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RESEARCH ARTICLE

MANAGEMENT OF FEVER BY TRADITIONAL AND MODERN MEDICINE IN THE NDÉ DIVISION: COMPARATIVE AND EXPERIMENTAL STUDY

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ABSTRACT

Fever is one of the reasons for consultation in Cameroon. Malaria and typhoid fever are the first incriminated, constitute public health problems in Cameroon. In Bangangté's Health District, these two diseases are managed by modern medicine and / or traditional practitioners, each according to his approach. This study aims to describe the management of fever by traditional medicine and modern medicine in order to explore the possibilities of collaboration. The methodological approach was based on a cross-sectional study with a sample of 65 patients and 50 health care providers. The data collections tools used was the questionnaires and the interview's protocol, their practices and their opinions of the care of others. We have also investigated the in vitro efficacy of traditional therapeutics on *S typhi* and *E Coli*. The study was conducted in hospitals and traditional healers in the department of Ndé during the period from 02nd January to 30th June 2018.The patients were submitted to the consensual admission for the treatment of typhoid and malaria in the hospital and a mixture of several plants, parts of plants and eggs usually used by traditional healers. The treatment follow-up criteria were clinical and paraclinical. This study shows that traditional medicine relies more than we think on modern medicine for clinical diagnosis of diseases but, especially for Para clinics. There are informals exchange of patients between these two systems of medicine. The follow-up of the patients in the two systems shows that, in traditional medicine, for these diseases, fever drops as from the second day of treatment whereas with the modern medicine, it is necessary to wait three to four days to observe an improvement. At the 15th day, all the parameters perturbated are normalized for all the Protocols. It appears that the treatment of typhoid with a juice of *Ocinum gratissinum*, *Lemon citrus*, egg yolk and that of malaria by a tea made from tuna *Ficus thonmigu* (bark), *Bidens pilosa* (leaf), *Eremonasta speciase*, *Ocimum gratissimum* (leaf), *Cymbopogon citratus* (fruit), citrus (fruit) and *Aloes vera* are effective. An extract based on the potion used to treat typhoid has a bactericidal activity, were better for *Salmonella typhi* than for Colibacille, confirming the activity of this potion on typhoid fever. Formalized clinical trials deserves to be undertaken on galenic preparations ensuring a better stability of these preparations. Based on this conclusion, we recommendates to health sector decision-makers in Cameroon that, traditional medicine which is often closer to the population, can be integrated into the medicine's modern circuit for more effective care of patients as in West Africa (Senegal) for example.

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INTRODUCTION

Fever is defined as an increase in body temperature above normal (hyperthermia) accompanied by general malaise and various symptoms. Measured in the anus or mouth, the normal temperature should not exceed 37°C in the morning and 37.5°C in the evening, around 5pm, at rest (1–3). It is a recurrent symptom in routine medical practice. It is one of the most frequent reasons for consultation in paediatrics and emergency departments (4–6). In Africa, south of the Sahara, fevers have often been equated with malaria.

However, fever is a symptom of several diseases, including infectious and parasitic diseases, with a high prevalence of malaria, typhoid fever, sepsis, bronchitis and other diseases in our context, septicaemia, bronchitis, etc., and an easy confusion between intermittent fevers and typhoid fevers. Similarly, the increase in the volume of the spleen, so often noted by observers, is not specific to malaria either: this splenomegaly may indeed follow repeated attacks of microbial or viral origin. Laveran noted that "malaria and typhoid often reigned in the same localities" (7). Typhoid fever was a continuous fever of short duration: either it ceased or the patient died. Intermittent fevers, on the other hand, were long-lasting, weakening the patients(8).WHO (2017) estimates that there are 17 million cases of typhoid fever worldwide (9). Marks *et al.,* 2017 more than 200,000 deaths from the disease, many of which are in children (9). Malaria remains one of the most important public health problems in sub-Saharan Africa and worldwide. Despite all the efforts already made to combat the disease, it is a major risk for more than two billion people worldwide. For the year 2010, the WHO estimates that there were 216 million cases of malaria worldwide(10), 174 million of which were in sub-Saharan Africa, which accounts for only 8% of the world's population but about 81% of the cases, mainly due to *Plasmodium falciparum*. When faced with these conditions, as with all diseases, patients generally adopt three attitudes: seek treatment from traditional medicine, from modern medicine or from both. A study conducted by Kemnhou (2017) in the Bangangté Health District reveals that 50% of victims of bone trauma prefer to be treated by traditional practitioners (10). In Cameroon, however, despite official declarations encouraging the integration of traditional medicine in the treatment of patients, it is as if the two types of medicine are still evolving in a conflicting manner. Wamba (2005) notes that "Among the African countries where the phenomenon of medical pluralism prevails and where health concerns are today oriented towards the integration of the various medical sectors in the development of training programmes, Cameroon remains one of the states where medical education is still based on a globally mono-therapeutic representation". However, he continues, "the demand for therapy shows that, faced with the disease and the therapist, the Cameroonian patient behaves as if he wanted his therapist to assume the roles of healer, prophet-healer and priest at the same time"(10).Traditional medicine would participate in the ″Promotion of Primary Health Care″ recognised by the populations as a credible alternative to modern medicine. by the populations as a credible alternative to modern medicine. In an attempt to bring these two approaches to medicine together, we undertook to try to bring these two approaches to medicine together, we undertook to conduct a comparative study of the management of fever patients. This work is based on the observation that we made in the Bangangté Health District where patients with fever are treated by traditional therapists practising in the neighbourhoods without any specific recognised status. This study is situated within the framework of medical science research, particularly in the field of public health, as it aims to show the advantages of traditional medicine so that the two types of medicine can work in synergy.

MATERIAL AND METHODS

Study Site, study population and ethical consideration: We conducted our study in the hospital structures of the Ndé Division, notably at the Bangangté District Hospital, the Bangangté Integrated Health-Centre, the Bangangté Ad-Lucem Integrated Health Centre, the Bangoua Protestant Hospital, the EEC Bazou Integrated Health Centre and in the homes of several traditional practitioners in the Ndé Division: Bangangté, Balengou, Bazou, Bangoulap, Bamena.

Type of study and Field data collection: From "02nd January, 2018 to 20th July, 2018, this cross-sectional and experimental study was conducted in the Ndé Division West region of Cameroon. Our study population consisted of any patient coming to one of the selected health facilities or to traditional healers with a fever with a body temperature higher than 38.5°C. Before the field works started, after obtaining research authorizations from our various recruitment hospitals sites and the ethical clearance of the Institutional Ethics Committee of the Université des Montagnes (CIE-UdM) under authorization number N° 2018/058/UdM/PR/CIE, the Bangangté District Health under reference N° 027/L/MINSANTE/DRSPO/DS Bgté and from the Ndé Divisional office Bangangté under reference N° 04/AR/F36/A2.

