Scientific Research Publishing

Open Journal of Gastroenterology, 2023, 13, 33-42
https://www.scirp.org/journal/ojgas
ISSN Online: 2163-9469
ISSN Print: 2163-9450

# Updated Review on the Panorama of Liver Diseases in Benin

**Jean Sehonou[1,2*], Aboudou Raïmi Kpossou[1,2], Celia Rosemonde Ablavi Mouzouvi[2,3], Comlan N'déhougbèa Martin Sokpon[1,2], Rodolph Koffi Vignon[1,2]**

[1]Hepato-Gastroenterology Department, National and University Hospital Hubert Koutoukou Maga (CNHU-HKM), Cotonou, Benin Republic
[2]Faculty of Health Sciences, University of Abomey-Calavi, Cotonou, Benin Republic
[3]Galenic Pharmacy and Pharmaceutical Technology Laboratory, Pharmacy Teaching and Research Unit, Faculty of Health Sciences, Cotonou, Benin Republic
Email: *jsehonou@yahoo.fr

**How to cite this paper:** Sehonou, J., Kpossou, A.R., Mouzouvi, C.R.A., Sokpon, C.N.M. and Vignon, R.K. (2023) Updated Review on the Panorama of Liver Diseases in Benin. *Open Journal of Gastroenterology*, **13**, 33-42.
https://doi.org/10.4236/ojgas.2023.131004

**Received:** November 28, 2022
**Accepted:** January 16, 2023
**Published:** January 19, 2023



## Abstract

**Introduction:** The aim of this work was to take stock of the epidemiological aspects of liver diseases in Benin. **Methods:** Two methods were used: documentary research and collection of the position of gastroenterologists on the subject. For the literature search, the sources interviewed were Medline, African Journal On Line (AJOL), Google and Google scholar. Additional searches were made on the websites of European gastroenterology societies (AFEF, EASL). A collection of the opinions of gastroenterologists, most of them members of the Beninese Society of Hepato-gastroenterology was made. **Results:** From a nosological point of view, the most frequent and serious liver diseases in Benin are mainly infectious: viral hepatitis B and C (9.9% and 4.12% of the general population in 2013). Bacterial liver diseases (ascites fluid infections and tuberculosis of the liver) come in 3rd position after cirrhosis and hepatocellular carcinoma. Amoebic abscesses of the liver tend to regress. The toxic causes are dominated, in addition to alcoholic liver diseases (steatosis, cirrhosis), by drug lesions: two fatal cases of hepatotoxicity by artesunate-amodiaquine combination and asymptomatic and transient cytolysis in 23.8% of 63 children less than 5 years old treated with arthemether-lumefantrine combination have been described. Phytotherapy, alone or in combination with modern drugs, can in some cases be hepatotoxic. Plants with recognized medicinal virtues (may be harmful to the liver (Senna, Moringa oleifera, tamarind). Chronic aflatoxicoses secondary to the consumption of contaminated food (maize, cassava or peanuts) are relatively under-documented. Overload diseases (in particular alcoholic or non-alcoholic fatty liver) are on the increase (3.19% of 662 ultrasounds in 1995 against 14.5% of 411 in 2011

in Cotonou) partly due to the demographic and nutritional transition underway in Benin. These diseases, often blamed on spells cast, lead to hospital deaths from cirrhosis or hepatocellular carcinoma in young economically active subjects. **Conclusion:** Despite anti-infectious therapeutic advances, the prevention of toxic and metabolic hepatopathies is essential. Clinical research is crucial.

## Keywords

Viral Hepatitis, Drug-Induced Hepatitis, Benin, Viral Hepatitis, Toxic Hepatitis

## 1. Introduction

Liver diseases are common in Benin. Their extent is not clearly defined. Piecemeal data exist, which relate to the most frequent diseases such as viral hepatitis. The frequency of the latter is estimated at 9.9% of the blood donor population for hepatitis B and 4.12% for hepatitis C [1].

They are responsible for significant morbidity: 20.82% (437/2098) of patients received between 1 January 2010 and 31 December 2016 in the Department of Hepato-Gastroenterology had a viral hepatitis B or C as the reason for consultation or hospitalisation [2].

Their clinical translation consists of jaundice (most often in the acute forms) and asthenia (in the chronic forms). On physical examination, a hepatomegaly is found (102/1930; 5.28% of cases of hospitalisation in the CNHU Department of Internal Medicine and Medical Oncology between 2012 and 2016) [3].

