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Original Research Article | **Medicine and Biomedical Sciences**

Medicinal Plants Used by Traditional Practitioners for the Treatment of Diabetes, Obesity and Arterial Hypertension in the Dja and Lobo Department of Cameroon

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Abstract

***Background/Purpose*:** Diabetes is a metabolic disease characterised by chronic hyperglycaemia, with disturbance of carbohydrate, lipid and protein metabolism, resulting from a defect in insulin secretion and/or action. The International Diabetes Federation (IDF) estimated in 2017 that 425 million people were living with diabetes worldwide. It is estimated that by 2045, 629 million adults will have diabetes. In Cameroon, a prevalence of 5.59% was recorded in 2018, regardless of gender [1]. In the Department of Dja and Lobo, an ethnopharmacological study was set up to identify and characterize the medicinal flower used in the management of metabolic syndrome. ***Material and methods*:** Surveys were conducted among 135 people. Data on medicinal recipes used in the management of diabetes, hypertension and obesity were collected according to a standardized framework. The plant samples mentioned were collected and identified at the National Herbarium of Cameroon and characterized. Phytochemical screening was performed on each species. ***Results*:** A total of 135 natives from six different villages were interviewed about plants used in the management of metabolic syndrome in the Department of Dja and Lobo. The study identified 85 species in 49 families. The fabaceae, asteraceae and flacourthiaceae families each had at least five species cited by the stakeholders who participated in our investigation. The medicinal plants inventoried totaled 7 biological types. In total 41 species were involved in the treatment of diabetes. The most used preparation methods were decoction and trituration. Phytochemical screening revealed the presence of flavonoids, Phenols, Polyphenols, Tannins, Saponins in almost all the extracts collected. Anthocyanins were extremely abundant in almost all extracts. ***Conclusion*:** The results obtained constitute a very valuable source of information for the region studied. The valorization of these plants and the determination of the health profile of the local populations of the Dja and Lobo department requires the establishment of modern processing units specialised in the manufacture of medicines.

Keywords: Ethnobotany, ethno pharmacology, frequency of citation, medicinal plants, diabetes, high blood pressure, obesity.

INTRODUCTION

Diabetes is a metabolic disease characterised by chronic hyperglycaemia, with disturbance of carbohydrate, lipid and protein metabolism, resulting from a deficiency in insulin secretion and/or action. In its latest report Diabetes Atlas 2017 Edition 8, the International Diabetes Federation (IDF) estimated that 425 million people are currently living with diabetes worldwide; this corresponds to 8.8% of the adult population aged 20-79 years. Approximately 79% of the population in emerging countries in sub-Saharan Africa has diabetes. In Cameroon, a prevalence of 5.59% was recorded in 2018 regardless of gender [1]. In the Department of Dja and Lobo, an ethnopharmacological study was set up to characterise the medicinal flower used in the management of metabolic syndrome.

I. MATERIALS AND METHODS

1. Study location

The study took place from October 2019 to August 2020, in the villages of Evindissi, Kombé,

Kondemeyoss, Mintyaemignumin, Ngon, and Nkpwang in the Department of Dja and Lobo (Southern Region).

Dja and Lobo covers 4 communes: for a cosmopolitan population of about 252,304 inhabitants.

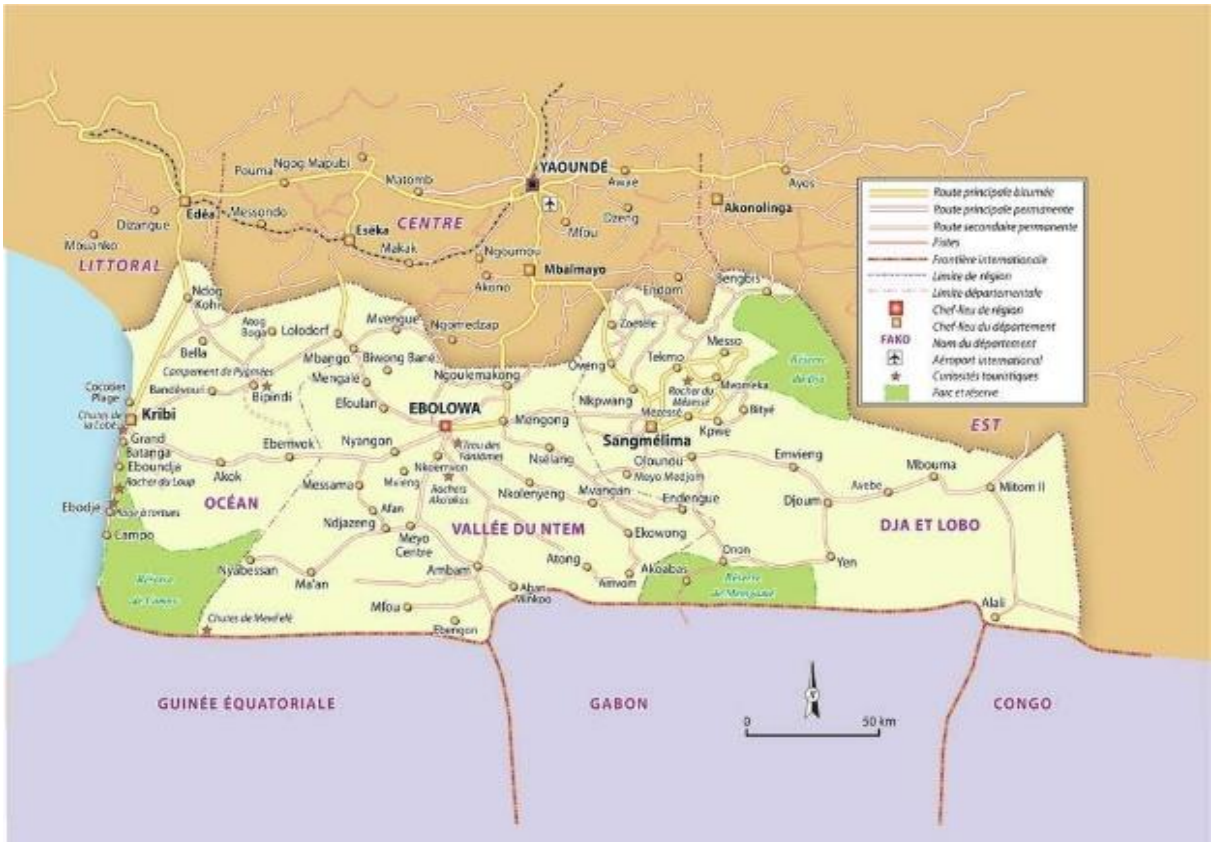

Figure 1: Map of study area location

2. Materials and Methods

2.1. Ethnobotanical survey in the Department of Dja and Lobo

The survey was conducted in 6 villages: EVINDISSI, KONDEMEYOSS, KOMBÉ, MINTYAEMIGNUMIN, NGON and NKPWANG. The main lines of the interview concerned information on the plants used in the recipes against metabolic syndrome, the method of preparation of these recipes, their modes of administration as well as the other diseases treated by these plants. The approach to the populations was based on dialogue in French and local languages (Bulu). One hundred and thirty-five (135) people between the ages of 10 and 80 were given a semi-structured survey giving information about the medicinal plants and their recipes. All were asked to identify the diseases included in the metabolic syndrome. These were: *Minko'o* (for diabetes), *Betanyoul* (for obesity), Tension (for high blood pressure). The snowball method combined with the door-to-door method was used.

