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Impact of Hepatitis B on Hematological and Biochemical Parameters of Patients Seen in Consultation at Kankan Regional Hospital

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Summary-- Hepatitis B is a viral hepatitis caused by infection with hepatitis B virus (HBV) and results in liver inflammation.

In the Republic of Guinea, hepatitis B is indeed a real public health problem, while it remains a little-known infection that silently devastates the population, almost all of whom are unaware of the means of its transmission and prevention.

Previous studies have proven the existence of hepatitis B in Kankan prefecture.

To achieve our objective, we performed hematological and biochemical diagnosis of hepatitis B for detection of HBsAg in patients received at our laboratory and measured the transaminases of GPT-ALT LR and GOT-AST LR.

The serodiagnosis carried out on 300 patients revealed 43 positive cases, representing a prevalence of 14% versus 257 negative cases, or 86%. 18% had a low hemoglobin level, 33% showed leucocytoses, and 14% had leukopenia, 5 patients had mild anemia, representing 28%, 6 patients had moderate anemia, or 33%, and 7 had severe anemia, or 39%; according to MCV, 9 patients had anemia (microcytic and macrocytic), or 50% for each. According to MCHC, 56% of patients had hypochromic anemia and 44% had normochromic anemia.

Patients with hepatitis B in most cases had a normal ALT level, 29 cases or 67%, whereas 14 cases or 33% had a high ALT level.

Overall, our study showed that the hepatitis B virus is indeed present within the population of Kankan.

Keywords-- hepatitis B, hepatitis B virus, transaminases.

I. INTRODUCTION

Viral hepatitis is an inflammation of the liver caused by one of five hepatitis viruses: A, B, C, D, or E [1].

Hepatitis B is a viral infection that attacks the liver. It can cause acute or chronic diseases [2].

The virus is transmitted through contact with blood or other body fluids from an infected person and is characterized by variable clinical and epidemiological manifestations [3].

The World Health Organization (WHO) estimates that more than 2 billion people have been infected with hepatitis B during their lifetime, representing about 30% of global population [4].

According to WHO, hepatitis B virus (HBV) is 50 to 100 times more contagious than HIV. Among this global patient population, 360 million (or 5%) suffer from chronic infection, primarily in Asian and African continents. More than one million of them die each year from complications related to this infection, in particularly cirrhosis and hepatocellular carcinoma. HBV ranks second, after tobacco, among agents known to be carcinogenic to humans [4].

In France, a survey conducted by the National Institute for Public Health Surveillance (INVS) using a sample of social security beneficiaries under general social security scheme between 2003 and 2004 reported a chronic HBV carriage rate estimated at 5.25% among people originally from sub-Saharan Africa and 0.92% among people originally from Asia, compared to 0.68% of the general population.

Only 45% of HbsAg carriers know their status, which leads to delayed management and increases risk of disease transmission [5].

In the Republic of Guinea, as in other countries, this infection is very poorly understood by the population, yet it constitutes a real public health problem that affects all age groups, both sexes, and all socio-professional strata.

II. MATERIALS AND METHODS OF WORK

2-1. Study Environment:

The city of Kankan served as setting for the realization of our study.

The city of Kankan is located approximately 690 km from the capital, of Conakry. It is situated in Upper Guinea, on Milo River.

The administrative region of Kankan covers an area of 72,145 km², occupying the entire northeast and centre of the country, which is about 40% of Guinean territory. It is subdivided into five (5) prefectures, which are: Kankan, Kouroussa, Mandiana, Siguiri, and Kérouané, includes five (5) urban Municipality and 52 sub-prefectures or rural Municipality. According to the general population and housing census of 1996, the population was 1,011,644 inhabitants. According to demographic projections from the same census, the population of Kankan region is estimated in 2007 at 1,452,554 inhabitants, with nearly half of the population of Kankan prefecture living in urban areas [5].

2.2 Study framework

Our study was conducted in Medical Biology Analysis Laboratory (LABM) of the regional hospital of Kankan.

The laboratory is in partnership within the framework of training and biomedical research with Biology laboratories of the Faculty of Pure Sciences of Gamal Abdel Nasser University of Conakry, Laboratory ISSMV/Dalaba Didactics laboratory, and with NGO's and Health-Education for All.

All the test results were verified by various laboratories involved.

2-3. Work materials

We used the following laboratory materials:

- Gloves,
- Tourniquet,
- Cotton,
- Disinfectant,
- Swab,
- Syringe,
- Needle,
- Hemolysis tube,
- Centrifuge,
- Rack,
- Epidural,
- 10 to 100 µl pipette,
- Tips (blue and yellow),
- Pasteur pipette,
- Markers,
- Stopwatch.

