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Research Article

# Seroprevalence of Hepatitis B Virus in Pregnant Women and Associated Risk Factors, Monitored at the Yaounde University Teaching Hospital, Cameroon

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## Abstract

*Background and justification*: Infection with the hepatitis B virus is a major public health problem; However, Asia and sub-Saharan Africa are the most affected by it. The status of hepatitis B virus in pregnant women is essential for the effective management of the disease and the prevention of mother to child transmission. The objective of this study is to determine the prevalence of HBV markers and risk factors associated with infection in pregnant women at the Yaounde University Teaching Hospital (YUTH). *Methodology*: A prospective, cross multicenter study was conducted from 17 September 2018 to 25 February 2019 in 102 pregnant women aged 15 to 44 years. After obtaining ethical clearance, obstetric and sociodemographic risk factors were collected; samples were also taken and analyzed by the immuno-chromatographic method for the detection of HBsAg, for anti-HBs, HBeAg, anti-HBeAc and the anti-HBc antibodies. Statistical analysis was performed by Microsoft Excel 2016; SPSS Version 22. A P value < 0.05 was considered statistically significant. *Results*: Of the 102 pregnant women, 10.78% (11/64) tested positive for HBsAg; 15.68% (16/64) had developed anti-HBs, and 26.47% (27/64) had previous contact with HBV. The highest prevalence of HBsAg was recorded in the age group 25-35 years (11.76%, P = 0.95). Similarly, the single status (P = 0.001) scarification (P = 0.00) and tattooing (P = 0.00008) were significantly associated with HBV infection and previous contact with HBV. Scarification and tattooing were significantly associated with a probable chronic hepatitis profile4 (P = 0.00009) and the inactive carrier HBsAg profile3 (P = 0.0002). *Conclusion*: The HBV infection is high among pregnant women at the YUTH (10.78%), especially among single pregnant women. Scarification, tattooing and no knowledge of the disease are factors significantly associated with HBV carriages (p <0.05). It is therefore necessary to introduce routine in prenatal assessment of pregnant women routine screening for HBV markers and possibly a vaccination to prevent vertical transmission (mother to child).

## Keywords

Pregnancy, Viral Hepatitis B, Risk Factors, YUTH

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# 1. Introduction

Hepatitis are inflammatory lesions of the liver whose causes can be multiple: medicinal, autoimmune, toxic, infectious. Among hepatitis, viral ones hold a very important place. The latter are linked to 7 different viruses belonging to 5 distinct viral families, and are distinguished by their mode of transmission and their aggressiveness. These are hepatitis viruses A, B, C, D (delta), E, G and GB [1, 2]. Of all viral hepatitis, viral hepatitis B (HVB) discovered in 1963 by Blumberg, is extremely contagious and constitutes a public health problem, due to its frequency, its complications and its socio-economic consequences on a global scale. [3]. The World Health Organization (WHO) estimates the number of people who are or have been infected at 2 billion, or around 30% of the world population, of whom 370 to 400 million are chronic carriers, mainly on Asian and African containers. This distribution causes 500,000 to 700,000 deaths per year worldwide [4]. The African continent is particularly concerned with chronic carriage rates of 15 to 20% in the general population and 22 to 25% among pregnant women [5]. Cameroon is located in an area of high endemicity for viral hepatitis B with an average prevalence estimated at more than 8%. The prevalence of pregnant women infected with HBV is high and exceeds 16.11%, further emphasizing the need for systematic screening during pregnancy as well as mass vaccination coverage to prevent vertical infection [6].

The hepatitis B virus (HBV) is mainly transmitted by blood (puncture or wound with equipment contaminated with contaminated blood, transfusions, transplants), by sexual relations, and vertically from mother to child. Transmission of the virus from mother to child can occur in utero but most often occurs through exposure to the mother's biological fluids at the time of delivery. The risk of vertical transmission (from mother to child) is 70% to 90% if the mother is positive for HBeAg; from 10 to 40% if the mother is only positive for HBsAg. In addition, the transmission rate is estimated at 60 to 70% during acute hepatitis at the end of pregnancy. In Switzerland, a country with low HBV endemicity, the prevalence of HBsAg among pregnant women was estimated at approximately 0.5% in 1990-1991. For approximately 80,000 births per year, this would correspond to 400-500 births per year with HBsAg positive mothers, including 10-14% with HBeAg positive. This made it possible to estimate that there would be around 100 cases of perinatal transmission per year in Switzerland, in the absence of neonatal prophylaxis, more than half of whom would have chronic HBV infection [7].

Pregnant women carrying the virus expose their offspring to infection; the infected newborn will most often remain a chronic carrier. The WHO also estimates that, each year, acute hepatitis B causes 1,100 deaths in the Cameroonian population and that cirrhosis and primary liver cancer are the two pathologies for which chronic hepatitis constitutes significant risk factors. causes hundreds of deaths per year [8]. The risk of becoming a chronic carrier and developing Hepatocellular Carcinoma (primary liver cancer) very early is linked to the age reached at the time of infection. This risk is 90% in children who contracted it at birth and 25% in those who contracted it in childhood and 5 to 10% in those who contracted it as adults [9]. Faced with the vulnerability of newborns, ensuring good vaccination coverage would require early detection of HBsAg in the mother to allow treatment as early as possible with adapted IgG serotherapy in the infant. Furthermore, in areas of high endemicity, systematic vaccination of newborns is strongly recommended from birth regardless of the mother's HBV status [10]. Testing for HBs antigen (HBsAg) should be carried out in all pregnant women. In France this screening is obligatory during examinations [11].