2.2. Floristic characterization

After identification in the field, the plants mentioned were recognised *in situ* and the complete samples were collected and dried after spraying with alcohol at 70°C. The samples were preserved according to the techniques and methods of Schnell [2]. The identification of the samples from the control Herbarium was confirmed by botanists from the Department of Plant Biology of the Faculty of Science of the University of Douala and the data available in the literature and the National Herbarium of Cameroon. The floras of the collected plants were characterised by phytogeographical distribution types, morphological types, biotope types, as well as types and mode of dissemination of diaspores [3].

2.3 Inventory of medicinal plants recipes

The approach used was the administration of an interview via a semi-structured survey form. The information provided included local names, common names of the plants used, the different parts used, their harvesting methods, preparation methods and administration of medicinal recipes.

2.4. Phytochemical screening of harvested medicinal plants

The phytochemical screening tests were carried out according to the method of Harbon [4] and Evans (2000) [5].

2.5. Data analysis

The data collected in the field were recorded in Microsoft Excel 2013. The analysis and graphing was done with XLSTAT.

II. RESULTS

1. Socio-demographic data

A total of 135 natives from six different villages (26 in EVINDISSI, 13 in KOMBÉ, 16 in KONDEMEYOSS, 33 in MINTYAEMIGNUMIN, 10 in NGON and 37 in NKPWANG) were interviewed (Table I). The age of the participants ranged from 10 to 80 years, divided into four groups: 10 to 14 years; 15 to 25 years; 26 to 64 years and 65 to 80 years with a majority of 76% in the 65 to 80 years age group and 51% men. Seventy-one percent of the respondents stated that they had received their knowledge from their ancestors, 24% had learned it and 5% inherited it empirically.

Table I: Socio-demographic characteristics of interviewees (N=135)

Characteristics		Frequency (%)
Gender	Women	49 %
	Men	51 %
Age groups	[**15-25**]	02 %
	[**26-64**]	22 %
	[**65-80**]	76 %
Nature of knowledge acquisition	Empirical	24 %
	Empirical/Hereditary	5 %
	Hereditary	71 %
Distribution by village	EVINDISSI	19.25 %
	KOMBÉ	9.62 %
	KONDEMEYOSS	11.85 %
	MINTYAEMIGNUMIN	24.44 %
	NGON	7.40 %
	NKPWANG	27.40

2. Floristic characteristics of plants used against metabolic syndrome

A total of 85 species were identified and divided into 49 families.

Table II: Plant species cited in the management of metabolic syndrome by some natives of Dja and Lobo Department

Local names (in Bulu)	Scientific names	Families
Okpwate	*Ageratum conyzoïdes*	*Astéraceae*
Mekaé m'aboé	*Alchornia cordifolia*	*Euphorbiaceae*
Ayang	*Alium cepa*	*Anthéricaceae*
Ail	*Alium sativum*	*Anthéricaceae*
Aloe vera	*Aloe vera*	*Liliaceae*
Ekuk	*Alstonia boonei*	*Apocynaceae*
Mfo'o	*Annickia chlorantha*	*Annonaceae*
Ebom	*Anonidium mannii*	*Annonaceae*
Céleri	*Apium graveolens*	*Apiaceae*
Angongui	*Antrocaryon klaineanum*	*Anacardiceae*
Ayang bulu	*Alum triccocum blanco*	*Liliaceae*
	Aspilia helianthoides	*Acanthaceae*
Choux	*Brassica oleraceae*	*Brassicaceae*
Ajab	*Baillonella toxisperma*	*Sapotaceae*
Otui (sève)	*Boswella papyrifera (Del) Hochst*	*Burseraceae*
Otui (écorce)	*Boswella papyrifera (Del) Hochst*	*Burseraceae*
Not available	*Caloncoba echinata*	*Flacourtiaceae*
Not available	*Caloncoba glauca*	*Flacourtiaceae*
Not available	*Caloncoba welwitschii*	*Flacourtiaceae*
Ozezen	*Carapa procera*	*Meliaceae*
Not available	*Casearia barteri*	*Flacourtiaceae*
Kinkéliba	*Combretum macronatum*	*Combretaceae*
Teu'e	*Corchorus olitorius Linn.*	*Tiliaceae*
Lemon	*Citrus aurantifolia*	*Rutaceae*
Not available	*Cataranthus roseus*	*Apocynaceae*
Nyafio	*Citrus lemon*	*Rutaceae*
Osanga	*Cymbopogon citratus*	*Poaceae*
Mekaé me fofo	*Carica papaya*	*Caricaceae*
Avom élé	*Cleistopholis patens*	*Annonaceae*

