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Endogenous knowledge of traditional healers on plants used against hepatitis in Mbandaka/DR Congo

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Abstract

The ethnobotanical study was carried out on medicinal plants used in the traditional treatment of hepatitis in Mbandaka in the Democratic Republic of Congo. Its general objective was to establish a relationship between the level of education of traditional healers and their expertise in alternative medicine to treat viral hepatitis.

On a floristic list of 36 plant species used in the composition of different anti-hepatitis recipes, the Fabaceae family is predominant with 5 species. Considering Citation Frequency (CF), species such as *Ageratum conyzoides* L., *Senna alata* (L.) Roxb., *Cymbopogon citratus* (DC.) Stapf, and *Millettia laurentii* De Wild. are the best known by traditional healers.

The high rate of illiteracy among traditional healers (42.9%) seems to challenge the reliability of endogenous knowledge. However, since the species inventoried have proven their effectiveness in other countries, the established expertise of the traditional healers of Mbandaka in the treatment of hepatitis is confirmed.

Endogenous knowledge, therefore, does not take into account the level of education.

Keywords: Endogenous knowledge; Complementary medicine; Viral hepatitis; Traditional healer; Level of education; Mbandaka

1. Introduction

In Africa, ancestors are reputed to possess phytotherapeutic knowledge. They transmit it from one generation to another through the oral tradition. Qualified as empirical, this knowledge is not based on any theory and is unaware of the chemical composition of drugs used for health care [1-2]. In traditional African settings, the population often relies on endogenous knowledge in order to solve their health problems. Indeed, the use of plant extracts in different galenic forms is common [3]. Endogenous knowledge is defined as knowledge experienced by society as an integral part of its heritage, as opposed to exogenous knowledge perceived, at this stage at least, as one of the elements of another value system [4].

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Hepatitis is an inflammation of the liver that can cause a myriad of health problems and be fatal. There are five main strains of the hepatitis virus, called types A, B, C, D, and E. [5]. Viral hepatitis is a frequent disease and constitutes a real public health problem affecting all countries of the world. This is why the World Health Organization (WHO) has declared a World Hepatitis Day celebrated every July 28 of each year [6].

Epidemiological studies show that 3.5% of the world's population is chronically infected with the hepatitis B virus (HBV) and that the prevalence of HBV among children in Africa is also 3%, despite the establishment of vaccination in 2006 [7]. Chronic liver viruses B and C induce liver fibrosis that can progress to cirrhosis and then hepatocarcinoma [8].In Burkina Faso, hepatocarcinoma is the second deadliest cancer (1,269 deaths in 2018) and the first in men, while liver diseases, in general, are responsible for 2.3% of mortality [9].

Medicinal plants play an important role in health care programs in developing countries. The use of traditional medicine as an alternative in most cases could be explained by several factors including the low cost of treatment compared to conventional medicine, the financial capacity of the patient or his family, the difficulties of access to modern health care, culture, nature of the disease, etc. [10].

In the Democratic Republic of Congo (DRC), urban and rural populations increasingly depend on medicinal plants to solve their health problems [11–13].In the urban-rural part of the municipality of Mbandaka in Equateur Province, the general opinion of the population suggests that hepatitis is among the pathologies, not only the most expensive, but also the most difficult to cure by modern medicine. Given the number of pathological cases traditionally treated and the growing number of those cured, on the one hand, and on going success of traditional medicine on hepatitis, on the other hand, the knowledge of the plants used for this purpose, the different medicinal preparations, and the physiological activities they would have in the therapeutic process remain grey areas that our study will try to elucidate by consulting traditional healers resident in this health zone.

The present study aims to inventory the local floristic richness used by local traditional healers whose medicinal virtues traditionally treat hepatitis.

2. Material and methods

2.1 Study framework

The study area is located on the wide left side of the Ruki River, mainly between the Eala botanical garden and the Catholic mission of Bamanya (more or less 5 km) for the land part and between the garden and the Luaka Camp (more or less 20 km) in the wet part. (Figure 1). It is a portion of land that is part of the Quartier Bokala, one of the ten districts of the Commune of Mbandaka. This district includes the following localities: Eala, Bolombo, Bantoy, Boyeka, Ifuma, Lolifa, Bamanya, Lokekia, Nganda Nkoy, Nganda Mpono, Nkombe and Luaka, an aquatic environment highly endemic for several pathogenic flies such as the Glossina africana responsible for sleeping sickness, other mosquitoes such as the Anopheles mosquito responsible for malaria.

