

## ORIGINAL ARTICLE

# The Prevalence and Risk Factors of Hepatitis B Virus Infection Among Dwellers in A Peri-Urban District of Ghana: A Cross-Sectional Study

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Hepatitis B virus (HBV) infection is a significant health issue affecting about 296 million people worldwide. The disease is of great public health concern in Ghana as the country is within the endemic region of HBV infection. This study sought to determine the prevalence of HBV infection and associated risk factors among dwellers in a peri-urban district of Ghana. This cross-sectional descriptive study was conducted in the Sunyani West District of the Bono Region of Ghana. Respondents aged  $\geq 18$  years were purposively recruited from the four major towns in the District with health centres. A questionnaire was used to collect data from participants, and a rapid diagnostic test for the sero-presence or otherwise of hepatitis B infection was conducted. A total of 992 respondents took part in the study, with the prevalence of HBV infection using HBsAg as a marker among all the study participants being 2.9% (male 4.0% (12/298), female 2.5% (17/694)). Females aged between 20-29 years had a comparatively higher prevalence of hepatitis B infection than their corresponding males. The intake of alcohol (RR=4.23; 95% CI:2.05-8.74,  $p < 0.000$ ), previously diagnosed of having a sexually transmitted disease (RR= 2.43; 95% CI: 1.03-5.71,  $p = .04$ ) and having multiple sexual partners (RR= 2.27; 95% CI: 1.11-4.65,  $p = .02$ ) were the significant risk factors for HBV infection among the study participants. The study showed a low prevalence of HBV infection in the Sunyani West District of Ghana using HBsAg as a serum marker to diagnose the infection.

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## INTRODUCTION

Hepatitis B virus (HBV) infection, a potentially life-threatening infection of the liver, is caused by the HBV (Seto et al., 2018). It is a major global

health issue affecting about 296 million people worldwide, with an estimated global incidence of 1.5 million infections annually. The infection has a propensity to cause chronic infection leading to cirrhosis and liver cancer (Blankson et al., 2005; WHO, 2021). Liver cirrhosis and hepatocellular carcinoma resulting from HBV infection accounted for 887,000 deaths in 2015 (WHO, 2017). In 2015, mortality due to HBV infection was ranked as the

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fifteenth-highest cause of death globally, with an estimated 887 000 deaths occurring mainly due to liver cirrhosis and cancer (Lavanchy and Kane, 2016; Si *et al.*, 2019).

Hepatitis B virus infection patterns vary globally, with about 45% of the world's population living in areas of endemicity for HBV infection where transmission is acquired perinatally and during early childhood (Goldstein *et al.*, 2005; Wasley *et al.*, 2010; WHO, 2017). Another 43% live in Intermediate endemicity areas where multiple modes of contracting the disease, such as intravenous drug use, multiple sexual partners, and perinatal transmission, are common (Seto *et al.*, 2018). Geographically, the prevalence of HBV is highest in the World Health Organization (WHO) African and Western Pacific Regions, with these two regions accounting for 6.1% and 6.2% of the global prevalence, respectively (MacLachlan and Cowie, 2015; Ofori-Asenso and Agyeman, 2016). However, in the WHO European, Eastern Mediterranean and South-East Asia Regions, the prevalence is 1.6%, 3.3%, and 2.0% of the general population, while the Americas' WHO Region has a prevalence of 0.7% (Lavanchy and Kane, 2016). HBV infection is highly endemic in Africa, with an estimated 5-8% of the population being infected, especially in West and Central Africa (Parkin *et al.*, 2005; Schweitzer *et al.*, 2015; WHO, 2017). In Ghana, as with other African countries, the disease is a significant public health concern as 25% of individuals who become infected during infancy and about 15% of those infected after infancy die of liver cancer or cirrhosis (Perz *et al.*, 2006). A 2013 index of the global burden of disease by Sweitzer *et al.* estimated the prevalence of the infection in Ghana to be 12.9% (Schweitzer *et al.*, 2015). While a systematic review of prevalence studies of HBV infection in Ghana between 1995-2015 pegged the prevalence of the infection in Ghana to be 10-15% (Ofori-Asenso and Agyeman, 2016).

