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Research Article

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Chronic Viral Hepatitis B: Epidemio-Clinical, Paraclinical and Evolutionary Aspects of Patients on Tenofovir in A Decentralized Area in Senegal

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ABSTRACT

Introduction: Chronic hepatitis B is a widespread disease worldwide. The WHO estimates that there were 260 million chronic carriers in 2019 with 820,000 deaths per year. In Senegal, there is a prevalence of 8.5% of HBV carriers with 17% of chronic carriers. As part of its management, an assessment is necessary to define the stage of the infection and the appropriate treatment strategy. The general objective of this study was to determine the evolution of the clinical and paraclinical parameters studied during the monitoring of patients under antiviral treatment.

Methodology: Open, descriptive, retrospective cohort study with analytical aim, conducted in the period from January 1, 2017 to June 30, 2022. Included were all patients aged 18 years or older, followed as outpatients for chronic hepatitis B and treated with Tenofovir disoproxil fumarate in two internal medicine departments of hospitals in the Thiès region of Senegal.

Results: We collected 48 cases of chronic carriers of the hepatitis B virus. The predominance was male (58.33%) with a sex ratio of 1.4. The discovery was fortuitous in 64.58% of cases. The clinical signs were dominated by the alteration of the general condition (14.58%) followed by abdominal pain (18.75%) and physical asthenia (8.33%). The HBV viral load was performed in all patients with a mean level of 24,424,931.5 IU/mL (±124,213,733.4 IU/mL). Fibroscan was performed in 43 patients (89.58%) with a mean value of 9.38 kPa ±11.11. The mean duration of treatment was 31 months (9-53 months). At the end of the study period, 21 patients were followed up regularly and 28 were lost to follow-up. There were 19 patients with an undetectable viral load, and 2 who had reactivation of viral replication.

Conclusion: The management of chronic HBV infection is complex in low-income countries. It requires therapeutic compliance and strict and rigorous monitoring of the evaluation of clinical and paraclinical parameters in decentralized areas.

Introduction

Chronic hepatitis B is one of the most widespread diseases in the world; approximately one third of the world's population has serological markers indicating a past or current infection with the Hepatitis B Virus (HBV). The WHO estimates that there are 260 million chronic carriers in 2019 with 820,000 deaths per year due to complications (hepatocellular carcinoma "HCC" or cirrhosis) [1].

Viral hepatitis B constitutes a major public health problem in sub-Saharan Africa with approximately 65 million chronic carriers and 56,000 deaths per year [2]. Senegal is one of the areas of high endemicity with a prevalence of 8.5% of HBV carriers in the general population where there are 17% of chronic carriers. According to some studies, this number would be slightly overestimated and only 10% or even 11% of adults would be chronic carriers of HBV [3].

Chronic HBV infection is a dynamic process, the natural history of which can be divided into 5 phases. not necessarily sequential (HBeAg positive chronic infection, HBeAg positive chronic hepatitis B, HBeAg negative chronic infection, HBeAg negative chronic hepatitis B and HBsAg loss phase. Since viral multiplication itself is not cytopathogenic, virological control and hepatic necroinflammatory lesions are linked to interactions between viral replication and the host immune system [4]. Before starting treatment, it is necessary to carry out an assessment not only to define the stage of the infection but

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also to define an adequate treatment strategy. This assessment aims to monitor or prevent the occurrence of complications or signs of poor prognosis [4]. The general objective of this study was to determine the evolution of the clinical and paraclinical parameters studied during the monitoring of patients under antiviral treatment.

Material and Method

This is an open, descriptive, retrospective cohort study with analytical aims, conducted from the records of patients screened and monitored for chronic hepatitis B on an outpatient basis, from January 1, 2017 to June 30, 2022 (66 months).

The population of our study consisted of all patients seen in consultation and followed up as outpatients for chronic hepatitis B in the internal medicine departments of the Barthimée de Thiès and Abdou Aziz Sy Dabakh de Tivaouane hospitals in Senegal.

We included all patients aged at least 18 years, with chronic viral hepatitis B and treated with tenofovir diproxyl fumarate (TDF) at a dosage of 300 g/day. We did not include patients with incomplete records or investigations. A structured survey form was established and administered by medical staff at each scheduled annual consultation. The form included the following parameters:

- Clinical signs: sociodemographic data, deterioration of general condition, jaundice, hepatomegaly, hepatitis insufficiency syndrome hepatocellular, cholestasis syndrome…
- Biological signs: Numeration blood count (CBC), aspartate aminotransferase (SGOT), alanine aminotransferase (SGPT) Gamma Glutamyl-Transferase (GGT), Alkaline Phosphatase (ALP), Total Cholesterol, HDL Cholesterol, LDL Cholesterol, Triglyceride, Proth Raterombin (TP)-Time of Cephalinactivated (TCA), Bilirubin, dosage of 'Viral DNA, the biological markers of hepatitis B
- Fibroscan, abdominal ultrasound
- Clinical and paraclinical data on the evolution under treatment.