Figure 1 presents the study environment.

2.2 Ethnobotanical surveys

Inspired by previous studies [11-13], data collection was carried out on the basis of the standardized interview method, favoring the individual interview technique. A four-section questionnaire was therefore developed and included:

- an introductory note section;
- a section of the socio-demographic characteristics of the respondent;
- a section of the actual survey;
- a section of ethical considerations

The questionnaire was administered to traditional healers renowned in the treatment of viral hepatitis. Former viral hepatitis patients, beneficiaries of local herbal medicine, were also consulted discreetly to testify their state of health before and after treatment.

The information sought on phytotherapy for hepatitis included the plants used, the parts or organs used, the mode of collection, the methods of sampling, the presumed functions exercised by these plants in the body during the treatment, the counter-indications, and side effects observed during and after treatment.

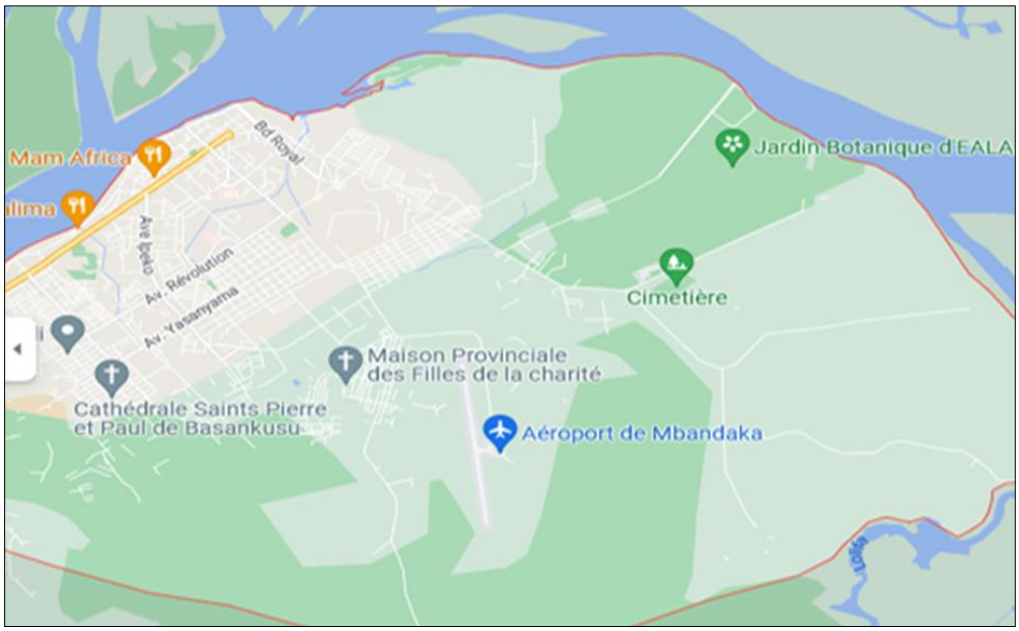

Figure 1 Map of the Bokala district in the Commune of Mbandaka

2.3 Ethnobotanical parameters

The data collected were analyzed through the following ethnobotanical parameters:

2.3.1 Citation Frequency (CF)

A technique that takes into account the consensus of participants can be used to assess the cultural significance of plants. The level of knowledge of medicinal plants was assessed by the Citation Frequency (CF). The FC is the number of times that respondents mentioned a given plant species to treat the pathology targeted by the study. It is a good index to assess the credibility of the information received and the level of knowledge of plants within a population.[13-15].

$$FC = \frac{\mathrm{Fc}}{\mathrm{N}}$$

where

- CF: Citation Frequency
- Fc: Number of respondents who mentioned the species in the treatment of hepatitis;
- N: Total number of respondents.

2.3.2 Use Value (VU)

The VU makes it possible to determine the species having a high use value in a given environment. It has been used to establish a hierarchy of importance at the species level according to the formula used by [16-17]

$$VU = \frac{\sum \mathrm{Si}}{\mathrm{n}} (1) \qquad \text{where}$$

- VU: Use Value of a given species.
- Si: Usage score assigned by respondent i
- n: number of respondents for the given category of use

2.3.3 Interpretation

- If 1 < VU < 1.50: the species has a low use value, therefore it is less threatened with extinction;
- If VU = 1.50: the species has an average use value;

- If 1.50 < VU < 03: the species is at risk of extinction following excessive exploitation.