In the acute forms, the evolution is often towards recovery without sequelae, rarely towards hepatocellular insufficiency and death. Chronic forms evolve towards cirrhosis (46.6%) and liver cancer. This cancer is primary in 30.1% of cases and secondary in 13.6% of cases [4]. Mortality is also high (21/52 of patients hospitalised for cirrhosis had died) [5].

The present work takes stock of the different nosological entities of liver diseases in Benin and the costs inherent to their management.

## 2. Methods

Two methods were used: documentary research and the collection of the position of gastroenterologists on the subject. For the literature search, the sources interviewed were Medline, the African Journal on Line (AJOL), Google and Google scholar. Additional searches were made on the websites of European gastroenterology societies such as the Association Française pour l'Etude du Foie (AFEF) and the European Association for the Study of the Liver (EASL). In addition, a reading of the theses and dissertations produced at the Faculty of Health Sciences was also carried out. The key words were "hépatite ou hépato-

pathies—Republique du Bénin" for searches in French or "hepatitis, liver diseases—Republic of Benin". The opinions of the hepato-gastroenterologists of Benin, most of whom are members of the Beninese Society of Hepato-gastroenterology, were collected.

## 3. Results

### 3.1. Epidemiological Aspects

#### 3.1.1. Infectious Liver Diseases

- *The parasitic liver: amoebic abscess of the liver*

Between 1991 and 1995, Boco and Hountondji [6] reported 33 cases of liver abscess out of 577 abdominal ultrasounds performed in the CNHU's medical imaging department.

This pathology has become rare and anecdotal: no case was found in the series of 411 abdominal ultrasounds performed by a gastroenterologist between 2009 and 2011 [7]; this is due to the availability of a modern treatment, metronidazole. This effective treatment is often prescribed at all levels of the health chain in Benin. It is often the first drug used in self-medication for most colonic diseases.

- *Liver damage due to malaria*

Is under-documented. In a study of children under 60 months recruited at the Hôpital Mère Enfant Lagune (HOMEL), Sehonou *et al.* [8] found hepato-cytolysis corresponding to this entity in 5 out of 68 cases (7.35%).

- *Viral liver diseases*

On the other hand, viral hepatitis is common. Viral hepatitis B is often acquired in childhood by essentially horizontal transmission; it is a disease of the young male subject. Viral hepatitis C, on the other hand, is a disease of older women, transmitted mainly by parenteral transmission [2]. Both of these diseases predispose to cirrhosis and hepatocellular carcinoma (HCC).

**Table 1** with references [9]-[19] and **Table 2** with references [2] [10] [12] [16] [20] [21] [22] summarise the main Beninese studies of viral hepatitis B and C respectively.

- *Bacterial liver diseases*

Very few publications exist on bacterial infections in Benin.

#### 3.1.2. Toxic Liver Diseases

- *Alcohol-related causes*

They are favoured by a high prevalence of alcohol consumption in the general population. According to the STEPS-Benin 2015 survey [23], the percentage of adults aged 18 - 69 years who engage in episodic heavy drinking (six or more units/glasses of alcohol on a single occasion in the past 30 days) was 7.6% (11.3% among men, 3.9% among women). However, harmful alcohol consumption was relatively low (0.5% - 1% in men and 0.1% in women). They contribute to the occurrence of cirrhosis, which is the second most common cause of cirrhosis (13.3%) in Benin after viral hepatitis [5].

