

Examining Prevalence and Risk Factors of Hepatitis B Virus Among Pregnant Women in the Context of Prevention of Mother-To-Child Transmission

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ABSTRACT

Background: Hepatitis B. virus continues to pose threat to human by infecting millions of people globally through the liver and remains a public health problem even though there has been the availability of HB vaccine and antiviral agents over the years. It is estimated that 240 million people worldwide are chronically infected, particularly in low and middle-income countries (LMICs). The major well-established risk of harm associated with maternal HBV infection is perinatal transmission to the infant occurring most commonly through the process of delivery. **Objective:** The aim of this study is to estimate the prevalence of Hepatitis B and associated risk factors among pregnant women in Ejura-Sekyedumase Municipal. **Method:** The study adopted a cross sectional approach to research design among pregnant women attending antenatal care. Proportion sampling method was applied to each facility based on the number of pregnant women attending ANC clinic to determine the number of pregnant women to be interviewed from each facility. Statistical analysis was done using STATA and results were presented in frequencies and percentages while regression analysis results was report in odds ratio with its associated chi-square and p-values. **Results:** Three hundred and thirteen pregnant women participated in the study with a mean age of 30.3 ± 2.5 . A total of 64 pregnant women tested positive for HB virus, giving a prevalence rate of 20.5%. Factors that were significantly associated with HB virus infection among pregnant women include age 18-24 and 45+ years, polygamous marriage, blood transfusion and multiple sexual partners. About 49% of the pregnant women had adequate knowledge on hepatitis B infection. Knowledge on hepatitis B infection was significantly associated with age, religion, place of residence and place of past deliveries. **Conclusion:** With the high prevalence of hepatitis B among pregnant women in the district, it is important urgent actions are taking to address the root causes of the high infection among the pregnant women. Screening and HBV vaccine introduction should be key on the agenda among policy-makers.

Keywords: pregnant women, hepatitis B, HB transmission, prevalence

BACKGROUND

Hepatitis B (HB) remain one of the major health problems with millions of people getting infected with the virus which affects the liver. Nearly 240 million people worldwide are living

with hepatitis B especially in low and middle-income countries (LMICs) including an estimated 65 million women of childbearing age (WHO, 2015). The WHO has explained that hepatitis B virus that destroys the immunity of a person by destroying the cells in the liver. Hepatitis B virus has generally been known to belong to hepatotropic deoxyribonucleic acid (DNA) and are included in the oncogenic group of viruses and may increase the risk of getting hepatocellular carcinoma (WHO, 2015). In 2017, hepatitis B status report from the World Health Organization (WHO) shows an estimated 328 million persons globally are infected with hepatitis B and C, with majority of these incidence coming from sub-Saharan Africa and East Asia (WHO, 2017). It has been established that hepatitis B and C are both transmitted through the same routes. Evidence has shown that in most cases hepatitis B and C are transmitted through contaminated blood, sexual activity or other means including perinatal transmission (WHO, 2015). An estimated 71 million people were infected with HCV in 2015, globally. In the same year, it was estimates that about 257 million people were living with chronic hepatitis B infection and this resulted in over 887,000 deaths through cirrhosis and hepatocellular carcinoma (WHO, 2017). Often about 15-40% with the infection progress to cirrhosis, liver failure and hepatocellular carcinoma (WHO, 2017)

Hepatitis B infection remains an important global public health concern despite the existence of an effective vaccine and antiviral agents. Chronic HBV in pregnancy is associated with mother-to-child transmission (WHO, 2017). The major well-established risk of harm associated with maternal HBV infection is perinatal transmission to the infant occurring most commonly through the process of delivery (Al-Mandeel et al., 2015). Higher risk of maternal and foetal complications have been associated with pregnancies with chronic infection. Children born to mothers with chronic hepatitis B infection are more likely to develop hepatitis B infection before the age of 5 years (WHO, 2016). Globally, screening has been identified as an effective mechanism in HBV detection, prompt diagnosis and intervention, especially at an early stage of the infection to prevent MTCT. Hepatitis B viral screening has very high accuracy (sensitivity and specificity >98%) as established in studies by the WHO in the 1980s and 1990s when the tests were developed (Alavian et al., 2016). A WHO report in 2016 shows that 10.5% of the world population are aware of their hepatitis B status with only 16.7% of those who are infected are able to have access to treatment (WHO, 2016). Recent statistics indicate that 1.1 million people were newly infected with hepatitis B in 2017 (CDC, 2019; WHO, 2019).

