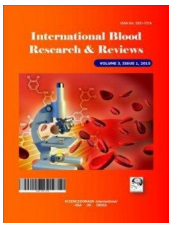

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Prevalence and Associated Factors of Hepatitis B Virus Infection among Pregnant Women Attending Antenatal Care Clinic at Mulago National Referral Hospital, Uganda

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Authors' contributions

Authors NA, MB and TIM conceived the study idea, participated in survey design, data acquisition, analysis, and interpretation. Authors NA and MB drafted the manuscript, and author TIM critically revised the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Aims: This study investigated the prevalence, and associated factors of hepatitis B virus (HBV) infection among pregnant women attending antenatal clinic at Mulago National Referral Hospital, in Uganda.
Study Design: This was a cross- sectional study.
Place and Duration of Study: This was conducted at Mulago National Referral Hospital, located in Kampala, Uganda. The study was carried out during the months of January to June, 2016.
Methodology: We collected about 4militres of blood samples from 323 assented/ consented female participants. These were analyzed for hepatitis B surface antigen using one step immunochromatographic test. A structured questionnaire was used to explore predisposing factors to HBV. Associated factors of HBV infection were determined using logistic regression analysis.
Results: The survey covered 323 pregnant women. Majority (N=141, 43.7%) were in the age category of 25 to 29 years (range 14–43 years). Their mean parity was 2.2; 106 (32.8%) were

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nullpara and 179 (55.4%) were in their first trimester. Three participants (0.9%; 95% Confidence Interval: 0.45-1.22) tested positive for hepatitis B surface antigen. The HBV infection was recorded most among the polygamous (100%), as well as multipara (66.7%). There was a statistical association between HBV infection with pregnant women who were in a polygamous relationship (AOR: 5.8; 95%: CI 2.1-10.4), scarification (AOR: 4.2; 95% CI: 3.2-17.9) and shared sharps (AOR: 8.6; 95% CI: 3.7-17.1).

Conclusion: We report a high prevalence of HBV infection, and the pattern tends towards increased perinatal HBV transmission. We identified a knowledge gap pertaining transmission, causation and prevention of HBV infection.

Keywords: Hepatitis B virus; prevalence; associated factor; pregnant women; Uganda.

DEFINITIONS

Vaccination – is administration of a vaccine so that an individual's immune system can be stimulated to provide an adaptive immunity to the pathogen.
Vertical transmission- is passage of the pathogen from the mother to the child before or after birth.

ABBREVIATIONS AND ACRONYMS

AOR: Adjusted Odds Ratio; CI: Confidence Interval; HBsAg: Hepatitis B surface antigen; HBV: Hepatitis B virus; MNRH: Mulago National Referral Hospital; SPSS: Statistical Package for Social Sciences; UNEPI: Uganda National Expanded Programme on Immunization.

1. INTRODUCTION

Infection with hepatitis B virus (HBV) poses a public health challenge, as it is 50–100 times more contagious than human immune deficiency virus (HIV) [1]. Globally, there are 400 million people infected with HBV [2], and the risk continues to rise as perinatal and early childhood infections revamp which risks over 95% of the infected persons to progress to chronicity [3]. Worldwide, there are 240 million chronic careers of HBV [4], with Africa harboring the second highest burden (with over 75 million of the cases) [3]. In Uganda, the prevalence of HBV remains unacceptably high; it is reported at 10% [5], with regional variations such as northern Uganda with the highest risk of 24.3% and 17.6% in Gulu district [6]. The associated global mortality remains high with 68,600 deaths due to HBV infection, and more than 300,000 secondary to its advanced sequale of hepatocellular carcinoma [7]. The virus poses a great risk owing to its asymptomatic manifestation and varied transmission modes that includes contact with body fluids of infected persons (such as, blood, semen, vaginal fluid, and saliva) [8,9].