General Criteria for Eligibility for Treatment

The introduction of antiviral treatment is recommended:

- In case of cirrhosis (compensated or decompensated) with detectable HBV DNA (grade A), in case of (grade A): hepatits HBeAg + with HBV DNA > 20.000 IU/mL and elevation of SGPT>2N or significant fibrosis (≥F2)
- Hepatitis Ag Hbe - with HBV DNA > 2.000 IU/mL and elevated SGPT > N or significant fibrosis (≥F2)
- hepatocellular carcinoma (HCC), regardless of the stage of viral B infection, the stage of liver fibrosis and the stage of HCC;
- extrahepatic manifestations related to HBV;
- coinfection with the virus of Hepatitis D (HVD)or the Virus of Human Immunodeficiency Virus (HIV).

Antiviral treatment should be considered systematically in case of family history of cirrhosis or hepatocellular carcinoma; if HBsAg is positive, treatment was initiated for viral loads greater than 2000 copies.

The data were used using Excel 2016 and Prism 8.0 software. In the descriptive analysis, qualitative variables were described by frequency tables, bar charts. Quantitative variables were described by their position parameters (mean, median) and dispersion (standard deviation, extremes). Ethically, we respected anonymity for each patient file followed during treatment and obtained consent to participate in the study.

Results

During our study, we collected 48 cases of chronic hepatitis B virus (HBV) carriers eligible for antiviral treatment followed over a period of 66 months from January 2017 to June 2022. During HBV screening, 12 women were pregnant.

Initial Assessment

The sociodemographic and clinical characteristics are presented in Table I. The population of our study consisted mainly of men (58.33%) with a sex ratio of 1.4. The mean age of the patients was 34.23 years ±10.2 with a median of 32 years [18 years -74 years]. The age group of 29 to 39 years was the most represented. The main circumstance of discovery was an incidental discovery (64.58%). A personal history of jaundice was found in 2 patients. Only a notion of herbal medicine was found in 1 patient.

Table 1: Patient characteristics

Age	34.23 (18 - 74)	
Sex		
Man	28	58.33%
Women	20	41.67%
Socio-economic level		
Weak	21	43.75%
AVERAGE	17	35.42%
Other	10	20.83%
Marital status		
Married	23	47.92%
Bachelor	3	6.25%
Not specified	22	45.83%
Circumstances of discovery		
Fortuitous	31	64.58%
Prenatal check-up	12	25%
Blood donation	5	10.42%
Concept of family carrying	9	18.75%
Clinical signs		
AEG	14	29.16%
Arthralgia	3	6.25%
Asthenia	4	8.33%
Abdominal pain	9	18.75%
Jaundice	2	4.17%
Dyspepsia	1	2.08%
Vomiting	1	2.08%
Hepatomegaly	1	2.08%

The notion of familial HBsAg carriership with a notion of unspecified liver cancer was found in the first-degree relatives of 9 patients.

The clinical signs were dominated by general condition alteration (GCA) (14.58%) followed by abdominal pain (18.75%) and physical asthenia (8.33%).

Fifteen patients (36.58%) had an increase in the SGPT level with an average of 41.51 IU/L [12-221 IU/L] on 41 tests performed. Elevation of bilirubin was observed in 5 patients out of 9 tests. Elevation of Gamma Glutamyl Transferase (GGT) in one patient out of 3. The prothrombin rate (PT) was performed in 15 patients (31.25%). It was lowered in only one case. Anemia was found in three patients with an average hemoglobin level of 11.3g/dl. Thrombocytopenia was observed in five patients. Creatinine levels were increased in 1 of 5 patients. Triglyceride levels were normal in all patients, mean total cholesterol levels were 2.03 [1.78-2.29], with mean levels of 0.42 for HDL and 1.56 for LDL. HBV viral load (VL) was performed in all patients.

It was less than 2,000 IU/mL or 3 log in 11 patients (22.92%). The viral load was between 2,000 and 20,000 IU/mL in 21 patients (42.75%) and was greater than 20,000 IU/mL (4.3 log) in 16 patients (33.33%). The mean rate was 24,424,931.5 IU/mL (±124,213,733.4 IU/mL) or 7.4 log with a median of 5,815 IU/mL.