3. Results

3.1 Analysis of socio-demographic data

The analysis of socio-demographic data focuses on 4 criteria:

- Age ;
- Marital status;
- Level of study
- Seniority in the profession of a traditional healer

Figure 2 presents the sociodemographic data relating to the age and marital status of the respondents.

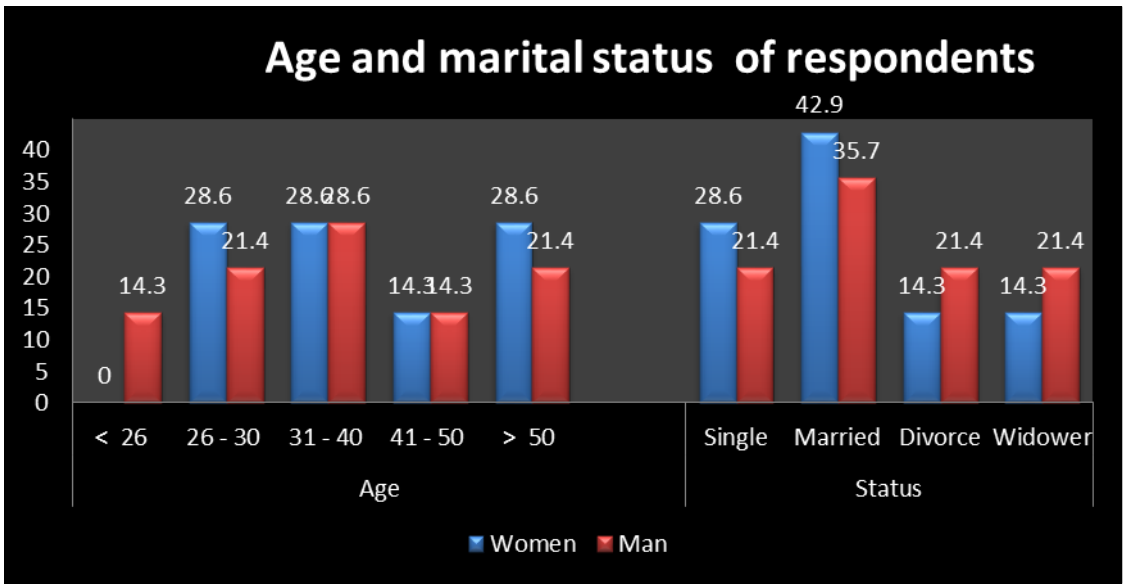

Figure 2 Age and marital status of respondents

Figure 2 shows that women are in the majority in the age brackets of 26-30 and over 50 (28.6% against 21.4%). Both sexes are equally represented in the age brackets of 31-40 years (28.6%) and 41-50 years (14.3%). On the other hand, men are in the majority in the age groups under 26 (14.3%) against 0% of women.

According to marital status, both married (42.9%) and single (28.6%) women predominate over men (35.7% and 21.4% respectively). On the other hand, divorced men and widowers are in the majority compared to women: 21.4% against 14.3%.

Figure 3 illustrates the socio-demographic data relating to the level of education of the respondents and their seniority in the profession of traditional healers.

The results in figure 3 show that the levels of illiteracy and primary education each represent 42.9% of women. Unlike men, women have neither a *graduat* degree nor a *licence*, even less a doctorate. On the other hand, 7.1% of men have the level of *graduat* and bachelor.

With regard to seniority in the profession, the segment under 10 years records 42.9% of women against 28.6% of men. Those between 11 and 30 years include more men (57.1%) compared to women (42.9%). No respondent has more than 50 years of seniority in the profession.