As HBV infection befalls endemic in Uganda, perinatal transmission and morbidities may portend global efforts to attain sustainable development goals (SDGs) particularly SDG-3 [10,11]. This has compelled ways to alleviate the HBV burden. One such programmatic approach is the Uganda National Expanded Program on Immunizations (UNEPI) initiative that integrated hepatitis B vaccine at 6-weeks [12]. Although the intervention is positive, it falls short of potency to prevent vertical transmission, at the same time, it permits contact transmission and may not guard against chronic infection [13,14]. The healthier approach necessitates immunization at birth for exposed infants as there is no evidence of protection against perinatal transmission if one is vaccinated after more than 7 days of birth [15]. Further, recommendations have been made to screen pregnant women for HBV and infants born to mothers who test HBV positive to receive hepatitis B vaccine at birth [16,17]. Despite these, the present practice at Mulago National Referral Hospital (MNRH) antenatal clinic neither tests for HBV, nor vaccinates at birth; consequently, there is no data to elucidate HBV burden, safety against perinatal transmission and associated factors. Thus, we report the prevalence of HBV infection among pregnant women attending antenatal care at MNRH. We also describe the factors associated with HBV infection among these women, with possible implications for routine testing, and vaccination of HBV-exposed neonates in an endemic set up.

2. MATERIALS AND METHODS

2.1 Study Design, Duration and Setting

This was a cross sectional study, conducted during the months of January to June, 2016 at Mulago National Referral Hospital. MNRH is located in Kawempe division, Kampala Capital City, in Uganda. The facility has an in-patient bed capacity of 1500 beds, more than 500 out-patients for the various specialized units at a national level. It receives referrals from all regions in the country, and some patients from the neighboring countries in the African continent.

2.2 Study Population, Inclusion Criteria and Sampling Technique

We included all pregnant women aged 14 to 43 years, who assented/consented respectively with a laboratory confirmation of pregnancy test. The study enrolled participants who were stable (i.e. not bed ridden and didn't have an obstetric emergency), and understood either English and/or Luganda languages. Simple random sampling was used to enroll participants through the antenatal clinic days.

2.3 Sample Size Determination

We used the Kish Leslie formula [18]. Assuming a 95% confidence interval, 30% prevalence of HBV infection [5] and the maximum allowable error at 5%; a sample size of 323 pregnant women was considered.

2.4 Data Collection

Data was collected by laboratory analysis of blood samples and an interviewer-administered questionnaire that focused on the sociodemographic information including maternal age, gestation age, parity, occupation, marital status and education. We assessed knowledge about HBV transmission, prevention and predisposing factors for HBV infection.

2.5 Blood Sample Collection, Processing and Analysis

Four millilitres of venous blood were collected into a plain vacutainer labelled with participants study number. The sample was allowed to clot at room temperature for about 30 minutes and then centrifuged at 1800 revolutions per minute for 20 minutes to obtain serum that was used to evaluate HBV viraemia using an immunochromatographic 1-step hepatitis B surface antigen (HBsAg) test, (the HEXAGON, *Human GmbH, Wiesbaden, Germany*). The quality of laboratory results was ensured by strict adherence to the standard operating procedures (SOPs) as developed from the manufacturer's test kit insert. Also, known positive and negative samples were included daily. We ensured environmental safety by properly disposing off samples and testing kits after analysis.

2.6 Data Analysis

Data was entered in EpiData3.1 and imported to SPSS version16.0 for statistical analysis. Descriptive statistical tests (proportion and mean) were used to compute the socio-demographic variables. Differences in proportions were assessed and statistical significance was considered for p-value <0.05. Results were presented in form of frequency table, and pie chart. Logistic regression analysis was used to determine the association between explanatory variables and the outcome variable with odds ratio at 95% Confidence Interval.

3. RESULTS

3.1 Socio Demographic Characteristics of the Participants

A total of 323 pregnant women were enrolled with a response rate of 100%. Majority of the respondents, (N=141, 43.7%) were in the age category of 25 to 29 years (range 14–43 years). Most participants (N=179, 55.4%) were in their first trimester. Most participants (N=218, 67.5%) reported a polygamous relationship. Details of the sociodemographic characteristics are presented in Table 1.

3.2 Prevalence of Hepatitis B Virus Infection

Of the 323 study participants, 3 tested positive by HBsAg test giving a prevalence of 0.9% (95% Confidence Interval 0.45-1.22), details indicated in Fig. 1.