In Table 2, we represent the number of patients according to the viral load.

Table 2: Distribution of patients according to viral load

CV (IU/mL)	Effective	Extremes	Percentage (%)
<2,000	21	15 - 1,730	22.92
2,000-20,000	21	2,110 - 19,700	42.75
>20,000	16	20 778 - 847 107 438	33.33

AntiHBc Ac testing was performed in 5 patients and was positive in all cases. HBeAg and its antibody testing was performed in 21 patients (43.75%). Several situations were found (table 3).

Table 3: AgHBe/Ac antiHBe status according to the number

Serological status	Effective
AgHBe (+) / Ac antiHBe (-)	1
AgHBe (-) / Ac antiHBe (-)	1
Ac anti Hbe (-)	2
AgHBe (+) / Ac antiHBe (+)	1
AgHBe (-) / Ac antiHbe (+)	14
AgHBe (+)	1
AgHbe (-)	1

Retroviral serology (SRV) was performed in ten patients and was negative. Hepatitis C serology was negative in 12 patients. Hepatitis D serology was performed in 6 patients and was negative. Fibroscan (Table 4) was performed in 43 patients (89.58%) with a mean value of 9.38 kPa ±11.11 and a median 7.35 kPa [3.3-34.8 kPa].

Abdominal ultrasound was performed in 32 patients (66.67%), of whom 24 had a normal ultrasound (75%). It found hepatic dysmorphism in 2 patients, diffuse heterogeneous hepatic steatosis in 3 patients, heterogeneous liver in 2 patients, irregular hepatomegaly in 1 patient.

Table 4: Distribution of patients according to anomalies found in fibroscan

Results	Effective
Normal	21
Minimal fibrosis	10
Moderate fibrosis	8
Severe fibrosis	1
Cirrhosis	3

Oesophagogastroduodenal fibroscopy (OGDF) was performed in six patients. It found stage 2 esophageal varices in one patient, Helicobacter Pylori (HP) gastritis in three patients. Endoscopy was normal in two patients.

Treatment consisted of tenofovir disoproxil fumarate (TDF) and was initiated in 100% of patients at a dose of 300 mg/day. The mean duration of treatment was 31 months (range, 9-53 months). Treatment duration was reported in 31 patients. The majority of patients (n=21) had a treatment duration of 40-88 weeks, followed by 90-212 weeks in 9 patients. One patient had a duration of 36 weeks.

Monitoring and Evolution

After the initiation of treatment, 17 patients were lost to follow-up (35.42%) at 12 weeks of follow-up. No clinical complications or deaths were recorded.

All patients tested had a normalization of the SGPT level. The dosage of Alpha fetoprotein (AFP) was carried out in 10 patients with 9 having a normal level. The patient with a level at 32.37 ng/ml had developed a HCC. In the follow-up, no patient benefited from the search for seroconversion or the disappearance of viral serological markers.

After 12 weeks of treatment, there was a significant decrease in viral load which was undetectable in 14 patients and remained high in 8 patients [13-955000 IU/ml]. After 24 weeks of treatment 23 patients were reviewed in consultation with 17 who had undetectable VL, 2 patients whose viral load remained high and 4 patients who had reactivation of viral replication.

Thirty-six weeks after the start of treatment, 16 patients were seen in consultation, of whom 13 had undetectable CV and 3 patients had reactivation of viral replication.

At the end of the 212 weeks of our study, 21 patients were followed up regularly and 28 were lost to follow-up. There were 19 patients with an undetectable viral load, and 2 who had a reactivation of viral replication.

A follow-up ultrasound scan was performed in 13 patients (27.08%) with normal ultrasound scans in 9 (69.23%). Two patients had hepatic steatosis, one case had multinodular liver and hepatic dysmorphism. Fibroscan was performed in 6 patients (12.5%) with a mean level of 8.32 kPa [4.4-19 kPa]. A decrease in the level was observed in 5 of these patients under treatment, but one patient with a value of 14 kPa before treatment increased

to 19 kPa after 6 months of treatment. This patient had a high viral load before and after treatment.

Figure 1 illustrates the combined evolution of biological parameters (CV, SGPT) and fibroscan during follow-up.

