to collect, identify and document plant species used traditionally for the management of pediatric diseases in the study area. **Methods:** The ethnobotanical data was collected through informal interviews with the traditional medicine practitioners, traditional birth attendants, herb sellers and some health workers. **Results:** A total number of sixty eight plant species belonging to thirty five families were reported to be used in the disease management among children in the study area. Most of the plants species belonged to the Fabaceae, Poaceae, Anarcadiaceae, Asteraceae, Combretaceae and Solanaceae families, while *Anogeissus leiocarpus*, *Boswellia dalzielii* and *Citrus sinensis* were the most frequently mentioned plant species. Leaves and stem bark were the most used plant parts in this study. **Conclusions:** Further studies should be conducted to evaluate the pharmacological activities of the plant species that have not yet been investigated and also to identify the phytochemical constituents responsible for their activities.

**Keywords:** ethnopharmacology, Kano State, pediatric diseases, phytochemical constituents

### Introduction

The medical care of infants, children and adolescents in medicine is known as pediatrics. The age limit usually ranges from birth up to 18 years of age, while in some places until completion of secondary education, and until age 21 in the United States [1].

Pediatrics could be differentiated from adult medicine in so many ways which includes physiological body size, congenital defects, developmental issues, etc. These differences are of greater concern in pediatrics than in adult medicine [2]. Many children in developing

countries suffer from diseases that can cause serious mortalities and about 7 million children under the age of 5 have died in 2011 simply because they did not have access to an affordable health care [3]. Infectious diseases like pneumonia, diarrhea, and malaria have been identified as the main cause of deaths in children younger than 5 years old mostly in developing countries [4].

A recent national demographic survey has revealed that for every 1000 live-births in Kano State, 185 of them would die before attaining the

age of five. This implies that one in every five children is dying before attaining the age of five. The study also showed that diarrhea and pneumonia accounts for 15 % and 14 % of the forgoing under-five mortality rate, respectively [5].

The extensive use of traditional medicine in African countries is because the people are very poor and thus cannot afford modern medicine [6, 7]. The practice of young mothers being guided in the care of their new born babies after delivery by older women is a common practice among the Hausa people of Kano State. Those older women are armed with traditional knowledge of plants used to treat pediatric ailments so that they can guide the new mothers on what herb to use and how to prepare and administer them [8].

However, to the best of our knowledge, no study has been conducted to document medicinal plants used to treat pediatric ailments in Kano State, Nigeria. Therefore, this study was aimed to investigate, collect, identify and document those plant species before such rich heritages are lost.

## Experimental

### Study area

The study was conducted in Kano, a state located in the Northwestern part of Nigeria. The State borders Katsina State to the north-west, Jigawa State to the north-east, Bauchi States to the south-east and Kaduna State to the south-west (figure 1).