The HBV infection was recorded most among the polygamous married (100%), as well as multipara (66.7%). On the other hand, HBV infection was evenly observed across the age categories of <20, 21-24 and 25-29 years and gestational period as detailed in Table 2.

Table 1. Socio demographic characteristics of the participants (n=323)

Variable	Categories	Number	Percentage (%)
Age category (in years)	< 20	87	26.9
	20-24	141	43.7
	25-29	65	20.1
	30-34	16	5.0
	>35	14	4.3
Religion	Catholic	91	28.2
	Muslim	84	26.0
	Orthodox	14	4.3
	Pentecostal	63	19.5
	Protestant	71	22.0
Education level	No formal education	18	5.6
	Primary	79	24.5
	Secondary	154	47.7
	Tertiary	46	14.2
	University	26	8.0
Occupation	Employed	89	27.6
	Self employed	71	22.0
	Un employed	163	50.5
Marital status	Divorced	23	7.1
	Married	277	85.8
	Widowed	9	2.8
	[†]Others	14	4.3
Marriage type	Monogamous	218	67.5
	Polygamous	105	32.5
Gestation period (trimesters)	First	179	55.4
	Second	83	25.7
	Third	61	18.9
Parity	Nullipara	107	33.1
	Multipara	216	66.9

[†] *Participants were either were in co-habiting relationship or raped therefore were living as single parents*

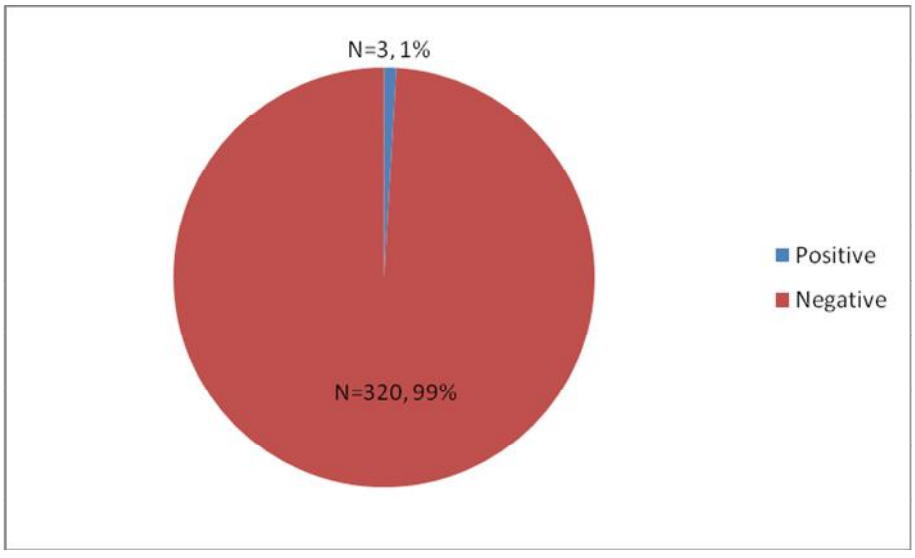

Fig. 1. A pie chat showing the prevalence of HBV infection among the participants

Table 2. Prevalence of HBV among pregnant women (n=323)

Variable	Categories	HBV status	
		Positive	Negative
Religion	Catholic	0	91(28.7%)
	Muslim	1(33.3%)	81(25.6%)
	Orthodox	0	13(4.1%)
	Pentecostal	1(33.3%)	61(19.2%)
	Protestant	1(33.3%)	71(22.4%)
Education level	No formal education	0	18(5.7%)
	Primary	1(33.3%)	75(23.7%)
	Secondary	1(33.3%)	153(48.3%)
	Tertiary	1(33.3%)	71(22.0%)
Occupation	Employed	0	89(28.1%)
	Self employed	1(33.3%)	67(21.1%)
	Un employed	2(66.7%)	161(50.8%)
Marital status	Others	0	14(4.4%)
	Divorced	0	20(6.3%)
	Married	3(100%)	274(86.4%)
	Widowed	0	9(2.8%)
Marriage type	Monogamous	0	212(66.9%)
	Polygamous	3(100%)	105(32.5%)
Age category	< 20	1(33.3%)	40(12.6%)
	20-24	1(33.3%)	95(29.7%)
	25-29	1(33.3%)	87(27.2%)
	30-34	0	59(18.4%)
	≥35	0	36(11.3%)
Gestation period (trimesters)	First	1(33.3%)	178 (55.1%)
	Second	1(33.3%)	82 (25.4%)
	Third	1(33.3%)	60 (18.6%)
Parity	Nullipara	1 (33.3%	106 (32.8%)
	Multipara	2 (66.7%)	214 (67.2)

