Original Research

Risk factors associated with hepatitis B virus infection among pregnant women attending the antenatal care unit of the Bamenda Regional Hospital

Nfor Omarine Nlinwe*, Desmond Lungle

The University of Bamenda, Faculty of Health Sciences, Department of Medical Laboratory Science. P.O Box 39 Bambili, Bamenda. North West Region, Cameroon

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ABSTRACT

Objectives: Approximately 257 million people are infected with hepatitis B virus (HBV) especially in the middle and low-income countries, despite the Global Health Sector Strategy on viral hepatitis 2016–2021 which aims to eliminate viral hepatitis as a public health threat by 2030. Hepatitis B virus (HBV) remains a common public health problem in Cameroon with a high prevalence among pregnant women. Therefore, this study was designed to assess risk factors associated with hepatitis B virus infection among pregnant women attending the antenatal care unit of the Bamenda Regional Hospital.

Study design: The study was a health facility-based cross-sectional study carried out from March to May 2020. The inclusion criteria were all pregnant women who came for their first visit.

Methods: A well-structured questionnaire and laboratory test methods were used to collect data from 221 pregnant women who were consecutively enrolled in the study. The OnSite HBsAg Rapid Test (source: CTK Biotech, Inc. REF: R0040), was used to detect HBsAg in serum. Both descriptive statistics and Chi-square (and Fisher’s exact) test were used for data analysis.

Results: The prevalence of HBV infection among pregnant women was 4.98% (11/221). Although knowledge, attitude and practice towards HBV by pregnant women were not significantly associated with the risk of infection, there were higher odds of poor practice (P = 0.0152) and attitudes (P = 0.0016) among those without knowledge on HBV infection.

Conclusions: Free of charge vaccination for those with negative HBsAg test results and extensive health education campaigns against HBV is recommended among pregnant women attending the antenatal care unit of the Bamenda Regional Hospital.

1. Introduction

Although the Global Health Sector Strategy on viral hepatitis 2016–2021 targets to eliminate viral hepatitis as a public health threat by 2030, there is rather an increase in the number of deaths caused by hepatitis [1]. About 257 million people are infected with hepatitis B virus (HBV) especially in the middle and low-income countries [2], with an approximate 2.7 million annual death rate from hepatitis-related deaths [3]. Hepatitis B virus (HBV) causes a common public health problem in Cameroon and across sub-Saharan Africa [4]. In the Limbe and Muyuka health districts of Cameroon, the prevalence of HBV infection among pregnant women was reported to be 5.7% and 7.5% respectively [5]. While all the women in this study assumed poor practices towards HBV, those in the Muyuka health district lacked adequate knowledge of HBV. Being married, increasing age, lack of knowledge, and poor practices toward HBV were potential risk factors [5]. In Uganda, antenatal education was recommended because most pregnant women showed excessively low knowledge and misconceptions about HBV [6]. Studies have reported a significant relationship between knowledge on the transmission/prevention of HBV and the spread of the infection [6,7]. HBV-infected patients were found to lack basic knowledge on the management and control of the disease, a risk factor for the spread of the infection.

Other significant risk factors were found to be involved in sexual activities below 19 years of age, history of multiple sex partners, and sexually transmitted infections [7]. A previous study in the Far North Region of Cameroon which reported a low rate of both HBsAg and HBeAg occurrence projected that perinatal transmission may not be common in that area [8]. Likewise, expected risk factors were found to have no significant outcome in a study with HBsAg prevalence of 12.5%
2. Methods

2.1. Study area and study population

This study was carried out at the maternity unit of the Bamenda Regional Hospital (BRH) which is located in the North West Region of Cameroon, Mezam Division, precisely in the Mezam I Sub Division. The approximate population of inhabitants in the Mezam Division is 575,312, with the BRH serving as a referral hospital for the five health districts in this Division. The study population is made up of diverse cultural and religious backgrounds, educational levels, and social statuses [20]. The maternity unit of the BRH has a fully functioning labor room and maternity ward. This unit is taken care of by two obstetricians, three general practitioners, 12 midwives, and nurses. In this unit, the average number of births per month is 320.