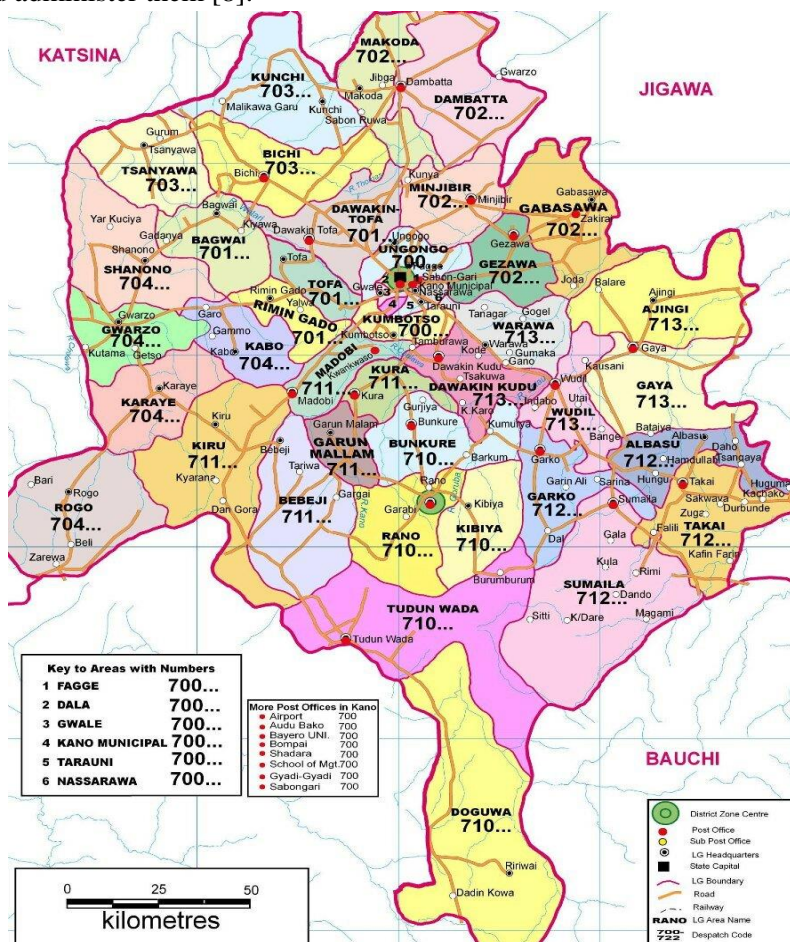


Figure 1. Map of Kano State

It is located on 11° 30' N and 8°30' E coordinates, with a mean height of about 472.45m above sea level. According to 2006 census, Kano is the most populous State in Nigeria with a population of 9,383,682 and popularly referred to as the centre of commerce in Nigeria [9].

*Ethnopharmacological survey*

The main data sources consisted of a series of informal interviews administered on the Traditional Medicine Practitioners (TMPs), Traditional Birth Attendants (TBAs), herb sellers and some health workers. The interviews were done in Hausa language, while the information obtained was sorted, and the data collected included the local names of plants, parts of the plants used, medical conditions they treated, methods of preparation and modes of administration. The plants were identified and authenticated at the Ethnobotany Unit of Bioresources Development Centre Kano, National Biotechnology Development Agency (NABDA), Nigeria. All species and families were validated taxonomically in the plant list (www.plantlist.org) and “Hausa names for plants and trees” written by Roger Blench.

*Statistical analysis*

Descriptive statistics such as percentages and pie chart were used in the analysis of the data.

**Results and Discussion**

A total number of 38 respondents were interviewed consisting majorly the traditional medicine practitioners, traditional birth attendants, health workers and herb sellers (table 1). Most of the respondents were within the age range of 41-50 years (34 %), female (63 %), primary school leavers (50 %) and traditional medicine practitioners (50 %).

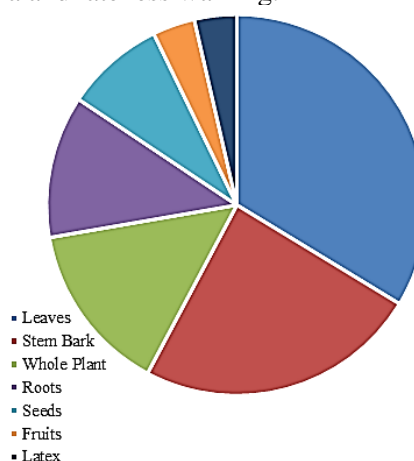
A total number of sixty eight plant species belonging to thirty six families have been collected, identified and documented as being used for the management of different pediatric diseases in Kano State. The families Fabaceae, Poaceae, Anarcadiaceae, Asteraceae,

Combretaceae and Solanaceae showed the highest incidence of encounter. *Anogeissus leiocarpus* was the most frequently mentioned plant species, followed by *Boswellia dalzielii* and *Citrus sinensis*. Leaves and stem bark were the most frequently used plant parts (figure 2).