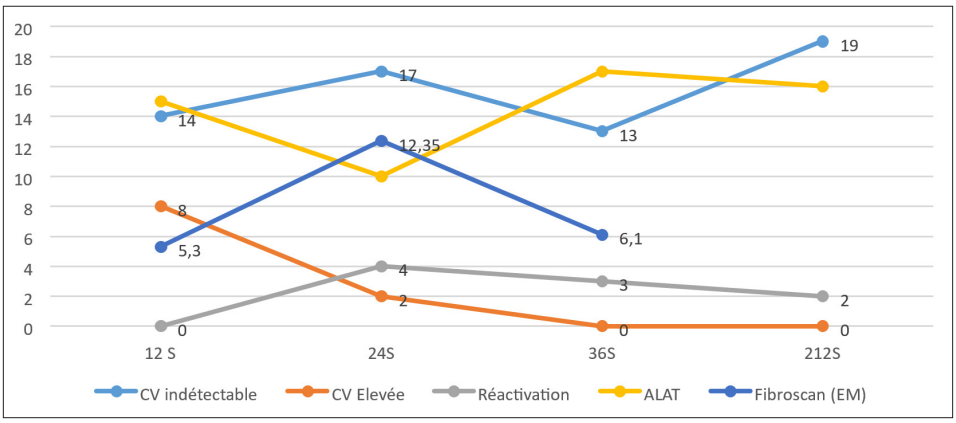

Figure 1: Evolution of the different biological parameters and the fibroscan in the follow-up

Discussion Initial Assessment

In our study, we found a juvenile predominance with an average age of 34.23 years ±10.2 [18-74 years] and the most represented age group is between 29 and 39 years. This observation is similar to the studies carried out by Apendi et al in Brazzaville in 2020 which found an average age of 35 years [5]. Diallo et al, in 2018 in Senegal found an average age of 33 years [6]. Other studies have found a higher average age, this is the case of Lovett et al in Australia in 2017 with an average age of 46 years [7].

The young age in our study could be explained by the fact that Senegal is not only a country with a high endemicity, where the infection is contracted during the perinatal period with a high risk of becoming chronic but also by the fact that the Senegalese population is young as shown by the national figures from 2019 which show an average age of 19 years [2,6].

We found a male predominance with a sex ratio of 1.4. This observation was made in the study by Diallo et al predominantly male and young in Senegal, also Cissé et al in 2019 who found a sex ratio of 2.2, Ntagirabiri for a sex ratio of 0.91, and Lovett et al reported a sex ratio of 2.28 [6-9].

This predominance could be explained by risky sexual behavior, promiscuity and also by the fact that injecting drug users are often male.

Familial carriage of HBsAg was present in 27.08% of cases. They were screened after the identification of HBV as the etiology of liver disease. Some studies found similar results: Apendi et al found familial carriage of HBsAg and liver disease in a small proportion of patients [5]. Bobilwindé in 2021 in Ouagadougou found 10 patients who had a family history of HBV carriage with 3 having developed HCC [10]. The promiscuity in the population favoring the sharing of personal effects (towels, toothbrushes, chewing gum) and the silent progression of the disease explain these results on familial carriage.

Systematic screening of relatives of a patient carrying HBV should be carried out because they are among those at risk.

Systematic screening allowed to follow 64.58% of patients, prenatal assessment 25% and blood donation 10.42%. This is comparable to the aforementioned studies Diallo and Apendi and Bobilwindé [5,6,10]. Most studies confirm this fortuitous discovery in asymptomatic patients. This is explained by the fact that the infection heals spontaneously in the majority of cases and in a small proportion, it can become chronic [11].

The physical examination at the time of screening was normal in 95.83% of cases, which is consistent with the literature [11]. The disease being silent in its chronic form, it causes few physical manifestations [11]. Diallo and Bobilwindé found a normal examination in 58.6% and 79.4% of their patients respectively [7,10].

We found a normal SGPT level in 26 patients with a mean level of 41.51 IU/L [12-221 IU/L]. But these results should be taken with caution because of the fluctuating nature of the SGPT level during the course of the infection as described in the literature [11].

At the initial exploration, renal function was sought in 5 patients and only 1 had a high serum creatinine level of 15 mg/l. This serum creatinine was normal during follow-up in 11 patients. The renal function test before the initiation of treatment is important because it allows to highlight in the follow-up a possible deterioration of renal tolerance compared to TDF and thus to adjust the dose of the treatment according to the state of the kidneys [12].

Thrombocytopenia was found in 5 patients without any evidence of hemorrhage. Only one patient had cirrhosis and his thrombocytopenia could be a hematological manifestation as described in the literature [13].

