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Herbal Medicine and Treatment of Diabetes in Africa: Case Study in Cameroon

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Abstract

African population lives in widespread ecosystems which are generally interconnected with many countries. Therefore, in the eyes of the situation of Cameroon from the Gulf of Guinea to the Sahel, medicinal plants used in this country, are frequently found in other African countries. The migrations of population and Fulani' moving's in African savannahs or in African altitude forests have encouraged the oral transmission of medical practices. The objective of this study was to determine the diabetic patients who use herbal medicine and collect and identify the types of plants used and the type of diabetic patients using familial herbal treatment. An ethnopharmacological and ethnomedical data form was prepared and addressed to diabetic patients, previously diagnosed in the hospitals between January 1988 and April 4, 2016. A total of 116 diabetic patients responded. These patients were constituted by 70 type 2 diabetic patients, 36 type 1 diabetic patients and 10 diabetics with hypertension patients. Twenty-one plants were recorded in 58 socio-cultural groups, living in several phytogeographic units. Twelve recipes, nine recipes and three recipes were respectively recorded in coastal dense humid rain forests, in continental dense humid rain forests and in soudano-Guinean-Zambesian savannahs. From this sample of plants, the chemical and pharmacological investigation may reveal interesting properties important for drugs discover.

Keywords: Followed up diabetic's type 1 and type 2; Herbal treatment; Medicinal plants; Herbal medicine; Phytogeographic units; Cameroon

Introduction

In Africa, particularly in Cameroon, the population facing the new outbreak of diabetes and poverty has developed the use of medicinal plants to overcome this pathology. Diabetes was since long time considered as developed countries' disease. Nowadays, type 2 diabetes affects 300 millions of people in the world, implying 6.6% of adult's population. This number increases by 7 million each year. From now to 2030, 438 millions of individuals all ages-groups worldwide will be attained of diabetes. South Sahara Africa will rich 23.9 millions of adult diabetics. About half-million of children of at least 15 years are attained of type 1 diabetes; more of the half amongst them live in poor countries (WHO, 2016) [1]. Diabetes is a chronic incurable disease, but that can be treat and control. It is caused by a lack or a false use of insulin which is a hormone produced by the pancreas. It permits to glucose to enter in the cells for being used as energy source. When there is a lack of insulin or when it cannot accomplish well it function, glucose cannot serve as fuel to the cells. Therefore, it accumulates in the blood and engenders an increasing rate of sugar call hyperglycemia. In time, an increased rate of sugar in the blood provokes complications that include blindness or retinopathy, kidney injury, diabetic neuropathy, heart failure and arteriosclerosis. The conventional medicine takes charge of diabetes become more difficult with the appearance of complications [2]. Does the use of herbal medicine capable to produce good and cheaper diabetes' treatment? Do antidiabetic plants exist in different socio-cultural and Cameroon ecosystems? Do diabetic patients use herbal medicine in familial or popular traditional medicine? To answer these questions, we have developed and use a methodology.

Methodology

A survey questionnaire was designed, validated and administered to 137 diabetic patients previously diagnosed in hospitals of Cameroon. Each of them presented a recent medical book that attests his diabetic state. Among them, 116 patients accepted the clinical follow up and 21

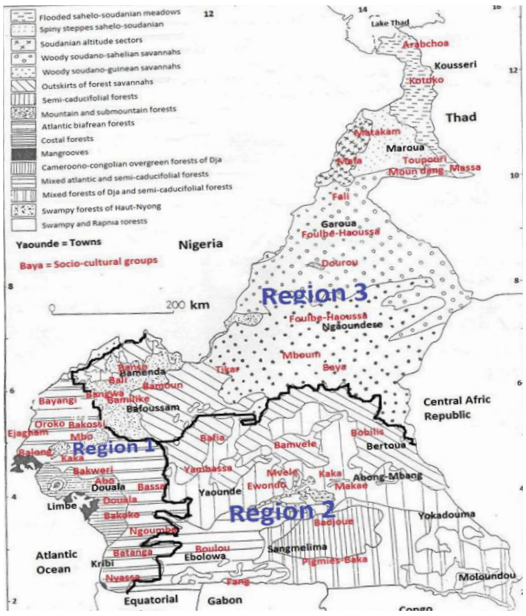

Figure 1: Relationship between socio-cultural groups of interviewers and different phytogeographic units of Cameroon (Tsabang, 2008).