**Table 1.** Demographic characteristics of the respondents

Variable	Specification	Percentage (%)
Age	20-30	8
	31-40	24
	41-50	34
	51-60	24
	>60	10
Sex	Male	37
	Female	63
Marital Status	Married	97
	Divorced	3
Educational status	No certificate	19
	Primary	50
	Secondary	26
	Tertiary	5
Practice	Traditional practitioners	50
	Herb sellers	20
	Traditional birth attendants	26
	Health workers	4

Common pediatric ailments which were said to be treated with herbal remedies by the respondents included malaria, fever, pneumonia, stomach ache, diarrhea, measles, nose bleeding, jaundice, pile, heat rashes, kwashiorkor, headaches, teething, hemophilia, coughs, eye problems, umbilical cord complications, sickle cell anemia, convulsion, ring worms, meningitis, bilharzia and lateness walking.



**Figure 2.** Percentage occurrence of plant parts used for the management of pediatric ailments

**Table 2.** Plants used for the management of pediatric ailments in Kano State

No.	Family	Plant name	Local name	Common name	Disease (s)	Part (s) used	Voucher number
1	Acanthaceae	<i>Dyschoriste perrottettii</i> (O. Ktze)	Fidda Hakukuwa	Tall yellow	Eye infection	Seeds	BDCKN/EB/1738
2	Anarcadiaceae	<i>Anarcadium occidentale</i> (L.)	Kashu	Cashew	Malaria, heat rashes and fever	Leaves and stem bark	BDCKN/EB/1772
		<i>Mangifera indica</i> (L.)	Mangwaro	Mango	Fever, malaria and jaundice	Leaves	BDCKN/EB/1763
		<i>Sclerocarya birrea</i> (A. Rich.) Hochst	Danya	Marula	Diarrhea	Stem bark	BDCKN/EB/1743
3	Annonaceae	<i>Annona senegalensis</i> (Pers.)	Gwandar Daji	African custard apple	Kwashiorkor malaria and sickle cell anemia	Leaves, stem bark and root	BDCKN/EB/1727
4	Amaryllidaceae	<i>Allium sativum</i> (L.)	Tafarnuwa	Garlic	Cough	Bulb	BDCKN/EB/1777
5	Apocynaceae	<i>Calotropis procera</i> (Aiton)	Tumfafiya	Sodom apple	Pile and umbilical cord complications	Latex and roots	BDCKN/EB/1758
6	Araceae	<i>Pistia stratiotes</i> (L.)	Kainuwa	Water lettuce	Convulsion	Whole plant	BDCKN/EB/1780
7	Asclepiadaceae	<i>Leptadenia histata</i> (Pers.) Decne	Yadiya	Hagal hadjar	Ear infection and sickle cell anemia	Leaves	BDCKN/EB/1755
8	Asteraceae	<i>Artemisia absinthium</i> (L.)	Tazargade	Wormwood	Diarrhea, stomach ache and witches' attack	Seeds and fruits	BDCKN/EB/1747
		<i>Centuarea praecox</i> (Oliv. & Hiern)	Dayi	Thistle plant	Measles	Leaves and stem bark	BDCKN/EB/1745
		<i>Vernonia amygdalina</i> (Delile)	Shuwaka	Bitter leaf	Sickle cell, anemia	Leaves	BDCKN/EB/1750
		<i>Vernonia khotschyana</i> (Schreb.)	Dumashi	Dumashi	Sickle cell	Whole plant	BDCKN/EB/1764
9	Balanitiaceae	<i>Balanites aegyptiaca</i> (L.)	Aduwa	Desert date	Jaundice and malaria	Stem bark and seeds	BDCKN/EB/1728
10	Boraginaceae	<i>Cordia africana</i> (Lam.)	Alilliba	Abyssinica	Lateness walking	Stem bark	BDCKN/EB/1744
11	Bursaceae	<i>Boswellia dalzielii</i> (Hutch.)	Ararrabi	African myrrh	Diarrhea, pile, heat rashes and umbilical cord complications	Stem bark	BDCKN/EB/1741
		<i>Balsamodendron africanum</i> (Var.)	Dashi	Myrrh	Bed wetting	Stem bark	BDCKN/EB/1752

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**Table 2.** Continued.

