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Medicinal plants used in the treatment of children's ailments in Bali subdivision of northwest region, Cameroon

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Abstract

Childhood diseases remains an increasing problem in many developing countries. This work accessed the existing knowledge on medicinal plants to treat Childhood disease in Bali Subdivision. An ethnobotanical survey was conducted with 177 participants with the aid of semi- structured questionnaires using the show and tell method of sampling. Data was analysed using relative frequency of citation and use value method. A total of 58 plants from 29 Families were recorded as medicine used for the treatment of children's ailments in Bali subdivision. The family Fabaceae and Lamiaceae were reported as dominant with a species contribution of 6 species each (10%), followed by Asteraceae (8.3%, 5 species). The highest number of plant species were used for dermatological disorders (21 species). The plant with the highest used report values were *Carica papaya* (35.9%), *Cymbopogon citratus* (22.2%), *Ocimum gratissimum* (18.8%). These plants should be considered when thinking of drug discovery for children.

Keywords: Medicinal plants, children's ailments, relative frequency of citation, ethnobotany, Bali subdivision

Introduction

Herbal remedies are an important part of healing and are among the oldest forms of healthcare system known to mankind ^[1]. Medicinal plant species against a wide range of diseases has a long history in human civilization ^[2]. Despite significant developments in biology and medicine, traditional systems of medicine continue to be widely practiced on many accounts. Population rise, inadequate supply of drugs, the prohibitive cost of treatments, side effects of several synthetic drugs for diseases and lack of access to sufficient healthcare systems have led to increased dependency on the use of plant materials as a source of medicine for a wide variety of human ailments ^[3].

Children are the most susceptible to various types of viral diseases and infectious due to low immune system. There are many important diseases which are common in children worldwide such as diarrhoea, infections, malaria gastrointestinal, respiratory, ear nose throat disease (ENT), eye infection, and dental anomalies ^[4]. The use of medicinal plants for childhood diseases in rural areas have been receiving an increased attention among researchers ^[5]. Childhood diseases are still a common problem in rural areas and local communities continue to rely on plants to meet the healthcare needs of their children ^[6].

Herbal medicine provides a promising source of anti-diarrheal drugs and potentially valuable antimicrobial plant compounds or their extracts preferably display activity against a wide range of microorganisms in children. Medicinal plant-based drugs have the advantage of being simple, effective and exhibit broad-spectrum activity ^[7].

Cameroonians in particular the Bali people are very much close to natural vegetation, as a result there are many remedies used by the locals to solve different ailments. Women use herbal medicines from the plants which they collect from fields for treatment of ailments. Different types of research have been done in Cameroon on children's ailments ^[8, 9]. This study though is not first of its kind on herbal remedies in children in Cameroon, Northwest, and in Bali on medicinal plants but the use of plants for paediatric purposes has not been exploited. So, a survey was considered necessary in above respect to enlist the local plant species, their parts used and their medicinal use in Bali subdivision.

Materials and Methods

Documentation of ethnomedicinal knowledge

Selection of study sites

This study was carried out in Bali subdivision is located in the Northwest Region of Cameroon (Fig 1). This study site is located between latitude 5° 54 North of the equator and longitude 10° East of Greenwich Meridian. This subdivision makes up one of the 32 Subdivisions of the North West Region of Cameroon. It has the Sudan savannah of vegetation of the Western Highlands of Cameroon. This study was based on the extensive survey of villages richly populated with tribal people of this subdivision. A total of 15 villages

(quarters) were selected from this subdivision. These villages include; Mbufong, Bosa, Washing, Naka, Ganua, Koblap, Beisen, Ngwadikang, Bawock, Mantum, Mudum, Mbeluh, Koppin Fulani, Koppin native and Qungong (Figure 1). The villages were selected based on their population, and the availability of healthcare services. There are least possible healthcare facilities in the areas and hence, the population remain dependent on the medicinal plants against a wide range of ailments. The diversity of flora is a gift to the population and few significant plants are gathered by populations for their livelihood (food, fuel, feed and income generation).



Fig 1: Study site (Bali Subdivision)

Selection of informants

In this study, a total of 117 respondents of both sexes belonging to the age groups of 25-80, involving people from different educational backgrounds, marital status, occupations and especially towards people who could be involved in the use of plants for therapy with indigenous knowledge of children diseases and medicinal plants used in treating children's ailments (Table 1). The selection of informant was done through snowball method in order to collect the desired information in the population [10]. Because our study focused on ethnomedicinal uses of plants for children health care, we intentionally intended to interview herbalists, traditional healers, mothers, midwives, indigenous people and others who practice self-medication. To obtain facts in the field, interview guidelines, documentation tools (voice recorders and cameras) and field notes were used.