2.2. Study design and study participants

This was a health facility-based cross-sectional study carried out from March to May 2020. The inclusion criteria were all pregnant women who came for their first visit at the maternity unit of the BRH, within the study period. The health facility-based study setting was chosen because of the required study population of pregnant women who register for regular antenatal care visits. Moreover, data collected at a specific point in time was deemed adequate to establish a diagnosis of hepatitis B virus, hence justifying the choice of a cross-sectional study design. The inclusion criteria for the study were all pregnant women who came for their first visit at the antenatal care unit of the Bamenda Regional Hospital, within the study period. This is because testing for hepatitis B virus has been made a routine test for all the pregnant women on their first antenatal care visit, at the Bamenda Regional Hospital. Consequently, there were no exclusion criteria. A total of 240 pregnant women registered for their first-time visit during the study period and all were approached with a request to take part in the study. However, 221 (92.1%) gave consent to participate in the study by signing the informed consent form and they were consecutively enrolled in the study.

The minimum sample size for this study was calculated using Fisher’s formula:

\[ N = \frac{Z^2 \times P \times (1-P)}{d^2} \]

Previous prevalence (P) = 7.5% (5)

The error margin (d) used is 0.05, at a 95% interval (Z = 1.96)

Therefore the estimated minimum sample size is approximately 107.

2.3. Ethical consideration

Ethical clearance for this study was gotten from the Ethical Review Committee of the University of Bamenda (the number is 2020/00117H/UH/UH/IRB). Signed informed consents were gotten from those who accepted to be enrolled in the study.

2.4. Laboratory test methods and data analysis

The OnSite HbsAg Rapid Test (source: CTK Biotech, Inc. REF: R0040), with a lateral flow chromatographic immunoassay, was used to detect HbsAg in serum [21]. Data were obtained using a well-structured questionnaire which was designed for the research and from laboratory analysis. Questions in the questionnaire elicited data to cover the objectives of the study. A four-point Likert-type rating scale [22] was used for the scoring of the knowledge on hepatitis B. The Likert-type rating scale was used because it allows respondents to express their opinion and allows them to be neutral if necessary. The points on the Likert-type rating scale for knowledge on the transmission, signs, and symptoms of hepatitis B were; I don’t know, strongly disagree, disagree, agree, and strongly agree. The rating which ranged from 0 to 4 was based on the accuracy of the responses. The midpoint (a cut-off mean) was gotten by adding 4, 3, 2, and 1, and then dividing the sum by 4 to have 2.5 [22]. Means which were more than 2.5 were interpreted as knowledgeable on the transmission, signs, and symptoms of hepatitis B.

Frequencies (sums and percentages) were calculated for the socio-demographic factors and the different attitudes and practices toward hepatitis B. A fourfold \((2 \times 2)\) contingency table displaying the frequency distribution for knowledge, attitude, and practice toward HBV was entered into Graph Pad Prism version 8.2.1. In each of the four cells, the contingency table had frequencies for knowledge, attitude, and practice by both HBV positive and negative cases. Chi-square (and Fisher’s exact) test was used to determine the relative risk, attributable risk, odds ratio, and likelihood ratio of HBV occurrence in exposed groups. The sensitivity and specificity for the prediction of risk of HBV in exposed pregnant women were also determined by Chi-square (and Fisher’s exact) test. Regression analysis was used to determine the effect of socio-demographic factors on knowledge of HBV infection.

3. Results

The prevalence of HBV infection among pregnant women was 4.98% (11/221). Up to 59.28% of the pregnant women were among the 27–38 years age group, while most were urban dwellers (68.33%), married (82.81%), and Christians (93.21%). Although 60.18% of the women were college graduates, 54.75% (121/221) were housewives and 61.09% (135/221) were in the low (<30,000 FRS) monthly income class (Table 1).