No.	Family	Plant name	Local name	Common name	Disease (s)	Part (s) used	Voucher number
12	Caricaceae	<i>Carica papaya</i> (L.)	Gwanda	Pawpaw	Fever, malaria and jaundice	Leaves	BDCKN/EB/1761
13	Cleomaceae	<i>Gynandropsis gynandra</i> (L.)	Gasaya	African cabbage	Pneumonia	Whole plant	BDCKN/EB/1748
14	Cochlospermaceae	<i>Cochlospermum planchonii</i> (Hook. f.)	Rawaya	Gbehutu	Jaundice	Root	BDCKN/EB/1730
15	Combretaceae	<i>Anogeissus leiocarpus</i> (DC.) Guill & Perr.	Marke	Chewing Stick tree	Cough, jaundice, fever and pile	Leaves and stem bark	BDCKN/EB/1737
		<i>Combretum micranthum</i> (G. Don)	Geza	Kinkeliba	Stomach ache, meningitis and eye infection	Leaves and roots	BDCKN/EB/1757
		<i>Guiera senegalensis</i> (J.F.Gmel)	Sabara	Sabara	Stomach ache, impetigo and Bilharzia	Leaves and roots	BDCKN/EB/1770
16	Cucurbitaceae	<i>Cucumis pustulatus</i> (Hook. f.)	Golon zaki	Wild cucumber	Headache	Roots	BDCKN/EB/1791
		<i>Momordica balsamina</i> (L.)	Garafuni	Balsam apple	Convulsion and headache	Whole plant	BDCKN/EB/1794
17	Cyperaceae	<i>Cyperus articulatus</i> (L.)	Kajiji	Jointed flat sedge	Fever	Stem bark	BDCKN/EB/1771
18	Euphorbiaceae	<i>Chrozophora senegalensis</i> (Lam.)	Bauren kiyashi	Fig of red ants	Diarrhea and rashes	Whole plant	BDCKN/EB/1729
		<i>Jatropha curcas</i> (L.)	Bini da zugu	Barbados nut	Malaria and ringworm	Leaves and latex from stem	BDCKN/EB/1735
		<i>Cassia singueana</i> (Delile)	Runfu	Scrambled egg	Malaria, kwashiorkor and stomach ache	Roots	BDCKN/EB/1736
19	Fabaceae	<i>Chamaecrista absus</i> (L.)	Fidili	Sensitive pea	Eye problem	Leaves	BDCKN/EB/1766
		<i>Detarium microcarpum</i> (Guill & Perr.)	Taura	Sweet detar	Heat rashes	Stem bark	BDCKN/EB/1788
		<i>Dichrostachys cinerea</i> (Wight et Arn.)	Dundu	Sickle bush	Ear infection, malaria and Kwashiorkor	Leaves and seeds	BDCKN/EB/1754
		<i>Faidherbia albida</i> (Delile) A. chev	Gawo	Winter thorn	Teething	Stem bark	BDCKN/EB/1762
		<i>Indigofera tinctoria</i> (L.)	Babaa	Indigo tree	Jaundice	Roots	BDCKN/EB/1774
		<i>Parkia biglobosa</i> (Jacq.) R. Br. Ex G. Don	Dorawa	African locust bean	Burns, malaria and measles	Seeds pod and stem bark	BDCKN/EB/1768

Table 2. Continued.

