

# Serological Status of Hepatitis B Virus Among Pregnant Women in the Mifi District (West Cameroon)

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**Abstract:** *Introduction:* Mother-to-child transmission is a major route of hepatitis B virus (HBV) transmission, particularly in highly endemic areas. The aim of our work was to determine the extent of HBV serological markers in pregnant women in the Mifi district (West Cameroon). *Method:* We conducted a descriptive cross-sectional study over a period of two months from 01 August to 02 October 2022. For the search for serological markers, we used immuno-chromatographic tests [HBV 5-in-1 Hepatitis B Virus markers Rapid Test Panel (serum/plasma), China, 2022] and enzyme-linked immunosorbent assays [Hepatitis B Virus surface Antigen (HBsAg) ELISA Test Kit, lot: HBSG37310B, China, 2022], both of which are from HIGHTOP. The markers investigated by the immuno-chromatographic tests were HBsAg, HBsAb, HBeAg, HBeAb, and HBcAb. Logistic regression analysis was performed to determine the degree of association with HBsAg carriage at the 5% significance level. *Results:* A total of 109 pregnant women were enrolled in the present study, the mean age was  $26.89 \pm 6$  years with a range of 16 to 42 years. The following serological profiles were obtained in 27 (24.77%) participants and distributed as follows 19% (5/27) of the pregnant women were surface antigen positive (AgHbs +; AcHbc +); 37% (10/27) had been in contact with the virus in the past and were cured (AcHbs +; AcHbc +), 7% (2/27) had been vaccinated against hepatitis B virus (AgHBs -; Ac Hbs +; Ac anti Hbc -) and 37% (10/27) were in contact with the virus (AcHbc +). Logistic regression analyses revealed no association between socio-demographic variables and HBsAg carriage. *Conclusion:* In sum, the present work resulted in a prevalence of HBsAg of 4.59% (5/109); with an estimated marker positivity of 11% (12/109); 22.94% (25/109); 7.34% (8/109) and 0% for HBsAg, cAbAg, HBeAg and HBeAg respectively. Furthermore, no socio-demographic variables showed an association with HBsAg carriage.

**Keywords:** Serological Markers, Viral Hepatitis B, Cameroon

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## 1. Introduction

Viral hepatitis B (HBV) is a highly contagious transmissible disease that represents a real public health problem in the world in general and in Cameroon in particular, where its average prevalence is estimated by the WHO at 10% [1]. This viral infection is caused by a virus

belonging to the *HEPADNAVIRIDAE* family called hepatitis B virus (HBV). The severity of HBV is linked to the risk of becoming chronic, and this risk is all the greater when the infection occurs at an early age, particularly in the case of neonatal contamination [2].

According to the World Health Organisation (WHO), approximately 2 billion people worldwide carry serological

markers for the hepatitis B virus, and 257 million people are living with chronic hepatitis B, including 65 million women of reproductive age with an estimated 887,000 deaths, mainly from cirrhosis or hepatocellular carcinoma [3].

Furthermore, the African continent is particularly concerned, with high rates of chronic HBsAg carriage, in the order of 15% to 20% in the general population and 22% to 25% in pregnant women in particular [4]. Similar studies of pregnant women in Buea (South West Cameroon) revealed a prevalence of 9.7%, with low awareness of the disease being the main determinant. Similarly, in the Tokombéré health district in the far north of Cameroon, the prevalence of pregnant women carrying HBV was estimated at 18.2%; a study in the city of Yaoundé, in a Knowledge, Abilities and Practices survey among pregnant women, revealed a prevalence of 16.11% with respect to HBV [1, 4]. In order to contribute to limiting the risks of transmission of HBV from mother to child, we set ourselves the objective of determining the extent of HBV serological markers in pregnant women in the Mifi district (West Cameroon).

## 2. Methods

*Setting and type of study:* From 01<sup>st</sup> August to 02 October 2022, we conducted a descriptive cross-sectional study of 109 pregnant women attending antenatal clinics (ANC) in the Mifi district located in the town of Bafoussam (West Cameroon region).

*Study population, tools and data collection procedure:* Participants were recruited consecutively (as they arrived for their ANC in the Mifi district) and a technical information sheet enabled us to collect socio-demographic data (age, sex, level of education, marital status, etc.), to assess the participants' level of knowledge about VBH.