• Blood Count Automatic (Sysmex XN-350)

• **Reagent:** the CYPRESS HBsAg strip

• **Reagents:** Human Transaminases GPT-ALT LR and GOT-AST LR

• **Biological material:** serum obtained after centrifugation of patients' whole blood

2-4. Working methods

2-4.1. Type and duration of study

It was a prospective, cross-sectional, and descriptive study that extended over a period of three (03) months from May 5th, to August 5th, 2024.

2-4.2 Study population

The study concerned all patients of both sexes, of all ages, who came to consult at Kankan Regional Hospital during the period of our study.

2-4.3. Sampling

The sample size was validated using prevalence of hepatitis B in Guinea as a percentage (%) or, failing that, using average of hospital prevalences by Schwartz method

$$N = \frac{t^2 \times P \times (1-P)}{m}$$

N: Sample size

T: Parameters related to the risk of error (1.96)

P: Existing prevalence = 15%

M: Margin of error at 5% (standard value of 0.05), hence N > 195.

Therefore, the size of our sample (N=300) is representative

2-4.4. Selection Criteria

• **Inclusion criteria:** All patients received in the laboratory with an medical checkup form on which HBs antigen test, CBC, and transaminase were requested were included in our study.

• **Non-inclusion criteria:** All patients who did not meet the inclusion criteria were not included in our study.

2-4-5. Study Variables

Our study variables are:

■ **Biological Variables:** Serological medical test of rapid test on HBsAg strip, CBC, and transaminases.

■ *Epidemiological Variables:*

- Sex
- Age
- Socio-professional categories
- Residence
- Marital status.

2-4-6. Serological Diagnosis of Hepatitis B

Its principle is based on immunological measurement in order to determine Hbs antigen in the blood. Monoclonal and polyclonal antibodies are used for specific identification of HbsAg.

2-4-7 Complete Blood Count Automatic (Sysmex XN-350) (blood count and differential analyser NFS)

The Sysmex XN-350 is a compact haematology analyser with high precision due to the use of automatic floating discriminants. It features a simple start-up menu and a single selection button for analyses and daily maintenance. - RBCs, WBCs and platelets are counted using direct detection method with coincidence correction. Automatic discriminants separate cell populations according to complex algorithms. The electrical pulse intensity for each analysis is proportional to the cell volume. - HCT is determined directly by counting RBCs and detecting the volume of each RBC. - Hb is measured directly using a cyanide-free method.

■ *Interpretation* - The parameters are measured and calculated by the system and then printed.

2-4-8 GPT-ALT LR and GOT-AST LR transaminases are based on the following two principles:

2-4-8.1 Principle of Human transaminases GPT-ALT LR test Alanine aminotransferase (ALT), also called glutamate pyruvate transaminase (GPT), is an enzyme that catalyses reaction between alpha-ketoglutarate and L-alanine. This produces glutamate and pyruvic acid. With the presence of lactate dehydrogenase (LDH), pyruvic acid reacts with NADH to produce lactic acid and NAD⁺. The change in absorbance is proportional to ALT activity. The reagent contains LDH to convert endogenous pyruvate to lactate during pre-incubation.

2-4-8.2 Principle of Human transaminases GOT-AST LR test Aspartate aminotransferase (AST), also called glutamic-oxaloacetic (GOT), catalyses reaction between alpha-ketoglutarate and aspartate to produce glutamate and oxaloacetate. Oxaloacetate reacts in with the presence of malate dehydrogenase (MDH), with NADH and thus produces malate and NAD⁺. The absorbance difference measured at 340nm is proportional to AST activity contained in the sample.

■ *Interpretation* - The parameters are measured and calculated by the system and then printed.

III. RESULTS AND DISCUSSIONS

3-1 Results

The application of the research methodology led to the following results in table form, which were commented on and discussed according to the available literature data.

Table 1: Overall prevalence of hepatitis B among patients seen in consultation.

N°	HbsAg serology	Number	Percentage%
1	Positive	43	14
2	Negative	257	86
Total		300	100

Table 2: Variation of haematological parameters in patients with Hepatitis B.

Setting	Values					
	Low		Normal		High	
	Staff	%	Staff	%	Staff	%
Haemoglobin	18	42	24	56	1	2
Red blood cells	4	9	33	77	6	14
Leukocytes	2	5	39	90	2	5
Lymphocytes	6	14	32	74	5	12
Neutrophils	6	14	28	65	9	21
Basophils	-	-	40	93	3	7
Monocytes	-	-	29	67	14	33
Eosinophils	-	-	41	95	2	5
Leaflets	1	2	39	91	3	7

Table 3: Typology of anaemias in patients with Hepatitis B.