No.	Family	Plant name	Local name	Common name	Disease (s)	Part (s) used	Voucher number
		<i>Parkinsonia aculeate</i> (L.)	Sarkin itatuwa	Jerusalem thorn	Measles	Stem bark	BDCKN/EB/1732
		<i>Piliostigma reticulatum</i> (DC.) Hochst	Kalgo	Abafe	Malaria and sickle cell anemia	Leaves and stem bark	BDCKN/EB/1739
		<i>Prosopis Africana</i> (Guill & Perr.)	Kiryra	African mesquite	Burn and pile	Stem bark	BDCKN/EB/1746
		<i>Senna occidentalis</i> (L.)	Rai dore	Coffee senna	Bilharzia	Roots	BDCKN/EB/1789
		<i>Tamarindus indica</i> (L.)	Tsamiya	Tamarind	Bedwetting	Fruits	BDCKN/EB/1785
20	Lamiaceae	<i>Vitex doniana</i> (L.)	Dinya	Black plum	Ringworm	Leaves	BDCKN/EB/1786
21	Malvaceae	<i>Adansonia digitata</i> (L.)	Kuka	Baobab	Heat rashes	Stem bark	BDCKN/EB/1733
		<i>Waltheria indica</i> (L.)	Hankufa	Butt coat	Teething	Whole plant	BDCKN/EB/1783
22	Meliaceae	<i>Azadirachta indica</i> (A. Juss.)	Darbejiya	Neem	Malaria, stomach ache and headache	Leaves	BDCKN/EB/1776
		<i>Khaya senegalensis</i> (Desr.) A. Juss	Madaci	Mahogany	Fever, malaria and stomach ache	Leaves and stem bark	BDCKN/EB/1765
23	Mimosaceae	<i>Acacia nilotica</i> (Lam.) Willd	Gabaruwa	Gum arabic tree	Malaria	Leaves and seed	BDCKN/EB/1751
24	Moraceae	<i>Ficus platyphylla</i> (Del.)	Gamji	Gutta percha	Malaria	Leaves and stem bark	BDCKN/EB/1742
		<i>Ficus thoningii</i> (Blume)	Chediya	Fig	Malaria, ringworm and jaundice	Latex	BDCKN/EB/1773
25	Moringaceae	<i>Moringa oleifera</i> (Lam.)	Zogale	Moringa	Bilharzia and malaria	Roots	BDCKN/EB/1781
26	Musaceae	<i>Musa sapientum</i> (Lam.)	Ayaba	Banana	Jaundice	Leaves	BDCKN/EB/1759
27	Myrtaceae	<i>Eucalyptus globulus</i> (Labill)	Turare	Tasmania blue gum	Malaria and jaundice	Leaves	BDCKN/EB/1734
		<i>Psidium guajava</i> (L.)	Goba	Guava	Headache and malaria	Leaves	BDCKN/EB/1793
28	Olacaceae	<i>Ximena americana</i> (L.)	Tsada	Yellow plum	Kwashiorkor	Roots	BDCKN/EB/1756
29	Poaceae	<i>Echinochloa stagnina</i> (Retz.) P. Beauv.	Buruku	Burgu millet	Bilharzia and malaria	Roots and whole plant	BDCKN/EB/1731
		<i>Eragrostis cilianensis</i> (All.) Vign ex Janchen	Bunsurun fage	Candy grass	Headache	Whole plant	BDCKN/EB/1749
		<i>Tripogon minimus</i> (Roem. & Schult.)	Bubukuwa	Bubukuwa	Lateness walking	Whole plant	BDCKN/EB/1769

Table 2. Continued.

No.	Family	Plant name	Local name	Common name	Disease (s)	Part (s) used	Voucher number
		<i>Triticum aestivum</i> (L.)	Alkama	Wheat	Headache	Seeds	BDCKN/EB/1784
		<i>Urelytrum giganteum</i> (Pilg)	Jema	Jema	Headache	Whole plant	BDCKN/EB/1740
30	Rubiaceae	<i>Mitracarpus hirtus</i> (L.) DC.	Gogamasu	Smear spear	Skin diseases	Whole plant	BDCKN/EB/1782
		<i>Citrus medica</i> (L.)	Lemon tsami	Citron	Fever and jaundice	Leaves	BDCKN/EB/1753
31	Rutaceae	<i>Citrus sinensis</i> (L.)	Lemo	Sweet orange	Malaria and Catarrh	Leaves and fruits	BDCKN/EB/1778
32	Sapotaceae	<i>Vitellaria paradoxa</i> (C.F. Gaertn.)	Kadanya	Shea tree	Chicken pox	Stem bark	BDCKN/EB/1779
33	Solanaceae	<i>Solanum americanum</i> (Mill)	Gautan kaji	American Black night shade	Convulsion	Whole plant	BDCKN/EB/1775
34	Sterculiaceae	<i>Sterculia setigera</i> (Del.)	Kukuki	Karaya gum tree	Cough	Leaves	BDCKN/EB/1787
35	Verbenaceae	<i>Clerodendrum capitatum</i> (Willd)	Taba taba	Gung	Pneumonia, sickle cell anemia, ear infection	Leaves	BDCKN/EB/1767

Recipes were made from combination of different parts of two or more plant species, while some were made from single plant parts (table 3). Decoction, infusion, pounding, soaking, squeezing and boiling were the main methods of preparation in the management of pediatric ailments.