Prevalence studies of HBV infection in some regions of Ghana have been done. Nkrumah *et al.* (2011) in a retrospective study in Agogo, a community in the Ashanti Region of Ghana, noted a 10.5% prevalence of the infection in blood donors. A study at the Tamale Teaching Hospital in the Northern Region of Ghana in 2012 identified a 10.8% prevalence of HBV among voluntary blood

donors and 11.6% in replacement donors (Dongdem *et al.*, 2012). Mutocheluh *et al.* (2014) determined the prevalence of the infection in prospective blood donors within the Techiman Municipality of the Brong-Ahafo Region to be 14.6%. Still, a more recent study in the same region at the Dormaa Municipality found a 10.2% prevalence of HBV infection among parturient women (Adjei *et al.*, 2018). To the best of our knowledge, there's no data on the prevalence of HBV infection and its associated risk factors in the Sunyani West District of Ghana, a void this work will fill. Therefore, this study aimed to assess the prevalence of HBV infection and associated risk factors in this peri-urban district of Ghana to guide policy on reducing the disease burden.

## MATERIALS AND METHODS

### *Study site*

This study was conducted in the Sunyani West District, a peri-urban district in the Bono Region of Ghana. The District has an estimated population of 108,111 with males constituting 49.2% (53,186) and females 50.8% (54,925) giving a male:female ratio of approximately 1:1 (GDHS, 2014). The District has four major towns, namely Nsoatre, Fiapre, Kwatre, and Chiraa. These towns were purposively selected for the study because they each have a health care facility with a HBV infection counseling units.

### *Study design and population*

This cross-sectional study was conducted from July 2019 to June 2020 among respondents aged  $\geq 18$  years who have resided in the Sunyani West District for at least 12 months. This age group was the last batch of unvaccinated individuals before the introduction of the universal Hepatitis B vaccination programme as part of the Expanded Programme on Immunization (EPI) by the Ministry of Health and Ghana Health Service (GHS) in 2002 (Le Gargasson *et al.*, 2015). Study participants who reported to the health care facilities were conveniently recruited and counseled. A thumb-printed consent to participate was obtained from all those who agreed to participate in the study.

A self-designed structured questionnaire was used to collect information on participants'

**Table 1. Socio-demographic characteristics of the study participants**

| <b>Variables</b>                  | <b>n (%)</b>    |
|-----------------------------------|-----------------|
| <b>Age (years)</b>                |                 |
| Mean $\pm$ SD                     | 32.3 $\pm$ 12.1 |
| <20                               | 147 (14.8)      |
| 20-29                             | 335 (33.8)      |
| 30-39                             | 252 (25.4)      |
| 40-49                             | 169 (17.0)      |
| >50                               | 89 (9.0)        |
| <b>Gender</b>                     |                 |
| Male                              | 298 (30.0)      |
| Female                            | 694 (70.0)      |
| <b>Marital status</b>             |                 |
| Single                            | 452 (45.6)      |
| Married                           | 455 (45.9)      |
| Separated                         | 38 (3.8)        |
| Widowed                           | 47 (4.7)        |
| <b>Employment status</b>          |                 |
| Unemployed                        | 286 (28.8)      |
| Salaried worker                   | 225 (22.7)      |
| Self-employed                     | 481 (48.5)      |
| <b>Religion</b>                   |                 |
| Christian                         | 853 (86.0)      |
| Islam                             | 116 (11.7)      |
| Others                            | 23 (2.3)        |
| <b>Highest level of education</b> |                 |
| None                              | 113 (11.4)      |
| Basic                             | 352 (35.5)      |
| Secondary                         | 323 (32.5)      |
| Tertiary                          | 204 (20.6)      |

socio-demographic characteristics, lifestyle activities, health-seeking behaviors and HBV sero-prevalence status. The questionnaire's test items were pretested among 40 respondents in the Sunyani East District, a district with a similar socio-demographic characteristic for consistency and understanding of the test items. The results of the pretest were not included in the final analysis. A capillary blood sample was obtained from all the study participants to test for seropositivity or otherwise of HBV infection.