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do not respond. All these patients were distributed in 58 tribes and in all the phytogeographic units of Cameroon (Figure 1). The distribution of the respondents is presented in Table 1. The survey starts by a fieldwork focusing on identification of patients, harvest and identification of plants, following by the ethnopharmacological details preparation description of recipes and the ethnomedical modes of administration, posology the duration of treatment, the undesirable or secondary/toxic effects. The chemical and pharmacological investigation focuses on previous searches were followed. Botanical samples were identified and/or confirmed in national herbarium of Cameroon. Voucher specimens were deposited in the Institute of Medical Research and Studies of Medicinal Plants [3].

Results

One hundred and sixteen selected diabetic patients over 137 reencountered used for several motivations herbal medicine, that represents 84.67% (Table 1).

The Table 2 presents the recorded plants, the followed up diabetic patients and the main phytogeagraphic region of Cameroon.

Table 3 reveals that 21 plants are used by 116 diabetic patients. These plants are distributed in many phytogeographic units of Cameroon. Plants that were used in many socio-cultural groups and that were found in many phytogeographic units may be more important in the treatment of diabetes. They are plants with higher ecological plasticity. Seventy-four (74.14%) percent of the followed up diabetic patients were relieved [4-9].

Ethno pharmacological preparation of herbal medicines and ethnomedical administration

Plants recorded in the coastal dense humid rain forests

1-*Mucuna pruriens*: Boil 0.2 g of seeds powder per kg of the body weight in 250 ml. Filter and drink the filtrate, repeat the operation times per day.

2-*Phyllanthus niruri*: Macerate 1 g of aerial parts per kg of the body weight, in 2 l of water, for 2 h. Drink 250 ml of filtrate 3 times per day. The filtrate also serves as laxative with higher doses.

3-*Phyllanthus amarus*: Macerate 1 g of aerial parts per kg of body weight, in 2 l of water, for 2 h. Drink 250 ml of filtrate 3 times per day. The filtrate also serves as laxative with higher doses.

Plants recorded in the continental dense humid rain forests

4-*Vernonia glabra*: Clean and cut 100 g of rhizome, add to that 3 l of water. Maintain in ebullition, for 30 mn. Filter and drink 250 ml of filtrate, 4 times per day.

6-*Momordica charantia*: Boil 2 g per Kg body weight of stem, leaves, flower and fruit powder in 2 l of water. Drink a teaspoon of herbal tea, Drink 300 ml of filtrate 3 times daily. The strong doses are toxic. Pregnant women must avoid taking this preparation.

7-*Rhizophora racemosa*: Boil 2 g of stem bark per kg of body weight, in 2 l of water, for 15 min. Drink 250 ml of decoction, 3 times daily.

8-*Anacardium occidentale*: Macerate 50 g of fresh leaves previously crumpled and 50 g of powder in 2 l of water, add 250 ml of juice of false fruit. Drink 3 times per day, 250 ml of filtrate.

9-*Persea Americana*: infuse 1g of young leaves and bud per kg of body weight, in 2 l of water. Drink 250 ml of filtrate, 3 times per day, for 7 days.

10-*Pterocarpus osun*: Boil 100 g of stem bark and 100 g of wood in 4 l of water, for 30 min. Drink 250 ml of filtrate every 6 h, for 5 days.

11-*Allium cepa*: Infuse 200 g of cut bulb in 2 l of water. Drink 250 ml of filtrate every 6 h.

12-*Momordica foetida*: Macerate 80 g of fresh leaves in 2 l of water, then use the filtrate to rup the painful muscles and numbed feet. Drink 250 ml of decoction, 2 times per day, for 7 days.

Plants recorded in the continental dense humid rain forests

13-*Laportea ovalifolia*: Boil 100 g of aerial parts in 6 l of water, for 15 min. Drink 250 ml of decoction, 3 times per day controlling the glycemia.