Data collection procedure: The sampling was exhaustive and consecutive. All patients admitted to health and traditional facilities and meeting the inclusion criteria were retained. In addition, after recruitment, we had a total sample size of 65 divided into two groups: 32 modern medicine cases and 33 traditional medicine cases. Each patient who came for fever was interviewed after informed consent was obtained for adults and assent for minors. For traditional medicine, after the agreement of the traditional practitioner and the patient, we proceeded to a 10 to 15 minutes training session for the monitoring of their body temperature and a thermometer was given to them free of charge by us, for taking their temperatures at home. Then we focused on the patients of the traditional healers who had first done the biological tests beforehand and who came to their homes for therapeutic management of the malaria or typhoid fever they had diagnosed. We also performed a well-conducted physical examination to assess the initial impact of the disease.

The patients who came to the traditional healers for treatment had a physical examination only. All patients had a check-up at 15 days at the end of the treatment. Three (3) categories of patients were included in this work:

- Inpatients;
- Patients who came to the hospital and whose biological tests were carried out in the hospital but who left secondarily to the traditional practitioners with the biological results (confirmation of the diagnosis);
- Patients who came to the traditional healers and were treated for fever.
- In all these patients, we submitted them to questionnaires, counselling, a complete physical examination and control tests (thick blood drop and Widal) on day 15.

Presentation of the questionnaires: The questionnaires collected quantitative data (age, weight, height, BMI, pulse, temperature, etc.) and qualitative data (sex, religion, education, history, reasons for consultation, etc.).
Each item finds its meaning in a specific hypothesis, so that in the end, the results obtained and processed confirm or refute it.
The traditional practitioners interviewed work in Bangangté, Balengou, Bangoulap and Bazou. They were recruited from the

list provided to us by the Bangangté District Health Service through the president of the Bangangté traditional healers. The patients were recruited in the sites selected for the study, as were the medical personnel interviewed in the hospitals of the Ndé Division. As for the content of the questionnaires:

The patient questionnaire has 02parts:

- Socio-demographic characteristics: gender, age, occupation, religion, level of education;
- The subject facing fever and its treatment: identification, history, reasons for consultation, physical examination on entry (weight, height, BP, BMI...), treatment (use of traditional therapies, current care pathway, integration of traditional medicine into the integrated health system, trust in medicine, advantages and disadvantages of the two medicines), prevention of reinfections.

The questionnaire for traditional practitioners has 3 parts:

- Socio-demographic characteristics: surname, first name, sex, age, religion, level of education.
- Management of fever by traditional and modern medicine in the department of Ndé: comparative and experimental study.
- Professional activity: speciality, training, skills, pathologies treated, diagnostic and therapeutic methods, consultation, recovery criteria.
- The relationship with modern medicine: patients referred by modern health workers, patients referred to health centres, making their knowledge available to science, integration into the integrated health system, obstacles to collaboration (assets and obstacles) between the two medicines.

The modern health worker questionnaire has two parts:

- Socio-demographic characteristics: gender, age, profession, specialty, service and place of practice, professional seniority, religion.
- Relationship with traditional medicine: private use of traditional therapies, relationship with traditional practitioners, patients referred to traditional practitioners, patients referred by traditional practitioners, (prescribing) traditional treatments to patients, collaboration between the two medicines, existence of a program to promote traditional medicine in Cameroon.

Plant's collection procedure

- At the end of the survey, the plants collected were dried and identified in the national herbarium of Cameroon and through the literature for others. The literature review enabled us to identify plants that had not yet been studied and their antimalarial, antibiotic and antipyretic activity. Among these plants, we retained for further experimentation those that had been cited at least twice by the traditional practitioners we met. And also, one of the compositions that we judged to be effective in the treatment of typhoid fever.
- To do this, we contacted the president of the Bangangté district association of traditional healers to arrange appointments. The volunteers were interviewed individually, using the survey form that we filled out. During the interview we used two standard techniques ethnobotanical techniques for data collection (23), namely
- Our plant material was Thyme, a popular aromatic plant belonging to the *Lamiaceae* family. The part used in our study was the leaves of *Thymus vulgaris*. The leaves used in the present investigation was harvested in the Bamboutos Division in the Western region of Cameroon in January 2019. A sample was identified in comparison with Daniel Dang's material N° 516 from specimen of herbarium collection under reference N° 25746/SRF/Cam at the Cameroon National Herbarium.

Antibacterial Activity

Bacterial inoculum preparation and MIC assessment: All isolates in pure culture were streaked on Mueller Hinton agar (Liofilchem ®) supplemented with 5% sheep blood and incubated under 5% CO_2 at 37°C for 18-24 h. From the resulting bacterial population, a suspension equal to 0.5 McFarland (˜10^6 -10^8 CFU/mL) was prepared and adjusted to the final density recommended for susceptibility tests by the « Comité de l'Antibiogramme de la Société Française de Microbiologie CA-SFM (2014) » (11,12). To assess the MIC, the macro-dilution technique in liquid medium was used with slight modifications. The stock dilutions were made in Mueller Hinton broth with DMSO (5 % v/v). They were prepared at 400 mg/mL. Two millilitres of Muller Hinton broth were dispensed into each of the series of ten tubes of the dilution range as well as into the three control tubes. Then a volume of 2 mL of the extract at a concentration of 5 g per 12.5 mL was dispensed into the first tube of the dilution range. From this preparation, cascade dilutions were made in Muller Hinton broth. Upon dilution completion 15 µL of the above prepared bacterial inoculum was dispensed into each tube in the dilution range and into the positive control tube. Three drops of mineral oil were subsequently added to each tube to create the anaerobiosis and the set underwent incubation at 37°C for 18 to 24 hours. The MIC for each extract was determined from the first tube of the range in which no visible bacterial growth observed (attested by absence of turbidity). All tests were conducted in triplicate.

Determination of minimal bactericidal concentration (MBC): About 5 µL of the dilutions of the extract in which no bacterial growth was recorded were streaked on MHA supplemented with 5% sheep blood. The streaked preparations were incubated anaerobically under 5% CO_2 at 37°C for 18 to 24 h. The MBC for each extract was recorded from the lowest concentration at which no culture was observed on MHA upon incubation completion. These experiments were also conducted in triplicate.

Evaluation of MBC/MIC ratios: This ratio made it possible to attest the bacteriostatic or bactericidal property each extract. When this ratio was larger than or equal to 4, the extract was referred to as bacteriostatic. It was regarded as bactericidal when this ratio was less than 4. When the ratio was equal to 1, the extract was said to be "absolutely bactericidal".