### ***Blood sample collection and hepatitis B virus infection testing***

Two millilitres of venous blood was aseptically obtained from all study participants through a venipuncture into a microtainer containing ethylene di-amine tetra-acetic Acid (EDTA) (BD, USA) and made to settle for 30 mins after which the serum was extracted. The serum sample obtained was tested for the sero-presence or otherwise of the HBV surface antigen by a commercial rapid diagnostic kit, The DiaSpot one step HBV (Diaspot Diagnostics, USA). This test employs the use of the chromatographic lateral flow technique and colloidal gold conjugated monoclonal antibodies reactive to HBsAg (sAb-Au). The test kit has been extensively used to detect HBV among diverse populace (Frambo *et al.*, 2014; Noubiap *et al.*, 2015). A seropositive result is obtained if there are two red bands on the test kit. A single red band at the control line indicates a negative result, and the absence of a red band at the control indicates an invalid result. All initial positive samples were retested with the same diagnostic kit for confirmation. There was no disparity in the positive test outcome after retesting. Participants who tested positive were referred to the respective HBV infection treatment and counseling units of the individual health centres for counseling and treatment according to established protocols. All positive and negative test samples and used kits were disposed of according to laid down protocols at the facilities. Ethical clearance for the study was sought from the Ethical Review Committee of the Tamale Teaching Hospital, Tamale, Ghana (THERC/21/07/19/03).

### ***Statistical analysis***

All completed questionnaires and corresponding HBsAg results were entered into and analysed with

Microsoft Excel, 2007 and R statistical programming language. Continuous variables were presented as mean  $\pm$  SD while categorical data are reported as proportions and percentages. The relative risk was reported for the risk of participants being infected with HBV. For all statistical analyses, a p-value  $<0.05$  was set as the level of statistical significance.

## **RESULTS**

### ***Socio-demographic characteristics of the study participants***

In all, 992 respondents with a mean age of 32.3  $\pm$ 12.1 years took part in the study. The majority, 33.8% (335), was within 20-29 years, with 69.9% (693) females. Most 69.9% (692) of the respondents were females, with 45.8% (453) being married. The majority, 48.6% (481), 86.0% (851) and 35.4% (350), respectively, were self-employed, Christians and had obtained a basic level of education as their highest level of education (Table 1).

### ***Prevalence of hepatitis B virus infection among the study groups***

The prevalence of HBV infection using HBsAg as a marker among the study participants was 2.9%, with the prevalence in males being 4.0% (12/298) and in females 2.5% (17/694).

Figure 1 shows the prevalence of HBV infection across different age groups and gender using HBsAg as a marker. Female participants aged 20-29 years had the highest prevalence of 0.71%, followed by males aged 20-29 years and females aged 30-39 years (0.51%). A higher prevalence of HBV infection was observed among males (0.40%) in the age category of 40-49 years compared to females (0.30%) within the same age group.

Risk factors associated with hepatitis B virus infection among the study participants

Presented in Figure 2 is the association of various lifestyle activities and health-seeking behaviours as risk factors for being HBV positive using HBsAg as a marker. It was noted that respondents who drink alcoholic beverages were about four times more likely to be infected with HBV (RR=4.23; 95% CI:2.05-8.74,  $p <0.000$ ). With those who had been previously diagnosed with a sexually transmitted disease (RR= 2.43; 95% CI: 1.03-5.71,  $p = .04$ ) and those with multiple sexual partners (RR= 2.27;

Figure 1: Sero-prevalence of HBV infection among different age groups and gender using HBsAg as a marker