**Table 1.** Prevalence of viral hepatitis B (and/or delta) in various populations in Benin (2002-2019) [9]-[19].

| Authors [Reference] | Period | Hepatitis | Population | Sample size | Prevalence (%) |
|---|---|---|---|---|---|
| Kei [9] | 2002 | B | Blood donors | 500 | 4.8 |
| Ade [10] | 2005 | B | Blood donors | 7654 | 7.5 |
| Sehonou [11] | 2007 | B | HIV* at the CNHU-HKM** | 205 | 11.2 |
| Sehonou[12] | 2007 | B | HIV in Comè | 150 | 11.3 |
| Affolabi [13] | 2012 | B | HIV and tuberculosis in Cotonou | 171 | 11.1 |
| Amidou [14] | 2012 | B | Consultants at the CHD*** Parakou | 1516 | 13.9 |
| Sehonou [15] | 2013 | B | Hemodialysis patients in Cotonou | 140 | 6.0 |
| De Paschale [16] | 2014 | B | Pregnant women in Tanguiéta | 283 | 15.5 |
| Affolabi [17] | 2015 | B | Persons deprived of liberty in Cotonou Abomey, Parakou, Porto-Novo (Benin) | 503 | 11.7 |
| Kpossou [2] | 2016 | B | Consultants or hospitalized at the CNHU-HKM | 2060 | 15.2 |
| Saké [18] | 2019 | B | Pregnant women in Parakou | 214 | 14.0 |
| Kpossou [19] | 2019 | B + D | Patients with HBsAg in Cotonou (CNHU-HKM and Atinkanmey) | 156 | 3.8 |

*: Human immunodeficiency virus; **: National and University Hospital Hubert Koutoukou Maga; ***: departmental hospital centre.

**Table 2.** Prevalence of HCV antibodies in various studies in Benin (2002-2019) [2] [10] [12] [16] [20] [21] [22].

| Authors [reference] | Period | Population | Sample size | Prevalence (%) |
|---|---|---|---|---|
| Sehonou [20] | 2002 | Recruits of the Beninese Armed Forces | 506 | 7.5 |
| Sehonou [21] | 2003 | HIV in Cotonou | 103 | 3.0 |
| Ade [10] | 2005 | Blood donors | 7654 | 4.1 |
| Sehonou [22] | 2005 | Hemodialysis patients in Cotonou | 65 | 29.2 |
| Sehonou [12] | 2008 | HIV in Comè | 150 | 14.0 |
| De Pascale [16] | 2015 | Pregnant women in Tanguiéta | 283 | 7.4 |
| Kpossou [2] | 2016 | Consultants or hospitalized at the CNHU-HKM | 2060 | 5.7 |

- ***Drug-related causes***

Drug-induced liver damage is most often acute. The most frequently studied are liver diseases due to artemisinin derivatives. Two cases of fulminant hepatitis and one case of hepatonephritis have been reported respectively by Guévart *et al.* [24], and Sabi *et al.* [25].

However, the combination of arthemether and lumefantrine (AL), the basic treatment for malaria, is responsible for moderate, transient and often asymptomatic hepato-cytolysis. Out of 63 children aged between 6 and 59 months who had been given AL at therapeutic doses, this hepato-cytolysis was found in nine patients (14.28%) on the third day (D3), two patients (3.17%) on D7, four patients (6.34%) on D14 and zero patients (0%) on D21. It was always moderate (less than twice the upper limit of normal aminotransferases), transient (one to two weeks) and asymptomatic. Hepatitis B and C serologies were negative in all the children who presented with hepato-cytolysis. AL attribution was possible in 23.8% [8].

- ***Hepatopathies by phytoxicity: Case of aflatoxin***

Chronic aflatoxicosis is common in Benin; it is linked to the consumption of cereals contaminated by mycotoxins produced by Aspergillus flavus. According to a study published in 2017 on the quality of maize sold in markets in Benin and Niger, the number of maize samples with a contamination rate of more than 20 parts per billion (ppb) of aflatoxin was 29.5% among wholesalers, 9.1% among retailers, and 4.2% among producers [26].

Links are currently being established between poverty, food consumption of maize and hepatocellular carcinoma. However, aflatoxin appears to be involved in the genesis of HCC through its association with viral hepatitis B [27].

Liver diseases related to phytotoxicity have been little reported in Benin. However, phytotherapy is common: 80% of the Beninese population uses it at some point in their lives [28]. The medicinal properties of plants should not obscure their possible hepatic side effects. Moreover, there is currently a craze among the Beninese population for medicinal plants: among these, Moringa olifeira has been the subject of much research showing its beneficial properties in the treatment of certain metabolic (diabetes) and cardiovascular diseases. However, recent study describes that feeding obese mice with Moringa olifeira leaf extract had a beneficial effect on liver steatosis [29].

### 3.1.3. Liver Overload Disease

- ***Liver steatosis***

Overload diseases are dominated in Benin by hepatic steatosis, which has increased sonographically from 3.19% (21/662) in 1995 [30] to 14.5% (60/411) between 2009 and 2011 [7]. The reasons for this increase in prevalence are unclear. The causes could be metabolic: between 2008 and 2015 there was an increase in the prevalence of diabetes (2.6% to 12.4%), hypercholesterolemia (1.8% to 18.2%), low consumption of fruit and vegetables 78% to 93.1% and physical inactivity from 9% to 15.9%. However, over the same period, the prevalence of

obesity decreased from 9.4% to 7.4% [23].