Interview methods

The related data was gathered by the use of semi-structured questionnaire and interviews. A prior verbal consent was obtained from the informants and the study purpose was described to them before administering the questionnaires. This was done to gain full participation of informants and to increase their confidence in supplying accurate information. The questionnaire consisted of two sections; A and B. Section A (demographic data of respondents), which included personal information including age, gender, marital status and educational background. Section B (the ethnobotanical uses of plants and ailments they treat) which was about their practice including the following information: medicinal plants local name, botanical name, part used, ingredients, disease/conditions treated, method of preparation, mode of utilization and route of administration, nature of plant

material, habit of the plant, state in which the organs of the plant are used (fresh or dry). The information was obtained in locally vernacular and pidgin then translated into English. The method of administration of the questionnaires was a show and tell method.

Ailment categories

Based on the information obtained from the respondents, all the reported ailments were characterized into eight children's categories. These categories include treating gastrointestinal diseases, respiratory disorders, ear nose throat (ENT), eye infection, dermatological problems, dental problems, fever and circulatory diseases

Collection and Identification of plants

The plant species with medicinal potential were collected for identification. Plant identification was done by the assistance of taxonomists, using various floras and with the help of available published and unpublished literature.

Data analysis

Based on previously used ethnobotanical indices, four quantitative parameters; frequency of citation (FC), Relative frequency of citation (RFC), used report (UR) and use-value (UV) were used to analyze the data.

The frequency of citation (FC) represents the percentage of informants citing the species a high frequency of citations indicates the potential importance of the plant species reported in the study area. Knowledge of the quotient frequency of a particular plant may be useful in determining its reliability and effectiveness for the treatment of one or more diseases^[11]. The relative frequency citation (RFC) index was calculated as described earlier^[12], using the following formula: $RFC = FC/N$ ($0 < RFC < 1$). This index is obtained by dividing the number of informants citing a useful species FC or frequency of citation by the total number of informants in the survey (N) as a percentage.

Use Value (UV): The relative importance of a locally known species is calculated by use value^[13]. $UV = \sum U_i/n_i$, Where, "U_i" is the number of use-reports cited by each informant for a given species and "n_i" is the total number of informants which interviewed for a specific plant species.

Results

Demographic information of respondents

Females were more (63.3%) represented among the respondents than the males (36.7%) (Table 1), indicating that females play a crucial role in managing households in Bali subdivision. Historically, the females are the primary custodians of indigenous knowledge related to children's healthcare needs. Majority (31.6%) of the respondents had attained University education level while those with no formal education and those with primary education were the least represented with each accounting for 12.4% of all the respondents. Majority of the respondents (32.8%) were in the 20-30 age range while those greater than 60 years were the least (6.8) represented. Most (39.55) of the respondents were married with the least (9.6%) represented group being the Widows/widowers. The respondents were

mainly farmers (23.7%), followed by herbalists and housewives 23.2% and 17.5% respectively.

Table 1: Demographic characteristics of respondent N = 177

Category	Sub-category	Number	Frequency (%)
Gender	Male	65	36.7
	Female	112	63.3
Education level	No formal education	22	12.4
	Primary level	22	12.4
	Secondary/High school	45	25.4
	University	56	31.6
	Others	32	18.1
Age group	20-30	58	32.8
	31-40	56	31.6
	41-50	34	19.2
	51-60	17	9.6
	>60	12	6.8
Marital status	Single	69	39
	Married	70	39.6
	Living with a partner	21	11.9
	Widow/widower	17	9.6
Religion	Christian	156	88.1
	Muslim	8	4.5
	None	10	5.7
	Others	3	1.7

Used Families and Family Importance Value (FIV)

During the present survey, a total of 58 medicinal plants of 45 genera and 27 families were documented. The enumeration of medicinal plants is shown in Table 2. The family Fabaceae and Lamiaceae were reported as dominant with a species contribution of 6 species each (10%) among the 29 families followed by Asteraceae (8.3%, 5 species); Rutaceae, Poaceae, Zingerberaceae (5%, 3 species each); Anarcadaceae, Euphobiaceae, Asperagaceae, Arecaceae, Apiaceae and Liliaceae (3.3%, 2 species). All other families contributed less than 2% as opposed to the results obtained by^[14] in which Asteraceae and Fabaceae plant families, followed by Solanaceae and Asparagaceae, were mostly used to treat children. Contrarily,^[15] and^[16] reported Leguminosae family as the dominant family. The highest number of medicinal plant species from these families for this study may be due to their wider distribution in this study area.