*Selection criteria for the study population:* The inclusion criterion was: consenting pregnant women coming for antenatal care (ANC) in the Mifi District. The non-inclusion criteria were: women who voluntarily refused to participate in the study.

Collection and laboratory analysis of blood samples: The conditions for proper collection were observed throughout the study. To obtain serum, we used collection tubes without anticoagulant (dry tubes). Each tube was coded according to the prenatal consultation record, the collected specimens were centrifuged at room temperature at 3000 rpm for one minute, the serum obtained was transferred into cryotubes previously labelled with the same starting code, and then stored at a temperature between 2°C and 8°C when the analysis was to be carried out later.

*Techniques used: Serological tests:* For the detection of serological markers, we used the immuno-chromatographic [HBV 5-in-1 Hepatitis B Virus markers Rapid Test Panel (serum/plasma), China, 2022] and enzyme-linked immunosorbent assays [Hepatitis B Virus surface Antigen (HBsAg) ELISA Test Kit, lot: HBSG37310B, China, 2022], both of the brand HIGHTOP. The markers tested were HBsAg, HBsAb, HBeAg, HBeAb, and cHbAb and the serological profiles obtained from said markers were:

Vaccinated (AgHbs negative, AcHbs positive, AcHbc negative); Infected (AgHbs positive, AcHbs negative, AcHbc positive); Immunised uninfected (AgHbs negative, AcHbs positive, AcHbc positive); Contacted with the virus/potentially infected (AgHbs negative, AcHbs negative, AcHbc positive). To maintain the quality of the laboratory results, the standard operating procedures (SOPs) of the test kit manufacturers were strictly followed.

*Data analysis:* Data were entered into Excel 2013 and exported to IBM SPSS statistics version 26 for descriptive analyses (percentages). A univariate logistic regression analysis was performed to determine the degree of association of HBsAg carriage, with a significance level set at 5%. The tables were built using Office Word 2013 and the figure using Excel 2013.

*Ethical consideration:* In order to carry out the present work, an ethical clearance was issued by the Institutional Ethics Committee of the University of the Mountains (CIE-UdM), under reference N°2022/184/UDM/PR/CEAQ; we also obtained an administrative authorisation under reference number: 2022/0139/CUM/ADMN\_GENE, for the analysis of our specimens in the microbiology laboratory of the Cliniques Universitaires des Montagnes (CUMs).

## 3. Results

### 3.1. General Characteristics of the Study Population

A total of 109 pregnant women were enrolled in the present work. The average age was  $26.89 \pm 6$  years with a range of 16 to 42 years.

**Table 1.** General characteristics of the study population.

Features	Workforce (%)	AgHbs	
		Negative (%)	Positive (%)
Age groups (years)			
Teenager	39 (36)	37 (95)	2 (5)
Adult	70 (64)	66 (94)	4 (6)
Marital status			
Single	69 (63)	65 (94)	4 (6)
bride	40 (37)	38 (95)	2 (5)
Profession			
Student	9 (8)	7 (78)	2 (22)
Student	17 (16)	17 (100)	0 (0)
Cleaning lady	21 (19)	19 (90)	2 (10)
Liberal	41 (38)	40 (98)	1 (2)
employee	21 (19)	20 (95)	1 (5)
Level of study			
No	3 (3)	3 (100)	0 (0)
primary	17 (16)	16 (94)	1 (6)
Secondary	68 (62)	63 (93)	5 (7)
Superior	21 (19)	21 (100)	0 (0)
Parity			
Multipare	78 (72)	75 (96)	3 (4)
Primigeste	31 (28)	28 (90)	3 (10)
Knowledge of HVB			
No	72 (72)	68 (94)	4 (6)
Yes	37 (28)	35 (95)	(5)

Adolescent: 15 to 19 years; adult: 20 years to older.

Table 1 shows that the majority of participants were adults

(64%); the most common marital status was single (63%); the most common occupation was that of a housekeeper; the most common level of education was secondary school (62%); more than half of the participants were multiparous (72%) and 72% of them had no knowledge of Hepatitis B (Table 1). In addition, the majority of participants with

secondary school education (5/68) were tested for HBsAg, followed by adult women (4/70), single women (4/69) and women with no knowledge of HBV (4/72).