For the HBV viral load, we found an average rate of 24,424,931.5 IU/Ml or 7.4 log. In their studies, Diallo, Apendi, Bobilwindé found respectively 4.5 log; 3.02 log;7.9 log The progression of the infection towards the appearance of complications depends on the persistence of viral replication [5,6,10].

The AgHBe-/Ac antiHBe + profile was predominant in the patients tested. They would be carriers of the pre-core mutant virus which was not systematically sought in our study. In their study, Bobilwindé et al found this profile in 9 patients out of the 12 patients tested [10]. This difference between our results and some studies would be due to the low proportion of patients tested, and the size of our sample. Many studies have shown the predominance of the mutant virus and the increase in the prevalence of chronic mutant hepatitis to the detriment of the wild virus. This would even be the form mainly found in black Africa, in the countries of the Mediterranean basin and the Middle East. Studies have shown that patients carrying the pre-core mutant virus have more severe symptoms that do not depend on the HBe status, but are attributable to the age of the patient and the longer duration of the disease, because the mutation occurs during the natural history of the infection. The DNA level is lower in patients carrying the mutated virus with fluctuations in viral load and transaminases [6].

The search for co-infections is important. The mortality rate in these patients is higher than in patients with mono HBV infection, and their management is different [6].

In our study, no cases of HIV co-infection were detected. HIV screening in patients with HBV is necessary because the interaction between these two pathologies has serious consequences. HIV and HBV share the same modes of transmission, hence the high prevalence of co-infection of these two viruses. HIV causes rapid worsening and progression to complications of hepatitis B [4].

No cases of HBV/HCV co-infection were found in 25% of the patients tested. The prevalence of HBV/HCV co-infection is between 5 and 20% with a very variable geographical distribution. In Senegal it is of the order of 1.7% according to national figures against 24.3% found in France by Larsen et al [6,9]. The search for HCV is important because of the high risk of progression to cirrhosis on the one hand, and on the other hand, for adequate management.

HDV testing was performed in 12.5% of patients and was negative. Epidemiological data on HDV are weak. HDV plays an aggravating role in the progression of hepatitis B infection, hence the importance of screening [6].

Abdominal ultrasound is important in the initial examination. Eight patients had liver abnormalities that suggest progression to complications. These patients had high viral load and elevated transaminases.

Only one patient was a carrier of the pre-core mutant virus. These data were consistent with the literature. Abdominal ultrasound is more useful in monitoring the infection for the detection of complications [4]. FOGD was performed before the initiation of TDF in 6 patients, 2 of whom had no lesions. In three patients who presented with ulcerative epigastralgia at the clinic, HP gastritis was found, without dysplastic lesions. One patient presented with grade 2 esophageal varices.

Fibroscan was performed in patients in our study to assess fibrosis, liver biopsy puncture (LBP) is less and less used especially in countries with limited resources [2].

Fibroscan is currently the gold standard in resource-limited countries in the detection of fibrosis, it is a very simple, non-invasive examination with good reproducibility for the assessment of fibrosis [4]. The fibroscan device used in our study provided information only on the elasticity of the liver. Lesions such as necroinflammation and fibrosis lead to the development of complications such as cirrhosis and HCC. This is why it is important to detect these lesions and follow them up [4].

Fibroscan, in our study, was performed in 43 patients and was normal in 48.84%. Three cases of cirrhosis (6.97%) were identified, 1 case of severe fibrosis (2.35%), 8 cases of moderate fibrosis (18.6%) and 10 cases of minimal fibrosis (23.25%). Our study found an average rate of 9.38 kPa [3.5-34.8 kPa].

Ntagirabiri et al in 2016 found a rate of 7 kPa while Touré et al in 2017 found 7.59 kPa [14,15]. Cases of cirrhosis demonstrated by fibroscan, in young male subjects with normal physical examination. The fibroscan results correlated with the ultrasound abnormalities (one patient had a heterogeneous liver, the second a regular homogeneous hepatomegaly and the third a hepatic dysmorphism). Two patients had a high CV and the third a CV < 2,000 IU/mL with elevated transaminases in all 3 patients.