It is generally agreed that ethnomedicinal survey is one of the primary steps in the identification, selection and development of drugs from medicinal plants [10,11]. Thus, the main focus of this study was to document medicinal plants used to manage common childhood or pediatric ailments in Kano State, Nigeria. Previous ethnobotanical studies conducted in Kano State included the ethnobotanical survey of medicinal plants in metropolitan Kano, ethnobotanical survey of medicinal plants used for the treatment of malaria and ethnobotanical survey of medicinal plants used in the management of diabetes mellitus in Kano metropolis [12-14]. Majority of the respondents were females (63 %), married (97 %) and traditional medicine

practitioners (50 %). Women have been identified as the main custodians of traditional knowledge of plants used to manage diseases among children [15-18].

The Fabaceae, Poaceae, Anarcadiaceae, Asteraceae, Combretaceae and Solanaceae families provided the highest proportion of plant species collected in this study. Previous studies also indicated that the families Fabaceae, Poaceae and Combretaceae have many species used in the management of different ailments including pediatric ailments [18-20].

The ethnomedicinal uses of some of the plant species identified in this study were also reported in previous ethnobotanical studies conducted in Kano State. These species include *A. sativum*, *B. dalzielii*, *C. papaya*, *C. singueana*, *F. thoningii*, *G. senegalensis*, *M. hirtus* and *P. biglobosa* [21,22].

*Anogeissus leiocarpus* was the most frequently mentioned plant species. Previous studies indicated that *A. leiocarpus* was used in African traditional medicine for the management of