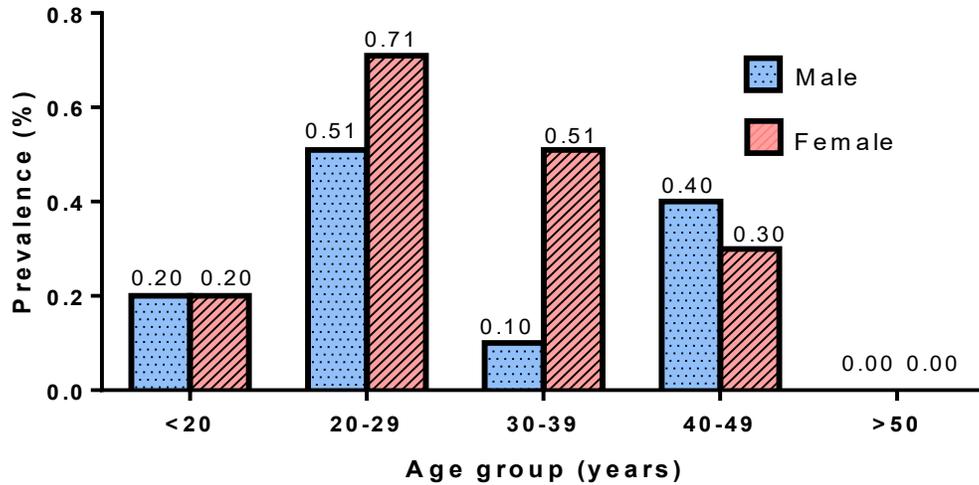
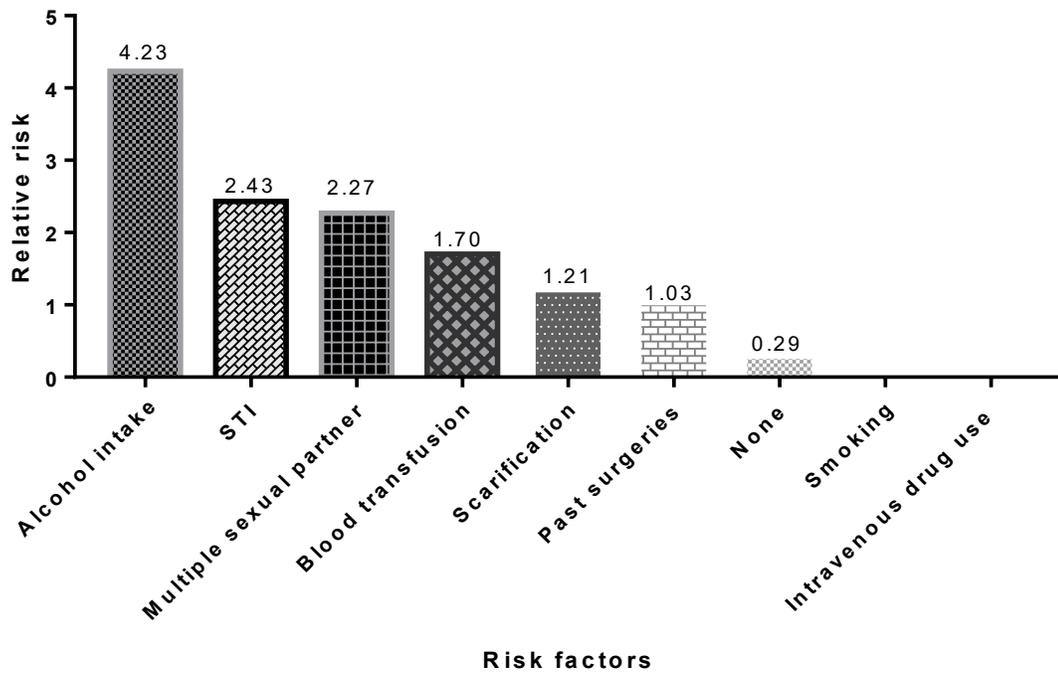


Figure 2: The risk of being HBsAg seropositive associated with various lifestyle activities and health-seeking behaviours among study participants



95% CI: 1.11-4.65,  $p = .02$ ) being approximately twice as likely to be hepatitis B virus-positive.