Mother-to-child transmission of hepatitis B virus (HBV) is responsible for more than a third of chronic viral hepatitis cases. Despite the importance of transmission of the virus from mother to child, the diagnostic test for HBV infection is not carried out systematically in all pregnant women in prenatal consultation, yet the risk of transmission is 70 to 90% if the mother is positive for HBe antigen (HBeAg), 10 to 40% if the mother is only positive for HBsAg and the transmission rate is estimated between 60 to 70% during acute hepatitis B at the end of pregnancy. Furthermore, current therapies for this infection are effective, have fewer significant side effects and are very expensive, yet effective prophylaxis through vaccination has been available for more than 20 years [12]. In view of the above, it is therefore rational to carry out new investigations on the profile of serological markers of HBV infection in pregnant women attending prenatal consultation in a context of high endemicity such as Cameroon in order to put on an algorithm compulsory and free screening for all pregnant women attending prenatal consultations.

This study aimed to estimate the carriage rate of different markers of hepatitis B virus infection, to evaluate the associated risk factors in order to prevent vertical transmission.

# 2. Material and Methods

## 2.1. Study Design and Participants

We conducted a cross-sectional study over a period of 6 months (September 17, 2018 to February 25, 2019) within the gynecology department of YUTH. The participants were pregnant women who came for consultation in the gynecology department of the YUTH. Our sample size was calculated using the following formula:

$$N = \frac{(Z\,1\text{-}\alpha)^2 \times P(1-P)}{i^2}$$

α= 0.05 → Z1-α= 1.96 according to the normal law; P: Prevalence of subjects presenting the variable studied; Z1-α: constant sampling error; i: operational error or margin of error [13].

Any patient who had consulted a gynecologist for a pregnant woman in the gynecology department of YUTH during the study period could be included. Excluded were any patients already on immunosuppressants or corticosteroids, and those unable to answer the investigator's questions. Each participant had to sign a consent form before enlisting. A questionnaire was then administered to him and a blood sample was taken and sent to the Hematology Department/Blood Bank of the YUTH, which served as a place for biological analysis of the samples. Demographic (age and sex) and clinical data (clinical manifestations, location, degree of malignancy, type, stage of disease and therapeutic protocol) missing during the interview could be completed using the medical file.

Collection and management of blood samples: the collection of blood samples took place within the gynecology department of the YUTH. Five milliliters (5 ml) of venous blood sample were collected from the crook of the elbow, in an EDTA tube. The blood sample was subsequently sent to the Hematology Department/Blood Bank of the YUTH.

## 2.2. HBV Testing

We used two rapid HBV diagnostic test from (Abbott Laboratories, Abbott Park, Illinois, USA). All tests were carried out following the manufacturer’s guidelines.

## 2.3. Ethics Committee

The research protocol received administrative authorization from the Directorate of the Yaounde University Teaching Hospital, reference N°245 / AR / CHUY / DG / DGA / CAPRC. The standard measures necessary to guarantee the confidentiality of the information collected in the files have been taken. Only patient file numbers were recorded and access to the data was secured by an encrypted password.

# 3. Results

## 3.1. Socio-Demographic and Obstetric Characteristics

We met a total of 135 pregnant women and 108 of them agreed to participate in the study; i.e. a participation rate of 80%. Among the 108 pregnant women, 102 were included in the study. They were aged 15 to 44 years with an average age of 24.11±5.58 years; with a median of 25 years [IQR: 20-27]. The most represented age group was [25-35[ years with a prevalence of 50% (95% CI: 40.2% - 59.8% 51/102) followed by the age group [15-25[ years with 46.08%. Concerning the marital status of our participants, 92.15% (95% CI: 85.13% – 96.55%; 94/102) lived as a couple compared to 7.85% (95% CI: 3.45% – 14.87%; 3/102) for singles.

According to the level of study, 86.27% (95% CI: 78.04% – 92.29%; 88/102) of pregnant women had a primary level, 10.79% (95% CI: 5.51% – 18.48%; 11/102) and only 2.94% (95% CI: 0.61% – 8.36%; 3/102) for the secondary level. Regarding profession, pregnant housewives were significantly more represented with a proportion of 83.33% (95% CI: 74.66%-89.98%; 85/102) followed by students, 7.85% (95% CI: 3.45%-14.87%; For parity, multiparous women had a proportion of 45.10% (95% CI: 35.22% - 55.26%; 46/102) compared to 31.37% (95% CI: 22.55% - 41.31%; 32/102) and 23.53% (95% CI: 15.69% – 32.96%; 24/102) respectively for pauciparous and primiparous. The sociodemographic characteristics of the study population are represented in Table 1 below.