14-*Aloe buettneri*: Macerate 200 g of leaves, in 2 l of water. Drink deliberately the filtrate controlling the glycemia and the blood pressure.

15-*Aloe barteri*: Macerate 200 g of leaves, in 2 l of water. Drink deliberately the filtrate controlling the glycemia and the blood pressure.

16-*Spathodea campanulata*: Drink orally 250 ml, 3 times per day, a 1 g herbal tea of stem bark powder per body weight, prepared in 2 l of water

17-*Morinda lucida*: Boil 1.5 g per kg of body weight in 4 l of water, for 30 min. Drink 250 ml every 6 h.

18-*Solanum melongena* and *Capsicum frutescens*: Cook fruits of garden egg (*Solanum melongena*) with a little salt or with or without pepper (*Capsicum frutescens*). Sift and drink the filtrate called Medip-me-zon in Ewondo and in Boulou, in the morning instead of coffee tea.

Plants recorded in Guinean and Soudano-Zambesian savannahs

19-*Vernonia glabra*: Clean and cut 100 g of rhizome, add to that 3 l of water. Maintain in ebullition, for 30 min. Filer and drink 250 ml of filtrate, 4 times per day.

Brassica oleracea and *Citrus grandis*: Pound 1 g of leaves of cabbage (*Brassica oleracea*), per kg of body weight and filtrate; add to the filtrate an equal volume of grape fruit juice (*Citrus grandis*) homogenize and drink the filtrate controlling the glycemia.

21- *Sclerocarya birrea* Boil 250 g of stem bark or 100 g of leaves in 4 l water. Drink 250 ml of decoction, 3 times per day.

Equality and clinical status of patients	Diabetics		Diabetic-Hypertensive	
	DNID	DID	DNID-HTS	DNID- HTE
Men	47	18	03	01
Women	28	21	04	02
Total	75	39	07	03
Total per type of diseases	85	39		
Patients who have undergone clinical monitoring.	70	36	07	03
Total by type patients	106		10	
Patients not followed	5	3	6	7

Table 1: Distribution of recorded diabetic patients.

Plants recorded in the coastal dense humid rain forests									
Scientific names Vernacular names and dialects	**Patients in treatment**		**Glycemic values in g/l**				**Phytogeo-graphic units**	**Socio-cultural groups**	**DT in Day**
	Type of diabetes	**M**	**F**	**∑**	**Before the treatment**	**After the treatment**			
1-Phyllanthus niruri	Type 2- diabetes with EHT (DNID-EHT)		•	3	2.85	0.90	180/108 Semi-caducifolial and over green forests Mountain and submountain forests	120/75 Ewondo Bamilike	05
			•		2.05	0.85	190/86	130/86	05
			•		2.31	0.80	170/105	135/88	06
2-Phyllanthus amarus Galalouba (Douala), Ekabou (Ewondo)	Type 2 diabetes with SHT (DNID-SHT)		•	2	2.70	0.77	160/96 Atlantic biafraen forests Semi-caducifolial and overgreen forests	120/60 Douala, Ewondo, Batanga, Bamiléké,	05
			•		2.99	0.74	180/95	210/99	05
3-Mucuna pruriens Meko sock (Yemba)	Type 2 diabetes with SHT (DNID-SHT)		•	2	2.13	0.78	190/100 Mixed semi-decidual and over green forests	130/70 Mob Nbo, Bassa Ewondo	
			•		2.90	0.74	180/90	210/120	05
4-Rhizophora racemosa Tanda (Douala),	Type 2 Diabetes (DNID)		•	9	2.04	0.76	Mangroves	Douala, Bakweri Batanga	03
			•		2.11	3.09			04
			•		1.78	0.69			02
			•		1.69	2.70			02
			•		2.74	0.82			04
			•		1.93	0.77			03
			•		1.77	0.71			03
		•			2.60	0.72			05
			•		1.77	0.71			03
5-Anacardium occidentale	Type 2 Diabetes (DNID)		•	8	2.13	3.07	Atlantic biafraen forests	Douala, Abo	03
			•		2.66	0.72			03
			•		3.13	3.57			02
			•		1.98	0.78			02
			•		2.07	0.89			03
					2.08	0.88			03
			•		1.97	2.71			04
			•		1.99	0.71			02
6-Persea Americana Fia (Ewondo), Pia (Yemba-Menoua), Peye (Balong), Eju Okara (Ejagham)	Type 2 diabetes (DNID)		•	9	1.82	0.72	Atlantic biafraen forests Mountain and submountain forests ixed semi-decidual and overgreen forests	Balong, Bassa, Bakossi, Bamiléké	04
			•		3.06	3.87			03
		•			1.97	0.81			04
			•		2.26	0.69			07
			•		2.09	2.99			03
		•			2.16	0.89			03
			•		1.47	0.70			02
			•		1.81	0.72			02
					3.22	3.97			04
7-Pterocarpus osun Mobingué Mossoumbé (Douala), mbel oswe (Ewondo)	Type 2 diabetes (DNID)		•	5	1.79	0.78	Atlantic biafraen forests	Douala, Ewondo, Oroko	04
			•		1.87	0.73			02
			•		2.13	3.80			02
			•		1.87	0.80			02
		•			1.88	0.84			02
8-Momordica charantia Bhghwei (Nso), Fegage-fegwe (Kom), Lepokenang (Yemba-Menoua-), Nji-Ngoue (Bamena-Ndé), Mangala, Nyangala (Douala), Nzoo-zonang (Bakossi), Layel dimel (Fufuldé), Nsul lombi (Bassa)	Type 1 diabetes (DID)	•		5	3.14	3.92	Mountain and submountain forests Atlantic biafraen forests	Douala, Malimba, Bakossi, Anyang Bakweri	03
		•			1.96	0.72			02
			•		2.78	0.82			05
			•		3.43	0.83			08
			•		2.57	0.74			06