Total		Anaemia					
		Frustrated		Moderate		Severe	
Number	%	Number	%	Number	%	Number	%
18	100	5	28	6	33	7	39

Table 4: Physiological variation of MCV in patients with hepatitis B.

Total		VGM					
		Microcytic		Normocytic		Macrocytic	
Staff	%	Staff	%	Staff	%	Staff	%
18	100	9	50	9	50	-	-

Table 5: Physiological variable of CCMH in individuals with hepatitis B.

Total		CCMH			
		Hypochromic		Normochromic	
Staff	%	Staff	%	Staff	%
18	100	10	56	8	44

Table 6: Distribution of patients with hepatitis B according to ALT transaminase levels

N°	ALAT	Number	Percentage%
1	Normal (8-45) IU/L	29	67
2	Elevated 45 IU/L	14	33
	Total	43	100%

Table 7: Distribution of patients with hepatitis B according to AST transaminase levels

N°	ASAT	Number	Percentage
1	Number (10-40) UI/L	16	37
2	Elevated»40 UI/L	27	63
Total		43	100%

Table 9: Distribution of hepatitis B prevalence among patients seen in consultation by sex .

Sex	Staff	Percentage
Female	14	33
Male	29	67
Total	43	100

Table 10: Distribution of prevalence by marital status

Marital Status	Staff	Percentage
Marié	35	81
Singles	7	16
Widowers	1	2
Total	43	100

Table 11: Distribution of prevalence of hepatitis B among patients seen in consultation by age group.

Age group	Staff	Percentage
0 à 10	-	-
11 à 20	4	9
21 à 30	13	30
31 à 40	13	30
41 à 50	6	14
51 and more	7	16
Total	43	100

Table 12: Distribution of prevalence according to socio-professional categories

Socio-professional Category	Staff	Percentage
Administrative Officer	21	49
Worker	3	7
Pupils and students	2	4
Housewives	9	21
Sales agents	8	19
Total	43	100

Table 13: Distribution of hepatitis B prevalence by residence

Residence	Staff	Percentage
Kankan	22	51
Mandiana	11	26
Siguir	5	12
Kérouané	1	2
Dinguiraye	1	2
Lero	1	2
Kouroussa	2	5
Total	43	100

3-2 Discussions

The serodiagnosis performed on **300** patients revealed **43** positive cases, a prevalence of **14%**, compared to **257** negative cases, or **86%**. This seroprevalence of 14% would be due to limited availability of vaccines at Kankan regional hospital and lack of awareness among health workers for a change in population behaviour. Our results were lower than those found by Ndonfack M. in 2010 at Kamsar hospital (ANAIM), which found 17.02% [6]. This difference in prevalence would be because Kamsar is an industrial area with high population density and very high risk factors for virus exposure due to diversity modes of contamination (sexual intercourse, saliva, sweat...) (**Table 1**) [6].

In our study, we found in haematological parameters that 42% had low haemoglobin levels. Leucocytosis and leucopenia were observed in 2 cases, or 5% each. Leucocytosis was the Predominance of monocytes in 14 cases (33%), neutrophils in 9 cases (21%), erythrocytes in 6 cases (14%), lymphocytosis in 5 cases (12%), basophils in 3 cases (7%), eosinophils in 2 cases (5%) and haemoglobin level in 1 case (2%). Leucopenia was predominantly lymphopenia and neutropenia in 6 cases (14%) each and erythropenia in 4 cases (9%). (**Table 2**) [7].

In our study, 18 patients presented with anaemia. Among them, 5 had mild anaemia, representing 28%, 6 had moderate anaemia, representing 33%, and 7 had severe anaemia, representing 39%. These results could be attributed to the patients' physiological condition.

This shows that in patients with hepatitis B, haematological parameters must be monitored; however, in patients with mild and moderate anaemia, this situation could be corrected through a good, rich, and balanced dietary hygiene, whereas in patients suffering from anaemia Severe, this could be corrected by a blood transfusion. Our results were different from those found by Rachel A.A. in 2018 at the Municipality health centre of Minière, where 75% of patients suffered from mild anaemia and 25% from moderate anaemia (**Table 3**) [8].

The analysis of the table showed that 50% of patients had microcytic anaemia and 50% had normocytic anaemia; the decrease in MCV consequently determined microcytic anaemia due to an iron deficiency. This would explain decrease in haemoglobin levels. Our results are different from those found by Binta F at the Municipality health centre in 2022, who reported 67% had microcytic anaemia and 33% normocytic anaemia (**Table 4**) [9].