Local names (in Bulu)	Scientific names	Families
Not available	*Costus afer*	*Costaceae*
Asa	*Dacryodes edulis*	*Burseraceae*
Owondo Bekon	*Desmodium adscendens*	*Burseraceae*
Atiti	*Bidens pilosa*	*Astéraceae*
Alo Nko'o	*Emilia coccinea*	*Astéraceae*
Eucalyptus	*Eucalyptus globulus*	*Myrtaceae*
Huile de palmiste Noire	*Elaeis guineensis*	*Arecacae*
Asé	*Entandrophragma cylindricum*	*Méliaceae*
Elone	*Erythrophleum suaveolens*	*Caesalpiniaceae*
Eyoyongo	*Fagara tesmanii*	*Rutaceaea*
Onyae	*Garcinia Kola*	*Clusiaceae*
Esok	*Garcinia lucida*	*Glusiacea*
Oveng	*Guibourtia demeusei*	*Caesalpiniaceae*
Esingan	*Guilbourtia tessmannii*	*Caesalpiniaceae*
Ataag	*Hypodaphnis zenkeri*	*Lauraceae*
Sas biten	*Fleureya ovalifolia*	*Urticaceae*
Bitetam	*Hibiscus esculencus L*	*Malvaceae*
Biban'e	*Musa textilis, NEE.*	*Musaceae*
Oyebe	*Massullaria acuminata*	*Rubiaceae*
Mekaé m'odjoé	*Musa parasidiaca L.*	*Musaceae*
Tabac	*Nicotiana tabaccum*	*Solanaceae*
Atyen	*Oxyanthus oliganthus*	*Rubiaceae*
Fio'o	*Persea americana*	*Lauraceae*
Persil	*Petroselinum crispum*	*Apiaceae*
Evele kone	*Phaseolus vulgaris*	*Fabaceae*
Not available	*Phaseolus vulgaris*	*Fabaceae*
Not available	*Phyllobotryon spathulatum*	*Flacourtiaceae*
Ebam	*Picralima nitida*	*Apocynaceae*
Mbeul	*Pterocarpus soyauxii*	*Fabaceae*
Eteng	*Pycnanthus angolensis*	*Myristicacea*
Acila	*Parinari excelsa*	*Chrysobalanaceae*
Atui	*Piptadeniastrum africanum*	*Mimosaceae*
Gui	*Phragmantera capitata*	*Loranthaceae*
Cassis	*Ribes nigrum L.*	*Grossulariaceae*
Esombo	*Ranvolfia macroplylla*	*Apocynaceae*
Ndanwolo ntanan	*Senna alata*	*Fabaceae*
Nga nteme	*Solanum indicum*	*Solanaceae*
Onkok	*Sacharum officinarum*	*Poaceae*
Ozon	*Solanum melongena Linn.*	*Solanaceae*
Okum zon	*Solanum aethiopicum Linn*	*Solanaceae*
Akom ntanan	*Terminalia catappa*	*Combretaceae*
Keka	*Theobroma cacao*	*Sterculiceae*
Nkpwasa	*Tetrapleura tretraptera P.Beaux*	*Fabaceae*
Yolo yolo	*Vernonia amygdalina*	*Astéraceae*
Zelane	*Vernonia cineria*	*Astéraceae*
Evele ekabé	*Xanthosoma mataffa*	*Araceae*
Fone	*Zea mays*	*Poaceae*
Not available	*Zinziber officinale*	*Zinziberaceae*
Jujube	*Ziziphus mauritiana*	*Rhamnaceae*
Ngende bewo'o	*Belonophora cylindricum*	*Rubiaceae*
Meva'a	*Plectranthus glandulosis*	*Lamiaceae*
Adum	*Cylicodiscus gabunensis*	*Fabaceae*
Beyeme elok	*Clerolendrum splendens*	*Linaceae*
Eyene	*Distemanthus benthamianus*	*Caesalpiniaceae*
Otu'u nden	*Ipomea involucrata*	*Convovulaceae*
Baobab	*Adansonia digitata*	*Bombaceae*

2.1. Taxonomic diversity

Among the 49 plant families surveyed, the fabaceae, asteraceae and flacourthiaceae families each had at least five species cited by the stakeholders who participated in our survey, i.e. 12.58%. The other families were less represented with a number of species between two and four. Twenty-five families were each represented by a single species.

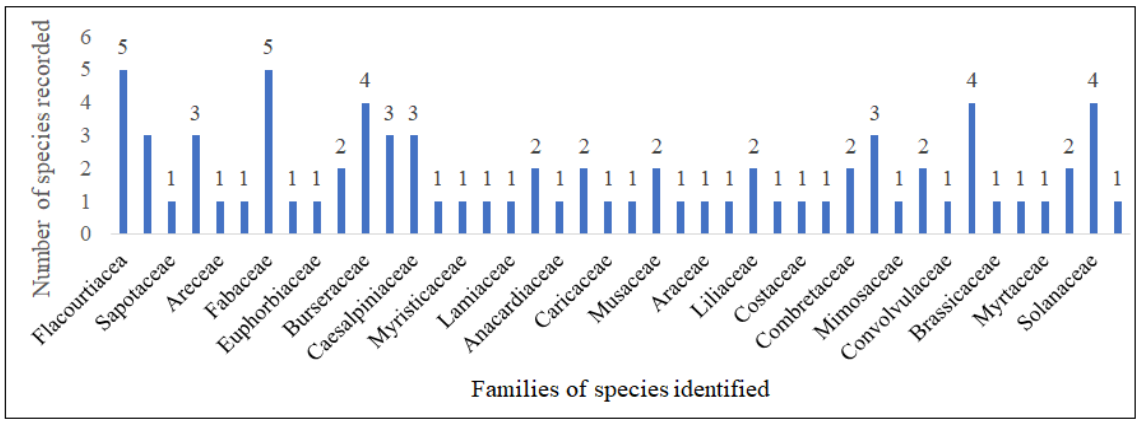

Figure 2: Families of the plant species recorded

2.2. Diversity of biological types

Figure 2 shows the most represented biological types in the management of metabolic syndrome. The medicinal plants inventoried total 7 biological types: Megaphanerophytes (17.94%), Mesophanerophytes (20.51%), Chamephytes (7.69%), Microphanerophytes (10.25%), Megagenophytes (2.56%), Phanerophytes (20.51%), Therophytes (20.51%).

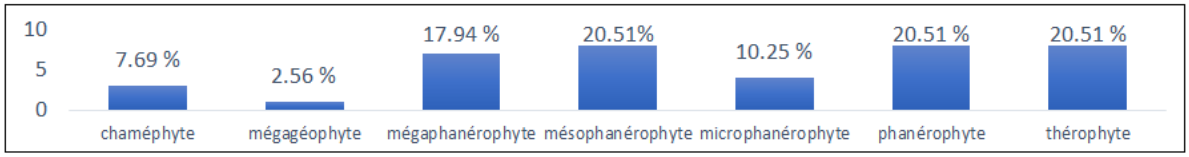

Figure 3: Variety of biological types

2.3. Diversity of phytogeographic types

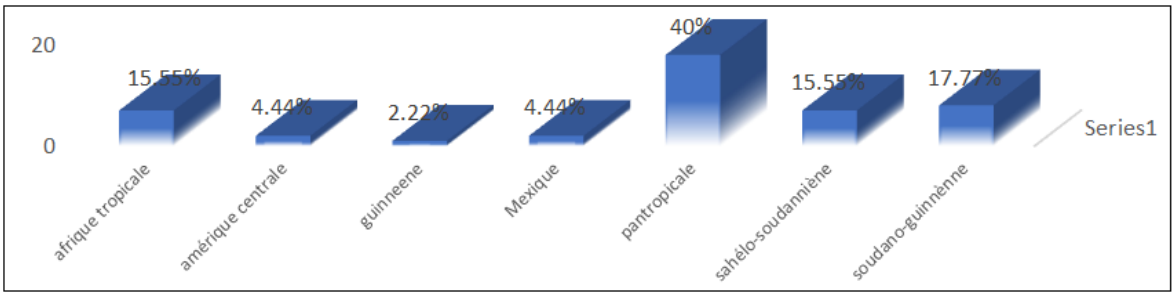

Figure 4: Diversity of phytogeographical types

2.4. Diversity of morphological types

The medicinal plants inventoried have 6 morphological types: Trees are the most used for the treatment of metabolic syndrome.

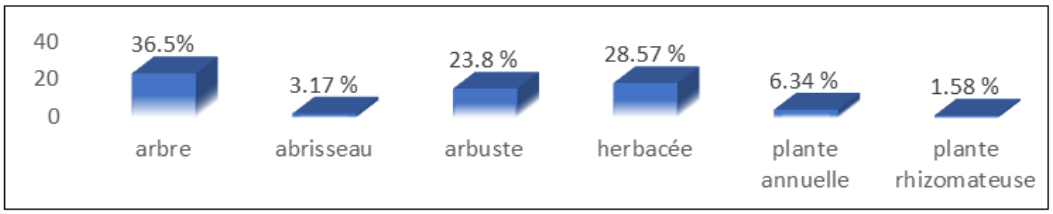

Figure 5: Diversity of morphological types

2.5. Diversity of diaspora types

Figure 5 shows the types of diaspores used in the management of metabolic syndrome in the Department of Dja et Lobo. Four types of diaspora are found among the medicinal plants surveyed.