Ghana has been categorized among the endemic areas with a high prevalence of chronic HBV (WHO, 2016). Owusu-Ansah (2015) indicated that HBV is one of the public health concerns identified in Ghana and requiring more attention. Different studies and reports put the prevalence at different levels for the country. For instance, Howell, Lemoine, & Thursz, (2014) and Kumar et al. (2015) estimates the prevalence of chronic HB infection as higher than 8% while Schweitzer *et al*, (2015) in an analysis of the burden of chronic HB prevalence in the world put the prevalence for Ghana at 12.9%. Teye (2015) also estimates the prevalence in Ghana as 10-15%. Issahaku et al. (2017) estimates that the prevalence of HB among pregnant women was 14.3%. Regional level data on HB prevalence among pregnant women is mostly limited.

The level of knowledge on hepatitis B infection among pregnant women is another key determinant of hepatitis B prevalence, but not many people are aware of their status and therefore unable to seek appropriate and timely care. In such cases, the viral infection develops to chronic state. This ignorance of the status especially among pregnant women has the

potential of affecting the unborn child, if early diagnosis is not done. There are other associated risks factors that may lead to HBV infection among pregnant women. This study seeks to provide empirical evidence regarding the prevalence of HB viral infection among pregnant women in Ejura Sekyedumase Municipal. The study further sought to ascertain the risk factors associated with HBV virus infection among pregnant women within the district in the context of preventing vertical transmission from mothers to their foetuses.

METHOD

Study Setting

The study was conducted in Ejura-Sekyedumase Municipality of Ashanti region of Ghana. Data for the study was collected from the two main hospitals of the municipality: Ejura Sekyedumase Municipal Hospital and St. Luke Hospital, Kasei.

Study Design

The study adopted an analytical cross-sectional design of research focusing on hepatitis B prevalence among pregnant women who utilise antenatal care services in the two main hospitals in the municipality. The study adopted a quantitative method of research to gather data. The quantitative approach of the research was to help estimate the prevalence of hepatitis B infection among pregnant women as well as determine the knowledge levels of the pregnant women. The quantitative method further helped to predict the risk factors that were significantly associated with hepatitis B infection among pregnant women.

Study Population

The study population included all pregnant women attending antenatal care clinic at the Ejura municipal hospital and St. Luke hospital Kasei in the Ashanti Region of Ghana and were willing to participate in the study were included in this study. However, pregnant women who were on admission with one or two pregnancy complications were excluded from the study.

Sample Size and Sampling Method

The minimum sample size for this study was determined by Yamane formula for sample size determination (Yamane, 1967) using single population proportion formula ($n_0 = \frac{N}{1+Ne^2}$). The sample size was determined based on the following assumptions: 95% level of confidence at standard value of 1.96; 5% margin of error; N = 1820; i.e., total number of pregnant women attending antenatal care at both Ejura Sekyedumase Municipal hospital and St. Luke Hospital, Kasei. This was obtained from the Hospitals' records for 2019 (GHS/Ejura Sekyedumase Annual Report, 2019).

Inputting the above into Yamane's formula, the minimum sample size required for this study was given by: $n_0 = \frac{1820}{1+1820(0.05)^2} = 327$.

Proportion sampling method was applied to determine the sample size for each of the two facilities based on the number of pregnant women attending ANC clinic. With the number of participants per facility determined, the names and details of pregnant women attending antenatal care at both hospitals were acquired from the antenatal care unit of these hospitals. From this list, simple random sampling was used to select participants. For each facility, pieces of papers were numbered 1 to 100 and participants on each day were asked to select one of the

papers. Participants who selected odd numbers were selected for the study. Respondents who were unwilling to participate in the study were replaced with the next willing participant.