Use Categories in Children Diseases

The Local population used medicinal plants species to cure different ailments. These ailments were grouped into 8 broad disease categories including gastrointestinal diseases, respiratory disorders, ear nose throat (ENT), eye infection, dental problem, dermatological problem, circulatory diseases and fever. In this study, the highest number of plant species were used in the treatment of dermatological disorders (21species), and the least was eye infection (1 species) (Figure 2).

Studies have shown that in most parts of the world, the gastrointestinal disorder is the first use category^[17, 18]. In this present study, dermatological disorder was first. This was in accordance with^[19]. This might be due to the fact that most of the villages are remote and exposed to insect bites.

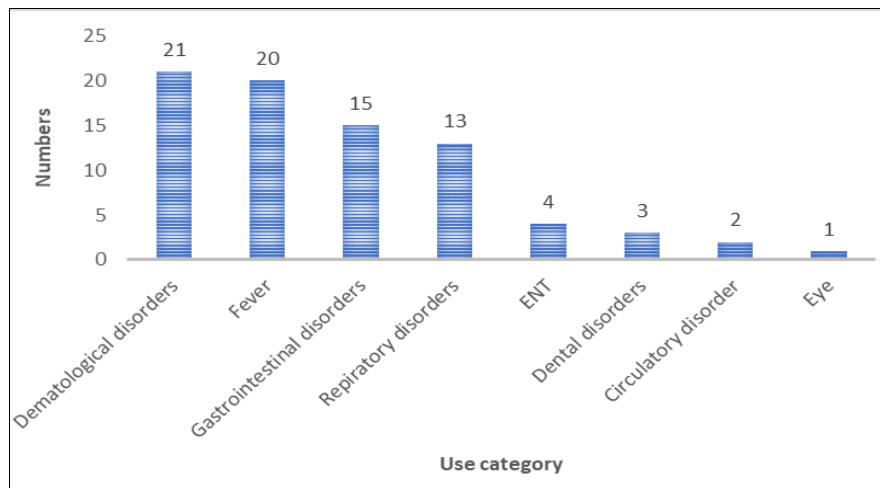


Fig 2: Use Categories in Children Diseases

Frequency of Citation (FC), Relative Frequency of Citation (RFC) and their Vernacular names of the local community

The most commonly used plants with the highest RFC values were *Carica papaya* (35.9%), *Cymbopogon citratus* (22.2%),

Ocimum gratissimum (18.8%), *Psidium guajava* (16.2%), *Allium sativum* (15.3%), *Mangifera indica* (14.5%), *Bidens pilosa* (11.1%), *Citrus limon* and *Perilla frutescens* (7.7% each) *Manihot esculenta* (6.8%), *Vernonia amygdalina* (5.1%). All others had an FC of less than 5%. Table 2.

Table 2: Plants families and species FC used in treating children's ailments in Bali subdivision