Inhibition zone diameter: The aqueous solution was dissolved into a convenient MHB volume and concentration. The original solution was used to prepare a serial dilution (d/2 step) in the appropriate broth as to, eventually obtain extract concentrations ranging from 400 mg/mL through 0.39 mg/mL,

as for the MIC test. About 15 µL of each of these solutions at the MIC and MBC concentrations was used to inoculate five paper disks (Whatman N°2) of six millimetre's diameter previously adjusted on the MH agar supplemented with 5% sheep blood on which the bacterial inoculum was lawn in a way to expected a monolayer confluent growth upon overnight incubation (0.5 McFarland) under 5% CO_2 at 37°C, according to the CA-SFM (2014).The results were read at incubation completion by measuring the inhibition zone diameters (in mm) that developed around the impregnated disks. The negative control consisted of a disk impregnated with sterile distilled water. Each of the above experiments was conducted three times. In this essay, Amoxicillin was used to guide activity comparison.

Statistical analysis of data: The data for the study was entered and the tables drawn up using Microsoft Office Excel and Word 2013. The statistical tool used was the calculation of percentages from descriptive statistics. The comparison was made at all stages of the patient management process. The test-student to compare temperature monitoring.

RESULTS

Sampling

Age range of participants involved in the study: The sample consisted of 65 patients distributed as follows: 32 cases for modern medicine and 33 cases for traditional medicine; we also interviewed 25 modern health workers and 25 traditional practitioners to explore areas of collaboration. The distribution of patients by age group and type of treatment is shown in Figure 1.

For both care choices, the distributions are relatively homogeneous in terms of numbers. The most numerous are between 16 and 45 years of age in both groups. Above the age of 50, they are very infrequent at the consultation (whether in modern or traditional medicine).

Participants' level of education: Taking into account the level of study of the patients, the recorded data were grouped and summarized as presented in Table I. This shows that at all levels of education, respondents are almost equally represented in the care choices, but also that those with secondary education represent the largest group.

Profession of participants: All strata of the population use both traditional and modern medicine for their treatment; thus the data are grouped in Table II. This shows that the largest clientele for modern medicine is farmers, while the largest clientele for traditional medicine is students.

Consultation

Reasons for consultation of participants: In total, 14 major symptoms were identified and the distribution is shown in Table III in terms of frequency of occurrence in the patient.
This shows that the first three symptoms are mainly responsible for balance. The different syndromes encountered in the two medicines are shown in Table IV. Grouped into syndromes, the majority syndrome is associated with: fever, headache, abdominal pain, dizziness and asthenia. Then come: Fever, Headache, Vertigo and Asthenia; followed by Fever, Headache, Asthenia, Abdominal pain.

Physical examination of participants: At reception, the patients who came to the two medicines, 32 and 33 cases respectively, have a physical examination as shown in Table V. It emerges that few patients are in good general condition in both traditional and modern medicine. In modern medicine, we find that patients are quite lucid and less obsessed, unlike patients in traditional medicine, who are less lucid but quite obsessed.

Participants' clinical parameters before treatment: The clinical parameters of the patients of both medicines are grouped in Table VI. It was found that the average temperature at reception varied from 39.29°C to 40°C, their pulse rate varied between 80.5 and 104.67 instead of 80 beats per minute.

Self-medication: In the face of fever, patients resort to self-medication and the different self-medications are grouped in Table VII. The results show that those who turn to traditional medicine make less use of self-medication than those in modern medicine. The patients of modern medicine generally take paracetamol in generic or speciality form. They also use traditional potions. Those who use traditional medicine also use paracetamol for self-medication.

Patient care

Medicines for the management of malaria and typhoid fever in health centres: The protocols used in modern medicine are similar to those recommended by the Ministry of Public Health in Cameroon, illustrated in Table VIII.

It emerges that the drugs used by modern health workers in the management of typhoid fever and malaria are primarily antipyretics for all patients, antibiotics (Ceftriaxon and Gentamicin) for typhoid, and ACTs (Artemether and Artesunate) for malaria. Injectable routes (intra-muscular and intra-venous) are preferred.

Medicines for the management of typhoid fever and malaria in traditional medicine

Galenic form used in traditional medicine: Traditional medicine, known as potion medicine, is the only form found and collected in Table IX. It emerges that the only galenic form used in traditional medicine is the potion consumed by the glass, i.e. 0.25 CC.

Plants used in traditional medicine: 14 different plants are used in preparations for the treatment of fevers. They belong to different families: *Apocynaceae, Caricaceae, Rutaceae, Asteraceae, Moraceae, Acanthaceae, Iromeliaceae*. These plants all have a name in their mother tongue with which they are referred to in Ndé.

This is illustrated in Table X. In the Bamileke Medumba language, the bark of *Rauvolfia Vomitoria* is called Neta'sha; the leaves of *Ociniumgratissimum* are called Massep etc... We note that most of these plants have no adverse effects, except for some that are bitter (Neta'sha, Tamfu (Kinkeliba) and Lengal (*Aloe vera*).

Table 1. Tests to identify the major families of secondary metabolites

Tests	Operating procedure
Alkaloid tests (Mayer)	Two labelled tubes were used in this essay: one as 'test' and the other as 'control'. 2 mL of the extract were dispensed into the test tube and 2 mL of distilled water into the control. Into each of these tubes, 3 to 5 drops of the Valse Mayer reagent were added. Development of a whitish-yellow creamy precipitate in the test tube indicated the presence of alkaloids.
Flavonoid tests	Into two tubes containing respectively 2 mL of the extract solution (test) and 2 mL of distilled water (control), a few drops of concentrated H_2SO_4 were gently allowed through the tube wall. A yellow color developing in the test tube was regarded as a positive test, indicating the presence of flavonoids in the extract.
Tannin tests	To 2 mL of the test solution a few drops of ferric chloride test reagent were added. An intense green,purple, blue or black color that developed was regarded as a positive test, indicating the presence of tannins in the extract.
Test for Polyphenols: Perchloride test	To 3 mL of the extract, 3 drops of $FeCl_3$ were added. The presence of polyphenols was evidenced by the development of a greenish colour.
Saponin tests	2 mL of the test solution were introduced into a test tube containing 2 mL of distilled water. The tube was stopped and shaken vigorously for about 15 seconds. Allowed to stand for 15 min, persistent frothing indicated the presence of saponosids.
Triterpene and sterol tests: Liebermann-Burchard test	To 2 mL of the extract 2 mL of chloroform were added. Concentrated H_2SO_4 (3 mL) was also gently added to form a layer. A reddish-brown coloration at the interface indicated the presence of terpenoids. About 2 mL of the extract were mixed with chloroform. 1-2 mL acetic anhydride and 2 drops concentrated H_2SO_4were further gently added from the wall of the test tube. First red, then blue and finally green color indicated the presence of sterols.
Test for flavonoids: Sodium hydroxyde Test	2mL of the plant extract and 2 mL of distilled water were dispensed into one tube (test) and the other (control), respectively. Into each of these, about 1 mL of a 1 N NaOH was added. A yellow-orange color developing in the test tube indicated the presence of flavonoids. This color changing into colorless upon addition of a few drops of HCl acid further confirmed their presence in the extract.
Coumarin tests: Test for Coumarins	Into two tubes (labeled 'test' and 'control') 2 mL of the extract and 2 mL of distilled water were dispensed, respectively. If a blue or green colordeveloped in the test tube upon addition of a few drops of a 10% $FeCl_3$ and changed into yellow with addition of NO_3, it indicated that coumarins were present in the extract