### DISCUSSION

Hepatitis B virus (HBV) infection has been categorized as a disease of public health importance in sub-Saharan Africa. Prevalence rates greater than 8% have been reported for Ghana, therefore, classifying the country as a hepatitis B endemic zone (Howell *et al.*, 2014; Abesig *et al.*, 2020).

The prevalence of HBV infection using HBsAg as a marker of 2.9% noted in this study was lower than the global HBV prevalence of 3.6% (Schweitzer *et al.*, 2015) and the country-wide prevalence 8.4% (Abesig *et al.*, 2020). Furthermore, a study by Schweitzer *et al.* in 2015 demonstrated a much higher (12.9%) prevalence of HBV infection in Ghana (Schweitzer *et al.*, 2015). Hepatitis B virus infection prevalence in this study was also lower than 12.3% reported by Ofori-Asenso and Agyeman in a systematic review and meta-analysis of HBV infection across all six regions of Ghana (Ofori-Asenso and Agyeman, 2016). Within the Bono Region, a comparatively higher prevalence of HBV infection has also been reported by Mutocheluh *et al.* (2014) and Walana *et al.* (2014). It is unclear the underlying causes of this low prevalence of HBV infection among the study participants, but it is not far-fetched to attribute this to the increase in vaccination awareness against HBV infection (Borch *et al.*, 2017). The increase in vaccination awareness is aimed at the World Health Organization (WHO) set target of eliminating HBV infection by 2030 (WHO, 2017; Waheed *et al.*, 2018).

The higher prevalence of HBV infection using HBsAg as a marker among males noted in this study was consistent with findings by Amidu *et al.* (2012) and Ephraim *et al.* (2015), in which they reported a higher prevalence among males among similar respondents in the Ashanti Region of Ghana. However, it must be emphasized that globally, the difference in prevalence between males and females is relatively small, although females had a lower overall HBsAg prevalence of 3.5% compared to 3.9% in males (Ott *et al.*, 2012). The higher prevalence among males is associated with faster clearance of the hepatitis B surface antigen (HBsAg) in women than in men (Yuen *et al.*, 2016).

The highest number of seropositive cases within the

age groups of 20-29 and 30-39 years noted in this study was consistent with earlier work by Dongdem *et al.* (2012) among blood donors at the Tamale Teaching Hospital. These age groups represent the most active people who are more likely to engage in activities that increase their risk of acquiring the virus.

The intake of alcohol as a significant risk for HBV infection noted in this study was consistent with earlier works by Iida-Ueno *et al.* (2017). Though alcohol is not a known direct risk factor for HBV infection, it contributes to the development of liver diseases (Osna *et al.*, 2021). Alcohol not only facilitates the disease progression of hepatitis in infected individuals it also enables the virus to persist chronically. Although the mechanisms through which alcohol enhances the development of HBV liver disease are not fully understood, oxidative stress, Golgi apparatus stresses, suppressed immune response and increased HBV replication are some of the mechanisms propounded as possible factors in the development of the disease (Ohashi *et al.*, 2018; Ganesan *et al.*, 2020).

Previous diagnoses of sexually transmitted disease and having multiple sexual partners as risk factors of HBV infection, which has been extensively reported in literature, were confirmed in this study (Obi *et al.*, 2006; Rabiou *et al.*, 2010). Modification of sexual behaviours with its associated reduction in sexually transmitted disease may go a long way in helping in the reduction of HBV infection.

### CONCLUSION

The study showed a low prevalence of HBV infection using HBsAg as a serum marker to diagnose the infection. Different infectivity rates prevail in other geographical areas of the country. Therefore, it is erroneous to extrapolate the findings of this study conducted in a specific study area to be the national HBV prevalence. Vaccination remains our best tool to prevent HBV infection. In light of these findings, it is recommended that health education on reducing alcohol intake and modification of sexual lifestyle activities should be stepped up. This may go a long way in reducing the burden of HBV infection in individuals and society as a whole.

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### Conflict of interest

The authors declare that they have no competing interests whatsoever.

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