S. N.	Scientific name	Common name	Vernacular name	Family	FC	RFC (%)
1.	<i>Carica papaya</i>	Pawpaw	Pawpawya	Caricaceae	42	35.9
2.	<i>Cymbopogon citratus</i>	Lemon grass	Fever grass	Poaceae	26	22.2
3.	<i>Ocimum gratissimum</i>	Massepo	Sip	Lamiaceae	22	18.8
4.	<i>Psidium guajava</i>	Guava	ntamti	Myrtaceae	19	16.2
5.	<i>Allium sativum</i>	Garlic	Galic	Amaryllidaceae	18	15.3
6.	<i>Mangifera indica</i>	Mango	Manguli	Anarcadiaceae	17	14.5
7.	<i>Bidens pilosa</i>	Black Jack	ngə-Nchamukəŋ	Asteraceae	13	11.1
8.	<i>Perilla frutescens</i>	Red/green perilla	Two side leaf	Lamiaceae	9	7.7
9.	<i>Citrus limon</i>	Lemon	Lamsi-nchə'ked	Rutaceae	9	7.7
10.	<i>Manihot esculenta</i>	Cassava	Kasinga	Euphorbiaceae	8	6.8
11.	<i>Senna alata</i>	Ringworm leaf	Ringworm leaf	Fabaceae	7	6.0
12.	<i>Vernonia amygdalina</i>	Bitter leaf	Vub	Asteraceae	6	5.1
13.	<i>Aloe barbadensis</i>	Aloe vera	Aloe vera	Liliaceae	6	5.1
14.	<i>Elaeis guineensis</i>	Kernel oil	ngwed-minyanga	Arecaceae	5	4.3
15.	<i>Ageratum conyzoides</i>	Billygoat weed	fifəm	Asteraceae	5	4.3
16.	<i>Telfaira occidentalis</i>	Fluted Pumpkin	okongbong	Cucurbitaceae	5	4.3
17.	<i>Curcuma longa</i>	Tumeric	tumeric	Zingiberaceae	5	4.3
18.	<i>Allium cepa</i>	Onion	Ayusi	Liliaceae	4	3.4
19.	<i>Ananas comosus</i>	Pineapple	Panapo	Bromeliaceae	3	2.6
20.	<i>Commelina benghalensis</i>	Wandering jew	ngingŋu	Commelinaceae	3	2.6
21.	<i>Sida acuta</i>	Wireweed	ntamsisaŋ	Malvaceae	3	2.6
22.	<i>Azadirachta indica</i>	Neem	yarro	Meliaceae	3	2.6
23.	<i>Musa acuminata</i>	Banana	ŋkindəŋ-banana	Musaceae	3	2.6
24.	<i>Citrus aurantifolia</i>	Lime	lime	Rutaceae	3	2.6
25.	<i>Urtica dioica</i>	Stinging nettle	kikwet	Urticaceae	3	2.6
26.	<i>Dracaena fragrans</i>	Peace plant	Nkeng	Asparagaceae	2	1.7
27.	<i>Berberis vulgaris</i>	Barberry	Bird fruit	Berberidaceae	2	1.7
28.	<i>Garcinia Kola</i>	Bitter cola	ŋgajom	Clusiaceae	2	1.7
29.	<i>Zehneria scabra</i>	Wild cucumber	Lam-mbenked	Cucurbitaceae	2	1.7
30.	<i>Euphorbia hirta</i>	Asthma plant	Asthma plant	Euphorbiaceae	2	1.7
31.	<i>Ocimum basilicum</i>	Sweet basil	Coti-manjo	Lamiaceae	2	1.7
32.	<i>Zea mays</i>	Maize	ngwafid	Poaceae	2	1.7
33.	<i>Persea americana</i>	Avocado	pear	Lauraceae	3	0.96
34.	<i>Allium cepa</i>	onion	onion	Amaryllidaceae	1	0.9
35.	<i>Centella asiatica</i>	Gotu cola	mitito'	Apiaceae	1	0.9
36.	<i>Eryngium foetidum</i>	Culantro	Headache plant	Apiaceae	1	0.9
37.	<i>Cocos nucifera</i>	Coconut	kukunot	Arecaceae	1	0.9
38.	<i>Sansevieria hyacinthoides</i>	Snake plant	giləŋ	Asparagaceae	1	0.9
39.	<i>Erigeron sumatrensis</i>	Tall fleabane	White	Asteraceae	1	0.9
40.	<i>Emilia coccinea</i>	Rabbit grass	ngə-taachi	Asteraceae	1	0.9
41.	<i>Brassica oleracea</i>	Cabbage	Cabige	Brassicaceae	1	0.9

42.	<i>Costus lucanusianus</i>	Monkey sugar cane	ḡini-ḡkan	Costaceae	1	0.9
43.	<i>Bryophyllum Pinnatum</i>	Air plant	Matuḡ	Crassulaceae	1	0.9
44.	<i>Acacia nilotica</i>	Gum Arabic tree	Gum	Fabaceae	1	0.9
45.	<i>Daucus carota</i>	Carrot	Carrot	Fabaceae	1	0.9
46.	<i>Mimosa pudica</i>	Shame plant	Na-kōbti-ndab	Fabaceae	1	0.9
47.	<i>Phaseolus vulgaris</i>	Beans	Māli	Fabaceae	1	0.9
48.	<i>Arachis hypogea</i>	Groundnut	Mbianḡ	Fabaceae	1	0.9
49.	<i>Perilla frutescens</i>	Red /green perilla	Two side leaf	Lamiaceae	1	0.9
50.	<i>Hyssop officinalis</i>	Hyssop	Nk	Lamiaceae	1	0.9
51.	<i>Mentha piperita</i>	Mint	Nk	Lamiaceae	1	0.9
52.	<i>Musa x paradisiaca</i>	Plantain	ḡkidōḡ	Musaceae	1	0.9
53.	<i>Saccharum officinarum</i>	Sugarcane	Nk	Poaceae	1	0.9
54.	<i>Citrus X Paradisi</i>	Grape fruit	Lamsi-mangi	Rutaceae	1	0.9
55.	<i>Capsicum annum</i>	Pepper	Tita	Solanaceae	1	0.9
56.	<i>Stachytarpheta jamaicensis</i>	Light blue Snake weed	Nk	Verbenaceae	1	0.9
57.	<i>Aframomum melegueta</i>	Alligator pepper	Tita-mikwen	Zingiberaceae	1	0.9
58.	<i>Zingiber officinale</i>	Ginger	Ginger	Zingiberaceae	1	0.9