Liver steatosis in people living with HIV [31] are described (102/259; 39.4%) as are liver steatoses in malnourished people (57/94; 60.6%) [32]. Steatoses linked to viral hepatitis B or C were frequent (36/339; 10.6%) [33]. They were associated with the presence of diabetes (20%), high blood pressure (18.7%) and alcohol consumption (12%), not necessarily linked to obesity, and have a particular pathophysiology. They are noted in subjects with excessive consumption of sugary drinks [34] [35].

- ***Iron overload***

Classically described as "African hemosiderosis" would be partly related to the consumption of local beer prepared and/or consumed in iron containers. It has been widely published in South Africa [36] [37] and Nigeria (8/98; 8.2% of apparently healthy women aged 26 - 71). In the latter case, self-prescription of iron for suspected anaemia could in some cases promote iron overload with liver and heart consequences [38].

It should be noted that autoimmune liver diseases (autoimmune hepatitis, primary biliary cholangitis) have been the subject of few publications. The weakness of the technical platform could partly explain this lack of information.

### 3.2. Therapeutic Aspects

Many therapeutic opportunities exist for hepatopathies: antiviral drugs, antivirals, improved traditional medicines. But prevention remains crucial: vaccination against hepatitis B, combating excessive alcohol consumption and obesity, improving the quality of food. In short, it is the fight for socio-economic development.

Research plays a key role in this fight.

### 3.3. Economic Aspects of Liver Diseases: A Challenge for Development

Liver diseases have a high cost. The direct costs, linked to diagnosis and treatment are often expensive: the diagnosis, involving the non-invasive evaluation of liver fibrosis and the viral load by polymerase chain reaction (PCR) amounts to approximately 350,000 F CFA (572 USD). The current treatment of viral hepatitis B by Interferon is of the order of 7,800,000 F (12,755 USD) for 48 weeks. That of hepatitis C is of the order of 900,000 to 1,500,000 F CFA (1472 to 2453 USD) for three months with direct action antiviral drugs in generic form.

The average cost per patient for the management of complicated cirrhosis was estimated at 300,080 F CFA (491 USD) for ascites, 344,406 F CFA (563 USD) for jaundice, 337,960 F CFA (553 USD) for digestive haemorrhage, and 331,690 F CFA (542 USD) for infections, 299,310 F CFA (489 USD) for hepatocellular carcinoma, 307,957 F CFA (504 USD) for hepatic encephalopathy, 267,480 F CFA (437 USD) for hematological disorders and 295,880 F CFA (484 USD) for hepato-renal syndrome [39].

To these direct costs must be added the indirect costs, for the individual (loss of vital energy, loss of productivity, years of life lost) and for society (loss of experience). To do this, cost-effectiveness analyses (CEA) are needed to put in place the different strategies for the prevention and management of viral hepatitis. As an example, the optimal management of viral hepatitis B would amount to 5% of Senegal's total health budget in 2012 [40]. In Benin there are are national social security plans and private insurance schemes, undertaking part of patients' medical expences. But the proportion of the population covered is currently quite low.

## 4. Discussion

On the evolutionary and therapeutic level, infectious liver diseases have a downward trend (decrease in viral hepatitis B and C). Thus, a study carried out in 2016 in a primary school in Gbahouté (Adjarra, Plateau department) showed a seroprevalence of hepatitis B of 1.6% (6/373) in children, compared with 8/44 (18%) in adults [41]; this is largely the result of hepatitis B vaccination introduced in Benin as part of the Expanded Programme on Immunisation since 2005. However, frequencies in the general population remain high, especially among adults. Conversely, toxic causes (alcoholism, drugs, phytotherapy) and metabolic causes (non-alcoholic hepatic steatosis) are on the increase.

Efforts should be made in the direction of health education to avoid replacing the infectious scourge by the metabolic or toxic one.

## 5. Conclusion

These liver diseases, which can lead to early death, can be prevented either by vaccination or by improving living conditions, or by providing therapeutic care for those already infected. Health education and the promotion of socio-economic development in Benin are major weapons in this fight. Research plays a fundamental role.