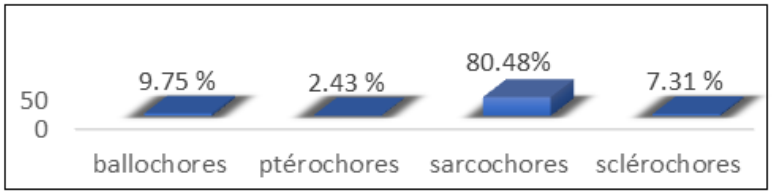

Figure 6: Diversity of diaspora types

3. Methods of preparation, modes of administration, dosage, diseases and symptoms treated

3.1. Method of preparation

Decoction (38.04%) and trituration (31.95%) are the most used preparation methods.

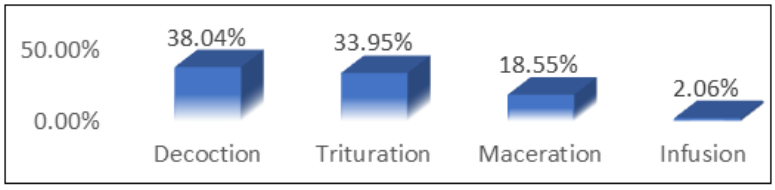

Figure 5: Proportion of preparation methods

3.2 Methods of administration

The oral route, (78.33%) was the most used by the villagers for the administration of traditional preparations.

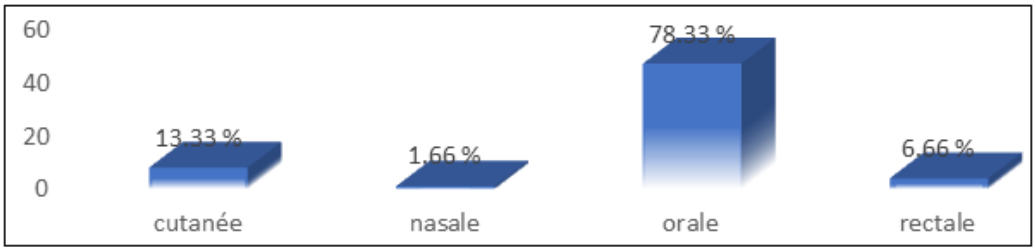

Figure 6: Proportion of modes of administration

3.3. Pathologies Treated

The diseases for which the survey was directed were diabetes, hypertension and obesity. Of the 85 species surveyed, 41 species were involved in the treatment of diabetes.

Table III: Summary of diseases treated according to medicinal species

Pathologies and symptoms treated	Families	Scientific name	organ used	Methods of preparation	Dosages	Citation frequency
hypertension	*Lecythidaceae*	*Petersianthus macrocarpus*	Bark	Decoction: boil together	1 Glass in the evening at bedtime after the meal	2.96
Diabetes	*Mimosaceae*	*Cylicodiscus gabunensis*	Bark	Decoction	1 Glass times 2/day for 1 month	4.44
High Blood Pressure, Diabetes,	*Liliaceae*	*alium sativa*	Seed	Trituration	15ml twice a day for 1 month	4.44
Obesity	*Sapotaceae*	*Baillonella toxisperma*	Bark	Macerate in 1L of water	Drink unlimited for 2 weeks	5.18
Diabetes	*Combretaceae*	*Terminalia catappa*	Sheet	Decoction	1 glass times 3/day for 15 days	2.22
Diabetes	*Flacourtiaceae*	*Casearia barteri*	trunk bark	Other	Chew a piece of bark twice a day after washing them for 7 days	4.44
Diabetes,	*Liliaceae*	*aloe vera*	Sheet	Decoction	10ml twice a day before	2.96

hypertension,					meals	
Obesity,	*Anacardiaceae*	*Antrocaryon klaineanum*	None	Decoction	1 full pear every 2 days in the anus	5.92
Obesity	*Burseraceae*	*Dacryoda edulis*	Atui	Decoction	1 pear every 3 days for 2 weeks	2.22
Obesity,	*Meliaceae*	*Entandrophragma cylindricum*	None	Decoction	Cover up and harness the heat	3.7
Obesity	*Chrysobalanaceae*	*Parinari excelsa*	None	Decoction	2 pears twice a day every 2 days for 3 weeks	3.7
hypertension	*Lauraceae*	*Hypodaphnis zenkeri*	None	Maceration for 1 hour	Wash the head morning and evening until normalization of BP	3.7
hypertension, diabetes	*Flacourtiaceae*	*Caloncoba glauca*	None	Decoction	1 drink twice a day for 4 weeks	5.74
Obesity	*Mimosaceae*	*Piptadeniastrum africanum*	None	Decoction	1 pear/day every 2 days	5.18
hypertension	*Rubiaceae*	*Oxyanthus oliganthus*	None	Decoction	1 glass on an empty stomach	5.18
hypertension	*Annonaceae*	*Cleistopholis patens*	Ataag	Macerate for 1 hour	1 bath in the morning, insisting on the head	2.96
Obesity	*Liliaceae*	*alum tricocum blanco*	None	Decoction	1 bath/day before 3 p.m.	2.96
Diabetes, hypertension ,	*Liliaceae*	*alium this*	Lemon	Trituration	1 Glass twice a day before meals	1.48
Diabetes	*Bombaceae*	*Adansonia digitata*	None	Decoction	1 Glass times 2/day For 3 days	1.48
Obesity	*Linaceae*	*Clerolendrum splendens*	None	Decoction	1 Glass times 2/day for 1 month	2.22
Diabetes	*Musaceae*	*Musa textiles*	None	Decoction	Drink at will like its water for 2 weeks	0.75
Diabetes	*Malvaceae*	*Hibiscus esculentus L.*	Elelengue	Maceration	Drink 2 liters / day at will	3.7
hypertension	*Costaceae*	*Costus afer*	Mistletoe	Decoction1 V	1 Glass times 2/day	4.44
hypertension	*Apocynaceae*	*Cataranthus roseus*	None	Decoction	1 glass on an empty stomach in the morning until complete recovery	3.7
hypertension	*Apiceae*	*apium graveolens*	None	Trituration	1 Tablespoon times 3/day for 2 weeks then check BP	2.96
diabetes, obesity,	*Brassicaceae*	*brassica oleraceae*	None	Trituration	1 glass times 2/day for 2 weeks	0.74
Diabetes, hypertension	*Apocynaceae*	*Picralima nitida*	Lemon	Decoction, Maceration	1 glass twice a day until normalization of BP	5.18
Diabetes, hypertension,	*Annonaceae*	*Anonidium mannii*	None	Decoction	1 glass twice a day before meals for 2 to 3 weeks	6.66
hypertension	*Annonaceae*	*Annoduim mannii*	Abing	Decoction	1 glass in the evening at bedtime	4.44
Obesity	*Rubiaceae*	*Massullaria acuminata*	Onkok	Trituration	Drink 1 glass in the morning on an empty stomach without having taken a bath every 2 days	3.7
Diabetes,	*Apocynaceae*	*Alstonia boonei*	None	Decoction	1 glass twice a day after meals for 2 to 3 weeks	4.44
hypertension	*Caesalpiniaceae*	*Erythrophleum suaveolens*	None	Trituration	2 doses twice a day nasally for 2 to 3 weeks	3.7
Diabetes,	*Meliaceae*	*Carapa procera*	Okum-zon	Decoction	2 cups full in the morning on an empty stomach	3.7
Diabetes	*Caesalpiniaceae*	*Guilbourtia tessmannii*	Abing	Decoction	1 glass at bedtime every day	5.92
Diabetes,	*Glusiaceae*	*garcinia lucida*	None	Trituration	1 Tablespoon 3 times a day for 3 weeks	7.4
Diabetes	*Apocynaceae*	*Ranvolfia macrophylla*	Eteng	Decoction	1 Glass times 2/day for 1 month	5.18
Diabetes	*Myristicaceae*	*Pycnanthus angolensis*	ekuk	Decoction	1 glass times 2/day	4.44