***Table 1.*** *Distribution of the study population according to socio-demographic characteristics.*

| Socio-demographic and obstetric characteristics | Number (n=102) | Percentage % | ($IC_{95\%}$) |
|---|---|---|---|
| Matrimonial status | | | |
| Live in couple | 94 | 92.15 | 85.13% – 96.55% |
| Bachelor | 8 | 7.85 | 3.45% – 14.87% |
| Age | | | |
| [15-25[ | 47 | 46.08 | 36.23%–55.93% |
| [25-35[ | 51 | 50 | 40.11%–59.89% |
| [35-45[ | 4 | 3.92 | 0.2%–7.64% |
| Level of study | | | |
| Primary | 88 | 86.27 | 78.04% – 92.29% |
| Secondary | 3 | 2.94 | 0.61% – 8.36% |
| University | 11 | 10.79 | 5.51% – 18.48% |

| Socio-demographic and obstetric characteristics | Number (n=102) | Percentage % | ($IC_{95\%}$) |
|---|---|---|---|
| Profession | | | |
| Pupils | 2 | 1.96 | 0.24%-6.90% |
| Student | 8 | 7.85 | 3.45%-14.87% |
| Housewives | 85 | 83.33 | 74.66%-89.98% |
| Sellers | 2 | 1.96 | 0.24%-6.90% |
| Seamstresses | 2 | 1.96 | 0.24%-6.90% |
| Nurses | 3 | 2.94 | 0.61%-8.36% |
| Parity | | | |
| Primiparous | 24 | 23.53 | 15.69% – 32.96% |
| Pauciparous | 32 | 31.37 | 22.55% – 41.31% |
| Multiparous | 46 | 45.10 | 35.22%- 55.26% |

## 3.2. Distribution of the Study Population According to Risk Factors

Depending on the risk factors, we noted that 11.76% (95% CI: 6.23%-19.65%; 12/102) of pregnant women reported having scarifications, 10.78% (95% CI: 5.51%-18.41%; 11/102) said they had tattoos, 8.82% (95% CI: 5.62%-18.83%; 9/102) said they had a history of surgery, and 46.08% (95% CI: 36.16%-56.23%; 47/102) had knowledge of the disease. All these risk factors are represented in Table 2 below.

***Table 2.*** *Distribution of the study population according to risk factors.*

| Risks factors | Effectifs (n=102) | Pourcentage (%) | (IC95%) |
|---|---|---|---|
| Transfusion | | | |
| Yes | 0 | 0 | 0 |
| No | 102 | 102 | 100% |
| Scarification | | | |
| Yes | 12 | 11.76 | 6.23%-19.65% |
| No | 90 | 88.24 | 80.35%-93.77% |
| Piercing or Tattoo | | | |
| Yes | 11 | 10.78 | 5.51%-18.41% |
| No | 91 | 89.22 | 81.52%-94.49% |
| History of surgery | | | |
| Yes | 9 | 8.82 | 5.62%-18.83% |
| No | 93 | 91.17 | 81.17%-94.38% |
| Knowledge of the disease | | | |
| Yes | 47 | 46.08 | 36.16%-56.23% |
| No | 55 | 53.92 | 43.77%-63.84% |

## 3.3. Biological Data of the Study Population

### 3.3.1. Carriage of Markers of Hepatitis B Virus Infection in the Study Population

A statistical analysis of the carriage rate of each marker reveals that 26.47% (95% CI: 15.67% - 37.27%; 27/64) of pregnant women were carriers of anti-HBc Ab (previous contact to HBV), 15.68% (95% CI: 6.78% - 27.58%; 16/64) of anti-HBs Ab (HBV immunization), 10.78% (95% CI: 3.19 % - 18.37%; 11/64) of HBsAg (HBV infection) and 9.80% (95% CI: 2.52% - 17.08%; 10/64) of our participants had AcHBe (HBV replication arrest). No cases of HBeAg (viral replication or infectivity) were found in the present study (Table 3).

*Table 3. Carriage rate of markers of hepatitis B virus infection.*

| Markers | Number (n=64) | Percentage (%) | (IC95%) |
|---|---|---|---|
| AgHBs | 11 | 10.78 | 3.19% - 18.37% |
| AcHBs | 16 | 15.68 | 6.78% - 27.58% |
| AgHBe | 0 | 0 | 0 |
| AcHBe | 10 | 9.80 | 2.52% - 17.08% |
| AcHBc | 27 | 26.47 | 15.67% - 37.27% |

### 3.3.2. Markers Based on Sociodemographic Characteristics

Distribution of the study population according to HBV markers and sociodemographic characteristics