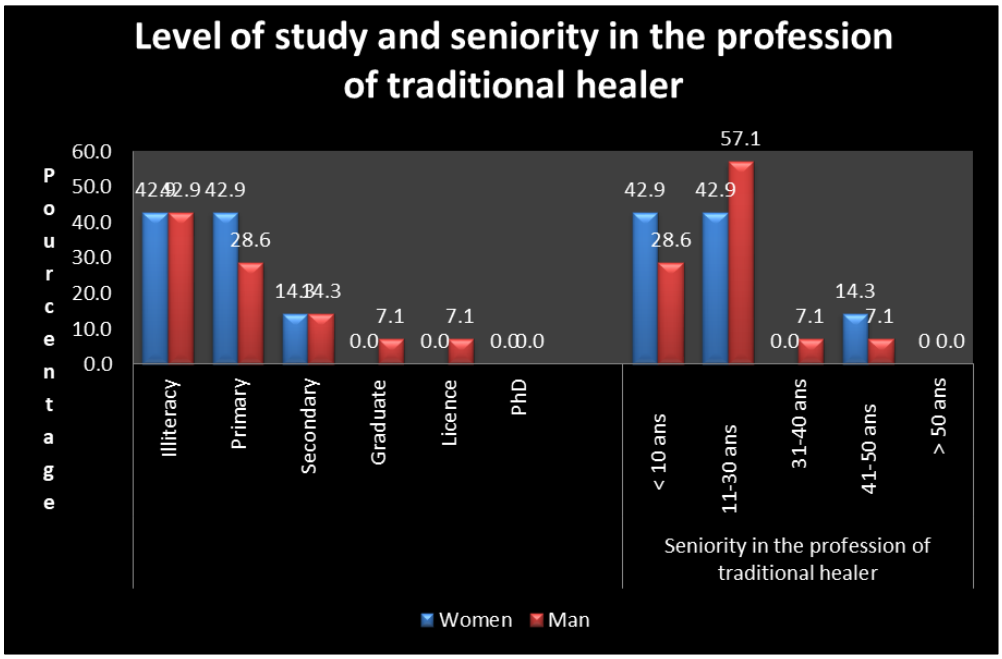

Figure 3 Respondents' level of study and seniority in the profession of a traditional healer

3.2 Floristic analysis

The list of plant species involved in the treatment of hepatitis in Mbandaka is given in Table 1 which presents the plant species, families and ethnobotanical parameters.

Table 1 List of plant species; families and ethnobotanical parameters

N°	Families	Species inventoried	Ethnobotanical parameters				
			Fc	FRC	∑ Si	n	VU
01	Alliaceae	*Allium cepa* L.	11	0,52	15	11	1,72
02	Amaranthaceae	*Celosia trigyna* L	12	0,57	21	13	1,61
03	Annonaceae	*Anonidiummannii* (Oliv.) Engl. & Diels	03	0,14	20	19	1.0
04	Arecaceae	*Elaeis guineensis* Jacq.	15	0,71	29	15	1,93
05	Asteraceae	*Ageratum conyzoides* L.	21	01	52	21	2,47
06	Asteraceae	*Chrysanthellum americanum* (L.) Vatke	12	0.57	19	18	1,05
07	Burseraceae	*Canarium schweinfurthii* Engl.	15	0,71	34	15	2,27
08	Burseraceae	*Dacryodes edulis* (G.Don) H.J.Lam	18	0,86	40	18	2,22
09	Caricaceae	*Carica papaya* L	14	0,67	30	14	2,14
10	Cecropiaceae	*Myrianthus arboreus* P.Beauv.	19	0,90	47	19	2,47
11	Clusiaceae	*Garcinia kola* Heckel	19	0,90	46	19	2,42
12	Clusiaceae	*Harungana madagascariensis* Lam. ex Poir.	17	0,81	38	17	2,23
13	Combretaceae	*Combretum micranthum* G.Don	13	0,61	24	13	1,84
14	Euphorbiaceae	*Jatropha curcas* L.	14	0,67	33	14	2,35
15	Euphorbiaceae	*Manihot esculenta* Crantz	11	0,52	23	11	2,09
16	Fabaceae	*Arachis hypogaea* L.	15	0,71	28	15	1,87