Data Analysis

Descriptive analysis was run to calculate means and standard deviations (SD) for continuous variables while proportions were calculated for categorical variables such as level of education, occupation, marital status and other variables such as knowledge of study participants, parity, etc. Knowledge score for Hepatitis B was determined based on correct responses with a range from 0 to 18. Total score was estimated at 1 with overall score estimated between 0 to 1 where 0 - 0.4 was rated low, 0.41-0.7 moderate and 0.71-1 high. Second, univariate analysis was done to determine which factors were associated with prevalence of HBV. The strength of each association at stage two was tested further with multiple logistic regression analysis to determine significant factors associated with HBV prevalence among pregnant women. All significant variables were further adjusted, and the results of the multiple regression analysis was reported in odds ratios. All analysis of the test of association was done at 95% confidence interval with significance level at ≤ 0.05 .

Expected Outcome

The study sought to determine the prevalence of hepatitis B among pregnant women as well as to determine the knowledge levels of pregnant women on hepatitis B infection and its preventive measures. The study further sought to outline all the significant factors that influenced the infection of hepatitis B among pregnant women.

Ethical Consideration

Ethical clearance with reference number GHS-ERC 036/07/20 was sought from Ghana Health Service Ethics Review Committee as requirement for the conduct of this study. A letter of introduction was obtained and sent to District Health Administration, Ghana Health Service in the municipality to seek for approval for the conduct of this study in the municipality. At the facility level, a similar letter and with an authorization note from the District Health Administration was sent to the facilities to inform them about the study and sought for their approval and support.

Informed Consent

Consent was sought from each study participants. Each participant was taken through the study purpose. For pregnant women who agreed to participate in the study, a consent form was signed to confirm their availability for the study. Participants (pregnant women) were assured of confidentiality and privacy of the information provided. To assure privacy and confidentiality, study codes were used on all data forms (completed questionnaires). Participants were not provided names to prevent easy identification of individuals on a particular questionnaire. This was discussed prior to the conduct of an interview.

RESULTS

Socio-demographic Characteristics

Table 1 presents the summary of demographic characteristics analysed in this study. A total of 313 pregnant women (200 from Ejura Sekyedumase Municipal Hospital and 113 from St. Luke Hospital Kasei) participated in the study. With a mean age of 30.3 ± 2.5 . About 15.5% had no formal education. Among the respondents, 44.7% were self-employed, 5.4% were students and

62.6% lived in rural communities. The respondents were predominantly married (75.4%) with 27.1% of the married women living in polygamous relationships. Of the total 313 pregnant women who participated in the study, 64 pregnant women tested positive to hepatitis B, giving a prevalence rate of 20.5% among the study participants.

Table 1: Socio-demographic characteristics of participants

Variable	Number	Percentage (%)
Age		
18-24	65	20.8
25-29	77	24.6
30-34	49	15.6
35-39	66	21.1
40-44	34	10.9
45+	22	7.0
Religion		
Christian	95	30.4
Muslim	171	54.6
Traditional	47	15.0
Educational level		
No formal education	48	15.3
Primary	92	29.4
Secondary	133	42.5
Tertiary	40	12.8
Occupational Status		
Unemployed	78	24.9
Self employed	140	44.7
Private sector	25	8.0
Public sector	24	7.7
Housewife	29	9.3
Student	17	5.4
Residence		
Rural	196	62.6
Urban	117	37.4
Gestation Period		
1st Trimester	108	34.5
2nd Trimester	153	48.9
3rd Trimester	52	16.6
Parity		
<3	173	55.3
3-5	114	36.4
>5	26	8.3
Marital Status		
Single	49	15.7
Married	236	75.4
Divorce/Separated	17	5.4
Widow	11	3.5
Type of Marriage (n = 236; only those who are married)		

Monogamy	172	72.9
Polygamy	64	27.1
Hepatitis B prevalence		
Negative	249	79.5
Positive	64	20.5

Hepatitis B Risk Factors among Pregnant Women

The anticipated risk factors of hepatitis B (Table 3) shows that 62.3% of the pregnant women had ever received blood transfusion, 45.1% had ever had an abortion, 37.1% have had surgery in the past and 34.5% had more than one sexual partner. Again, 45.4% of the pregnant women had STI infection in the last 12 months prior to the study while 59.4% did not use condom consistently, 33.2% were alcoholic consumers while 48.6% have ever used contraceptive prior to their current pregnancy.