Nk: Not known

RFC value varied from 0.01% to 0.9% in the present study. Maximum RFC value was calculated for species *Bidens pilosa* (0.9%) followed by *Carica papaya* (0.29%), *Cymbopogon citratus* (0.2%), *Ocimum gratissimum* (0.2), *Allium sativum* (0.13), *Mangifera indica*, *Psidium guajava* and *Zingiber officinale* (0.1 for each), *Citrus limon*, *Perilla frutescens* and *Vernonia amygdalina* (0.07 for each). Others had less than 0.70, with 32 species of plant having the least RFC value of 0.01. Highest RFC values showed that these species are the most popular medicinal plants agreed by the majority of the informants as they might be the most popular plants in Bali subdivision Table 3.

The highest UR value was recorded by *Ocimum gratissimum* [13] followed by *Carica papaya* and *Allium sativum* (10 each), *Zingiber officinale* [8], *Cymbopogon citratus* and *Psidium guajava* [7], *Perilla frutescens* [6]. All others had a use report of 5 and below with the least used value being 1 for twenty-nine plant species (Table 3).

The highest use value reported in this study was 1, and the

least value was 0.025 (Table 3). The highest UV of 1 was recorded by the following plant species; *Ageratum conyzoides*, *Ananas comosus*, *Centella asiatica*, *Citrus aurantifolia*, *Euphorbia hirta*, *Ocimum basillicum*, *Commelina benghalensis*, *Acacia nilotica*, *Aframomum melegueta*, *Arachis hypogea*, *Berberis vulgaris*, *Brassica oleracea*, *Bryophyllum Pinnatum*, *Capsicum annum*, *Citrus X Paradisi*, *Cocos nucifera*, *Costus lucanusianus*, *Eryngium foetidum*, *Daucus carota*, *Dracaena fragrans*, *Emilia coccinea*, *Erigeron sumatrensis*, *Hyssop officinalis*, *Mimosa pudica*, *Musa x paradisiaca*, *Phaseolus vulgaris*, *Saccharum officinarum*, *Sansevieria hyacinthoides*, *Sida acuta* and *Stachytarpheta jamaicensis* (1 use report/use-value 1) followed by *Persea americana* (4 use report/use-value 1) and the least UV of 0.25 were recorded by *Carica papaya* (10 use report/use-value 0.250) and *Bidens pilosa* (3 use report/use-value 0.25). The high use values of most of the plants might be attributed to their wide distribution making these plants the first to be selected for treatment of children's ailments.

Table 3: Medicinal plants and the associated diseases they treat among children in Bali Subdivision ranked using use values and use reports

Scientific name	Family	Disease treated	FC	RFC	UR	UV
<i>Ageratum conyzoides</i>		Convulsion, yellow fever and headache	3	0.025	3	1.0
<i>Ananas comosus</i>		Malaria, Typhoid	2	0.017	2	1.0
<i>Centella asiatica</i>		Pneumonia, Stomach Ache	2	0.017	2	1.0
<i>Citrus aurantifolia</i>		Cough, Malaria	2	0.017	2	1.0
<i>Euphorbia hirta</i>		Diarrhoea, Stomach Ache	2	0.017	2	1.0
<i>Ocimum basillicum</i>		Headache, Nose Bleeding	2	0.017	2	1.0
<i>Commelina benghalensis</i>		Ringworm	3	0.025	1	1.0
<i>Acacia nilotica</i>		Diarrhoea	1	0.008	1	1.0
<i>Aframomum melegueta</i>		Cough	1	0.008	1	1.0
<i>Arachis hypogea</i>		Kwashiorkor	1	0.008	1	1.0
<i>Berberis vulgaris</i>		Diarrhoea	1	0.008	1	1.0
<i>Brassica oleracea</i>		Conjunctivitis	1	0.008	1	1.0
<i>Bryophyllum Pinnatum</i>		Cough	1	0.008	1	1.0
<i>Capsicum annum</i>		Cough	1	0.008	1	1.0
<i>Citrus X Paradisi</i>		Typhoid	1	0.008	1	1.0
<i>Cocos nucifera</i>		Yellow Fever	1	0.008	1	1.0
<i>Costus lucanusianus</i>		Measles	1	0.008	1	1.0
<i>Daucus carota</i>		Worms	1	0.008	1	1.0
<i>Dracaena fragrans</i>		Tooth Ache	1	0.008	1	1.0
<i>Emilia coccinea</i>		Typhoid	1	0.008	1	1.0
<i>Erigeron sumatrensis</i>		Stomach Bite	1	0.008	1	1.0
<i>Eryngium foetidum</i>		Stomach Ache	1	0.008	1	1.0
<i>Hyssop officinalis</i>		Filaria	1	0.008	1	1.0
<i>Mimosa pudica</i>		Yellow Fever	1	0.008	1	1.0
<i>Musa x paradisiaca</i>		Malaria	1	0.008	1	1.0
<i>Phaseolus vulgaris</i>		Kwashiorkor	1	0.008	1	1.0
<i>Saccharum officinarum</i>		Yellow Fever	1	0.008	1	1.0