17	Fabaceae	*Senna alata* (L.) Roxb.	21	01	62	21	2,95
18	Fabaceae	*Copaifera mildbraedii* Harms	20	0,95	46	20	2,3
19	Fabaceae	*Millettia laurentii* De Wild.	21	01	53	21	2,52
20	Fabaceae	*Senna occidentalis* (L.) Link	19	0,98	35	14	2,50
21	Lamiaceae	*Solenostemon monostachyus* (P.Beauv.) Briq.	19	0,90	46	19	2,42
22	Lauraceae	*Beilschmiedia diversiflora* Pierre ex Robyns & R.Wilczek	17	0,81	29	17	1,70
23	Myristicaceae	*Pycnanthus angolensis* (Welw.) Warb.	11	0,52	16	11	1,45
24	Nyctaginaceae	*Boerhavia diffusa* L.	16	0,76	29	16	1,81
25	Pentadiplandraceae	*Pentadiplandra brazzeana* Baill.	20	0,95	51	20	2,55
26	Phyllanthaceae	*Bridelia micrantha* (Hochst.) Baill.	18	0,86	29	18	1,61
27	Phyllanthaceae	*Phyllanthus amarus* Schumach. & Thonn.	08	0,38	09	08	1,12
28	Phytolaccaceae	*Phytolacca dodecandra* L'Hér.	14	0,67	30	14	2,14
29	Piperaceae	*Piper guineense* Schumach. & Thonn.	11	0,52	17	11	1,54
30	Poaceae	*Allium schoenoprasum* L.	16	0,76	38	16	2,37
31	Poaceae	*Cymbopogon citratus* (DC.) Stapf	21	01	60	21	2,85
32	Poaceae	*Panicum maximum* Jacq.	04	0,19	18	17	1.05
33	Polypodiaceae	*Polypodium sp*	14	0,67	31	14	2,21
34	Rubiaceae	*Morinda morindoides* (Baker) Milne-Redh.	20	0,95	54	20	2,70
35	Sapotaceae	*Chrysophyllum lacourtianum* De Wild	11	0,52	23	11	2,09
36	Spirulinaceae	*Spirulina sp*	02	0,09	15	14	1.07

3.3 Family frequency analysis

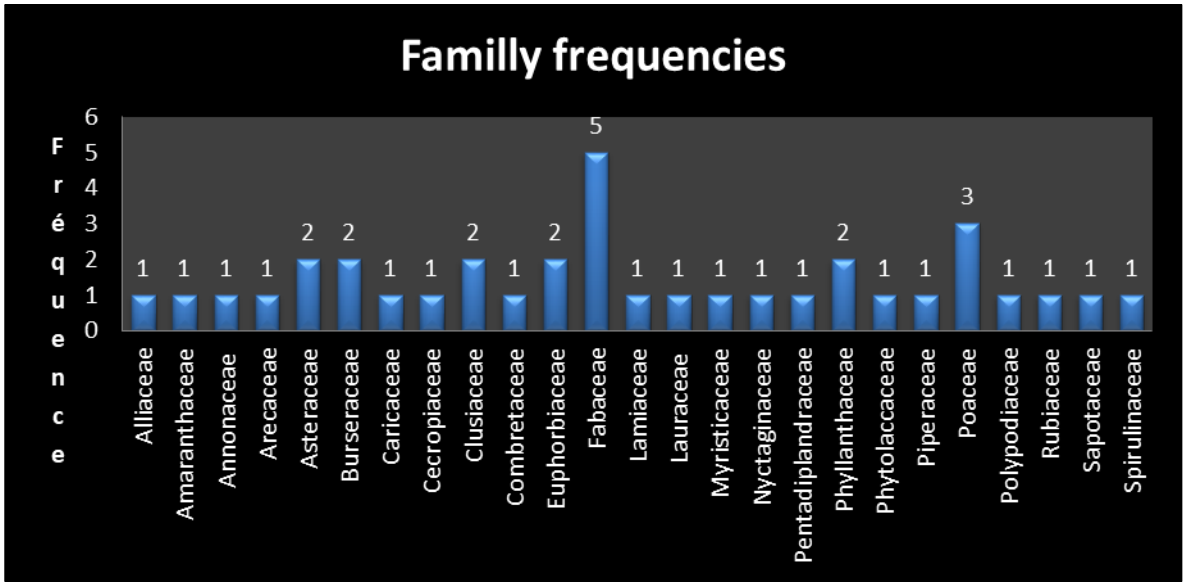

Figure 4 Family frequencies

Figure 4 shows the frequency of plant families used in herbal medicine against hepatitis in Mbandaka.