Table 3. Assessment of knowledge of hepatitis B among the participants (n=323)

Variable	Categories	Frequency (N)	Percentage (%)
Knowledge of HBV infection			
Ever heard about disease	Yes	188	58.2
	No	135	41.8
Viral disease	Yes	92	28.5
	No	231	71.5
Knowledge of HBV transmission			
Sharing sharps	Yes	61	18.9
	No	262	81.1
Contact with body fluids of infected persons	Yes	55	17.0
	No	268	83.0
Scarification	Yes	57	17.6
	No	266	82.4
Through un protected	Yes	62	19.2
	No	261	80.8
Through mother-child transmission	Yes	53	16.4
	No	270	83.6
Knowledge of HBV infection treatment			
Treatable	Yes	78	24.1
	No	245	75.9
Self-cured	Yes	36	11.1
	No	287	88.9

Table 4. Multivariate analysis of predictor variables to HBV infection (n=323)

Variable	HBV infection status		Crude odds ratio	Adjusted odds ratio	
	Positive, N (%)	Negative, N (%)	[COR (95% CI)]	AOR (95% CI)	P-value
Age category (in years)					
< 20	1(33.3%)	40(12.6%)	1	*	
20-24	1(33.3%)	95(29.4%)	1.632 (0.884-3.612)		
25-29	1(33.3%)	87(26.9%)	0.941 (0.211-1.422)		
30-34	0	59(18.3%)	3.210 (1.743-5.001)		
≥35	0	36(11.1%)	2.981 (1.134-3.644)		
Religion					
Catholic	0	91(28.7%)	1	*	
Muslim	1(33.3%)	81(25.6%)	1.330 (1.238-3.211)		
Orthodox	0	13(4.10%)	1.022 (0.811-1.899)		
Pentecostal	1(33.3%)	61(19.2%)	2.671 (1.133-3.812)		
Protestant	1(33.3%)	71(22.4%)	1.914 (0.612-2.312)		
Education level					
No formal education	0	18 (5.7%)	1	*	
Primary	1(33.3%)	75 (23.7%)	1.141 (0.544-1.892)		
Secondary	1(33.3%)	153 (48.3%)	1.900 (1.121-2.521)		
Tertiary	1(33.3%)	71(22.0%)	0.781 (0.412-1.322)		
Occupation					
Employed	0	89(28.1%)	1	*	
Self employed	1(33.3%)	67(21.1%)	2.451 (1.781-2.916)		
Un employed	2(66.7%)	161(50.8%)	1.723 (0.988-1.926)		
Others	0	14(4.3%)	2.014 (1.920-2.311)		
Marital status					
Married	3(100.0%)	274(86.4%)	1	*	
Divorced	0	20(6.3%)	1.723 (0.766-1.981)		
Widowed	0	9(2.8%)	1.322 (1.288-1.924)		

Variable	HBV infection status		Crude odds ratio	Adjusted odds ratio	
	Positive, N (%)	Negative, N (%)	[COR (95% CI)]	AOR (95% CI)	P-value
Marriage type					
Monogamous	0	212(66.9%)	1		
Polygamous	3(100.0%)	105(32.5%)	6.901 (2.871-8.661)	5.8 (2.1-10.4)	*0.01*
Gestation period (trimesters)					
First	1(33.3%)	178 (55.1%)	1	*	
Second	1(33.3%)	82 (25.4%)	1.608 (0.744-1.882)		
Third	1(33.3%)	60 (18.6%)	0.644 (0.017-1.022)		
Parity	1 (33.3%	106 (32.8%)	1		
Nullipara	2 (66.7%)	214 (67.2)	1.884 (1.061-1.963)	*	
Multipara					
History of sharing sharps					
Yes	2 (66.7%)	218 (67.5)	11.611 (6.012-11.127)	8.6 (3.7-17.1)	*0.04*
No	1 (33.3%)	102 (31.6)	1		
Practiced scarification					
Yes	3 (100.0%)	306 (94.7)	7.915 (2.111-11.201)	4.2 (3.2-17.9)	*0.02*
No	0	14 (5.3)	1		