It appears from this distribution of the study population that 11.76% (6/51) of pregnant women aged between 25-35 years were carriers of HBsAg compared to 8.57% (4/47) for those whose ages were between 15-25 years. In addition, we note that 31.37% (16/51) whose ages were between 25 and 35 years had AcHBc compared to 21.27% (10/51) among those aged between 15-25 years. In addition, 25% of women aged between 35 and 45 years carried HBsAg and HBcAc respectively. No pregnant women were carriers of HBeAg. (Table 4). Regarding marital status, it appears that single pregnant women were more infected with HBV (carriers of HBsAg) with a prevalence of 50% (4/8) compared to 7.44% (7/94) for pregnant women living as a couple with a statistically significant difference (x2 =9.80; df=1; p=0.001). 50% (4/8) of pregnant women in couples were carriers of AcHBc compared to 24.46% (23/94) for singles without statistically significant difference, (x2 =2.47; df=2; p=0,24). Another 50% (4/8) of single pregnant women carried anti-HBe Ab compared to 6.38% (6/94) for those living as a couple with a highly significant difference (x2 =11.31; df=1; p=0.0007) (Table 5). Depending on the level of study, only pregnant women at primary level carried HBsAg (12.5%) with a non-statistically significant difference (x2 =1.96; df=2; p=0.37). In addition, 28.40% (25/88) of these primary school women had a high HBc Ab level compared to 6.67% (2/3) for secondary school pregnant women with no statistically significant difference (x2 = 6.67; df=2; p=0.16). In addition, 28.40% (25/88) of these primary school women had a high HBc Ab level compared to 6.67% (2/3) for secondary school pregnant women without a statistically significant difference (x2 = 6.67; df=2; p=0.16). Carriage according to profession reveals that housewives were carriers of both HBsAg (10.58%; 9/85), HBsAc (18.82%; 16/85), HBeAc (9.41%; 8/85) and AcHBc (27.05%; 23/85), compared to no marker for students, seamstresses and nurses. However, the HBsAg carriage rate was significantly more represented among shopkeepers (100%, 2/2) compared to 10.58% (9/85) for housewives without a statistically significant difference (x2 =9.7; ddl =2; p=0.08). Also the AcHBe carriage rate was found among shopkeepers (100%, 2/2) and housewives (9.41%; 8/82) (p=0)..05). (All this data is contained in Table 4 below.

*Table 4. Distribution of HBV markers according to sociodemographic factors.*

| Socio-demographic characteristics | AgHBs (n=11) n (%) | AcHBs (n=16) n (%) | AcHBe (n=10) n (%) | AcHBc (n=27) n (%) |
|---|---|---|---|---|
| Age | | | | |
| [15-25[ (n=47) | 4 (8.57) | 7 (14.89) | 4 (8.51) | 10 (21.27) |
| [25-35[ (n=51) | 6 (11.76) | 9 (17.64) | 6 (11.76) | 16 (31.37) |
| [35-45[ (n=4) | 1 (25) | 0 (0) | 0 (0) | 1 (25) |
| *P-Value* | 0.95 | 0.96 | 0.95 | 0.58 |
| Matrimonial status | | | | |
| Live in couple (n=94) | 7 (7.44) | 14 (14.89) | 6 (6.38) | 23 (24.46) |
| Bachelor (n=8) | 4 (50) | 2 (25) | 4 (50) | 4 (50) |

| Socio-demographic characteristics | AgHBs (n=11) | AcHBs (n=16) | AcHBe (n=10) | AcHBc (n=27) |
|---|---|---|---|---|
| | n (%) | n (%) | n (%) | n (%) |
| *P-Value* | 0.001 | 0.80 | 0.0007 | 0.24 |
| Level of study | | | | |
| Primary n=88 | 11 (12.5) | 16 (18.18) | 10 (11.36) | 25 (28.40) |
| Secondary n=3 | 0 (0) | 0 (0) | 0 (0) | 2 (6.67) |
| University n=11 | 0 (0) | 0 (0) | 0 (0) | 0 (0) |
| *P-Value* | 0.71 | 0.52 | 0.74 | 0.16 |
| Profession | | | | |
| Pupils (n=2) | 0 (0) | 0 (0) | 0 (0) | 2 (100) |
| Students (n=8) | 0 (0) | 0 (0) | 0 (0) | 0 (0) |
| Housewives (n=85) | 9 (10.58) | 16 (18.82) | 8 (9.41) | 23 (27.05) |
| Sellers (n=2) | 2 (100) | 0 (0) | 2 (100) | 2 (100) |
| Seamstresses (n=2) | 0 (0) | 0 (0) | 0 (0) | 0 (0) |
| Nurses (n=3) | 0 (0) | 0 (0) | 0 (0) | 0 (0) |
| *P-Value* | 0.08 | 0.92 | 0.05 | 0.24 |
| Parity | | | | |
| Primiparous | 0 (0) | 2 (8.33) | 0 (0)) | 4 (16.66) |
| Pauciparous | 2 (6.25) | 5 (15.62) | 2 (6.25) | 8 (25) |
| Multiparous | 9 (19.56) | 9 (19.56) | 8 (17.39) | 15 (32.60) |
| P-Value | 0.08 | 0.66 | 0.13 | 0.34 |

### 3.3.3. Markers According to Risk Factors

This distribution shows us that 58.33% (7/12) pregnant women who agreed to have scarifications carried HBsAg (infection marker) compared to 4.44% (4/90) for pregnant women who were not scarified. with a highly significant difference (x2 =11.31; df=1; p=0.000). In addition, the carriage rates of AcHBe and AcHBc were high in these women with respectively, 50% (6/12) and 83.33% (10/12) compared to 4.44% (4/90) and 18.89% (17/90) for non-scarified women, with highly significant differences (p=0.000007; p=0.00001). (Table 5). Compared to piercing and/or tattooing, women who declared yes had a high rate of HBsAg with a proportion of 45.45% (5/11) compared to 6.59% (6/91) for women who did not have piercings or tattoos with a highly significant difference (X2=15.40; df=1; p=0.00008). (Table 6). Concerning knowledge of the disease, 36.36 % (20/55) of participants who had no knowledge of the disease had anti-HBc Ab compared to 14.89 (7/47) for those who had knowledge of the disease with a statistically significant difference (X2=6.002; df=1; p=0.01).