Diabetes	*Myrtaceae*	*Eucalyptus globulus*	None	Decoction	1 Glass times 2/day for 1 month	0.74
Obesity	*Araceae*	*Xanthosoma violaceum*	None	Other: grate then rock salt with a little water	Drink 1L of the preparation / day for 3 weeks	0.74
Diabetes	*Fabaceae*	*Phaseolus vulgaris*	None	Macerate all night then make a decoction	15ml in the morning on an empty stomach for 2 weeks	2.96
hypertension	*Caesalpiniaceae*	*Distemanthus benthamianus*	Garlic	Decoction	15ml in the morning on an empty stomach for 2 weeks	5.92
Diabetes, obesity,	*Rutaceae*	*fagara tessmannii*	Ase	Decoction	1 drink twice a day for 3 weeks	5.92
Diabetes, hypertension,	*Lauraceae*	*persea americana*	None	Infusion	1 Glass*3/day for 1 month	1.48
Diabetes	*Poaceae*	*Zea mays*	None	Infusion	1 drink twice a day for 6 weeks	0.74
hypertension	*Samacopeae*	*Phragmantera capital*	Costus afer	Trituration	1 glass twice a day until normalization of BP	7.4
Diabetes	*Fabaceae*	*Phaseolus vulgaris*	None	Trituration	1 glass in the morning on an empty stomach for 2 weeks	0.74
Diabetes	*Rhamnaceae*	*Ziziphus mauritiana*	None	Decoction, To chew	1 cup times 2/day	0.74
Diabetes	*Malvaceae*	*Theobroma cacao*	None	Other: roast the beans	Eat 10 beans/day at will for 1 month then resume blood sugar	6.66
Diabetes	*Combretaceae*	*Combretum micranthum*	None	Maceration	1 Glass times 2/day for 2 months	6.66
Obesity	*Rutaceae*	*Citrus aurantifolia*	None	Maceration	Drink on an empty stomach and at bedtime for 3 weeks	1.48
Diabetes	*Acanthaceae*	*Aspillia helianthoides*	None	Decoction	1 Glass times 3/day for 6 weeks	0.74
Diabetes	*Fabaceae*	*Pterocarpus soyauxii*	None	Decoction	1 drink twice a day for 3 weeks	5.18
Obesity	*Arecaceae*	*Elaeis guineensis*	None	Other: grill until oil is obtained	1 application times 2/Week	0.74
Diabetes	*Euphorbiaceae*	*Alchornia cordifolia*	None	Decoction	1 drink twice a day for 2 to 3 weeks	3.7
Obesity	*Caricaceae*	*carica papaya*	corn beard	Infusion	2 glasses twice a day for 2 to 3 weeks	1.48
Obesity	*Musaceae*	*Musa parasidiaca L.*	None	Decoction	Hot bath morning and evening for 2 weeks	0.74
Diabetes	*Lamiaceae*	*Plectranthus glandulosis*	None	Decoction	1 glass times 2/day	1.48
Diabetes	*Annonaceae*	*Annickia chlorantha*	Abing , Okpwate	Decoction	1 glass times 2/day	5.92
Obesity	*Fabaceae*	*Senna alata*	None	Trituration	Drink 1 glass on an empty stomach	3.7
Diabetes	*Zinziberaceae*	*Zinziber cassumar*	None	Crush and use the powder in maceration or infusion	Drink, Rub on skin	3.7
Diabetes	*Solanaceae*	*Solanum indicum*	None	Decoction	1 drink twice a day for 3 weeks	3.7
Diabetes	*Rubiaceae*	*Belonophora cylindricum*	None	Infusion	1 glass on an empty stomach every 3 days	1.48
Diabetes, hypertension	*Fabaceae*	*Tetrapleura tretraptera*	None	Decoction	1 glass times 3/day for 3 weeks	2.96
Obesity,	*Rutaceae*	*Citrus lemon*	Aloe vera, Manyama nkama	Decoction	1 Glass times 2/day every 2 days	0.74
Diabetes	*Flacourtiaceae*	*Calancoba*	None	Decoction	1 drink at bedtime	4.44

		echinata				
hypertension, obesity	*Solanaceae*	*Solanum aethiopicum*	corn beard	Decoction	1 hot drink twice a day	4.44
hypertension, obesity	*Poaceae*	*Sacharum officinarum*	None	Decoction	1 glass in the morning on an empty stomach for 3 weeks	3.7
Diabetes, hypertension	*Clusiaceae*	*Garcinia Cola*	None	Decoction	1 Glass times 3/day for 2 months	3.7
Hypertension, Diabetes, Obesity	*Poaceae*	*Cymbopogon citrus*	Okumzon, Meva'a	Decoction	Drink as much as you want until you notice a change	3.7
Obesity,	*Burseraceae*	*Boswella sacra Flueck*	None	Decoction	1 pear in the evening at bedtime, i.e. 1 can of 5L every 2 weeks and local action	3.7
Obesity	*Burseraceae*	*Boswella sacra Flueck*	None	Other: burning and harnessing smoke	Cover yourself with a blanket while exploiting the smoke 1 to 2 times/week	1.48
Obesity	*Burseraceae*	*Desmodium ascends*	Zelan	Decoction	2 baths twice a day for 2 weeks	2.96
hypertension	*Caesalpiniaceae*	*Guibourtia demeusei*	Abing	Decoction	1 drink in the evening at bedtime	5.18
Obesity	*Solanaceae*	*Solanum melongena*	Osanga	Decoction	1 hot glass times 3/day for 1 month	1.48
Obesity, Diabetes	*Apiaceae*	*Petroselinum crispum*	Nyafio	Decoction	1 glass times 3/day for 3 weeks	1.48
hypertension	*Urticaceae*	*Fleureya ovalifolia*	None	Decoction	1 glass times 2/day	3.7
Diabetes, Obesity	*Solanaceae*	*Nicotiana tabaccum*	None	Decoction	1 drink twice a day for 3 weeks	3.7
Diabetes	*Tiliaceae*	*Corchorus olitorius*	None	Macerate then sieve	1 glass on an empty stomach for 1 month	0.74
Diabetes	*Flacourtiaceae*	*calancoba welwetschii*	None	Trituration	1 glass in the morning on an empty stomach every 2 days for 3 weeks until recovery	11.11
Obesity	*Flacourtiaceae*	*Phyllobotryon spathulatum*	None	Decoction	1 hot glass on an empty stomach for 2 months	2.96