## Conflicts of Interest

The authors declare no conflict of interest in this work.

## Authors' Contribution

All the authors were involved in the active writing and editing of the article. All authors have read and approved the final version of the manuscript.

## References

[1] Kodjoh, N. (2015) Situation de la lutte contre les hépatites virales B et C en Afrique. *Médecine et Santé Tropicales*, **25**, 141-144.

[2] Kpossou, A.R., Sehonou, J., Wanvoegbe, F.A., *et al.* (2019) Hépatites virale B et C: Aspects épdemologiues et cliniques au Centre National Hospitalier et Universitaire de Cotonou. *Médecine d'Afrique Noire*, **66**, 5-12.

[3] Sehonou, J., Dodo, L.R.S., Azon-Kouanou, A., *et al.* (2017) Profil clinique et étiologique des hépatomégalies au Centre National Hospitlaier et Universitaire HKM de Cotonou. *Journal de la Société de Biologie Clinique du Bénin*, **27**, 10-14.

[4] Sehonou, J., Dodo, L.R.S., Azon-Kouanou, A., *et al.* (2017) Profil épidémiologique et diagnostique du carcinome hépatocellulaire dans le service de Médecine Interne du CNHU-HKM de Cotonou. *Journal de la Société de Biologie Clinique du Bénin*, **27**, 47-51.

[5] Sehonou, J., Kodjoh, N., Saké, K., and Mouala, C. (2010) Cirrhose hépatique à Cotonou (République du Bénin): Aspects cliniques et facteurs liés au décès. *Médecine et Santé Tropicales*, **70**, 375-378.

[6] Boco, V. and Hountondji, A. (1996) Echographie et abcès amibien du foie: Au sujet de 33 cas. *Cahiers Santé*, **6**, 157-160.

[7] Sehonou, J. and Hounto, F. (2011) Apport de l'échographie dans le diagnostic des affections abdominales de patients consultant un gastroentérologue. Poster aux 14e Journées Africaines Francophones de formation continue en Hépatogastroenterologie. Brazzaville. https://www.sahge.org/jgaf/14emes-jgaf/communications-affichees

[8] Sehonou, J., Ogouyemi-Hounto, A., Kodjoh, N., *et al.* (2009) Tolérance hépatique de l'association Artéméther-Luméfantrine dans le traitement de l'accès palustre simple chez des enfants au Bénin. *Journal Africain d'Hépato-Gastroentérologie*, **3**, 67-70. https://doi.org/10.1007/s12157-009-0084-y

[9] Fujiwara, K., Tanaka, Y., Orito, E., *et al.* (2005) Distribution of HBV Genotypes among HBV Carriers in Benin: Phylogenetic Analysis and Virological Characteristics of HBV Genotype E. *World Journal of Gastroenterology*, **11**, 6410-6415. https://doi.org/10.3748/wjg.v11.i41.6410

[10] Ade, G., Bigot, A., Sehonou, J., *et al.* (2005) Prévalence des marqueurs sérologiques des Virus des hépatites B et C chez les donneurs de sang à Cotonou. *Le Bénin Médical*, **29**, 74-76.

[11] Sehonou, J., Fiogbe, A., *et al.* (2010) Co-infection VIH-VHB chez des patients sous traitement antirétroviral au Centre National Hospitalier et Universitaire de Cotonou (République du Bénin). *Revue du C.A.M.E.S.—Serie A*, **10**, 85-89.

[12] Sehonou, J., Zannou, D.M., Azon Kouanou A., *et al.* (2012) Prévalence et facteurs de risque de portage de l'Ag HBs et des anticorps anti-virus de l'hépatite C chez des patients traités pour SIDA à Comè. Co-infection hépatites et VIH à Comè. *Journal de la Société de Biologie Clinique*, **17**, 14-20.

[13] Affolabi, D., Ade, G., Faïhun, F., *et al.* (2012) Double infection par le Virus de l'immunodéficience humaine et par le virus de l'hépatite B chez les tuberculeux à Cotonou. *Journal de la Société de Biologie Clinique*, **16**, 29-33.