**Table 3.** Ailments, recipes, method of preparation and mode of administration

No.	Ailment	Recipe	Method of Preparation	Mode of Administration
1	Bilharzia	<i>Echinchloa stagnina</i> (root) + <i>Combretum micrantum</i> (root) + <i>Moringa oleifera</i> (root) + red potash	Decoction	Oral
		<i>Gueira senegalensis</i> (root)	Decoction	Oral
2	Convulsion	<i>Pistia stratiotes</i> (whole plant)	Soaking	Oral
3	Cough	<i>Anogeissus leiocarpus</i> (leaves) + garlic + potash	Decoction	Oral
		<i>Steculia setiga</i> (leaves)	Decoction	Oral
4	Diarrhea	<i>Boswellia dalzielii</i> (stem bark)	Infusion	Oral
		<i>Artemisia absinthium</i> (seeds)	Soaking	Oral and bath
5	Ear problem	<i>Nicotiana tobacum</i> (leaves) + palm oil	Mixing	Dropping
		<i>Clerodendrum capitatum</i> (leaves)	Squeezing	Dropping
6	Eye infection	<i>Dyschoriste perrotti</i> (seeds)	Crushing	Dropping
		<i>Chamaecristus absus</i> (leaves)	Decoction	Dropping
7	Fever	<i>Mangifera indica</i> (leaves) + <i>Psidium gaujava</i> (leaves) + <i>Carica papaya</i> (leaves) + <i>Musa sapientum</i> (leaves) + <i>Eucalyptus globulus</i> (leaves)	Decoction	Oral
		<i>Cyperus articulatus</i> (stem bark)	Decoction	Oral
8	Headache	<i>Cucumis pustulatus</i> (root)	Pounding	Topical
		<i>Urelytrum giganteum</i> (whole plant)	Decoction	Oral
9	Heat rashes	<i>Anarcadium occidantale</i> (stem bark) + <i>Scoparia dulcis</i> (whole plant)	Decoction	Oral and bath
10	Jaundice	<i>Balanites aegyptiaca</i> (stem bark)	Decoction	Oral
		<i>Parkinsonia aculeate</i> (stem bark)	Infusion	Oral
		<i>Annona senegalensis</i> (root)	Decoction	Oral
11	Kwashiorkor	<i>Cassia singueana</i> (root) + <i>Allium cepa</i> + <i>Vigna unguiculata</i> (offal)	Boiling	Oral and bath
12	Lateness walking	<i>Tripogon minimus</i> (whole plant)	Pounding	Bath
		<i>Cordia Africana</i> (stem bark)	Boiling	Steam bath
13	Malaria	<i>Khaya senegalensis</i> (leaves)	Decoction	Oral
		<i>Mangifera indica</i> (Leaves)	Decoction	Oral
		<i>Centuarea praecox</i> (whole plant)	Infusion	Oral and bath
14	Measles	<i>Parkia biglobosa</i> (stem bark) + <i>Mangifera indica</i> (stem bark) + <i>Citrus medica</i> (stem bark)	Infusion	Oral
15	Meningitis	<i>Combretum micrantum</i> (root) + <i>Tamarindus indica</i> (root)	Infusion	Oral
16	Pile	<i>Boswellia dalzielii</i> (stem bark) + <i>Gueira senegalensis</i> (roots) + <i>Parkia biglobosa</i> ( seed pod) + Red potash	Decoction	Bath
		<i>Anogeissus leiocarpus</i> (stem bark)	Decoction	Oral
		<i>Gyandropis gynandra</i> (whole plant)	Pounding	Topical
17	Pneumonia	<i>Clerodendrum capitatum</i> (leaves) + <i>Momodica balsamina</i> (whole plant)	Decoction	Oral
18	Ringworm	<i>Vitex doniana</i> (leaves) + <i>Vitellaria paradoxa</i> (Oil)	Pounding	Topical
		<i>Ficus thoningii</i> (latex)	Cutting	Topical
19	Sickle cell disease	<i>Clerodendrum capitatum</i> (leaves)	Infusion	Oral
		<i>Vernonia khoschyna</i> (whole plant) + <i>Clerodendrum capitatum</i> (leaves) + <i>Gyandropis gynandra</i> (whole plant) + <i>Allium sativum</i>	Infusion	Oral
20	Stomach ache	<i>Gueira senegalensis</i> (leaves) + Red potash	Infusion	Oral
		<i>Momordica balsamina</i> (whole plant)	Soaking	Oral and bath
21	Teething	<i>Faidherbia albida</i> (stem bark)	Decoction	Oral
		<i>Waltheria indica</i> (whole plant)	Pounding	Topical
22	Umbilical cord complications	<i>Boswellia dalzielii</i> (stem bark)	Pounding	Topical
		<i>Calotropis procera</i> (latex)	Cutting	Topical



various ailments, some of which have also been reported in this study [21]. Many pharmacological activities have been reported for this important plant which includes; antimicrobial, anthelmintic, antiplasmodial, trypanocidal, leishmanicidal, antioxidant and hepatoprotective activities [22-35]. Therefore, *A. leiocarpus* could be considered as a promising candidate for further scientific evaluations in the search for new, effective and affordable drugs.

Malaria was the most frequently mentioned disease in this study (table 3). This finding was in agreement with the fact that malaria has been identified as one of the main causes of child mortality in developing countries [4].

Regarding the present study, it was observed that different parts of plants were reported to be used for the herbal preparations, with leaves and stem bark being the most frequently used parts. This finding is in agreement with other researches [36,37]. The use of leaves could be due to the abundance of phytochemical constituents [38]. Leaves are considered as the main synthesis site of phytochemical constituents and are the most commonly used plant parts by traditional medicine practitioners [39].

To the best of our knowledge, this is the first attempt to document the traditional knowledge and practices on the use of medicinal plants in the management of pediatric ailments in Kano State, Nigeria. Further studies should be conducted to evaluate the pharmacological activities of the plant species that have not yet been investigated and also to identify the phytochemical constituents responsible for their activities.

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#### **Declaration of interest**

The authors declare that there is no conflict of interest. The authors alone are responsible for the content of the paper.

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