4. Phytochemical screening of the species identified by pathologies

The table below presents the results of the various tests carried out on the aqueous extracts, highlighting the presence of the families of phytochemical compounds present in the extracts studied.

Diabetes	Scientific name	Flav	Alc	trit	ster	Phe	Po phe	Tan gall	Tan cat	Wisdom	Anthr free	Anthr linked	Then
P1	*Parsley curly* (foil)	-	+	-	+	+	-	+	-	+	-	-	+
P2	*Combertum macronatum* (pépin)	-	-	-	-	+	-	-	-	+	-	-	+
P3	*Ranvolfia macroplylla* (trunk bark)	+	-	+	+	+	+	-	+	-	-	-	+
P4	*Hibiscus esculencus* ***L*** (fruit)	+	+	-	-	+	+	-	+	+	+	+	+
P5	*Aspilia helianthoides* (leaf)	+	-	-	-	+	+	-	-	+	-	-	+
P6	*Alchornia cordifolia* (leaf)	+	-	+	+	+	+	-	+	-	+	+	+
P7	*Nicotiana tabaccum* (sheet)	+	-	+	+	+	+	-	+	-	+	+	-
P8	*Terminalia catappa* (sheet)	+	-	+	+	+	+	+	-	-	+	+	+
P9	***Phylobotryum spathulatum* (sheet)**	**+**	**-**	**-**	**-**	**+**	**+**	**-**	**+**	**-**	**+**	**+**	**+**
P10	*Senna alata* (sheet)	-	+	-	-	+	-	-	-	+	-	+	-
P11	***Caloncoba welwitschii* (trunk bark)**	**+**	**-**	**+**	**+**	**+**	**+**	**-**	**+**	**-**	**+**	**+**	**-**
P12	*Corchorus olitorius* ***Line.*** (leaf)	+	-	+	+	-	+	-	-	-	-	-	+
P13	*Persea americana* (trunk bark)	+	-	+	+	+	+	-	+	-	+	+	+
P14	*Ziziphus mauritiana* (fruit)	-	+	-	-	+	-	+	-	+	-	-	-
P15	*Theobroma cacao* (leaf)	-	-	-	-	-	-	-	-	+	-	-	+
P16	*Pycnanthus angolensis* (trunk bark)	-	+	+	+	-	-	-	-	+	-	-	-
P17	*Phaseolus vulgaris* (vegetable)	+	-	-	-	-	+	-	-	-	-	-	+

P18	***Casearia barteri* (trunk bark)**	+	-	+	+	+	+	-	+	-	+	+	+
P19	*Belonophora cylindricum SP* (trunk bark)	+	+	+	+	+	+	-	-	-	-	-	+
P20	*Garcinia Cola* (fruit)	+	-	-	+	-	+	-	-	-	-	-	-
P21	*Alstonia boonei* (trunk bark)	+	-	+	+	+	+	-	+	-	-	-	+
P22	*fagara tessmannii* (trunk bark)	+	+	+	+	+	+	-	+	-	+	+	+
P23	*Anonidium manni* (bark from tronc)	+	-	-	-	+	+	-	-	+	-	-	-
P24	*Carapace tall* (bark cut)	-	-	+	+	+	-	-	-	-	-	-	-
P25	*Annickia chlorantha* (bark cut)	-	+	+	+	+	-	-	+	-	-	-	+
P26	*Another one identification* (grain)	-	+	+	+	+	-	-	-	+	+	+	-
P27	*Cylicodiscus gabunensis* (trunk bark)	+	-	+	+	-	+	-	+	+	+	+	+
P28	*Theobroma cacao* (bean)	+	+	+	+	-	+	-	+	+	+	+	+
P29	*Cabbage vegetable* (foil)	+	+	+	+	+	+	-	+	-	-	-	+
P30	*Another one onion* (bulb)	+	+	+	+	+	+	-	+	-	-	-	-
P31	*aloe vera* (leaf and sap)	+	+	+	+	+	+	-	-	+	+	+	+
P32	*Plectranthus glandulosis* (sheet)	-	-	-	-	-	-	-	+	+	-	-	+
P33	*Pterocarpus soyauxii* (trunk bark)	+	+	+	+	-	+	-	+	+	+	+	+
P34	*Tetrapleura tretraptera P.Beaux _* (fruit)	+	-	-	-	+	+	-	+	-	-	-	+
P35	*eucalyptus globulus* (leaf)	-	+	+	+	+	-	-	+	-	-	-	-
P36	*Garcinia lucida* (trunk bark)	+	+	+	+	+	+	-	+	+	+	+	+
P37	*Zinziber officinale* (rhizome)	+	-	+	+	+	+	-	+	-	-	-	+
P38	*Zea mays* (leaf)	+	-	+	+	+	+	-	+	-	+	+	+
P39	*Andansonia fingered* (bark cut)	+	+	+	+	+	+	-	+	-	-	-	+
P40	*Solanum is indicated* (fruit, leaf)	+	+	+	+	+	+	-	+	+	+	+	+
P41	*Combertum macronatum* (fruit)	-	+	-	-	+	-	-	+	+	-	-	+
P42	*common bean* (grain)	+	-	-	-	+	+	+	-	-	-	-	-
P43	*Theobroma cacao* (trunk bark)	+	-	+	+	-	+	-	+	-	-	-	+
P44	*Caloncoba welwitschi* (trunk bark)	+	+	+	+	+	-	+	+	+	-	-	-

Legend: (-) = absent, (+) = present

Alc = alkaloids, Phé = phenols, Po phé = polyphenols, Tan gal = gallic tannin, Tan cat = catechin tannin, Sap = saponins, Flav = flavonoids, Trit = triterpenes, Stér = steroids, Anthoe = anthocyanins and Anthr = anthraquinones