Out of the 221 pregnant women, 48.87% (108/221) knew about the hepatitis B virus. While 59.28% (131/221) have not heard of a disease caused by hepatitis B virus, 33.94% (75/221) do not know that hepatitis B can cause liver cancer and 62.9% (139/221) agreed/strongly agreed...
Table 1
Socio-demographic information among pregnant women attending ANC.

|                                | Pos (%) | Neg (%) | Column total (%) |
|--------------------------------|---------|---------|------------------|
| **Row total**                  | 11      | 210     | 221              |
| **Age (in years)**             |         |         |                  |
| 15–26                          | (4.98)  | (95.02) | 96 (37.1)        |
| 27–38                          | (9.34)  | (90.66) | 113 (50.98)      |
| 39–49                          | (9.95)  | (90.05) | 11 (4.98)        |
| **Residence**                  |         |         |                  |
| Urban                          | 0       | 174     | 174 (78.38)      |
| Rural                          | 0       | 49      | 49 (21.62)       |
| **Marital status**             |         |         |                  |
| Single                         | 1 (2.94)| 33      | 34 (15.38)       |
| Married                        | 9 (4.09)| 174     | 183 (82.81)      |
| Widowed                        | 1 (0.45)| 2       | 2 (0.92)         |
| **Religion**                   |         |         |                  |
| Orthodox                       | 0       | 2       | 2 (0.92)         |
| Muslim                         | 0       | 11      | 11 (5.00)        |
| Christian                      | 11      | 196     | 207 (95.08)      |
| **Educational status**         |         |         |                  |
| No formal education            | 0       | 2       | 2 (0.92)         |
| Able to read and write         | 0       | 18      | 18 (8.14)        |
| Elementary education           | 2 (7.69)| 24      | 26 (11.76)       |
| Secondary education            | 4 (9.52)| 38      | 42 (19.09)       |
| College                        | 5 (3.73)| 128     | 133 (60.18)      |
| **Occupational status**        |         |         |                  |
| Self-employed                  | 2 (8.72)| 24      | 26 (11.76)       |
| Government employed            | 2 (5.41)| 35      | 37 (16.74)       |
| Housewife                      | 5 (4.13)| 116     | 121 (54.75)      |
| Not employed                   | 2 (5.41)| 38      | 40 (18.18)       |
| <30,000                        | 6 (2.73)| 129     | 135 (61.09)      |
| ≥300,000                       | 5 (2.26)| 72      | 77 (34.84)       |

that hepatitis B can affect all age groups. 56.56% (125/221) agreed/strongly agreed that hepatitis B can be transmitted from mother to child, 68.78% (152/221) agreed/strongly agreed that hepatitis B is curable and 77.38% (171/221) agreed/strongly agreed that vaccine is available for hepatitis B (Table 2).

The pregnant women with urban residence had more knowledge (P = 0.0254) than those who lived in rural areas, likewise those with higher educational status (P = 0.0004) and monthly income (P = 0.0252) (Table 3).

Up to 78.28% (173/221) of the pregnant women will go to a health facility if they found out they have hepatitis B and 74.21% (164/221) would communicate to a physician about their illness. Also, 92.76% (205/221) will go to a health facility as soon as they realize they have symptoms of hepatitis B. Generally 44.8% (99/221) of the women did not know the cost of diagnosing and treating hepatitis B, meanwhile, 18.55% (41/221) thought it is expensive. The worry of most (36.36%) of those who tested positive for HBsAg was the fear of death while most (42.38%) of those who tested negative were afraid of transmitting the disease to family members if diagnosed with hepatitis B. All (100%) of those who tested positive thought they could get hepatitis B and only 18.18% (2/11) thought they are infected with hepatitis B. However 72.38% (152/210) of those who tested negative thought they could get it while only 0.48% (1/210) thought she is infected with hepatitis B (Table 4).

Table 2
Knowledge on hepatitis B virus among pregnant women attending ANC.

|                                | Num (% Knowledgeable = 108 |
|--------------------------------|---------------------------|
|                                | (48.87%)                  |
| **I don’t know**               | (31.67)                   |
| Strongly disagree              | (18.07)                   |
| **Disagree**                   | (18.07)                   |
| Strongly agree                 | (31.67)                   |
| Agree                         | (48.87)                   |
| **Have you heard of a disease**| (25.79)                   |
| caused by the hepatitis B virus?| (94.29)                   |
| Can hepatitis B affect the liver?| (95.02)                  |
| Can hepatitis B cause liver cancer?| (95.02)                  |
| Are nausea, vomiting, and loss of appetite common symptoms of hepatitis B?| (95.36)                  |
| Can hepatitis B be transmitted from mother to child?| (95.36)                  |
| Can hepatitis B be transmitted through contaminated blood?| (95.36)                  |
| Can hepatitis B be transmitted by blades of ear or nose pierces?| (95.36)                  |
| Can hepatitis B be transmitted by unsafe sex?| (95.36)                  |
| Can hepatitis B be transmitted from mother to child?| (95.36)                  |
| Is hepatitis B curable/treatable?| (95.36)                  |
| Is vaccination available for hepatitis B?| (95.36)                  |