<i>Sansevieria hyacinthoides</i>		Filaria	1	0.008	1	1.0
<i>Sida acuta</i>		Stomach Ache	1	0.008	1	1.0
<i>Stachytarpheta jamaicensis</i>		Cough	1	0.008	1	1.0
<i>Zehneria Japonica</i>		Colic pain	1	0.008	1	1.0
<i>Persea americana</i>		Dysentery, Malaria, Typhoid, Measles	4	0.034	4	1.0
<i>Allium cepa</i>		Catarrh, Cough, Chicken Pox, Yellow Fever, Mouth odour.	6	0.051	5	0.83
<i>Curcuma longa</i>		Chicken Pox, Ringworm, Constipation, Measles	5	0.042	4	0.80
<i>Aloe barbadensis</i>		Chicken Pox, Constipation, Pile, Ringworm.	5	0.042	4	0.80
<i>Azadirachta indica</i>		Chicken Pox, Malaria	3	0.025	2	0.66
<i>Urtica dioica</i>		Jetti-Jetti, Nose Bleeding	3	0.025	2	0.66
<i>Manihot esculenta</i>		Anaemia, Chicken Pox, Cholera, Malaria, Measles	8	0.068	5	0.62
<i>Perilla frutescens</i>		Diarrhoea, Food Poisoning, Jetti-Jetti, Malaria, Rashes, Yellow Fever	10	0.085	6	0.60
<i>Ocimum gratissimum</i>		Catarrh, Colic pain, Rashes, Convulsion, Cough, Typhoid, Food Poisoning, Jetti-Jetti, Kwashiorkor, Diarrhoea, Pneumonia, Yellow fever, Malaria	22	0.188	13	0.59
<i>Senna alata</i>		Jetti-Jett, Malaria, Typhoid, Ringworm	7	0.059	4	0.57
<i>Allium sativum</i>		Catarrh, Chicken Pox, Cough, Eczema Filaria, Pneumonia Typhoid, Worms Yellow Fever, Mouth odour	18	0.153	10	0.55
<i>Vernonia amygdalina</i>		Chicken Pox, Cholera, Malaria, Typhoid, Worms	9	0.076	5	0.55
<i>Garcinia Kola</i>		Cough	2	0.017	1	0.50
<i>Zea mays</i>		Cough	2	0.017	1	0.50
<i>Zehneria scabra</i>		Catarrh	2	0.017	1	0.50
<i>Zingiber officinale</i>		Catarrh, Cough, Diarrhoea, Jetti-Jetti, Malaria, Pneumonia, Stomach Ache, Typhoid	18	0.153	8	0.44
<i>Citrus limon</i>		Catarrh, Cough, Fever, Malaria	9	0.076	4	0.44
<i>Elaeis guineensis</i>		Diarrhoea, Jetti-Jetti	5	0.042	2	0.40
<i>Telfaira occidentalis</i>		Anaemia, Typhoid	5	0.042	2	0.40
<i>Psidium guajava</i>		Diarrhoea, Dysentery, Fever Malaria, Running Stomach Stomach Ache, Typhoid	19	0.162	7	0.36
<i>Musa acuminata</i>		Diarrhoea	3	0.025	1	0.33
<i>Mangifera indica</i>		Diarrhoea, Fever, Malaria, Typhoid, Stomach Ache	18	0.153	5	0.30
<i>Cymbopogon citratus</i>		Cough, Fever, Jetti-Jetti Malaria, Typhoid, Rashes, Yellow Fever	25	0.213	7	0.28
<i>Carica papaya</i>		Diarrhoea, Fever, Headache, Jaundice, Jetti-Jetti, Malaria, Stomach Ache, Typhoid Worms, Yellow Fever	40	0.341	10	0.25
<i>Bidens pilosa</i>		Fever, Malaria, Typhoid	12	0.102	3	0.25

Plant Parts Used in the Herbal Medicines Treatment for Children’s ailments in Bali in Cameroon

Different plant parts contain different proportion of secondary metabolites which can be used in the treatment of children’ ailments [20]. The frequency of plant parts used in the treatment of diseases in children in this study are presented in Table 4. According to the majority of study participants, the

fruits, rhizome, and leaves of the specific medicinal plants were the most important plant parts with a high concentration of medication. The most commonly used plant part in this study were the leaves while the least cited plant part used were the roots. Leaves have been mostly used in herbal treatment as reported by [21].