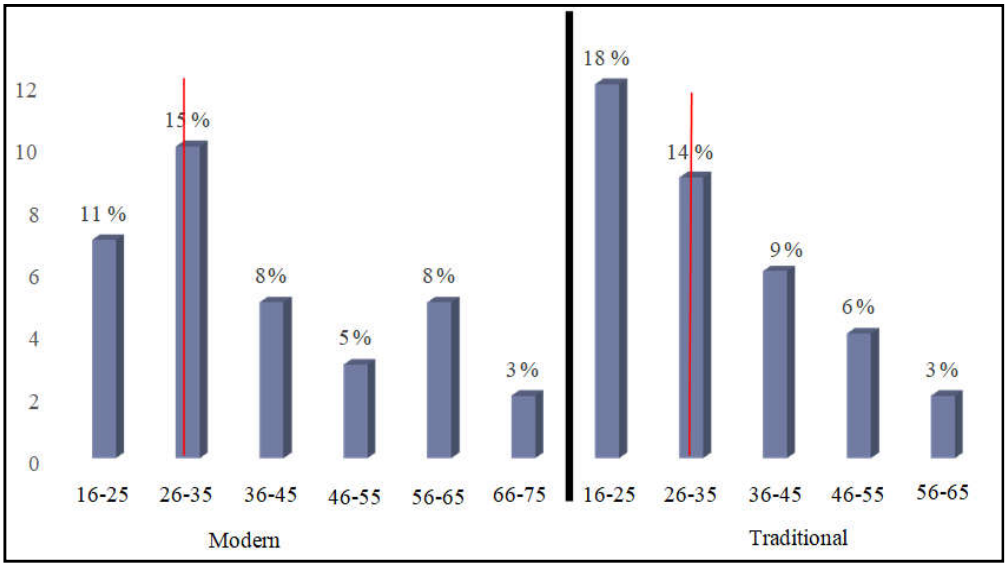

Figure 1. Distribution of participants by age group and type of treatment

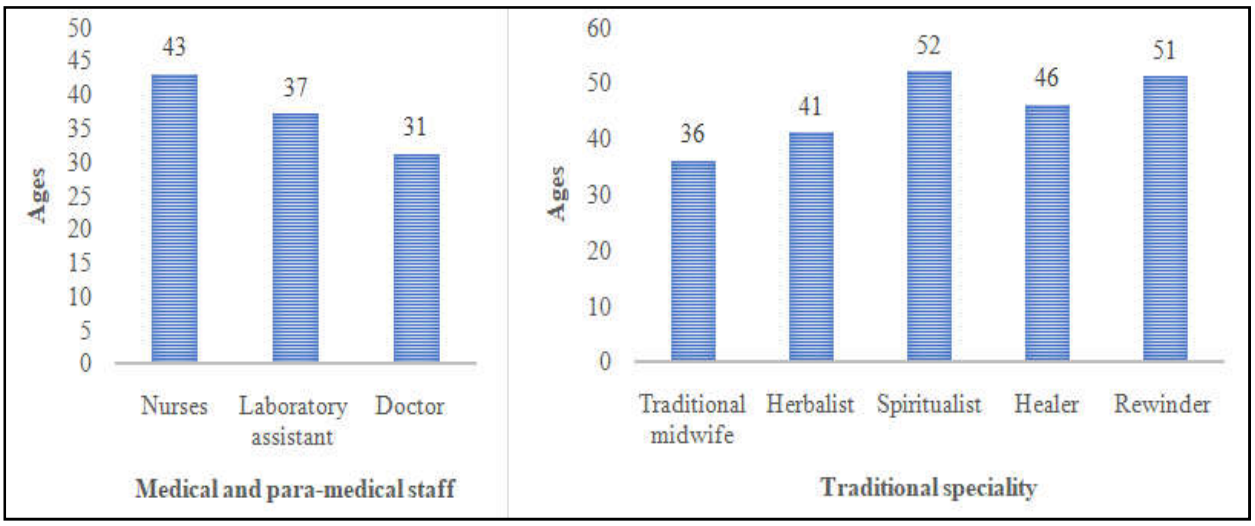

Table I. Level of education of the participants studied in the two types of medicine

	Modern Medicine (%)	Traditional Medicine (%)
Primary	8 (25)	9 (27)
Secondary	15 (47)	18 (55)
Higher	5 (16)	5 (15)
None	4 (12)	1 (3)
Total	32 (100)	33 (100)

Table II. Profession of participants in both types of medicine

Profession	Modern Medicine (%)	Traditional Medicine (%)
Farmer	7 (22)	6 (18)
Trader	5 (16)	2 (6)
Caretaker	1 (3)	0 (0)
Pupils	3 (9)	11 (33)
Student	4 (13)	2 (6)
Bricklayer	1 (3)	0 (0)
Mechanic	1 (3)	0 (0)
Housewife	6 (19)	2 (6)
Motorbike taxi	1 (3)	5 (15)
Private sector	1 (3)	1 (3)
Public sector	2 (6)	4 (13)
Total	32 (100)	33 (100)

Table III. Reasons for consultation of our patients in both medicines

Reasons for consultation	Number of cases (n)	Percentage (%)
Fever	65	100
Asthenia	61	93,84
Headaches	58	89,23
Dizziness	55	84,61
Anorexia	44	67,69
Abdominal pain	42	64,61
Diarrhoea	30	46,15
Insomnia	18	27,69
Prostration	10	15,38
Constipation	8	12,30
Cough	6	9,23
Weight loss	6	9,23
Vomiting	4	6,15
Epitaxia	2	3,07

Table IV. Syndromes found in the participants of the two medicines studied

Reasons for consultation	Number of reasons	Percentage
Fever + Headache + Abdominal pain + Vertigo + Asthenia	13	20
Fever + Headache + Dizziness + Asthenia	12	18
Fever + Headache + Asthenia + Abdominal pain	10	15
Fever + Diarrhoea + Weight loss	7	11
Fever + Insomnia + Constipation + Prostration	5	8
Fever + Headache + Vertigo + Asthenia	8	12
Fever + Headache + Epitaxia + Anorexia	6	9
Fever + Headache + Vomiting + Asthenia	4	6
TOTAL	65	100

Potions used in traditional medicine: These plants are used in potions, either alone or in combination. Thus, we were able to count 1 potion for malaria and 2 potions for typhoid fever.