High blood pressure	**Scientific name**	**Flav**	**Alc**	**trit**	**ster**	**Phe**	**Po phe**	**Tan gall**	**Tan cat**	**SAP**	**Anth free**	**Ant Related**	**Anth**
P1	*Fleureya ovalifolia* (sheet)	-	+	-	-	+	-	-	+	-	-	-	+
P2	*Solanum ethiopicum* ***Linn*** (fruit)	+	+	+	+	+	+	-	+	+	-	-	-
P3	***Phyllobothrium spatulated* (trunk bark)**	+	-	+	+	+	+	-	+	-	+	+	-
P4	*Hypodaphnis zenkeri* (trunk bark)	+	-	+	+	+	+	-	+	+	+	+	-
P5	*Picralima nitida* (trunk bark)	-	+	+	+	+	-	+	-	+	-	-	-
P6	***Phyllobothrium spatulated Mull.* (sheet)**	+	-	+	+	+	+	-	+	-	+	+	+
P7	*Cleistopholis patens* (bark bark)	+	+	+	+	+	+	-	-	-	+	+	+
P8	*Solanum roots* ***Linn.*** (fruit)	+	-	+	+	-	+	-	-	+	-	-	+
P9	*Anonidium the house* (trunk bark)	+	-	-	-	+	+	-	-	+	-	-	-
P10	*Distemanthus benthamian* ***(bark)***	-	-	+	+	+	-	-	-	-	-	-	-
P11	*Ipomea involved* (heart)	+	-	+	+	+	+	-	+	-	-	-	-
P12	*Costus afer* (sheet)	+	-	+	+	+	+	-	+	-	+	+	-
P13	*Guibourtia demeusei* (bark)	-	+	+	+	+	-	-	-	+	-	-	+
P14	*Sacharum officinarum* (leaf)	-	-	+	+	+	-	-	+	-	-	-	+
P15	*Phragmantera capital* (whole stem)	+	-	+	+	+	+	-	+	-	+	+	-
P16	*Another one identification* (seed)	-	+	+	+	+	-	-	-	+	-	-	+
P17	*Another one onion* (bulb)	+	+	+	+	+	+	-	+	-	-	-	-
P18	*Plectranthus glandulosis* (sheet)	-	-	-	-	-	-	-	+	+	-	-	+
P19	*Petersianthus macrocarpus* (trunk bark)	+	-	+	+	-	+	-	-	+	-	-	+
P20	*Tetrapleura tretraptera* ***P.Beaux _*** (fruit)	+	-	-	-	+	+	-	+	-	-	-	+
P21	*Cataranthus roseus* (whole stem)	+	+	+	+	+	+	-	+	-	+	+	+
P22	*Cymbopogon citrus* (whole stem)	+	+	+	+	+	+	-	+	+	-	-	+
P23	*carica papaya* (leaf)	+	+	+	+	+	+	-	+	+	-	-	+
P24	*Erythrophleum suaveolens* (trunk bark)	+	-	-	+	+	-	+	-	+	-	-	+
P25	*Oxyanthus oliganthus* (sheet)	+	-	+	+	+	+	-	+	-	+	+	-
P26	*apium graveolens* (sheet)	+	+	+	+	+	+	-	-	+	+	+	+

Legend: (-) = absent, (+) = present

Alc = alkaloids, Phé = phenols, Po phé = polyphenols, Tan gal = gallic tannin, Tan cat = catechin tannin , Sap = saponins, Flav = flavonoids, Trit = triterpenes, Stér = steroids, Anthoe = anthocyanins and Anthr = anthraquinones (free and linked)

Obesity	Scientific name	Flav	Alc	trit	ster	Phe	Po phe	Tan gal	Tan cat	You know	Ant book	Ant Lied	Anthony
P1	*Massullaria acuminata* (fruit)	+	-	-	-	+	+	-	+	+	+	+	-
P2	*Parinari excellent* (bark)	+	+	-	-	+	+	-	-	+	-	-	+
P3	*Musa parasidiaca* **L.** (leaf)	-	+	+	+	-	-	+	-	-	+	+	+
P4	***Caloncoba glauca* (sheet)**	+	-	+	+	+	+	-	+	-	-	-	+
P5	*Dacryoda edulis* (trunk bark)	+	-	+	+	+	+	-	+	+	+	+	+
P6	*Senna alata* (sheet)	-	+	-	-	+	-	-	-	+	+	+	-
P7	*Baillonella toxisperma* (trunk bark)	+	-	-	-	+	+	-	-	+	-	-	-
P8	***Caloncoba echinata* (leaf)**	-	+	+	+	-	-	-	+	-	-	-	-
P9	*Boswell papyri* ***(Del) Hochst*** (bark)	+	+	-	-	-	+	+	-	-	-	-	+
P10	*Saccharum officinarum* (fruit)	+	+	+	+	+	+	-	+	+	+	+	-
P11	*Fagara tessmannii* (trunk bark)	+	+	+	+	+	+	-	+	-	+	+	+
P12	*Piptadeniastra African* (root bark)	+	+	+	+	+	+	-	-	+	+	+	-
P13	*alum tricocum* ***blanco*** (whole stem)	+	-	+	+	-	+	-	-	+	-	-	-
P14	*Citrus lemon* (fruit)	+	-	+	+	-	+	-	-	-	-	-	+
P15	*Cleroland shining* (foil)	+	+	+	+	-	+	-	+	-	-	-	-
P16	*Antrocaryon Klainean* (bark cut)	-	-	-	-	+	-	-	+	+	+	+	+
P17	*Entandrophragma cylindrical* (bark cut)	+	-	-	-	+	+	+	-	+	+	+	-
P18	*Elaeis of Guinea* (fruit)	+	+	+	+	-	+	-	-	+	-	-	+
P19	*Xanthosoma mataffa* (tuber)	+	+	+	+	-	+	-	-	-	-	-	+
P20	*boswella papyrifera* ***(Del) Hochst*** (root sap)	+	-	-	-	-	+	+	-	+	-	-	+
P21	*Cymbopogon citrus* (whole stem)	+	+	+	+	+	+	-	+	+	-	-	+
P22	*Desmodium ascends* (sheet)	+	-	+	+	-	+	-	+	+	-	-	+
P23	*Petroselinum crispum* (sheet)	-	+	+	+	+	-	+	-	+	-	-	+

Legend: (-) = absent, (+) = present,
Alc = alkaloids, Phé = phenols, Po phé = polyphenols, Tan gal = gallic tannin, Tan cat = catechin tannin, Sap = saponins, Flav = flavonoids, Trit = triterpenes, Stér = steroids, Anthoe = anthocyanins and Anthr = anthraquinones (free and linked)

III. DISCUSSION

Each individual has a secret that has been passed on to them either by their ancestors, through training with the holders or through years of experience, but communication between individuals from neighbouring villages promotes an exchange of knowledge. The participation of men (51%) in the survey was higher than that of women (46%). In Cameroon, Ngoule and *al*. in 2015 also found a majority of men (60.41%) in the markets of Douala East [6], while Ndjouondo Gildas *et al.*, (2015) found a high percentage of women (96.97%). On the other hand, the majority of the respondents belonged to the age group between 65 and 80 years [7]. Most of the young people were in school and had lost interest in traditional medicine in favour of various leisure activities. They thus break off contact with medicinal plants and reduce the flow of knowledge between adults and their generation. However, the knowledge provided on medicinal plants by the respondents was mainly acquired from their parents. Hence the risk of the disappearance of knowledge on the use of medicinal plants in rural areas. The ethnopharmacological survey of medicinal plants in six villages (Evindissi, Kombé, Kondemeyoss, Mintyaemignumin, Ngon, Nkpwang) in the Dja and Lobo department revealed 85 species belonging to 49 families. However, different results were found in Nigeria by Sofowara F.H. who recorded 60 species (56 genera and 31 families) [8]. In Cameroon, Dibong *et al.*, in their ethnobotanical study identified respectively 30 species (25 families and 29 genera) and 35 species (33 genera and 27 families) in three markets (Nkoulouloun, Dakar and the goat market) in the city of Douala [9]; Betti and *al* recorded 35 species in five markets in the city of Yaounde [10]. The number of species inventoried and characterised is significant and complements previous work in Cameroon.