Table 2: Hepatitis B risk factors

Variable	Frequency	Percentage (%)
Blood Transfusion		
No	118	37.7
Yes	195	62.3
History of Abortion		
No	172	54.9
Yes	141	45.1
Past Surgery		
No	197	62.9
Yes	116	37.1
Multiple Sexual Partners		
No	205	65.5
Yes	108	34.5
STI in the last one year		
No	171	54.6
Yes	142	45.4
Tattoo		
No	226	72.2
Yes	87	27.8
Piercing		
No	182	58.2
Yes	131	41.8
Condom Use		
Consistent	127	40.6
Inconsistent	186	59.4
Use of sharp objects in the last 12 months		
No	104	33.2
Yes	209	66.8
Mode of previous delivery		
TBA	197	62.9
Health Facility	110	35.2
Others	6	1.9

Alcohol Consumption		
No	209	66.8
Yes	104	33.2
Contraceptive Use		
No	161	51.44
Yes	152	48.56

Factors Associated with Hepatitis B Prevalence Among Pregnant Women

After controlling for all variables, age, marriage setting, blood transfusion and multiple sexual partners were significantly associated with hepatitis B prevalence (Table 4). Women who were aged 40-44 years had 6 times the odds of testing positive for hepatitis B than pregnant women who were age 18-24 years (AOR = 6.13; CI: 1.39-26.89). Again, pregnant women aged 45+ had about 7 times the odds of testing positive for hepatitis B than women aged 18-24 years (AOR = 6.79; CI: 1.17-39.43). Women who were into polygamous marriage had about 3 times higher the odds than of getting infected with hepatitis B than women who were into monogamous marriage (AOR = 2.6; CI: 1.23-5.48).

Pregnant women who have ever received blood transfusion had about 3 times the chances of testing positive for hepatitis B compared to women who never received blood transfusion (AOR = 2.69; CI: 1.14-6.34). The odds of testing positive for hepatitis B among pregnant women who have had multiple sexual partners was about 2 times higher than the odds of pregnant women who have never had multiple sexual partners in the past (AOR = 2.12; CI: 1.02-4.41).

Table 3: Multiple Regression Analysis of factors associated with HB Prevalence among pregnant women

Characteristics	HB Prevalence (Positive)			
	Unadjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Age				
18-24	1		1	
25-29	1.24 (0.44-3.46)	0.685	1.65 (0.43-6.39)	0.464
30-34	2.69 (0.97-7.44)	0.057	2.17 (0.54-8.69)	0.272
35-39	3.10 (1.19-8.06)	0.020	3.55 (0.97-12.99)	0.055
40-44	4.52 (1.57-12.96)	0.005	6.13 (1.39-26.89)	0.016
45+	2.43 (0.68-8.66)	0.169	6.79 (1.17-39.43)	0.033
Education				
Never Schooled	1		1	
Primary	0.95 (0.43-2.09)	0.899	2.45 (0.85-7.06)	0.097
Secondary	0.59 (0.27-1.28)	0.186	1.35 (0.48-3.79)	0.557
Tertiary	0.22 (0.06-0.83)	0.026	0.52 (0.11-2.35)	0.397
Marriage Setting				
Monogamy	1			
Polygamy	3.16 (1.66-6.00)	0.000	2.60 (1.23-5.48)	0.012
Gestation Period				
1st Trimester	1			
2nd Trimester	2.33 (1.17-4.64)	0.016	2.15 (0.88-5.20)	0.090
3rd Trimester	2.69 (1.16-6.26)	0.021	2.14 (0.70-6.57)	0.180