*1= reference category; *= P-value greater than 0.05 in logistic regression*

3.3 Assessment of Knowledge of HBV

Participants' knowledge regarding HBV infection, exposure and transmission risks are shown in Table 3.

3.4 Assessment of Predictor Variables Associated with HBV Infection

Using logistic regression analysis, some predictor variables showed statistically significant association with HBV infections. Pregnant women who were in a polygamous relationship were 5.8 times more likely of being HBV infected than those with no history of multiple sexual partners. Additionally, scarification had a 4.2 and sharing sharps was 8.6 more likely of being HBV infected than those who had not carried out scarification, details indicated in Table 4.

4. DISCUSSION

In this study, we report 0.9% prevalence of HBV infection. This finding is similar to 0.9% prevalence reported in Brazil [19]; although it is higher than 0.35% reported in Kashan [20]. On the other hand, the prevalence is lower than 11.8% reported among the pregnant women in northern Uganda [21], and that observed from other African countries; such as 3.9% in Tanzania [22], 9.3% in Kenya [23] and 8.3% in Nigeria [24]. The observed low prevalence is ascribed to the variations in geographical location, cultural practices, sexual patterns, and differences in the test methods used.

The highest cases of HBV infection were recorded among the age categories of <20, 21-24 and 25-29 years. Although complex, the likely explanation for this lies in the high sexual activity of this group, which may prompt multiple sex partners as observed. This finding is similar to what was reported in Nigeria [24]. Biological and social factors including unemployment and little formal education contribute significantly to a higher prevalence of STIs, including hepatitis B, among adolescent girls; however, in our study, there were no statistical significant differences in employment status and education levels.

Our study has demonstrated that history of sharing sharps and scarification could predispose one to HBV infection. Similar results were reported in Ethiopia [25], and Nigeria [26]. This might be attributed to poor practices of infection prevention control.

For the purpose of this study, our results ought to be interpreted in light of the following limitations: 1) only hepatitis B surface antigen (HBsAg) test was determined which tells about active infection rather than total prevalence. 2) Although we tested for HBsAg, we could not determine the extent of perinatal transmission of HBV; because the prevalence of HBeAg or the viral load was not assessed due to logistical constrains. 3) this was a hospital-based study and it included a selected population of women with exposure to no condom sexual intercourse and therefore at high risk of sexually transmitted infections including HBV.

5. CONCLUSION

We report a high prevalence of HBV infection, and the pattern tends towards increased perinatal HBV transmission. Most participants showed a knowledge gap pertaining transmission, causation and prevention of HBV infection. The high prevalence necessitates the need to uphold preventive measures against HBV infection to lessen HBV perinatal transmission. Further, there is need to institute nosocomial infection control to prevent transmission through healthcare related activities. The identified knowledge gap requires a concerted effort to relay information on HBV during antenatal care. As HBV infection befalls endemic in Uganda, all pregnant women ought to be screened for HBV, and if deemed necessary, be treated to reduce the viral loads and their newborns vaccinated at birth with the single doze hepatitis B vaccine to break the cycle of mother-to-child transmission. Thus, as HBV infection befalls endemic in all parts of Uganda, It is critical that the Ministry of Health could subsidize the cost, or give free hepatitis B vaccination to pregnant women to lessen cases of HBV perinatal infections.

CONSENT AND ETHICAL APPROVAL

Ethical approvals were obtained from research and ethics committees of International Health Sciences University and Mulago National Referral Hospital Research and Ethics Committees. Written informed assent/consent was sought from each participant and confidentiality was strongly upheld. Laboratory results of HBsAg were reported to the antenatal care clinic for apt management by the attending doctor. All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have

therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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