Potions for the treatment of typhoid

Potion 1: *Picralima nitida*, *Aloe schweinfurthii* Baker, *Rauvolfia vomitoria*, *Ficus thonningii*, *Ocimum gratissimum* L., *Carica papaya* L., *Ananas comosus* L., *Lannea microcarpa,* Citrus + limon L." Different parts of these plants are used.

Table V. General condition, conjunctivitis and consciousness of patients of both medicines

		Modern Medicine	Traditional medicine
General condition	Bad	15 (47)	11 (33)
	Fair	13 (41)	18 (55)
	Good	4 (12)	4 (12)
Status of Conjuncts	Coloured	9 (28)	17 (52)
	Pale	10 (31)	3 (9)
	Lightly coloured	13 (41)	13 (39)
State of consciousness	Lucid	26 (81)	19 (58)
	Obnubilated	6 (19)	14 (42)

In this recipe, the plant parts used are fruits (4), leaves (4), bark (2) and roots (1). 11 plant parts are used in this preparation.

Potion 2: ***Ocinum gratissinum, Lemon citrus, Egg yolk***
The plant parts used are the leaves and the fruit respectively. After mixing the different components of the leaves and fruits, stripped of the peelings, the whole is pressed with a press and consumed at once.

Potion for the treatment of malaria: The potion used to treat malaria is a mixture of plant parts: *Ficus thonmigu* (bark), *Bidens pilosa* (leaf), *Eremonasta speciase, Ocimum gratissimum* (leaf), *Cymbopogon citratus* (fruit), citrus (fruit) and *Aloes vera.*

Distribution of patients in the two medicines

The patients were grouped into 6 groups

Have been subjected to modern medicine

- 6 patients who tested positive for thick drop
- 20 Patients with a positive Widal test
- 6 patients with positive thick drop and Widal tests;
- Thus, 26 patients for typhoid fever and 12 patients for malaria were subjected to modern treatment.
- The following were subjected to traditional medicine:
- 8 patients who tested positive for thick drop
- 23 patients with a positive Widal test
- 2 patients with positive thick drop and Widal test

Thus, 25 patients for typhoid fever and 10 patients for malaria were subjected to traditional treatment. In modern medicine, patients treated for typhoid were put on the protocol. In modern medicine, patients treated for typhoid were put on the Ceftriaxon-Gentamycin-Analgin protocol and those with malaria were put on Artemether Analgin. The injectable route was used. When patients had both thick drop and positive Widal, they were put on both protocols. In traditional medicine, patients were treated with a juice based on *Ocinum gratissinum*, *Lemon citrus*, Egg yolk for typhoid (single dose) and a decoction based on the plants described in the recipe for the treatment of malaria. (1 glass morning and evening for 10 days).

Clinical and biological monitoring of the treatment of patients of both medicines

Monitoring of temperatures under treatment: All treatments used by both medicines gradually lower the body temperature of the patients. Table XI illustrates this. Thus, the temperature at D0 is above 39.4°C and at D3 it is 38.3°C for patients treated with modern typhoid protocols, compared to 37.3°C for patients treated with traditional medicine.

Table VI. Clinical parameters prior to the Management of participants in the modern medicine and traditional medicine

	Modern Medicine						Traditional medicine				
Age groups	16-25	26-35	36-45	46-55	56-65	66-75	16-25	26-35	36-45	46-55	56-65
Average age	19.57	28.6	38.2	48.33	58.6	69	21	29.22	40	51	58
Standard deviation	2.5	1.89	2.48	2.51	1.67	4.24	3.21	2.48	2.82	3.74	2.82
Average T0	39.47	39.29	39.32	39.43	39.3	40	39.25	39.4	39.67	39	39.4
Average weight	58.86	69.3	71.4	76	63.4	74.5	55.92	66.67	70.17	55.75	59
Average size	1.63	1.66	1.67	1.72	1.63	1.6	1.61	1.64	1.69	1.58	1.6
Average BMI	22.06	25.13	25.51	25.93	23.78	28.29	21.58	24.71	24.39	22.46	23.19
Average pulse	94.86	89	102.6	97.67	88	87	90.33	104.67	101.67	82.5	88.5

T0= initial temperature.

Table VII. Self-medication by participants who used modern or traditional medicine

	Modern		Traditional	
Drugs	Number of cases (n)	%	Number of cases (n)	%
Efferalgan	3	9	4	12
Paracetamol	8	25	6	18
Doliprane	2	6	1	3
Ibuprofen	1	3	1	3
Metronidazole	1	3	0	0
Traditional Potion	5	16	0	0
No self-medication	12	38	21	64
TOTAL	32	100	33	100

Table VIII. Medicines for malaria and typhoid fever in health centres

	Cases submitted	Percentage	Administered Med	Galenic form	Posology
Typhoid	20	62.5	Gentamicin	Suspension for injection	2g*2/ Day
			Analgin		2A/24h
			Artemether		1A/8h
			Ceftriaxone		2A/ Daily for 3days
Malaria	21	65.62	Artemether	Suspension for injection	by weight/24h
			Artesunate		
			Analgin		1A/8h
Others	16	50	Fleming	Drinkable solution	1Tab*2/Day
			Carbocysteine	Drinkable solution	10ml*3/ Day
			Cimetidine	Suspension for injection	1A
			Fluconidazol	Capsules	1cap*2/ Day

	Cases Submitted	%	Administered Med	Galenic Form	Posology
Typhoid	30	90.9	Potion	Drinkable solution	1 glasssingle dose
Malaria	7	21.2	Potion	Drinkable solution	1 glass *2/ Day
Others	1	3.03	Potion	Drinkable solution	1 glass*2/ Day

Table X: Plants available from traditional healers

N°	Scientific names (family)	Names in Mother Tongue	Parts Used	Adverse effects
1	*Biden spilosa* (Asteraceae)	Tcha'nena	Leaves	None
2	*Rauvolfia Vomitoria(apocynaceae)*	Neta'sha	Bark	Bitter
3	*Ficus thonningii (Moraceae)*	Tcha'lô	Bark	None
4	*Lanneamicrocarpa (Anacardiaceae)*	Nga' lô	Leaves	None
5	*Eremomastax speciosa* (Acanthaceae)	Banjamnshe'(Red on one side)	Leaves	None
6	*Ocimum gratissimum* (Lamiaceae)	Tchame (Massep)	Leaves	None
7	*Citrus*	Lamasi (Lime)	Fruit	Sour
8	*Carica Papaya L. (Caricaceae)*	Fû bubu	Leaves	None
9	*Carica Papaya L. (Caricaceae)*	Ngâtu bubu	Root	None
10	*Ananas comosus L. (Iromeliaceae)*	La keba (Unripepineapple)	Fruit	None
11	*Citrus + Limon L. (Rutaceae).*	Lamasikesha g (Lemon)	Fruit	Sour
12	*Picralima nitida (Apocynaceae)*	Tamfu (Kinkeliba)	Fruit	Bitter
13	*Cymbopogon Citratus (Poaceae)*	(Citronnelle) Lângale	Leaves	None
14	*Aloe schweinfurthü Baker (Aloaceae)*	Lângale (Aloes vera)	Leaves	Bitter