9-Spathodea campanulata	Type 1 diabetes (DID)		•	5	3.17	0.90	Mountain and submountain forests Woody soudano guinean savannahs	Ndi Widekum Bamileke Mbum	05
		•			2.53	0.86			06
		•			2.66	0.87			07
			•		2.04	0.97			03
			•		1.97	0.78			03
Plants recorded in the continental dense humid rain forests									
10-Laportea ovalifolia Tololi, Itoil (Oroko), Sasa kola (Bassa), Sasangulu (Pygmées), Kinhiemou (Widekam), Kinshei (Banso), Sisie (Bamiléké), Dandy (Bagweri)	Type 1 diabetes (DID)		•	5	1.46	0.68	Mountain and submountain forests Atlantic biafrean forests	Nyassa, Mbo, Bassa, Bakweri, Oroko, Korup Bayangi	01
			•		1.75	0.71			02
			•		1.75	2.40			03
		•			1.68	0.69			02
		•			1.97	0.71			03
22-Aloe buettneri Ladieheu (Féfé, Haut-Nkam), Lélang Tséwang (Bamiléké), Lahridah (Bassa) ; Nchahsame (Bandjoun), Mavoh (Nso), Zabonko, Zabon dafi (Fufulde)	Type 2 diabetes (DNID)		•	3	2.21	0.79	Outskirsts of forests savannahs Semi-decidual forests Woody Savannahs	Ewondo, Eton Bamvele. Bafia, Eton, Bassa Banen,	03
			•		2.59	0.83			03
			•		3.99	0.97			07
Cf 8-Momordica charantia	Type 1 diabetes (DID)		•	7	3.07	0.93	Mixed semi-decidual and overgreen atlantic forests Outskirsts of forests savannahs	Bobilis, Bamvele Bassa.	04
			•		2.97	0.87			06
			•		1.58	0.83			07
			•		1.67	0.74			07
			•		1.87	2.36			08
		•			2.97	3.09			06
		•			2.78	0.73			05
11-Alloe barteri Niate (Bassa), Lêkôt (Medumba, Ndé)	Type 2 diabetes (DNID)	•		8	2.07	3.74			04
		•			2.91	0.86			04
		•			1.74	0.78			07
		•			1.99	0.87			08
		•			2.06	3.87	Mountain, and submountain forests Semi-caducifolial forests	Ewondo, Boulou, Bamvélé, Bassa Yambassa,	08
		•			1.75	0.74			07
			•		3.07	0.79			06
		•			1.63	0.72			05
12-Ceiba pentandra Kwe (Tikar), Evovon (Ewondo), Mafou (Yemba, Menoua) Fohem (Batié, Haut-Plateau), Doumoh (Badjoué), Aguem (Yemba, Menoua), Boumo (Douala), Kulo, Kuku (Baka) Duma tufeur (Eton), Doum (Ewondo), Njobwelé (Bakossi), Dum, Odouma, (Fang)	Type 2 diabetes (DNID)		•	4	2.54	0.71	Mixed atlantic forests semi-caducifolial Mountain, and submountain forests Semi-caducifolial forests	Ewondo Bamvélé Badjoué, Fang, Yambassa, Bassa, Eton Ewondo.	03
		•			2.05	0,85			06
		•			2.52	0.69			03
		•			1.80	2.33			04
13-Allium cepa Lalang (Bassa); Noussi ou Gnossi (Bamiléké: Yemba, Nufi-Haut-Nkam)	Type 2 diabetes (DNID)	•		6	1.89	0.83	Mountain, and submountain forests Semi-caducifolial forests Mixed atlantic and forests semi-caducifolial	Ejagham, Bamiléké, Nyassa	05
			•		2.51	3.03			06
		•			2.14	0.80			06
		•			2.18	0.92			05
			•		1.94	0.91			04
		•			1.78	2.73	Mixed atlantic and forests semi-caducifolial		03
Cf 9-Spathodea campanulata	Type 2 diabetes (DNID)		•	9	2.23	0.88			03
		•			2.51	0.77			03
		•			1.98	0.83			02
		•			2.13	3.75			03
		•			1.53	0.69			01
			•		2.08	0.77			07
		•			2.33	0.74			07
			•		1.58	2.73			06
		•			1.63	2.72			06