The table showed us that 10 patients, or 56%, had hypochromic anaemia and 8 patients, or 44%, had normochromic anaemia. Our results were different from those found by Binta F at the Municipality health post in 2022, who reported 67% with hypochromic anaemia and 33% with normochromic anaemia (**Table 5**) [9].

The table showed us that patients with hepatitis B mostly had a normal ALT level, 29 cases or 67%, compared to 14 cases or 33% who had elevated ALT levels. Indeed, transaminases (AST and ALT) are enzymes present inside cells, particularly in the liver and muscles. They are involved in a multitude of biological reactions.

Our results were different from those found by Amiratou-Laye A. AMADOU at Haematology-Oncology Department of Donka National Hospital, where transaminases were elevated in 19% of cases (**Table 6**).

From the table, we observed that majority of patients with Hepatitis B patients had a high AST level in 63% of cases compared to 37% of normal cases. A preferential increase in AST with an AST/ALT ratio greater than or equal to 2 supports excessive consumption. An associated increase in GGT, although not specific, supports an alcoholic origin. Our results were different from those found by Amiratou - Laye A. AMADOU in Haematology-Oncology Department of Donka National Hospital where transaminases were elevated in 19% of cases. (**Table 7**)

The table showed us that males were the most affected with 29 cases, representing a seroprevalence of 67%, and females with 14 cases, representing 33%. This difference is random as both sexes were equally exposed to risk of contamination by hepatitis B virus. Moreover, during our survey, there were more men than women. Our results were higher than those found by Kéita A in 2018 at the Municipality health centre Flamboyants, who found 54% in males compared to 46% in females (**Table 8**) [7].

The result showed us that married people were most affected with a prevalence of 81% versus 16% in single individuals and 2% in widows/widowers. This could be explained by lack of knowledge about modes of contamination among couples and especially the absence of diagnostic tests for this disease before marriage. Our results were higher than those found by Kéita A in 2018 at the Municipality health centre of Flamboyants, who reported 60% in married people and 35% in singles (**Table 9**) [7].

All age groups were affected by hepatitis B, with a high prevalence from 21 to 30 and 31 to 40 age groups, at 30% each. The high prevalence in these two groups from [21 to 30 and from 31 to 40] could be explained by fact that they are sexually active age groups and especially, their probable lack of knowledge about modes of transmission of hepatitis B virus. Our results were different from those found by SYLLA K. in 2012 at the Municipality health centre of Minière, who found a seroprevalence of 27.77% from 16 to 30 age group and 25% from 31 to 40 age group (**Table 10**) [10].

In the table, we observed that all socio-professional categories were affected by hepatitis B except healthcare workers, with a high prevalence among administrative staff 49%, followed by housewives 21%, and commercial agents 19%. Workers 7% and pupils and students 4% were at least affected.

Our results differed from those found by TOURE S. A. in 2011, at the Municipality health centre of Ratoma with 42% among commercial agents and 32% among housewives (**Table 11**) [11].

In the table, we observed that patients residing in Kankan city town were the most affected 51%, followed by the prefecture of Mandiana 26%, Siguiri 12% and Kouroussa 5%. The prefectures of Kérouané, Dinguiraye and Léro were the least affected 2% for each results. Its were higher than those found by TOURE S.A in 2011, at the Municipality health centre of Ratoma with 30% [11]. This situation is linked to lack of knowledge for the preventive measures against virus by most citizens (**Table 12**) [11].

IV. CONCLUSION

By the end of our studies on haematological and biochemical parameters of patients with hepatitis B attending consultations at Kankan Regional Hospital, we reached the following conclusion: Serodiagnosis carried out on 300 patients revealed 43 positive cases, a prevalence of 14% compared to 257 negative cases, or 86%. 18% had a low haemoglobin level, 33% showed leucocytosis and 14% leucopenia, 5 patients had mild anaemia, or 28%, 6 patients had moderate anaemia, or 33% and 7 had severe anaemia, or 39%, according to MCV 9 patients had anaemia (microcytic and macrocytic), or 50% for each. According to MCHC, 56% of patients had hypochromic anaemia and 44% had normochromic anaemia.

The male sex was the most affected with a seroprevalence of 67%, married individuals were most vulnerable to hepatitis B virus with a percentage of 81%. The most affected age groups are from 21 to 30 and from 31 to 40 years, each with 30%. According to socio-professional categories, the prevalence is more marked among administrative staff at 49%, followed by housewives at 21%, commercial agents at 19%, labourers at 7%, and pupils and students had a prevalence of 4%. By residence, from Kankan city town was the most affected with 51%, followed by Mandiana with 26% and Siguiri with 12%. In summary, hepatitis B constitutes a real public health problem, while it remains a poorly known infection that silently devastates the population, most of whom are unaware of the means of transmission and prevention

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