Table XI: Temperature monitoring of participants undergoing traditional and modern treatments

Pathologies	T0	T1	T2	T3
Modern malaria	39.3	39	38	38
Traditional malaria	39.4	38	37.7	37.2
Modern typhoid	39.4	39	38.5	38.3
Traditional Typhoid	39.3	38.5	37.8	37.3

Table XII. Treatment control in modern medicine by Widal and thick drop at D 15

	Total Case	Number of exams performed	Positives
Widal	26	20	11 (55%)
Thick drop	12	12	0 (0%)

Table XIII. Treatment control in traditional medicine by Widal and thick drop at D 15

	Total Case	Number Of Exams Performed	Positives
Widal	25	25	2 (8%)
Thick drop	10	10	0 (0%)

Religion	Modern medicine	Traditional medicine
Christians	92	20
Animists	8	80

Table XV. Professions and specialties practiced by traditional healers represented in percentage

Modern Medicine		Traditional Medicine	
Profession	Number (%)	Specialities	Number (%)
Nurses	17 (68)	Traditional birth attendant	3 (12)
Laboratories	4 (16)	After-dream	2 (8)
Doctors	4 (16)	Mystical choice	1 (4)
Overall total	25 (100)	Healer	11 (44)
		After-dream	6 (24)
		Mystical choice	3 (12)
		Transmission	2 (8)
		Herbalist	4 (16)
		Transmission	4 (16)
		Rewinder	2 (8)
		Transmission	2 (8)
		Spiritualist	5 (20)
		Transmission	5 (20)
		Grand total	25 (100)

Table XVI. Existing relationship between the two medicines represented in percentage

Relation	Modern medicine	Traditional medicine
Personal recourse to other medicine	72	100
Collaboration	44	100
Patient exchange	76	100
Referral to other medicine	52	68
Collaboration desirable	84	100

Table XVII. Type of collaboration represented in percentage

Types of collaboration	Nurses	Laboratory assistant	Medicaldoctor	Traditional healers
Numbers (%)	17	4 (16)	4 (16)	25 (100)
Consultation box	20	0	8	32
Complementarity	4	0	0	12
Knowledge exchange	8	0	4	40
Training	24	12	4	4
Opening	4	0	0	4
No response	8	4	0	8

At D0, 22 of these patients had temperatures above 40°C for malaria, while patients treated in hospital saw their temperatures drop from 39°3 C at D0 to 38° at D3. During this time, those treated with traditional medicine saw their temperatures drop from 39.4°C to 37.2°C. It is observed that the temperatures of the patients treated with traditional medicine fall more rapidly than those treated with modern medicine in hospital. At D3, 22 patients treated with the modern medicine protocol had temperatures above 37.5°C, 10 had temperatures above 38°C.

Table XVIII. Suggestions for collaboration made by agents of modern medicine in percent

Suggestion	Nurses	Laboratory assistant	Medical doctor	Traditional healers
Number (%)	17 (68)	4 (16)	4 (16)	25 (100)
Partnership	28	8	8	56
Respect	8	0	0	32
Sensibilisation	20	4	8	0
No response	8	4	0	12

Table XIX. Obstacles encountered in collaboration by the two medicines represented in percentage

Barriers	Nurses	Laboratory assistant	Medical doctor	Traditional healers
Number (%)	17 (68)	4 (16)	4 (16)	25 (100)
Anarchy	40	4	8	54
Ethics	12	4	8	4
Misunderstanding	4	4	0	20
Refractory	4	4	0	14
No response	8	0	0	8

Table XX. State of knowledge on the programme for the promotion of traditional medicine in Cameroon represented in percentage

Knowledge	Nurses	Laboratory assistant	Medicaldoctor	Traditionalhealers
Number (%)	17 (68)	4 (16)	4 (16)	25 (100)
Didn't know	20	12	4	40
No	8	0	0	4
Yes	40	4	12	56

Meanwhile, only 4 in traditional medicine had a temperature above 38°C. Thus, 7 of the 12 patients treated for malaria in modern medicine have an individual temperature above 38°C. The proportion is much lower for patients under traditional protocol (2/10). As for typhoid, the proportion of patients with temperatures above 38°C is 20/26 in modern medicine; 2/25 in traditional medicine. It is clear from all this those traditional treatments for both malaria and typhoid lower the temperature more quickly than modern therapies.

Thick drop and Widal of participants after treatment

In Modern Medicine: 15 days after treatment, the treatment was monitored by the Widal for patients treated for typhoid.

Table XII: Treatment control in modern medicine by Widal and thick drop at D 15. Of the 26 patients treated for typhoid, 20 performed the Widal examination. 11 examinations were positive (55% of cases) 9 patients out of 20 who had their Widal positive before their treatment became negative. As for the thick drop, 12 were performed, none of the 12 were positive at D15. It was also found that all 25 patients on traditional treatment had their Widal check-ups. Of these, 2 had a positive Widal (8%); 23 of the 25 patients who had a positive Widal at baseline were negative at control; the 10 patients on traditional malaria treatment had a negative control result.

Relationship between Modern and Traditional Medicine

Socio-demographic characteristics of caregivers

Ages of caregivers: We interviewed 25 modern health workers and 25 traditional healers to explore areas of collaboration.

Table XXI. Phytochemical screening

Substances	Alkaloids	Saponosides	Tannins	Flavonoids	Quinones	Coumarins	Cardiotonic heterosides	Mucilage
Presences	+	-	+	+	+	-	+	-

Table XXII. Values of MIC and BMC concentrations on the different bacterial strains

Strain / Concentration	S. Enteritidis	S. Typhimurium	E. coli ATCC 25922	S. Typhi
MIC	75mg/L	37,5mg/L	150mg/L	37,5mg/L
MBC	150mg/L	150mg/L	150mg/L	150mg/L

The age distribution of modern health workers and traditional healers is shown in Figure 2. It was found that modern health workers are more Christian than animist. While traditional practitioners are more animist than Christian.

Profession: All professions of modern health workers were present in our study. In addition, traditional practitioners were represented by specialities practised. The data are thus grouped in Table XV. The results show that the most represented profession in modern medicine is nursing. Fifty-two percent of the traditional healers stated that they had acquired their knowledge by transmission from a master; 32% after a dream and 16% by mystical choice. The modes of training could be combined among the traditional healers.