Although it is a simple and reliable examination, it has failure factors such as the limited experience of the operator and obesity in the patient. In our study, we have a case that is in contradiction with the biological and ultrasound results. It was a woman with no particular pathological history, whose diagnosis of chronic hepatitis B was made during an assessment initiated by the practitioner in the face of persistent abdominal pain. The physical examination was normal as was the liver function test. Thrombocytopenia was found at 119,000 g/L with a viral load of 1,680 IU/ml and stage 2 esophageal varices (VO) on FOGD. Abdominal ultrasound revealed hepatic dysmorphism without abnormalities in the splenic or portal vein and a fibroscan at 6.4 kPa. These results are contradictory. The ultrasound suggests that this patient was already at the stage of cirrhosis with a fibroscan that does not find any significant fibrosis. We could therefore assume that there would be an inaccuracy in the fibroscan results. This could be due either to poor handling during the examination or to abdominal obesity. A control of the fibroscan would be indicated in this case for confirmation.

Treatment was initiated in all patients according to the latest EASL 2017 recommendations. They were on TDF dosed at 300 mg at a rate of 1 tablet/day [4].

Seventeen patients disappeared after treatment initiation at W12. Compliance was poor in 10 patients. This involved irregular intake in 9 patients and 1 patient who had stopped treatment for 6 months. It should be noted that TDF is not available at the sites of our study and associated with the low socioeconomic level mainly found in our study, could explain the poor compliance.

Six patients had side effects, which included muscle weakness without any notion of fracture, headaches, nausea, abdominal pain, menstrual cycle disorders and dizziness. These results are superimposable to those found in 2010 by Duarte [8].

Renal tolerance was good in the patients tested, creatinine and phosphorus were normal in the patients controlled during the study. This is what Diallo found in their study [6]. However, 24-hour proteinuria was not performed in our patients.

Although side effects are rare, their presence may be the cause of treatment discontinuation. These data confirm the safety of TDF, as found in the literature [13].

Bone and renal monitoring during treatment is important, as it allows for readjustment of treatment doses in case of poor tolerance [4,14].

TDF, the main molecule used, is available at the National Supply Pharmacy (PNA), in the pharmacies of the main hospitals and at the level of the national program for the fight against hepatitis (PNLH).

Significant efforts have been made by the PNLH for the financial accessibility of TDF: payment of 5,000 FCFA for patients with medical coverage, 2,500 FCFA for patients without medical coverage [6].

On the Evolutionary Level

After 12 weeks of treatment, 22 patients were tested. Fourteen of these patients had an undetectable viral load, and 8 patients had a partial virological response. Twenty-one patients, after 212 weeks, underwent regular monitoring. In these patients, the virological response was 90.47%, in fact the viral load was undetectable in these patients. Two patients (9.53%) had a reactivation due to poor compliance with treatment, this is a virological escape.

Bobilwindé had found a virological response in 72.7% after 6 months while Lovett et al found a rate of 83.7% at 112 months [7,11]. In their study in 2008, Marcellin et al had a rate of 93% at 48 weeks, and Diallo et al, 85% after 120 weeks of treatment [6,16].

At the end of our study, a normalization of the clinical examination was noted in all patients. The biological response was 66.67%, i.e. 4 patients out of the 6 who had a high SGPT level before treatment. The majority of patients already had a normal transaminase level. The study by Apendi et al found 20% while Lovett et al 76% [4,5].

No worsening of pre-existing ultrasound lesions was found. The serological response is not available in any patient. The low socio-economic level of the patients (56.75%) in our study associated with the non-availability of these tests in all hospitals explains this result [17].

As part of the assessment of the histological response, liver biopsy (LBP) could not be performed in our practice conditions. Only fibroscan was used to monitor fibrosis. It is not available in all hospitals and associated with the cost makes monitoring difficult in patients. Only 6 patients were able to do it at the request of the doctor. Five patients had a decrease in fibrosis. A cirrhotic patient, under treatment, had a fibroscan at 19 kPa 6 months into treatment, with a heteronodular liver but painless on ultrasound, an AFP level of 33.37 ng/ml; a high CV and transaminases. There is a progression of cirrhosis in this patient which could be explained by the intermittent compliance with his treatment. Diallo et al in their study, found 1 cirrhotic patient who developed HCC under treatment [6,18].

AFP was measured in 10 patients, 9 of whom had normal levels. The patient with a level of 32.37 ng/ml was already at the cirrhosis stage [19].

Treatment does not eliminate the risk of HCC occurring, hence the importance of ultrasound and biological monitoring to detect the appearance of complications such as HCC [4].

During our study, no cases of death were recorded. However, the high rate of loss to follow-up does not allow an objective analysis of the survival of our patients.

Conclusion

The management of chronic HBV infection is complex in low-income countries. It requires therapeutic compliance and strict and rigorous monitoring of the evaluation of clinical and paraclinical parameters in decentralized areas.

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