***Table 5.*** *Distribution of HBV markers according to risk factors.*

| Risk factors | AgHBs (n=11) | AcHBs (n=16) | AcHBe (n=10) | AcHBc (n=27) |
|---|---|---|---|---|
| Transfusion | | | | |
| Yes (n=0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) |
| No (n=102) | 11 (10.78) | 16 (15.68) | 10 (9.80) | 27 (26.47) |
| *p-value* | 0.87 | 0.89 | 0.86 | 0.90 |

| Risk factors | AgHBs (n=11) | AcHBs (n=16) | AcHBe (n=10) | AcHBc (n=27) |
|---|---|---|---|---|
| Scarification | | | | |
| Yes (n=12) | 7 (58.33) | 0 (0) | 6 (50) | 10 (83.33) |
| No (n=90) | 4 (4.44) | 16 (17.78) | 4 (4.44) | 17 (18.89) |
| *p-value* | 0.00000 | 0.24 | 0.000007 | 0.00001 |
| Piercing or Tattoo | | | | |
| Yes (n=11) | 5 (45.45) | 4 (9.09) | 3 (27.27) | 5 (45.45) |
| No (n=91) | 6 (6.59) | 12 (13.19) | 7 (7.69) | 22 (24.18) |
| *p-value* | 0.00008 | 0.11 | 0.12 | 0.25 |
| History of Surgery | | | | |
| Yes (n=9) | 0 (0) | 1 (9.09) | 0 (0) | 2 (18.18) |
| No (n=93) | 11 (12.36) | 15 (16.85) | 10 (11.24) | 25 (28.09) |
| *p-value* | 0.59 | 0.93 | 0.65 | 0.92 |
| Knowledge of the disease | | | | |
| Yes (n=47) | 3 (6.38) | 8 (14.55) | 5 (10.64) | 7 (14.89) |
| No (n=55) | 8 (14.55) | 8 (17.08) | 5 (9.09) | 20 (36.36) |
| p-value | 0.31 | 0.73 | 0.79 | 0.01 |

n = Number % = percentage

### 3.3.4. Different Profiles Observed in the Pregnant Women in the Study

It appears from this distribution that seven profiles were detected in the pregnant women in our series with 59.80% (95% CI: 49.63%; 69.39% 61/102) representing profile 1 followed by profile 7 with 14, 71% (95% CI: 8.47% 23.09%, 15/102) as shown in Table 6 below.

***Table 6.*** *Distribution of HBV marker profiles in the study population.*

| Different profiles | Number | Frequency (%) | (IC95%) |
|---|---|---|---|
| Profile1 | 61 | 59.80 | 49.63%-69.39% |
| Profile2 | 2 | 1.96 | 0.24%-6.90% |
| Profile3 | 6 | 5.88 | 2.19%-12.36% |
| Profile4 | 2 | 2.94 | 0.61%-8.36% |
| Profile5 | 14 | 13.73 | 7.71%-21.96% |
| Profile6 | 1 | 0.98 | 0.02%-5.34% |
| Profile7 | 15 | 14.71 | 8.47%-23.09% |

Profile 1 means: Absence de marqueurs
Profile 2 means: presence d'AgHBs, AcHBs, AcHBe, AcHBc
Profile 3 means: presence d'gHBs, AcHBe, AcHBc
Profile 4 means: presence d'AgHBs et d'AcHBc
Profile 5 means: presence d'AcHBs
Profile 6 means: presence d'AcHBe et d'AcHBc
Profile 7 means: presence d'AcHBc

### 3.3.5. Profiles According to Sociodemographic and Obstetric Characteristics

Table 7 below showing the distribution of profiles according to socio-demographic factors highlights that the age group [15 25[ years had a high rate of profiles 1,3,5 or respectively 63.83% (CI95% 54, 26% 73.4%; 30/47), 8.51% (95% CI: 3.04% 13.98%; 4/47) and 14.89% (95% CI: 7.91% 21.87%; 7/47), against 56.86% (95% CI: 47.03% 66.69%; 25/51), 3.92% (95% CI: -3.46% 11.3%; 2/51) and 13.72% (95% CI: 6.97% 20.47%; 7/51) for women in the age group [25 35[ years without statistically significant difference between the differences observed (p > 0, 05). We noted for marital status that singles were more represented for profile 2 with a proportion of 25% (2/8) compared to 0% among pregnant women living as a couple with a highly significant difference (p=0.0003) (Table 7). Regarding the level of study, a statistical analysis shows that profile 1 (absence of marker) was present in 100% (11/11) of pregnant women with a university level of study55.68% (49/88) from the primary level, and 33.33% (1/3) from the secondary level with a statistically significant difference (p=0.04). In addition, 1.13% (1/88) of pregnant women at primary level had profile 1 compared to 0% for other levels of study with a statistically significant difference (p=0.01). (Table 7). Depending on the profession, only housewives had profile 2; 4 and 6 with respectively 2.35% (2/85) (p=0.0009), 3.52% (3/85) (p=0.02) and 1.17% (1/85) (p =0.000). In addition, profile 3 was present among both shopkeepers and housewives with respectively 100% (2/2) and 4.70% (4/85) and a highly significant difference (p=0.0009) (Table 7).