The analysis of Figure 4 reveals that the Fabaceae family is predominant with 5 species. It is followed by Poaceae (3 species). The Asteraceae, Burseraceae, Clusiaceae, Euphorbiaceae,and Phyllanthaceae have each 2 species. The other families are monospecific.

Considering Citation Frequency rates, species such as *Ageratum conyzoides* L., Senna alata (L.) Roxb., *Cymbopogon citratus* (DC.) Stapf, and *Millettia laurentii* De Wild. are the best-known by traditional healers involved in the treatment of hepatitis in traditional medicine in Mbandaka. Indeed, they display a FRC equivalent to 1. They are closely followed by *Senna occidentalis* (L.) Link, (0.98); *Pentadiplandra brazzeana* Baill.(0.95); *Morinda morindoides* (Baker) Milne-Redh. (0.95); *Copaifera mildbraedii* Harms (0.95); *Garcinia kola* Heckel (0.90); *Myrianthus arboreus* P. Beauv. (0.90) and *Solenostemon monostachyus* (P.Beauv.) Briq. (0.90).

On the other hand, the floristic analysis based on the Use Value indicates that certain species are overexploited and at the risk of extinction. These include *Senna alata* (L.) Roxb. (2.95); *Cymbopogon citratus* (DC.) Stapf (2.85); *Morinda morindoides* (Baker) Milne-Redh.(2.70); *Pentadiplandra brazzeana* Baill.(2.55); *Millettia laurenti* De Wild.(2.52); *Senna occidentalis* (L.) Link (2.50).

3.4 Analysis of Organs Used and Routes of Administration

Figure 5 illustrates the weighting of the organs used during the management of hepatitis in Mbandaka and that of the routes of administration.

Note also that *Pycnanthus angolensis* (Welw.) Warb. (1.45) and *Phyllanthus amarus* Schumach. & Thonn.(1.12) *Chrysanthellum americanum* (1.05) and *Spirulina sp* (1.07) are the least threatened, as their VU is less than 1.50.

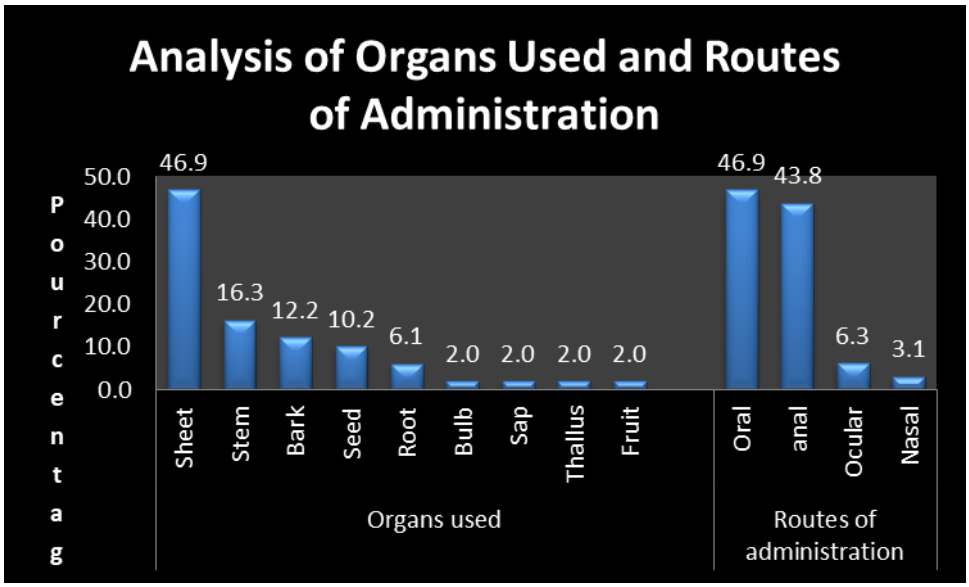

Figure 5 Analysis of Organs Used and Routes of Administration

Figure 5 shows that the leaves are the most used organs (46.9%). They are followed by stems (16.3%) stem bark (12.2%), seeds (10.2%), and roots (6.1%). The other organs are weakly solicited (2.0%).

On the other hand, the oral route takes precedence over the others (46.9%). It is followed by the anal route (43.8%). The ocular (6.3%) and nasal (3.1%) routes are the least recorded.