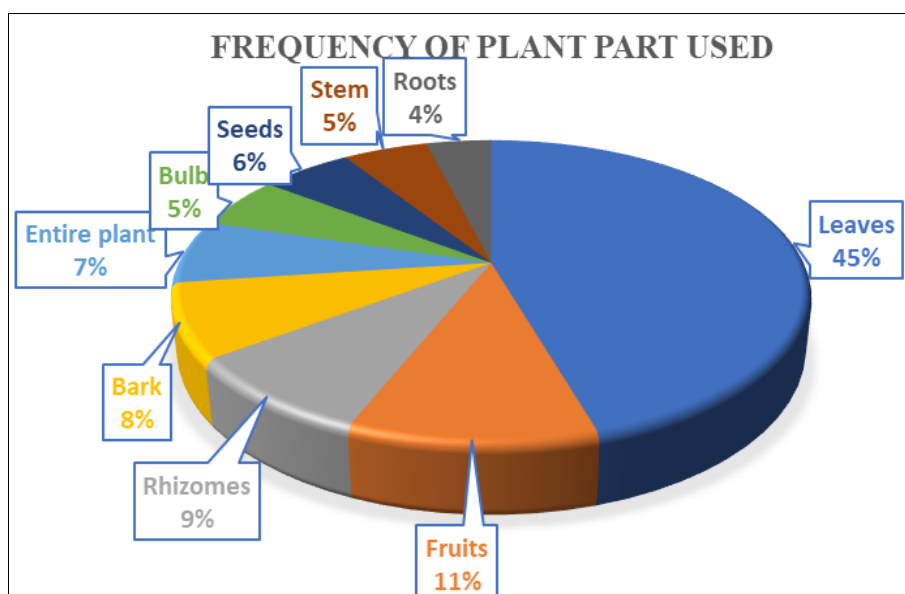


Fig 3: Frequency of plant parts used in the treatment of diseases in children in Bali subdivision

Habit, habitat and state in which the plants are used

Most of the plants were herbs (52.5%) among 58 species followed by trees (29.0%) and shrubs (18.4%). Herbs were mostly used by local inhabitants due to greater availability and access to such herbaceous plants in the study area.

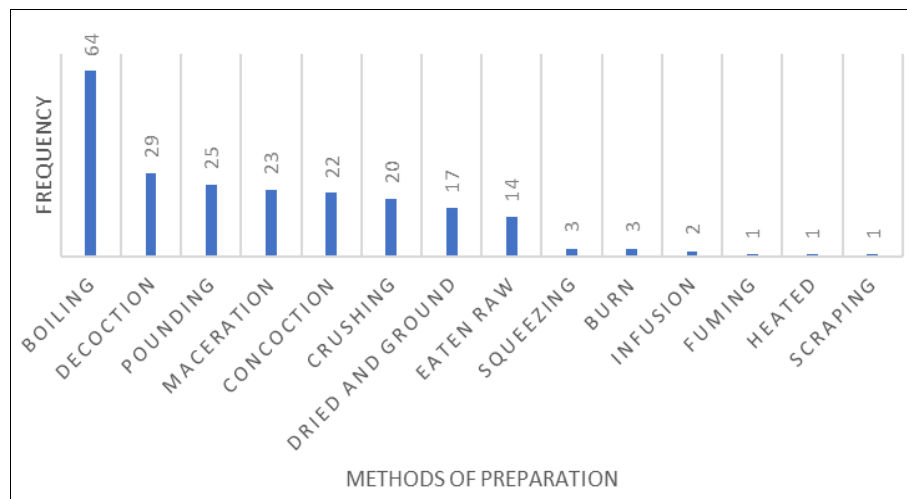
Majority (74.2%) of the plants were cultivated while others (25.8%) were harvested from the wild. Most (76.9%) of the respondents used these plants in their fresh states, 5.9% used them dried while 17.2% used them both in the dried and fresh states (Table 5).

Table 5: Habit, habitat and state in which the plants are used

Category	Sub-category	FC	RFC (%)
Plant habit	Tree	63	29.0
	Herb	114	52.5
	Shrub	40	18.4
Habitat	Wild	50	25.8
	Cultivated	144	74.2
Use state of these plants	Dried	10	5.9
	Fresh	130	76.9
	Both	29	17.2

The most (28.4%) used method of preparation of plants was by boiling while the least (0.4%) used methods were Fuming,

Heating and Scraping (Figure 4).