***Table 7.*** *Distribution of HBV Profiles according to sociodemographic factors.*

| Socio-demographic characteristics | Profile 1<br>n (%) | Profile 2<br>n (%) | Profile 3<br>n (%) | Profile 4<br>n (%) | Profile 5<br>n (%) | Profile 6<br>n (%) | Profile 7<br>n (%) |
|---|---|---|---|---|---|---|---|
| Age | | | | | | | |
| [15-25[ (n=47) | 30 (63.82) | 0 (0) | 4 (8.51) | 0 (0) | 7 (14.89) | 0 (0) | 6 (18.76) |
| [25-35[ (n=51) | 29 (56.86) | 2 (3.92) | 2 (3.92) | 2 (3.92) | 7 (13.72) | 1 (1.96) | 9 (17.64) |
| [35-45[ (n=4) | 2 (50) | 0 (0) | 0 (0) | 1 (25) | 0 (0) | 0 (0) | 0 (0) |
| *p-value* | 0.87 | 0.25 | 1.073 | 0.39 | 0.97 | 0.06 | 0.90 |
| Matrimonial status | | | | | | | |
| Live in couple (n=94) | 57 (60.63) | 0 (0) | 4 (4.27) | 3 (3.19) | 14 (14.89) | 1 (1.06) | 15 (15.95) |
| Bachelor (n=8) | 4 (50) | 2 (25) | 2 (25) | 0 (0) | 0 (0) | 0 (0) | 0 (0) |
| *P-Value* | 0.83 | 0.0003 | 0.10 | 0.56 | 0.52 | 0.11 | 0.48 |
| Level of study | | | | | | | |
| Primary (n=88) | 49 (55.68) | 2 (2.27) | 6 (6.81) | 3 (3.40) | 14 (15.90) | 1 (1.13) | 13 (14.77) |
| Secondary (n=3) | 1 (33.33) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 2 (66.66) |
| University (n=11) | 11 (100) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) |
| *p-value* | 0.04 | 0.15 | 0.70 | 0.35 | 0.60 | 0.01 | 0.14 |
| Profession | | | | | | | |
| Pupils (n=2) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 2 (100) |
| Students (n=8) | 8 (100) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) |
| Housewives (n=85) | 48 (56.46) | 2 (2.35) | 4 (4.70) | 3 (3.52) | 14 (16.47) | 1 (1.17) | 13 (15.29) |
| Sellers (n=2) | 0 (0) | 0 (0) | 2 (100) | 0 (0) | 0 (0) | 0 (0) | 0 (0) |
| Seamstresses (n=2) | 2 (100) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0 |
| Nurses (n=3) | 3 (100) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) |
| *p-value* | 0.22 | 0.0009 | 0.0009 | 0.02 | 12.51 | 0.0000 | 0.25 |
| Parity | | | | | | | |

| Socio-demographic characteristics | Profile 1<br>n (%) | Profile 2<br>n (%) | Profile 3<br>n (%) | Profile 4<br>n (%) | Profile 5<br>n (%) | Profile 6<br>n (%) | Profile 7<br>n (%) |
|---|---|---|---|---|---|---|---|
| Primiparous (n=24) | 18 (75) | 0 (0) | 0 (0) | 0 (0) | 2 (8.33) | 0 (0) | 4 (16.66) |
| Pauciparous (n=32) | 20 (62.5) | 0 (0) | 2 (6.25) | 0 (0) | 4 (12.5) | 0 (0) | 6 (18.75) |
| Multiparous (n=46) | 23 (50) | 2 (4.34) | 4 (6.69) | 3 (6.52) | 8 (17.39) | 1 (2.17) | 5 (10.86) |
| p-value | 0.11 | 0.80 | 0.62 | 0.52 | 0.78 | 0.81 | 0.80 |

### 3.3.6. Profiles Based on Risk Factors

It appears from Table 8 that 65.55% (59/90) of the participants who had answered no for scarification were the most numerous for profile 1 compared to 16.66% (2/12) for those who had accepted that they were scarified with a statistically significant difference (p=0.003). On the other hand, pregnant women who had said yes for scarification were more numerous for profiles 3 and 4 with respective proportions of 33.33% (4/12) and 25% (3/12) versus 2.22% (2/90) and 0% for those who said no with highly significant differences (X2=8.59; ddl=1; p= 0.0002 and X2= 15.25, df=1; p=0.00009). In relation to piercing or tattooing, 64.83% (59/91) of pregnant women who answered no had profile 1 compared to 18.18% (2/11) for those who answered yes with a statistically significant difference (X2= 7.05, df=1; p=0.007). However, we observe that 27.27% (3/11) and 18.18% (2/11) of the participants who answered yes had profiles 3 and 4 compared to 3.29% (3/11) and 1.09 (1 /91) for those who answered no with p = 0.01 and p = 0.02 respectively. The participants who had knowledge of the disease were more numerous with a proportion equal to 70.21% (33/47) for profile 1 compared to 50.90% (28/55) for those who had no knowledge of it. the disease with a statistically significant difference (X2=3.92, df=1; p= 0.04). Profile 7 was represented by 21.81% (12/55) of women with no knowledge of the disease compared to 6.38% (3/47) for those with knowledge of the disease with p=0.05.