4. Discussion

Guinnin *et al.* [6] identified 54 plant species used in the treatment of hepatitis B and C in Benin. The inventory of plants harvested in Mbandaka for the same use is limited to 36. However, the two lists have 7 species in common, i.e. 7.78%. These are *Bridelia micrantha* (Hochst.) Baill., *Carica papaya* L., *Senna occidentalis* (L.) Link, *Elaeis guineensis* Jacq., *Garcinia kola* Heckel, *Jatropha curcas* L., *Phyllanthus amarus* Schumach. & Thonn. The coincidence between traditional healers far from each other and without physical contact gives credibility to their respective endogenous knowledge.

The traditional healers of Benin make the diagnosis of viral hepatitis B and C from the physiological state of the patient (jaundice, asthenia, headache, fever, insomnia, intolerance to fatty substances, accumulation of gas, pasty mouth, flu, etc.). Those from Burkina Faso Tibiri *et al.* [9] are based on visible physical symptoms such as yellowing of the skin and eyes, color changes in urine and feces, flank pain and severe fatigue.

The clinical evaluation of hepatitis B under traditional treatment in Mali retained the following clinical signs: jaundice, constipation, bloating, anorexia, headaches, arthralgia, nausea, vomiting, pruritus, fever, tenderness of the right hypochondrium [18]

In Mali, liver disease is the leading cause of consultation in the Traditional Medicine Department. The management of the liver disease is based on the use of interferons and antiretrovirals. Doumbia *et al.* [19] analyzed the chemical and antiradical constituents of aqueous extracts of *Acacia nilotica, Carica papaya, Citrus aurantifolia, Mitragyna inermis* and *Sarcocephalus latifolius*.

The combination of *Combretum micranthum* (Combretaceae) and *Cochlospermum tinctorium* (Cochlospermaceae) improves the clinical condition of patients and contributes to the reduction of transaminase values. In view of all these elements, phytotherapy has a place of choice in the therapeutic arsenal. It can be an alternative to the treatment of viral hepatitis, especially in developing countries [20]

The leaves of *Desmodium adscendens*., or the whole plant are frequently used in case of liver problems and hepatitis [21].

5. Conclusion

The present study aimed to establish a relationship between the level of education of traditional healers and their expertise in alternative medicine to treat viral hepatitis.

After investigation, the levels of illiteracy and primary education each represent 42.9% of women. Unlike men, women have neither a graduate degree nor a license, let alone a doctorate. On the other hand, 7.1% of men have the level of *graduat* and *licence*.

With regard to seniority in the profession, the segment under 10 years records 42.9% of women against 28.6% of men. Those between 11 and 30 include more men (57.1%) than women (42.9%). No respondent has more than 50 years of seniority in the profession.

The therapeutic arsenal includes 36 species divided into 25 families. The Fabaceae family is predominant with 5 species. It is followed by Poaceae (3 species), Asteraceae, Burseraceae, Clusiaceae, Euphorbiaceae, and Phyllanthaceae (2 species each). The other families are monospecific.

Considering Citation Frequency rates, species such as *Ageratum conyzoides* L., *Senna alata* (L.) Roxb., *Cymbopogon citratus* (DC.) Stapf, and *Millettia laurentii* De Wild. are the best-known among traditional healers involved in the treatment of hepatitis in traditional medicine in Mbandaka. Indeed, they display a Citation Frequency equivalent to 1.

On the other hand, the floristic analysis based on the Use Value indicates that certain species are overexploited. These include *Senna alata* (L.) Roxb. (2.95); *Cymbopogon citratus* (DC.) Stapf (2.85); *Morinda morindoides* (Baker) Milne-Redh.(2.70); *Pentadiplandra brazzeana* Baill.(2.55); *Millettia laurentii* De Wild.(2.52); *Senna occidentalis* (L.) Link (2.50).

Some species used by traditional healers in Mbandaka have proven their effectiveness elsewhere. These are *Bridelia micrantha* (Hochst.) Baill., *Carica papaya* L., *Senna occidentalis* (L.) Link, *Elaeis guineensis* Jacq., *Garcinia kola* Heckel, *Jatropha curcas* L., *Phyllanthus amarus* Schumach. & Thonn. The coincidence between traditional healers far from each other and without physical contact gives credibility to their respective endogenous knowledge.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

There is no conflict of interest among the authors of this manuscript.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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