Relationship between the two types of medicine: The existence of relationships between the two medicines represented is summarised in Table XVI. Seventy-two percent (72%) of the modern health workers used traditional therapies for themselves as adults, compared to 100% for the traditional health workers. The pathologies for which modern health workers go to traditional practitioners are: typhoid fever, malaria, constipation, abdominal colic, dysmenorrhea, coughing, milky discharge. 44% of the modern health agents declared that they collaborated with traditional practitioners against 100% of the traditional practitioners who replied that they collaborated with modern health agents. Most often, for a therapeutic complement, mixed treatment, mystical aspects for example. 76% of the modern health agents have already received patients referred by traditional healers, as opposed to 100% of the traditional healers who receive patients from modern medicine, most often after a therapeutic failure, therapeutic complement or for diagnosis. Fifty-two percent (52%) of modern health workers refer patients to traditional medicine, while 68% of traditional practitioners refer patients to modern medicine 84% of modern health workers agree to collaborate with traditional practitioners, while 100% of traditional practitioners agree to this collaboration.

Modality of collaboration: The modalities of collaboration proposed by the agents of modern and traditional medicine, the consultation boxes in the hospital for traditional practitioners, complementarity, etc., the different modalities of each of the professional categories are grouped in Table XVII. The majority of modern health workers opt for collaboration and training of traditional healers as a practical modality.

Focus of collaboration between the two types of medicine
The suggestions for collaboration made by the modern and traditional medicine agents are: partnership, respect and awareness. The different suggestions from each of the professional categories are grouped in Table XVIII. The results show that traditional healers are more likely than modern health workers to suggest a frank partnership with them; similarly, modern health workers are more likely than traditional healers to request good sensitisation from traditional healers.

Barrier to collaboration: The obstacles to collaboration proposed by the agents of modern and traditional medicine are: anarchy, respect for ethics, misunderstanding between the two agents of medicine and refractory behaviour. The different obstacles that each of the professional category's face is grouped in Table XIX. It emerges that traditional practitioners talk much more about anarchy than modern health workers; similarly, modern health workers talk about ethics more than traditional practitioners, to name but a few.

Knowledge of the programme to promote traditional medicine in Cameroon: The results recorded in relation to knowledge of the medicine promotion programme are shown in Table XX. The results show that modern health workers and traditional practitioners say they know about the existence of the programme for the promotion of traditional medicine in Cameroon, while a minority of modern health workers and traditional practitioners say they never know about the existence of this programme.

Making traditional knowledge available to science: To this question, 64% of traditional practitioners answered YES, provided that they were given ownership of the product and that it was patented, as several of them said that their recipes had been "stolen". The reasons for the refusal of the other practitioners (36%) were

- Fear of punishment from the spirits;
- The hereditary nature of the recipes, which therefore cannot be given to scientists;
- The mystical aspects of many treatments;
- Fear of being killed (example cited of Ghanaian tradi-therapist Drobo II murdered in 1992 for his research and discovery of cures for HIV/AIDS infection).

In vitro demonstration of the antibacterial activity of traditional typhoid treatment

Phytochemical screening: The different substances present in the potion that allowed us to demonstrate in vitro antibacterial activity are listed in table XXI. ***** The MBC for *S. Typhi*, *S. Typhimurium* are 37.5mg/L. It is 75 mg/L for *S. Enteritidis* and 150mg/L for *E. Coli*. It can be seen that our extract is more active on *Salmonella* than on *E. coli*.

DISCUSSION

In the face of disease, populations are confronted with two health systems that sometimes fight each other: modern medicine and traditional medicine.

The aim of our work was to compare the management of fever, particularly typhoid fever and malaria, by these two approaches to medicine. Our aim was to describe it in order to find out whether there are any elements of complementarity between the two systems of medicine. We have carried out a descriptive work. We did not intervene in either the diagnosis or the treatment. We only followed the patients who freely oriented themselves in each of these two medicines. We did not influence the usual work of the agents of modern medicine nor that of the traditional practitioners. At the level of health systems, it can be seen that modern medicine operates on a hierarchical model, because around the doctor there are nurses, laboratory technicians and pharmacists. Meanwhile, traditional medicine relies on a single person who makes the diagnosis, seeks the treatment and carries out the care; even if some are assisted by apprentices whose role is purely secondary (harvesting plants, errand boys). This study corroborates that of Alice Konan (2012)(13). Modern medicine takes place in concentrated centres, whereas traditional medicine takes place in the dwellings. We realize that the modern health system is designed to receive many patients at a time, while traditional medicine is organized to receive fewer patients generally in privacy. We also found that modern medicine receives more patients than traditional medicine, especially for fever in the Ndé department where we conducted our study.

In our study, patients with fever have practically the same characteristics in terms of age; both in modern medicine (median 29 years) and traditional medicine (median 39 years); they have the same level of education; on the other hand, students are more likely to go to traditional medicine. On average, it is the adults who make up our sample. As we realised that it is the patients aged over 15 years on average who go to traditional medicine, we did not specifically look after the fever of young children. This result is identical to that obtained by Kemnhou Marleine (2017) who found the median age to be 37 years and 37.5 years respectively (14). This could be justified by the fact that the average age of the active population of the society is almost the same everywhere in the world. The finding highlights the following: whether in modern or traditional medicine, the young population is the one that makes use of it on both sides; this is probably explained by the fact of cost. On the other hand, the proportion of adult patients aged between 36 and 45 years is higher in traditional medicine than in modern medicine. This is explained by the fact that the culture (Bamileke) considers the disease to be a curse before being a biological problem, and also by the cost of traditional medicine, which is more accessible (500-1000 frs) in the treatment of fever in the department. The same is true for the 46-55 age group. This study corroborates that of Alice Konan (15). The patients seen in traditional medicine have a secondary level of education, followed by primary education. The same is true for patients going into modern medicine. However, even patients with higher education use traditional medicine for the treatment of their fever. It can therefore be said that all segments of the population are not reluctant to be treated by traditional medicine for fever. This shows a degree of confidence in traditional medicine for the treatment of fever. Kemnhou Marleine found the same results (14). Farmers were the most represented (22%), followed by housewives (19%) in modern medicine; this could be explained by the fact that in Ndé, agriculture is the primary source of income. This result is very close to those of Bounang and Ngaroua who found respectively 24.5% and 18.9% (57) and Kemnhou M. who found 24.2% in his study carried out in the department of Ndé on osteo-articular trauma(9). Unlike traditional medicine, students were more represented, followed by farmers. This could explain the phenomenon that arose initially and also because of the financial accessibility of traditional medicine in the treatment of fever in Ndé 500- 1000 frs study corroborating that of Alice Konan in 2012, which found the same phenomena of cost 500-10 frs and coinciding with the same figures (14). Fever, asthenia, headache, then anorexia and abdominal pain are the most common symptoms and characterise the majority syndrome. These are the clinical signs recognised in the two diseases studied and which can only be differentiated by para-clinical examination. On physical examination, few patients show a good general condition in both traditional and modern medicine. Patients with coloured conjunctiva represent 26% and less pale 5% in traditional medicine, while those in modern medicine are less coloured at 14% and paler at 15%. In modern medicine, we find that patients are fairly lucid (40%) and less obsessive (9%), unlike patients in traditional medicine, who are less lucid (29%) and more obsessive (22%), a result corroborated by Alice Konan (14). Hyperthermia is constant in all patients and is around 40°C. This can be explained by the fact that in our study population and in the society around us, many patients try to take care of their fever at home, either with medicines not prescribed by a doctor, or with potions made from plants, and it is in the event of aggravation that many resort to the hospital. Faced with this clinical picture, patients who turn to modern medicine have the most recourse to self-medication, based on paracetamol but also on medicinal plants; on the other hand, 64% of patients who turn to traditional medicine do not resort to self-medication, as traditional medicine is their first choice. This self-medication would justify the different clinical parameters before treatment as observed in table II; in particular those of temperature and pulse (14).