Table 3
Regression analysis on the effect of sociodemographic factors on knowledge of HBV infection.

| Variable              | t value | P value | P-value summary |
|-----------------------|---------|---------|-----------------|
| Intercept             | 1.105   | 0.2705  | Ns               |
| B: Age (in years)     | 0.5625  | 0.5744  | ns               |
| C: Residence          | 2.253   | 0.0254  | *               |
| D: Marital status     | 0.4288  | 0.6722  | ns               |
| E: Religion           | 0.8833  | 0.3781  | ns               |
| F: Educational status | 3.626   | 0.0004  | ***              |
| G: Occupational status| 0.4211 | 0.6741  | ns               |
| H: Monthly income     | 2.254   | 0.0252  | *               |

Up to 63.64% (7/11) of the women who tested HBV positive and 57.14% (120/210) of those who tested negative had earlier screened for hepatitis B. Generally 53.39% (118/221) asked their barber to change the blade while 91.86% (203/221) would go for further investigation and treatment when diagnosed with hepatitis B. 36.66% (4/11) of those who tested hepatitis B positive indicated to have been vaccinated while only 26.19% (55/210) of those who tested negative were vaccinated (Table 5).
4. Discussion

The 4.98% prevalence of HBV among pregnant women in the current study could be considered high especially with the possibility of perinatal transmission. Findings from an earlier study carried out five years ago reported a higher prevalence of 6% among pregnant women in the Bamenda health district [4]. However compared to findings from a study in the South-West and Far-North regions of Cameroon, the prevalence of HBV in the recent study is relatively low. The prevalence of HBV among pregnant women was 5.7%, 7.5%, and 9.7% in Limbe, Muyuka, and Buea respectively, all located in the South-West region [5,10]. A higher prevalence of 10.2% and 20.4% among pregnant women was reported in a rural settlement, in the Far North region [5,10]. Another study in Iran also reported a higher prevalence of HBV in rural settings, with low educational level being a risk factor in the urban areas [26]. Another study in Iran also reported a higher prevalence of HBV in rural settings, with low educational level being a risk factor in the urban areas [26]. A lower prevalence in the current study confirmed findings from a previous study that categorized the North-West region under low HBV seroprevalence [24]. The Far-North and South-West regions were categorized under high and medium HBV seroprevalence respectively [24]. The prevalence of HBsAg among pregnant women in Eastern parts of Germany was low (0.48%) [25], compared to the current study. This may be expected since Cameroon falls under the middle and low-income countries with a higher prevalence of HBV [2].