Socio-demographic factors associated with HBsAg carriage: Among the socio-demographic characteristics, no variable was associated with HBsAg carriage.

**Table 2.** Socio-demographic factors associated with HBsAg carriage.

Variables	AgHbs		OR (95% CI)	P-value
	Negative (%)	Positive (%)		
Age				
Adolescent	37 (95)	2 (5)	0,379 (0,038 - 3,763)	0,407
Adult	66 (94)	4 (6)	2,639 (0,266 - 26,201)	0,407
Marital status				
bride	38 (95)	2 (5)	2,400 (0,259-22,252)	0,441
Single	65 (94)	4 (6)	0,417 (0,045-3,863)	0,441
Study levels				
No	3 (100)	0 (0)	79973996,91 (-)	0,999
Primary	16 (94)	1 (6)	0,727 (0,076-6,936)	0,782
Secondary	63 (93)	5 (7)	0,400 (0,043-3,707)	0,420
Superior	21 (100)	0 (0)	97317764,76 (-)	0,998
Knowledge about HBV				
Yes	68 (94)	4 (6)	- (-)	-
No	35 (95)	2 (5)	89748608,21 (-)	0,999

Adolescent: 15 to 19 years; adult: 20 years to older.

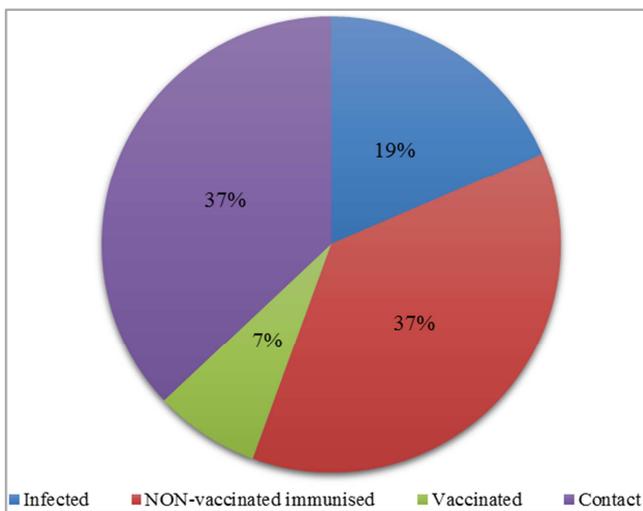
**3.2. Prevalence of Serological Markers of Viral Hepatitis B**

Analysis of our data revealed that the prevalence of serological markers in our sample was 45.9% (50/109) of which, 5 (4.59%) were HBsAg positive, 12 (11%) were HBsAb positive, 25 (22, 94%) were HBcAb positive and 8 (7, 34%) were HBeAb positive; none of them were HBeAb reactive. In addition, the following serological profiles were obtained in 27 (24.77%) participants and distributed as follows 19% (5/27) of the pregnant women were surface antigen positive (AgHbs +; AcHbc +); 37% (10/27) had been in contact with the virus in the past and were cured (AcHbs +; AcHbc +), 7% (2/27) had been vaccinated against hepatitis B virus (AgHbs -; Ac Hbs +; Ac anti Hbc -) and 37% (10/27) had been in contact with the virus (AcHbc+).

**4. Discussion**

The objective of our work was to determine the seroprevalence of serological markers of viral hepatitis B in pregnant women who came to the Mifi district hospital in western Cameroon. Of the 109 pregnant women enrolled in the present study, the HBsAg was found mainly in participants with secondary school education (5/68), followed by adult women (4/70), single women (4/69) and women with no knowledge of HBV (4/72). Indeed, the absence or low level of education could have an impact on knowledge and practices regarding HBV, regardless of age. Similarly, being single and having several sexual partners could be associated with HBsAg carriage [5]. However, the logistic regression analyses conducted in the present work did not reveal any association between socio-demographic parameters and HBsAg carriage. This could be explained, on the one hand, by the small size of our sample and, on the other hand, by the cross-sectional quantitative nature of our present work. Indeed, quantitative cross-sectional studies have a lower degree of evidence of causality than case-control studies, for example.