Both systems use two laboratory tests to confirm their diagnoses: the Widal and the thick drop. It is regrettable that the Widal results are positive or negative without any mention of the known salmonella species (*Salmonella typhi*, *S paratyphi* A, B). No type of H or O antigen is mentioned on the results; it is therefore difficult to have an idea of the species of salmonella

involved, or the type of antigen concerned. Furthermore, the antibody titre is not mentioned. It is not possible to know if it is a recent or old infection or a vaccination. However, the existing test kits have everything you need for a complete serology. It must also be said that the interpretation of the Widal is not easy. Indeed, the Widal is not positive immediately after the infestation, it is practically at the second septennium that the Widal is positive; whereas the infection is taken care of as soon as it is known. Moreover, the Widal is not positive simply for typhoid because there are cross-reactions described with Plasmodium falciparum for example. The diagnosis of certainty for typhoid fever is the coproculture and the haemoculture which unfortunately have not been done because they are not routine examinations in the Bangangté Health District. It is true that the positivity of the culture occurs in the second seven years of infestation and the medication is taken immediately after the heat stroke.

It is therefore regrettable that confirmation by the Widal was incomplete for an examination that only detects a third of positive cases, but also that the coproculture is not part of the routine check-ups for our diagnostic approach. The protocols used in modern medicine are similar to those recommended by the Ministry of Public Health in Cameroon (Table VIII). The drugs used by modern health workers in the management of typhoid fever and malaria are primarily antipyretics for all patients, antibiotics (Ceftriaxon and Gentamicin) for typhoid, ACTs (Artemether and Artesunate) for malaria. Injectable routes (intra-muscular and intra-venous) are preferred. For traditional medicine, natural plants are used in the treatment of typhoid fever and malaria. In galenic form, the solutions are drinkable with bi-daily and daily dosage. This is a "potion" medicine whose only route of administration is the oral solution. We conducted an in-depth study of the plants used by traditional practitioners in the treatment of fever in the department of Ndé, which enabled us to discover several therapeutic properties of these plants described in the scientific literature. Thus,

- Kinkeliba is an antimalarial, antioxidant, antidiabetic and antifungal.
- Neta'sha is an antioxidant, antimicrobial, anti-inflammatory, anti-malarial, anti-tumour and anti-convulsant whose roots and leaves are recommended as a decoction in malaria treatment.
- Tchà'nena is an antioxidant, an antibacterial, an antifungal, an antimalarial, an anti-leukemic and an antidiabetic
- Châlo is an anti-malarial, whose leaves are indicated in decoction in the pernicious accesses of the malaria and in case of hepatitis icterus, fevers, anaemia.

The plants are used in a mixture. The recipes used to treat typhoid are a mixture of 3 products, whereas to treat malaria, traditional medicine mixes about ten products (15). Most of the research to confirm the observations in ethnopharmacology studies the activity of the plants one by one. It seems useful to us to get closer to the model of the traditional practitioners by studying their mixture of plants. Scientific research in this area will support the findings of traditional healers observed from generation to generation (9). From an environmental point of view, proof of the therapeutic usefulness of selected medicinal plants would make it possible to preserve endangered species (16). For the clinical monitoring of patients, all treatments progressively lower the body temperature of patients.

The temperatures of patients treated by traditional medicine fall more rapidly than those of those subjected to modern treatment in hospital (17). It appears from all this those traditional treatments for both malaria and typhoid lower the temperature more rapidly than modern therapies. In terms of biological monitoring, 15 days after the treatment, the treatment was monitored by the Widal for patients treated for typhoid. It was found that patients treated with modern therapy had more Widal positivity after control examination than those treated with traditional medicine; on the other hand, for malaria, the two medicines had almost similar results as regards the control test (18). This would make us understand that for the treatment of fever in the department of Ndé, traditional practitioners are not neglected and should not be neglected.

Traditional medicine has always existed and remains a first resort in the department of Ndé, despite the access to modern medicine inherited from the colonial era. Regardless of religious beliefs, level of education and social rank, indigenous treatments have been used since birth, being an integral part of Cameroonian culture in general and of Ndé in particular (19). These results corroborate those obtained by Kouame on the "evaluation of the collaboration between modern and traditional medicine in the health districts of Yopougon (Abidjan)" (medical thesis 2010), which revealed that 91% of the population used traditional medicine (20).

CONCLUSION

At the end of our study, which aim was to investigate the strengths of traditional medicine by comparing the management of fever, particularly typhoid fever and malaria, between this medicine and modern medicine from 02nd January 2018 to 20th July 2018and included of 65 patients distributed as follows: 32 cases for modern medicine and 33 cases for traditional medicine; we also interviewed 25 modern health workers and 25 traditional practitioners to explore areas of collaboration. To do this, we evaluated the activity of the potion that gives a high rate of cure in traditional medicine and look for possible areas of collaboration. Both medicines may use the same para-clinical tests to confirm their diagnoses.

The management of fevers by modern medicine follows national and international consensus treatment standards, while that of traditional medicine is based on decoctions or juices of plants, plant parts and even animal parts. The fever drops significantly faster for these two diseases treated by traditional medicine therapies than for those of modern medicine.

But at D14, all the parameters disturbed by these diseases return to normal. Thus, treatment with a herbal cocktail: (*Ocinum gratissinum*, *Lemon citrus*, Egg yolk) in a single dose, brings down fever more rapidly than that used by the protocol of modern medicine. Bactericidal activity has been found in vitro on Salmonella typhi strains. Similarly, a decoction based on 10 plants acts in the same way for malaria, even if it is taken for a long time (10 days).

For the management of this disease, informal relations exist between the two systems of medicine. It can be seen that traditional practitioners have more recourse to the services of modern medicine, both in terms of laboratory services and therapeutics. Informal exchanges of patients exist between these two systems of medicine. Traditional medicine has obvious resources that can be exploited in such a way that there would be benefit in improving collaboration between the two health systems. These relationships should be further formalised.

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