[14] Amidou, S.A., Dovonou, C.A., Houehanou, C., *et al.* (2018) Prévalence de l'hépatite B chronique selon le statut sérologique VIH à Parakou au Bénin. *The Pan African Medical Journal*, **30**, 180. https://doi.org/10.11604/pamj.2018.30.180.16117

[15] Sehonou, J., Ade, G., Azon Kouanou, A., *et al.* (2012) Séroprevalence et facteurs associés au portage des anticorps anti-Virus de l'hepatite C chez des patients insuffisants rénaux traités par hémodialyse à Cotonou. *Journal de la Société de Biologie Clinique du Bénin*, **16**, 34-38.

[16] De Paschale, M., Ceriani, C., Cerulli, T., *et al.* (2014) Prevalence of HBV, HDV, HCV, and HIV Infection during Pregnancy in Northern Benin. *Journal of Medical Virology*, **86**, 1281-1287. https://doi.org/10.1002/jmv.23951

[17] Affolabi, D., Ahoussinou, N.H.B.B., Agbodande, A., *et al.* (2018) Infection par le VIH et hépatite virale B dans les prisons au Bénin: Etat des lieux. *Journal de la*

*Société de Biologie Clinique du Bénin*, **28**, 5-8.

[18] Saké, A.K., Imorou, R.S., Sonombiti, H., *et al.* (2019) Séroprévalence et facteurs associés à l'hépatite virale B chez les gestantes à Parakou en République du Bénin. *The Pan African Medical Journal*, **33**, 22. https://doi.org/10.11604/pamj.2019.33.226.19429

[19] Kpossou, A.R., Zomahoun, A.M.O., Sogbo, F., *et al.* (2019) Influence de l'infection par le virus de l'hépatite Delta sur le profil évolutif de l'infection par le VHB à Cotonou, *Médecine d'Afrique Noire*, **66**, 493-498.

[20] Sehonou, J., Atadokpede, F., Abdoulaye, I., *et al.* (2007) Séroprévalence des anticorps anti-virus de l'hepatite C dans une population de jeunes recrues au Bénin. *Journal Africain d'Hépato-Gastroentérologie*, **1**, 103-105. https://doi.org/10.1007/s12157-007-0025-6

[21] Sehonou, J., Kodjoh, N. and Atadokpede F. (2008) Prevalence des anticorps antivirus de l'hépatite C chez des patients porteurs de Sida sous traitement à Cotonou. *Journal Africain d'Hepato-Gastroenterologie*, **4**, 163-166. https://doi.org/10.1007/s12157-008-0059-4

[22] Chevaliez, S., Brillet, R., Sehonou, J., *et al.* (2007) Outbreak of a New Hepatitis C Virus Subtype (subtype 1M) in a Hemodialysis Unit. *Hepatology*, **46**, 624A. https://doi.org/10.1016/S0168-8278(08)60726-6

[23] Ministère de la Santé. Direction Nationale de la Santé Publique. Programme National de Lutte contre les Maladies Non Transmissibles (PNLMNT) (2016) Rapport final de l'enquête pour la surveillance des facteurs de risque des maladies non transmissibles par l'approche "STEPSwise" de l'OMS. ENQUETE "STEPS 2015" au Bénin. OMS. 152 p. https://untobaccocontrol.org/impldb/wp-content/uploads/benin_2018_annex-1_STEPs_2015.pdf

[24] Guévart, E. and Aguémon, A. (2009) Deux hépatites fulminantes survenues au cours d'un traitement curatif par l'association artésunate-amodiaquine. *Médecine et Maladies Infectieuses*, **39**, 57-60. https://doi.org/10.1016/j.medmal.2008.09.024

[25] Sabi, K.A., Kaza, B.N.K., Amekoudi, E.Y., *et al.* (2017) Hepatonephritis Associated with Artemether: Report Case. *Therapie*, **72**, 409-410. https://doi.org/10.1016/j.therap.2016.10.003

[26] Bakoye, O.N., Baoua, I.B., Seyni, H., *et al.* (2017) Quality of Maize for Sale in Markets in Benin and Niger. *Journal of Stored Products Research*, **71**, 99-105. https://doi.org/10.1016/j.jspr.2017.02.001

[27] Manda, P., Adépo, A.J.P., Kouassi M'bengue, A., *et al.* (2018) Évaluation du rôle de l'aflatoxine B1 dans l'apparition du carcinome hépatocellulaire en Côte d'Ivoire: Etude préliminaire. *Toxicologie Analytique et Clinique*, **30**, 85-95. https://doi.org/10.1016/j.toxac.2018.02.001