The prevalence of hepatitis B in the present work was 4.59%, which is much lower than those found in Buea district (9.7%) by Frambo *et al* (2014) and in Guidiguis (10.2%) by Noubiap *et al* (2015) [6]. In addition, Bigna *et al* [7] reported a prevalence of 10.2% among pregnant women in rural areas in the far north of Cameroon. These variations in prevalence in different regions of Cameroon could be explained by the presence of certain socio-cultural factors that would hinder the implementation of barrier measures aimed at slowing down the spread of HBV, such as religion, communalism, polygamy and lack of education.



**Figure 1.** Frequency of hepatitis B serological profiles.

The prevalence of HBsAb carriage in our sample was 11%. This rate is low compared to that obtained by Zayet et al [8] who worked on 229 health workers with a positivity rate of 15.3%. This difference could be explained by the small size of our study sample and by the unavailability of vaccines in local health facilities. Furthermore, in the present work, the prevalence of AcHbc was 22.94%, which is far higher than that reported by Zayet et al [8] who obtained a prevalence of 0.8% among 229 health workers in Tunisia. This could be explained by the fact that some women in our sample had at least one contact with the virus. We obtained a prevalence of 7.34% for AcHbe, which could indicate an absence of DNA replication of the hepatitis B virus in some of our participants. In addition, none of our participants were reactive to AgHbe. This result is in disagreement with that obtained by Katilé et al [9-11] who recorded a prevalence of 7.4% of persons positive for HBeAg in a study carried out at the regional hospital of Kayes. This difference could be related to the lack of use of molecular biology techniques used for HBV DNA detection. Nevertheless, HBeAg positivity would increase the risk of prenatal transmission, and the risk of transmission of HBV from mother to child depends on the extent of viral replication. This risk has been estimated to be more than 90% if HBe antigen (HBeAg) is detected in the maternal serum [12, 13]. However, even in the absence of HBeAg, the risk of HBV transmission exists and the interpretation of the absence of HBeAg must take into account the possibility of viral replication in asymptomatic carriers and in the case of viral mutation of the C gene, in which case high levels of viremia are possible [14, 15]. However, work by Shimakawa et al has shown that there is a substantial risk of mother-to-child transmission despite timely administration of HBV vaccine at birth, highlighting the importance of perinatal antiviral prophylaxis and increasing HBV vaccination coverage at birth in some parts of Africa in order to meet WHO elimination targets [16].

Certain limitations were identified in the present work, namely, the lack of use of more sensitive diagnostic tests such as Elisa or PCR leading to an underestimation of the prevalence of HBsAg in the present work; the measurement of the HBV viral load could not be carried out even though it is crucial in determining the risk of transmission of the viral genome (HBV) from the mother to the child; Furthermore, the quantitative cross-sectional nature of the present work did not allow causal associations to be found in the same way as in a case-control study, which has a more thorough degree of evidence of causality than cross-sectional studies.

## 5. Conclusion

In sum, the present study, which aimed to identify HBV serological markers in pregnant women in the Mifi district in western Cameroon, yielded a prevalence of HBsAg of 4.59%, with marker positivity estimated at 11%, 22.94%, 7.34% and 0% for HBsAg, cAbAg, HBeAg and HBeAg respectively. Logistic regression analysis of socio-demographic parameters

revealed no association with HBsAg carriage. The prevalence of HBsAg in the present study was lower than the national prevalence, which may reflect the effectiveness of WHO measures to reduce the risk of mother-to-child transmission of HBV.

## Conflict of Interest

The authors declare no conflict of interest.

## Current State of Knowledge on the Subject

- 1) Viral Hepatitis B (VHB) is caused by a virus called hepatitis B virus (HBV);
- 2) The prevalence of HBV in Cameroon is 10%;
- 3) The prevalence of HBV among pregnant women living in the city of Buea (South-West Cameroon) and in the health facilities of the Mokolo district (Far North Cameroon) is 9.7% and 18.2% respectively.

### *Contribution of our study to the knowledge*

- 1) Prevalence of HBV serological markers in pregnant women in the Mifi district (West Cameroon);
- 2) Proportion of each serological marker found in pregnant women.

## Authors' Contributions

Pascal Blaise WELL à WELL à KOUL proposed the manuscript, Esther VOUNDI-VOUNDI expertly reviewed the document in substance. All other authors contributed to the financing and correction of the manuscript.

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