Parity				
Below 3	1			
3-5	1.46 (0.81-2.65)	0.205	0.94 (0.41-2.17)	0.902
Above 5	2.63 (1.07-6.47)	0.036	1.83 (0.55-6.09)	0.322
Blood Transfusion				
No	1			
Yes	2.08 (1.12-3.86)	0.020	2.69 (1.14-6.34)	0.024
Abortion				
No	1			
Yes	1.01 (0.58-1.76)	0.962	0.97 (0.44-2.14)	0.960
Past Surgery				
No	1			
Yes	1.21 (0.69-2.12)	0.508	0.79 (0.35-1.77)	0.573
Multiple Sexual Partners				
No	1			
Yes	2.10 (1.19-3.67)	0.009	2.12 (1.02-4.41)	0.043
STI Infection				
No	1			
Yes	1.55 (0.89-2.69)	0.120	1.12 (0.53-2.39)	0.761
Contraceptive Use				
No	1			
Yes	0.99 (0.57-1.72)	0.982	0.87 (0.40-1.87)	0.724
Contact with Liver Patient				
No	1		1	
Yes	1.00 (0.57-1.76)	0.988	1.00 (0.46-2.19)	0.986

DISCUSSIONS

Among the 313 pregnant women who participated in this study, 64 tested positive for Hepatitis B, giving a prevalence rate of 20.5%. This rate is noted as a high rate among several countries. The WHO in 2016 classified Ghana as one of the hepatitis B endemic areas after series of studies have confirmed a higher prevalence. For instance, Owusu-Ansah (2015) observed that HB prevalence has become a public health concern in Ghana which requires immediate attention. However, none of the studies had hepatitis B prevalence exceeding 20% as observed in this study. Gasim et al., (2013) and Ofori-asenso & Agyeman, (2016) in different studies had observed hepatitis B prevalence among pregnant women at 16% and 13.1% respectively. Others studies (Cho *et al.*, 2012; Walana et al., 2014; Ephraim et al 2015; Adjei et al., 2016) have all observed rates of more than 8%, classifying Ghana as an endemic country. Nonetheless, the findings from all these reviewed studies were relatively lower than the observed result in this study. Comparative assessment with other countries further confirms the assertion by Owusu-Ansah (2015) and WHO (2016) that hepatitis B in Ghana is a major health concern since all studies across Africa show relatively lower rate as compared to that of Ghana, as confirmed in this study.

With the high prevalence of hepatitis B infection among pregnant women, the study further sought to ascertain the factors that were associated with high hepatitis B prevalence among the pregnant women. At both bivariate and multivariate level, the study observed that age,

marriage setting, blood transfusion and multiple sexual partners were variables that were significantly associated with hepatitis B prevalence. On age, the study observed that pregnant women who are aged 40-44 years had higher odds of testing positive for hepatitis than pregnant women who are age 18-24 years. This finding is slightly different from a number of studies. With a general prevalence of 9.7% among pregnant women, Frambo *et al.*, (2014) observed a higher prevalence of 20% of hepatitis B among women aged 15-19 years. Yakasai *et al* (2012) also in a study which observed a general HB prevalence of 7.9% among pregnant women, noted that women who were between the ages of 25-29 had higher prevalence of 10.5% compared to other age groups. Kolawole *et al.*, (2012) also observed a higher prevalence of 23.3% among pregnant women aged 30-34 while the general HB prevalence was observed to be 16.5%. These findings show different prevalence among different age groups as compared to this study. The risk of hepatitis B infection is relatively higher among younger population of pregnant women than the older. The deviation of the age relationship with hepatitis B infection in this study may relatively be linked to different factors. In the study area, traditional, religious and cultural practice encouraged men to marry more than one wife or enjoy multiple sexual partners. Older women who had remained in sexual relationships may be at higher risk of all infections from their husbands if they continue to have multiple sexual partners. This assumption may also hold for younger women though their risk may relatively lower. The study however did not digest further to understand why this deviation of the norm. However, the key outcome in all these studies is that the age of pregnant women plays a major role in determining HB prevalence.