***Table 8.*** *Distribution of HBV Profiles according to risk factors.*

| Profiles<br>Risk factors | Profile 1<br>n (%) | Profile 2<br>n (%) | Profile 3<br>n (%) | Profile 4<br>n (%) | Profile 5<br>n (%) | Profile 6<br>n (%) | Profile 7<br>n (%) |
|---|---|---|---|---|---|---|---|
| Transfusion | | | | | | | |
| Yes (n=0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 0 (0) |
| No (n=102) | 61 (59.80) | 2 (1.96) | 6 (5.88) | 3 (2.94) | 14 (13.72) | 1 (0.98) | 15 (14.70) |
| *p-value* | 0.92 | 0.72 | 0.83 | 0.76 | 0.88 | 0.61 | 0.88 |
| Scarification | | | | | | | |
| Yes (n=12) | 2 (16.66) | 0 (0) | 4 (33.33) | 3 (25) | 0 (0) | 1 (8.33) | 2 (16.66) |
| No (n=90) | 59 (65.55) | 2 (2.22) | 2 (2.22) | 0 (0) | 14 (15.55) | 0 (0) | 13 (14.44) |
| *p-value* | 0.003 | 0.55 | 0.0002 | 0.00009 | 0.30 | 0.23 | 0.81 |
| Piercing or Tattoo | | | | | | | |
| Yes (n=11) | 2 (18.18) | 0 (0) | 3 (27.27) | 2 (18.18) | 4 (36.36) | 0 (0) | 0 (0) |
| No (n=91) | 59 (64.83) | 2 (2.19) | 3 (3.29) | 1 (1.09) | 10 (10.98) | 1 (1.09) | 15 (16.48) |
| *p-value* | 0.007 | 0.51 | 0.01 | 0.02 | 0.06 | 0.20 | 0.31 |
| History of surgery | | | | | | | |
| Yes (n=9) | 8 (88.88) | 0 (0) | 0 (0) | 0 (0) | 0 (0) | 1 (11.11) | 2 (22.22) |
| No (n=93) | 51 (54.83) | 2 (2.15) | 6 (6.45) | 3 (3.22) | 3 (3.22) | 13 (13.97) | 13 (13.97) |

| Profiles | Profile 1 | Profile 2 | Profile 3 | Profile 4 | Profile 5 | Profile 6 | Profile 7 |
|---|---|---|---|---|---|---|---|
| **Risk factors** | **n (%)** | **n (%)** | **n (%)** | **n (%)** | **n (%)** | **n (%)** | **n (%)** |
| *p-value* | 0.10 | 0.41 | 0.96 | 0.62 | 0.62 | 0.78 | 0.86 |
| Knowledge of the disease | | | | | | | |
| Yes (n=47) | 33 (70.21) | 2 (4.25) | 1 (2.12) | 0 (0) | 7 (14.89) | 1 (2.12) | 3 (6.38) |
| No (n=55) | 28 (50.90) | 0 (0) | 5 (9.09) | 3 (5.45) | 7 (12.72) | 0 (0) | 12 (21.81) |
| p-value | 0.04 | 0.40 | 0.28 | 0.29 | 0.75 | 0.93 | 0.05 |

## 4. Discussion

Screening asymptomatic people is an effective means of detecting a generally chronic condition such as viral hepatitis B. Since pregnant women carrying the hepatitis B virus represent a risk of transmission of HBV infection to their newborn, we proposed to conduct a cross-sectional study to determine the proportion of pregnant women carrying at least one marker of HBV infection attending prenatal consultation services at the gynecology department of the YUTH. Our study reported that the most represented age groups are between 25 and 35 years old. This could be explained by the fact that the population is predominantly young, sexually active and likely to become pregnant. These results are similar to that of the work carried out by Omatola et *al.* (2019) in Anyigba, Nigeria, who found that the most represented age groups were 20-25 years, 25-30 years and 30-35 years [14]. Our results could therefore be of key use in the integrated management of mother-child illnesses program. In the present study the prevalence of HBsAg in pregnant women was 10.78%; this prevalence is relatively high given the fact that our participants were asymptomatic. We obtained 94% of married women in our study which is higher than the 62.1% of brides reported by Torimiro et al. (2018) for similar work carried out in third category hospitals in the city of Yaoundé [15]. Participants with a higher level of education were the most represented, i.e. 8.30% (11/102) participants. This finding lends credence to the role of education in disease prevention. Individuals who are generally less literate have limited knowledge about the importance of prenatal consultation. Comparing our results with those of other studies carried out in Cameroon, the prevalence reported in this study is close to 9.7% and 10.2% found by Andréas et al (2014), Noubiap et al (2015) respectively in the studies conducted among pregnant women in the health districts of Buea in the southwest of Cameroon and Guidiguis in the far north of Cameroon [16, 17]. This similarity could be explained by the fact that the same risk group was studied and also, the diagnostic test used was similar in principle to what we used in our study. However, we observe a dissimilarity between our results and those of Kfutwah et al (2012), Fomulu et al (2013) and Njoya et al (2014) respectively of 7.85%, 7.7%, and 16.11% [18, 19, 6]. this difference could be explained by the socioeconomic status (our populations are mostly rural), the size of the samples (959 versus 102), the study sites, the duration of the study and the test used (ELISA). Our study adds to the various endemicity data reported among pregnant women in countries south of the Sahara; 9.5% in Gabon; 10.7% in Mauritania; 12.6% in Ghana [17]. Indeed, we expected this high prevalence and this is in accordance with the established fact that Cameroon, like the other countries of Africa south of the Sahara, is in an area of high endemicity (greater than 8%).