The floristic inventory shows that the three families, Fabaceaes (6 species represented), Flacourtiaceae (5 species represented) and Asteraceae (5 species represented) predominate. The work of Leitao and *al*. showed a predominance of Asteraceae and Lamiaceae in Brazil [11]. In other African countries, notably Uganda, the Flacourtiaceae family was the most represented [12]. In Cameroon, the floristic analysis of Ngene and *al* revealed a predominance of the Fabaceae [13]. In Kidik pouka *et al.*, a predominance of the Fabaceae family, followed by the Asteraceae, Apocynaceae and Euphorbiaceae families is observed in the floristic characteristics of flavonoid species recorded in the markets of Douala city [14].

Pantropical species are the most cited (40%). This dominance of pantropical species thus translates into a strong impact of these species distributed in all

tropical regions of the globe in several regions of the African continent on the exploitation of medicinal plants and the distribution of local crops [15]. Ngoule *et al.,* [6] emphasised in their work that pantropical and Guinean-Congolese species (71%) are the most represented.

The phytogeographical distribution of these species is a good indication of the endemic nature of the plants used and the conservation of local pharmacopoeia know-how [14]. The bark is used because it is the easiest organ for the villagers to collect. Scientifically, the bark, fruit and leaves are the seat par excellence of the metabolites responsible for the curative properties of plants.

The morphological types observed show a majority of woody species (trees) i.e. 36.5% against 28.57% which is in line with the result found by Dibong and *al* who counted 60% woody species against 40% herbaceous species in the markets of the city of Douala [9]. Adomou and *al* found similar results in an ethnobotanical study of medicinal plants sold in the market of Abomey-Calavi in Benin [16]. The medicinal plants inventoried totalled four types of diaspora. Sarcochores are the most represented, i.e. 80.48%. Their mode of dissemination is zoochory, which favours the extension of the species and the diversification of its genetic heritage. In other words, fauna plays a primordial role in the regeneration of most plants [17]. Betti also showed the importance of zoochorous species in the forest zone in Dja and Lobo on medicinal plants [10]. The most common method of preparation was decoction (38.04%). The local population believes in the decoction method and finds it adequate for warming the body and disinfecting the plant [18]. On the other hand, decoction allows the collection of the most active principles and attenuates or cancels the toxic effect of certain recipes [16]. This percentage is close to 42% established by N'guessan *et al.,* [19]. In general, informants were unaware of the precise weights and measurements in the preparation and dosage of phytomedicines. Precise parameters of use were lacking for several plants, such as the quantities of plant parts to be prepared, the solvent or vehicle used, the time needed to prepare solutions (decoction, infusion, maceration and trituration) and the precise dose to be prescribed. The dose administered was given by handful, spoonful or pinch. The dose was still random. The oral mode of administration of the preparations was requested by 78.33%, a higher proportion than that found in the work of N'guessan *et al.,* [19], which indicated 49%, and that of Ouattara, which was 32% [20]. Several of the plants listed had a frequency of citation equal to or greater than (5%). For common diseases, these plants constitute assets in the traditional use of the management of metabolic syndrome in the Dja and Lobo department and advanced ethnopharmacological research could lead to the obtaining of improved traditional medicines (MTA) effective in the treatment of the pathologies concerned. Traditional knowledge of medicinal practices is therefore widespread among the populations of Dja and Lobo and should be pursued and documented in order to serve the development of alternative medicine [21]. Leaves and barks are the parts of the plant most solicited by the people interviewed. The preference for these vegetative organs is explained by their ease of harvesting. However, this preference would also be justified by the abundance of chemical groups they contain, as they are known to be the site of synthesis of secondary metabolites.

Furthermore, plant users tend to pull up the whole plant instead of only the desired part (mainly the leaves or bark). On the other hand, there is a clear relationship between the used part of the plant and the effects of this exploitation on its existence, which seriously compromises the sustainability of medicinal species, especially bulbous ones [22]. According to Ouattara, the removal of 50% of a tree's leaves does not significantly affect its survival [20].

The results obtained from the phytochemical screening show that the distribution of secondary metabolites is uneven among the families. The tests for polyphenolic compounds were positive in almost all extracts. The presence of flavonoids, tannins, saponins is also marked taking into account the results obtained. The presence of alkaloids, flavonoids and tannins in the different species analysed is an important indicator for the hypoglycaemic or antidiabetic activity of these plant species [23]. In addition, several studies have shown that the consumption of flavonoid-rich foods is inversely correlated with the risk of developing cardiovascular diseases [24]. These results would justify the use of species belonging to these families in the management of diseases related to the metabolic syndrome. Katsung's results also corroborate our findings on certain plant families, recalling the effects of acetylcholine observed by some authors [25] on blood pressure, ECG and heart contractile activity. It probably indicates the presence of cholinomimetic substance in the aqueous extract of *Costus afer* (Zinziberaceae) in the management of hypertension. From our survey, of the 49 families listed, 44 were involved in alternative therapies to treat diabetes; 23 involved in the treatment of obesity and 26 in the management of hypertension. The two most represented families were Fabaceae (5 species) followed by Flacourtiaceae (04 species). Their citation frequencies were all greater than 4, with the species *Calancoba welwetschii* having a citation frequency of 11.11; followed by *Caloncoba glauca* at 5.74. *Caloncoba echinata* and *Caesaria barteri* both had a citation frequency of 4.44.

CONCLUSION

Local traditional knowledge and the practice of medicine are still widespread in rural areas in

Cameroon. This is the case in the villages studied in the Dja and Lobo department. This is probably due to the frequent incidence of diabetes and the unavailability of conventional therapies in these villages, the easy access to plants and the simplicity of preparing medicines from plants.

The data collected in this survey could help to identify plant species and extraction methods for developing plant-based medicines for diabetes in Cameroon. *In vitro* screening programmes, based on the results of this and other ethnobotanical studies, could be important to validate the traditional use of herbal remedies and to provide leads in the search for new active ingredients.

Traditional Cameroonian medicine can have a significant role in primary health care, especially in poor and remote rural areas such as some villages in the Dja and Lobo department. This highlights the value of traditional knowledge and the need to collect and preserve traditional health practices.

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