In the current study, the prevalence of HBV was higher among those who resided in the rural area (5.71%: 4/70) than in the urban area (4.64%: 7/151). Also, HBV was significantly high in a rural setting in the Far-North region of Cameroon [8,23]. In the Southeastern region of Turkey, the prevalence of HBsAg was higher in the rural setting, with the low educational level being a risk factor in the urban areas [26]. Another study in Iran also reported a higher prevalence of HBV in rural settings, with low educational level being a risk factor in the urban areas [27]. Contrary to the current study, HBsAg was significantly higher in urban than rural populations in Gabon [28]. Urban residence, high educational level, and increased monthly income had significant effects on increase knowledge on HBV among the pregnant women in this current study. However, only 48.87% of the pregnant women in the current study knew hepatitis B. The lack of knowledge, poor practice, and attitude towards HBV was not significantly associated with the risk of HBV infection. The lack of knowledge, poor practice, and attitude towards HBV was not significantly associated with the risk of HBV infection. The lack of knowledge, poor practice, and attitude towards HBV was not significantly associated with the risk of HBV infection. The lack of knowledge, poor practice, and attitude towards HBV was not significantly associated with the risk of HBV infection. The lack of knowledge, poor practice, and attitude towards HBV was not significantly associated with the risk of HBV infection. The lack of knowledge, poor practice, and attitude towards HBV was not significantly associated with the risk of HBV infection. The lack of knowledge, poor practice, and attitude towards HBV was not significantly associated with the risk of HBV infection. 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also poor. Up to 42.53% (94/221) of the pregnant women had not done the screening for HBV even though they have been sexually active. Although 54.3% (120/221) had earlier screened and tested negative for HBV, only 45.83% (55/120) got themselves vaccinated against HBV while up to 54.17% (65/120) did not. This demonstrates poor practice towards HBV and also indicates a lack of post-screening follow-up. Instead, 36.36% (4/11) of those who tested positive and did not need the vaccine, had been vaccinated. The cost of the vaccine and lack of knowledge are the possible reasons for the lack of vaccination by some of those who had earlier been tested negative. As earlier indicated, the cost of the vaccine has contributed to the high infection rates in poor countries [29].

5. Conclusion

The seroprevalence of HBsAg among the pregnant women attending the antenatal care unit of the Bamenda Regional Hospital was 4.98% (11/221). Knowledge, attitude, and practice towards HBV by pregnant women are not significantly associated with the risk of infection. However, there are higher odds of poor practice and attitudes among those without knowledge of HBV infection. The current practice of routine screening of pregnant women and free-of-charge vaccination of all babies against HBV in the study area is highly commendable. Nevertheless, to ensure rational control and management of the disease among pregnant women, free-of-charge vaccination should immediately be given to those with negative test results. Extensive health education campaigns against HBV are also recommended during antenatal care visits.

Limitation of study

Because this study had a relatively small sample size and was a cross-sectional study carried out in a single center, it is difficult to make causal inferences.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Conflict of interest and authorship confirmation form

✓ All authors have participated in (a) conception and design, or analysis and interpretation of the data; (b) drafting the article or revising it critically for important intellectual content; and (c) approval of the final version.

 ✓ This manuscript has not been submitted to, nor is under review at, another journal or other publishing venue.

 ✓ The authors have no affiliation with any organization with a direct or indirect financial interest in the subject matter discussed in the manuscript.

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Table 6

Risk of HBV infection among pregnant women.

| Variable | Relative Risk (95%) | Attributable Risk (95%) | Odds Ratio (95%) | Sensitivity (95%) | Specificity (95%) | LR | P-value |
|----------|---------------------|------------------------|-----------------|-------------------|------------------|----|---------|
| Not Knowledgeable | 1.67 (0.54-5.24) | 0.023 (-0.04-0.1) | 1.72 (0.53-5.36) | 63.64 (35.38-84.83) | 49.52 (42.83-56.23) | 1.26 | 0.5395 |
| Poor Attitude | 0 (0-0.33) | 0 (0-0.33) | 0 (0-0.33) | 6 (0-25.98) | 46.19 (39.56-52.94) | 0 | 0.0003*** |
| Poor Practice | 0.92 (0.31-2.76) | 0 (-0.06-0.08) | 0.92 (0.31-3.24) | 45.45 (21.27-71.99) | 52.38 (45.64-59.03) | 0.95 | >0.9999 |

Risk of no knowledge of HBV on poor attitude and practice toward HBV

| Variable | Relative Risk (95%) | Attributable Risk (95%) | Odds Ratio (95%) | Sensitivity (95%) | Specificity (95%) | LR | P-value |
|----------|---------------------|------------------------|-----------------|-------------------|------------------|----|---------|
| Poor Attitude | 2.05 (1.46-18.74) | 0.52 (0.16-0.58) | Infinity (3.02-infinity) | 8.85 (4.88-15.53) | 100 (96.57-100) | - | 0.0016** |
| Poor Practice | 1.43 (1.08-1.92) | 0.17 (0.03-0.3) | 1.98 (1.14-3.38) | 60 (50.44-68.86) | 56.9 (47.81-65.54) | 1.39 | 0.0152* |

*Significant P values.
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