On risk factors, the study observed three key factors, marriage setting, blood transfusion and multiple sexual partners. Pregnant women who were in polygamous marriage had higher risk of getting infected with hepatitis B. Again, pregnant women who have had blood transfusion in the past had higher risk of HB infection. Finally, pregnant women who were engaged in or had ever engaged in multiple sexual partners had higher risk of getting infected with HB. These observed results corroborate other results from different. Frambo *et al* (2014) in the study on prevalence among pregnant women in Cameroon observed some risk factors which confirms the finding in this study. Key risk factors that were observed in the study by Frambo *et al* (2014) included blood transfusion, abortion and multiple sexual partners. Even though the prevalence rate was high among women who have had abortion in the past, the outcome was not statistically significant in this study as compared the findings from Frambo *et al.*, (2014). Trëpo, Chan, & Lok (2014) also in a similar study in Ghana observed that blood transfusion, multiple sexual partners were among some of the predominant risk factors that were associated with hepatitis B infection. Ngaira *et al.*, (2016) in their study noted that history of blood transfusion, polygamous marriage among others were significantly associated with hepatitis B infection among pregnant women. Molla, Munshea, & Nibret, (2015) also confirmed that the risk of hepatitis B infection among pregnant who have multiple sexual partners is three times higher than pregnant women who have single partners.

The risk of multiple sexual partners increases the risk of sexually transmitted infections (STIs) and may result in frequent unwanted pregnancies. in recent times, the phenomenon has increased and has significantly increased STIs among the youth. It is an established fact that multiple sexual activities are largely associated with frequent coitus and unprotected coitus. With multiple sexual partners, one risk of having several unprotected sex (without condom) and this becomes the root for all forms of infection. In cases where there is polygamous

marriage, the man is does not consider the use of condom as option. The use of condom is described as “evil” intent to break given natural course. Multiple sexual partners and polygamous marriage are synonymous and may potentially have similar influence. Addressing these challenges requires culturally sensitive and traditionally acceptable strategy that may resonate well with the people. For blood transfusion to be a major determinant factor in this era and age of scientific and improved technology is a major concern to public health. Prior to blood transfusion, it is anticipated that different scientific test would be run to detect and eliminate any risk of infection. Nonetheless, instances of infectious complications within blood transfusion cycle is likely to occur at any given time, perhaps due to the failure of technology or other systems (Buerger & Jain, 2023). As much as possible, the risk of hepatitis B infection through blood transfusion should be minimised to bearest minimum. It only on this that individuals can continue to trust the health system and utilise services that are available.

Limitation of the Study

The study employed a cross-sectional approach to research which use inferences and interpretation of results to generalise for the entire population. However, this may not necessarily reflect the entire population. The study did not make use of community systems and other socio-cultural factors that may influence the prevalence of hepatitis B infection. Nonetheless, the results obtained is a reflective of the district and can be used for policy decision making.

Conclusion

The prevalence of hepatitis B infection among the pregnant women in the district was relatively higher. It confirms the global assertion of Ghana been categorised as endemic country despite Government of Ghana’s effort to fight hepatitis B including the introduction of hepatitis B vaccine at all levels. Risk factors of multiple sexual partners continue to be a major concern, not only in hepatitis B infection but all related STIs. It is therefore recommended that hepatitis B prevalence in Ejura Sekyedumase should be considered or declared a major public health concern, calling for multi-stakeholder consultation on key approaches to adopted in reducing the prevalence. The Municipal Director of Health Services should lead the call and process in addressing this challenge. Preventive measures including the increasing vaccination services among general population as well as key targeted screening should be intensified in the Municipality by Ghana Health Service of Ejura-Sekyedumase Municipal. Despite the thorough investigation in blood screening before transfusion, it is further recommended that proper screening should be conducted for each blood sample to rule out any possibility of any existence of hepatitis B infection.

As a policy suggestion, the Government of Ghana should facilitate the process of making Hepatitis B vaccine free to all women to ensure that accessibility is improved among women. Additionally, government should intensify campaigns/education on the need for Hepatitis B vaccination, to ensure that women in general are interested in the vaccine and get vaccinated. Also, the cost of vaccine for new-born children (neonates under 24 hours) should be subsidized and made available to all neonates to reduce the risk of mother-to-child transmission.

In the areas of further research, the study therefore recommends that similar studies be conducted in selected study sites across the country to be able to estimate current HBV

seroprevalence in the country as mostly done for HIV and STI since this has currently become a major public health concern.

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