Plants recorded in Guinean Soudano-zambesian savannahs									
14-Morinda lucida. Nime (Medumba, Ndé), Akeng (Ewondo), Ikeng (Bassa), Akyang (Fang), Kikengue, Koua Kengué (Baya)	Type 2 diabetes With SHT (DNID-SHT)	•		3	1.97	0.80	196/83	131/67	08
			•		3.12	0.71	190/75	110/85 Ewondo, Kaka, Bobilis 200/60	07
		•			1.92	0.67	180/85 Spiny steppes sahelo soudanian		05
15-Brassica oleracea Chou (Yemba, Menoua) associé à 16- *Citrus grandis*	Type 2 diabetes (DNID)		•	3	1.77	0.67	Mountain and sumountain forests	Bamileke Banso Widekum	08
		•			2.09	0.81			06
		•			3.01	0.83			09
17-Vernonia glabra Anfûgsa (Kom)	Type 2 diabetes (DNID)		•	2	2.78	3.83	Outskirst of forests and savannahs Mixed atlantic and forests semi-caducifolial	Bamoun, Dourou Kom, Widekam, Bamileke Fufulde.	06
		•			2.91	0.86			03
18-Momordica foetida Oyalzom (Ewondo, Boulou), Nyabe (Bassa) *19-Solamum melongena* Cheuche'eu (Yemba, Menoua); Zon (Ewondo, Boulou), Chuitadje (Fufuldé)	Type 2 diabetes (DNID)	•		12	1.75	0.87	Mountain, and submountain forests Semi-caducifolial forests	Bamoun Wum fulani	07
		•			1.83	0.84			06
		•			1.73	2.80			09
		•			1.63	0.69			08
		•			1.58	0.73			07
		•			1.68	2.84			07
		•			2.66	0.89			05
		•			1.93	2.91			10
		•			2.72	0.73			07
		•			1.84	2.91			07
		•			1.72	0.86			07
		•			2.51	2.86	Mountain, and submountain forests Semi-caducifolial forests camerono congolian overgreen forests of Dja	Mafa Guisiga Baya. Nvele Mbanvele Bodjoue	08
	Type 2 diabetes (DNID)	•			2.04	3.73			09
		•		3	1.75	0.80			07
		•			1.92	0.72			07
	5	•			1.94	0.68	Mountain, and submountain forests and Flooded sahelo-soudabian meadows	Arabe-Choa, Kom, Bamiléké, Kotoko, Fufuldé Bafut	08
		•			1.78	0.72			08
		•			1.79	3.09	Flooded sahelo-soudanian meadows Soudanian altitude sectors	Matakam Massa	05
		•			1.95	0.83			07
		•			1.67	2.32			07
Total		58	58	116					