**Fig 4:** Methods of preparation

Medicinal plants were mainly taken orally by drinking (60.0%) while the least methods of administration were “Mixed with Food”, Gagging and “Mixed with Palm Oil” (Table 6).

Table 6: Method of administration of medicinal plants used in treating children’s ailments in Bali subdivision

Method of administration	FC	RFC (%)
Drinking	111	60.0
Chewing/Swallowing	28	15.1
Dropping	12	6.5
Steam Bathe/ Inhalation	10	5.4
Bathe/Inhalation	8	4.3
Eating	5	2.7
Inhalation	3	1.6
Enema	2	1.1
Bathing	2	1.1
Smoked	1	0.5
Mixed With Food	1	0.5
Gagging	1	0.5
Mixed With Palm Oil	1	0.5

Discussion

Medicinal practices are known to still be an important component of everyday life in many regions of the world [22] as evident by the information gathered from the respondents in the present study. The preferential use of one or another plant is a function of the availability in the study site. One or more plants were used in the treatment of a particular ailment and some plant species were used to treat more than one ailment, as also observed from studies by [23]. The demographic information of the respondents relative to gender (62.3%) were female because women are always home

with the rest of the families while the male mostly go out to work. The respondents were mostly farmers (23.7%). Most of the population in the rural and semi-urban population in Cameroon are farmers, resulting to the fact that they are versed with the used of plants in herbal treatment. Cough had the highest frequency of citation (18.4%) reason been that children have weak immune system which cannot efficiently fight against bacterial and viruses present in the food, water and the air they breathe. The frequency of citation was equally high due to the cold and harsh climate in this study. This was followed by Malaria (14.3%) because Bali Subdivision is part of the tropics whose climate favours the growth and reproduction of Mosquitoes (anopheles) which are the vectors of Malaria. This reflects the importance of malaria in Cameroon, which is located in the high-risk area of malaria, zone C according to WHO. According to the map drawn by the National Center of Chemical Sensitivity of Malaria based at Paris, Cameroon is situated in the area of high-level prevalence of chloroquin-resistant type of malaria [24].

Carica papaya was the most commonly used plant with a relative frequency of 13.5%. Though cultivated for its edible fruits, all of its parts (leaf, fruit, seeds, roots, latex, flower) are used in treating a wide range of diseases followed by *Cymbopogon citratus* (8.4%), which has been reported to have pharmacological properties like anti-amoebic anti-bacterial, anti-diarrhea, anti-filarial, anti-fungal and anti-inflammatory. *Allium cepa* and *Allium sativum* have equally be reported as a treatment for cough in other parts of Africa [25, 26]. *Psidium guajava* and *Mangifera indica* have been reported by [27] used in the treatment of diarrhoea. Though *Manihot esculenta* cited to be used in the treatment of anaemia. This plant is equally being used in other parts of the

country for the treatment of the same ailment.

Part of the medicinal plants used are roots, tubers, rhizomes, stems, leaves, flowers, seeds and fruit by varying processing methods such as: dried, pounded, kneaded, grated, brewed, boiled, roasted, fried, chewed, rubbed, squeezed, smeared, eaten and drunk directly. The study shows that leaves (45.4%) were the most common plant part use because of their potency and fast regeneration ability and also due to the fact that active ingredients of the plants are located in the leaves coupled with the ease with which they are harvested. Similar results were reported by 28 and 29. Any rate of use of leaves has no adverse effect on the life of medicinal plants and is therefore encouraged. Similarly, the excessive harvesting of these plants in a long term is likely to be unsustainable. This may lead to local extinction of important medicinal plants and therefore compromise future supplies of the needed remedies. Conservation of these plants is encouraged for sustainability reasons.

Most of the plants use are cultivated not only because of their medicinal properties but also for purposes of food, fuel wood, timber and for cultural activities.

The most used method of preparation of plants was by boiling with a relative frequency of citation (28.4%) due to the fact that boiling extracts the bioactive ingredients from the plant while the least (0.4%) used were fuming, heating and scabbing.

Medicinal plants were mainly taken by drinking (60.0%). The most used administration or consumption mode was oral route, which can be explained by the fact that metabolites contained in the liquid form are usually assimilated rapidly [30].

Conclusion

Medicinal plants are playing a vital role in traditional medicines. Primary health care in this study area is based on medicinal plants from 61 plant from 29 families. Colic pain, Diarrhea, Ear ache and measles are most common diseases that are treated by medicinal plants recipes. Despite having few modern health care facilities available in the study area, the local community still rely on herbal remedies. It is imperative to integrate herbal remedies into the treatment of infant disease alongside orthodox line of medication.

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