The diagnosis of HBV infection was made by testing for HBsAg. The observed prevalence remains high and confirms the geographic distribution of HBV endemicity, according to which the prevalence of HBV is 8% in the Sub-Saharan region [17]. Given this high prevalence, it is established that pregnant women represent a risk of transmission of HBV from mother to child. As a result, it could serve as a very important reservoir to fuel the HBV epidemic in the general population [18]. This risk is low because no woman carried HBsAg (infection markers) in our study, and on the other hand 9.80% carried HBeAc (replication stop markers). In addition, a pregnant woman carrying HBsAg associated with AcHBc and the viral load has a 70 to 90% risk of transmitting HBV to the newborn and only 10 to 40% if she only carries HBsAg. [18]. Concerning the risk factors, tattooing and scarification were significantly associated with the presence of HBsAg in pregnant women in our series (P=0.0000; P=0.00008) Noubiap et al., (2015), in their series found a significant association only with blood transfusion [19]. Anti-HBc Ab is the first antibody that appears in the serum in the event of HBV infection and which persists throughout life. Our study reveals that 26.46% of pregnant women carried anti-HBc Ab (markers of previous exposure to HBV). Our data are lower than those of Fomulu et al., (2013) and Aba et al., (2016) who for their part found 40.8%; 58.1% [19-21]. The presence of anti-HBc Ab indicating HBV infection or ongoing time frame not determined. Consequently, women with isolated anti-HBc Ab (profile 7) (profile 6) have no immunity to HBV and would carry chronic hepatitis B infection with a risk of transmission. vertical. Anti-HBs Ab is the only neutralizing Ab against HBV. Its isolated presence marks a vaccination (profile 5). On the other hand, when it is associated with anti-HBc Ab, this reflects natural immunity. In our study, 15.68% of women carried anti-HBs Ab, among whom 13.72% presented a vaccination profile (Profile5). Our data are contrary to those of Aba et al., (2016) who in their study did not find any women carrying anti-HBs Ab. They are not comparable to the data from other studies in Cameroon carried out by Frambo et al. (2014) which only looked for HBsAg and HBeAg [10, 22].

The analysis of markers according to age groups reveals that the prevalence of HBsAg was higher in the age group [35-45[ years 25% (1/4) compared to other age groups. However, regarding anti-HBs Ab; anti-HBe Ab; anti-HBc Ab prevalence is higher in the age group [25-35[ years compared to other age groups 17.64%; 11.76%; 31.37%. However, the differences observed between these age groups were not statistically significant (p ›0.005). This could be explained by the fact that the number of participants in the age groups was disproportionate. Another reason would come from the fact that our study was non-probabilistic. Similar observations were found by [22]. We deduce from these observations that women in the age group [15-25[ years were the most representative in profile 1 (63.82%), reflecting the absence of all the markers. In our study the prevalence of all markers was higher in singles varying from 25-50%. However, the differences observed were statistically significant for HBsAg and anti-HBe Ab, respectively p=0.001 and p=0.0007. Concerning the risk factors, scarification and tattooing are significantly associated with chronic hepatitis (profile 3 and 4) (p=0.01 and p=0.02). Concerning the other risk factors, only knowledge of the disease was significantly associated with the absence of marker (profile 1) and occult hepatitis (profile 7). We found no statistical association between surgical and transfusion history with the other profiles. The present work shows numerous limitations, namely the cross-sectional type of the study, however, did not allow conclusions to be drawn on the causal links with the associated factors identified. The hepatitis B viral load was not carried out in our patients.

## 5. Conclusion

At the end of the present study, the general objective was to determine the prevalence of viral hepatitis B in pregnant women as well as the associated risk factors linked to the infection in order to prevent vertical transmission (mother-child). It appears that: Depending on the marker carriage rate, 10.78% of women were carriers of HBsAg, 15.68% of HBsAc, 9.80% of HBeAc and 26.47% of AcHBc. Concerning the factors associated with the occurrence of HBV infection, it appears that depending on marital status, single pregnant women were more infected by HBV (carriers of HBsAg). Regarding scarification, it was associated with HBsAg and HBeAc. piercing or tattoo was associated with HBsAg. Concerning knowledge of the disease, it was associated with the carriage of anti-HBc Ab. Depending on the profession, only housewives had profile 2,4 and 6. In addition, profile 3 was present among both shopkeepers and housewives. Pregnant women who said yes for scarification were more numerous for profiles 3 and 4. We observed that most of the participants who answered yes had profile 4 and those who answered no. Profile 7 was represented by women with no knowledge of the disease versus those with knowledge of the disease.

## Abbreviations

| | |
|---|---|
| VHB | Viral Hepatitis B |
| WHO | World Health Organization |
| HBV | Hepatitis B Virus |
| YUTH | Yaounde University Teaching Hospital |
| HBeAg | Hbe Antigen |
| HBsAg | HBs Antige |


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## Author Contributions

**Mbongue-Mikangue Chris Andre:** Conceptualization, Data curation, Formal Analysis, Investigation, Writing – original draft, Writing – review & editing

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**Riwom Essama Sara Honorine:** Software, Supervision, Validation

## Consent

As per international standards or university standards, participants written consent has been collected and preserved by the authors.

## Conflicts of Interest

The authors declare no conflict of interest.

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