M: Male; F: Female; DT: Duration of treatment; ∑: Total; DNID: Diabetes non-insulin dependent; DID: Diabetes insulin dependent; EHT: Essential hypertension; SHT: Secondary hypertension.

Table 2: Distribution of followed up diabetic patients and plants used for their treatment in the phytogeographic units.

% of patients who used plants, Motivations and manifestations	Present study: % of respondents	Previous study: % of respondents	References
Respondents who used herbal medicines	75 %	33%	Balde et al. [3]
Belief in herbal medicine efficacy	70%	74%	
Low cost	78%	48%	
Search for complete cure of diabetes	39	37%	
Hearing about a positive experience had convinced of the users to use herbal medicine.	78%	78%	
Satisfaction of the users	64.70%	85%	
easy access to herbal medicines	74 %	70%	
Appearance of complications in patients	31 patients (22.62%)	23 patients (18%),	
Manifestations occurred concomitantly with use of herbs	**Number of patients affected**		
	Gastritis: 2	Gastritis: 10	
	Numbness: 6	Skin problems: 8	
	Gangrene: 8		
Hypoglycemia	2 Cases	2 Cases	

Table 3: Proposed herbal medicines use's motivations of clinical followed up diabetic patients recorded.

Discussion

The strong percentage (84.67%) of respondents who used herbal remedies is based on several motivations. The Table 3 presents these motivations with the comparison with the results of the similar study realized in Guinea.

Table 3 shows that there is not significant different between the

two studies in many points that include the belief in herbal medicine efficacy, the low cost, the easy access to herbal medicines, the percentage of patients with complications and the cases of hypoglycemia [5]. But there is a significant difference between the satisfaction of the diabetic patients, the manifestations occurred using the plants. The percentage of satisfied diabetic patients followed up is weak when compared to that of similar Guinea study because of the presence of diabetic with non-treated hypertension which may cause many other problems to patients. The appearance of many complications in the present study may be explained by the important number of elderly diabetic patients recorded. They may develop already some complications. The percentage of respondents who used herbal medicines is high in the present study than the similar study realized in Guinea because we have selected patients who used plants in familial medication. The follow up of these patients permit up to verify the effectiveness of herbal medicines that they used. *Allium cepa*, *Momordica charantia*, *Persea americana* and *Phyllanthus amarus* are amongst principal plants used both in Cameroon and in India for managing diabetes. *Allium cepa* is also known to have antioxidant and hypolipidaemic activity. *Phyllanthus amarus* was found to have strong antioxidant activity. Its extract also reduced the blood sugar in alloxanized diabetic rats [6]. The plant also reveals the strong anti-inflammatory, antimutagenic, anticarcinogenic, antidiarrhoeal activity. *Persea americana* seed extract reduced blood sugar, protected and restored pancreatic islet cells in diabetic rats [7].

Conclusion

In term of this work, herbal medicine plays an important role in the management of diabetes in Cameroon. The follow up of diabetes patients who used herbal familial medicines was a scientific evidence of the control of patients by plants. But many other studies like constant research of convinced antidiabetic species, toxicity tests, clinical trials and antidiabetic improved traditional medicine, are needed. The herbal recipes were recorded nearby 116 diabetic patients belonging to 58 tribes, and living in several phytogeophic units. Plants recovered in many phytogeographic units may reveal important properties in the management of diabetic herbal treatment. It is very important too precise the conditions of use for better avoiding potential adverse effects.

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