[28] OMS (2013) Renforcement du rôle de la médecine traditionnelle dans les systèmes de santé: Une stratégie pour la région Afrique 2013. AFR/RC63/6. Comité régional de l'Afrique, 63. Renforcement du rôle de la médecine traditionnelle dans les systèmes de santé: Une stratégie pour la Région africaine: Rapport du secrétariat. OMS. Bureau régional de l'Afrique. https://apps.who.int/iris/handle/10665/96605

[29] Attakpa, E.S., Sangaré, M.M., Behanzin, G.J., *et al.* (2017) *Moringa olifeira* Lam. Stimulates Activation of the Insulin-Dependent Akt Pathway. Antidiabetic Effect in a Diet-Induced Obesity (DIO) Mouse Model. *Folia Biologica* (*Praha*), **63**, 42-51.

[30] Boco, V. and Hountondji, A. (1996) Bilan de quatre années d'exploration échographique de la pathologie hépatique au CNHU de Cotonou: A propos de 632

examens. *Cahiers Santé*, **6**, 151-155.

[31] Bonou, N.O. (2017) Stéatose hépatique chez les personnes vivant avec le VIH: Prévalence et facteurs associés au CNHU HKM de Cotonou. Thèse de Médecine, Faculté des Sciences de la Santé, Université d'Abomey-Calavi, Cotonou, 165 p.

[32] Dakin, M. (2017) Aspects échographiques de la stéatose hépatique chez l'enfant malnutri: Corrélation radio-clinico-biologique. Thèse de Médecine, Faculté des Sciences de la Santé, Université d'Abomey-Calavi, Cotonou, 124 p.

[33] Sokpon, C.N.M., Kpossou, A.R., Séhonou, J., *et al.* (2019) Stéatose hépatique échographique chez les patients suivis pour hépatites virales B et/ou C à Cotonou: Prévalence et facteurs associés. *Journal de la Société de Biologie Clinique du Bénin*, **31**, 56-60.

[34] Zelber-Sagi, S., Nitzan-Kaluski, D., Goldsmith, R., *et al.* (2007) Long-Term Nutritional Intake and the Risk for Non-Alcoholic Fatty Liver Disease (NAFLD): A Population Based Study. *Journal of Hepatology*, **47**, 711-717. https://doi.org/10.1016/j.jhep.2007.06.020

[35] Yousef, M.H., Al Juboori, A., Albarrak, A.A., *et al.* (2017) Fatty Liver without a Large "Belly": Magnified Review of Nonalcoholic Fatty Liver Disease in Non-Obese Patient. *World Journal of Gastrointestinal Pathophysiology*, **8**, 100-107. https://doi.org/10.4291/wjgp.v8.i3.100

[36] Gordeuk, V.R. (2002) African Iron Overload. *Seminars in Hematology*, **39**, 263-269. https://doi.org/10.1053/shem.2002.35636

[37] Kasvosve, I., Gangaidzo, I.T., Gomo, Z.A., and Gordeuk, V.R. (2000) African Iron Overload. *Acta Clinica Belgica*, **55**, 88-93. https://doi.org/10.1080/17843286.2000.11754276

[38] Fasola, F.A., Anetor, J.I. and Ilesanmi, O.S. (2013) An Investigation of the Prevalence of Iron Overload in Nigerian Women. *African Journal of Medicine and Medical Sciences*, **42**, 231-237.

[39] Wollo, T.A.B. (2015) Aspects épidemiologiques, étiologiques et économiques de la cirrhose hépatique dans le service de médecine interne du CNHU-HKM de Cotonou. Thèse de Médecine N° 1763, Faculté des Sciences de la Santé, Université d'Abomey-Calavi, Cotonou, 105 p.

[40] Agbassi, Y.J.P. (2014) Coût annuel de l'hépatite B au Sénégal. [Mémoire de DES Economie de Santé]. CESAG, Dakar, 66 p. http://bibliotheque.cesag.sn/index.php?lvl=notice_display&id=12199

[41] Agossou, R. and Nouel, O. (2017) Dépistage par TROD de l'Ag HBs dans une école rurale du Sud Bénin. Résultats d'une journée de dépistage systématique chez 417 personnes. Poster JFOD 2017. Paris 23-26 mars 2017. Poster 60, page 99. https://www.snfge.org/sites/default/files/SNFGE/JFHOD/jfhod_2017_resumes_vf.pdf