Research Article

Prevalence and associated risk factors of hepatitis B virus infections among women of reproductive age in Juba, South Sudan

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ABSTRACT

Introduction: Hepatitis B virus (HBV) is a partially double-stranded, enveloped virus with a circular DNA genome. This virus increasingly infects the population. Information on HBV infections in South Sudan is limited. This study aimed to examine the prevalence and major risk factors of HBV infections among women of reproductive age in Juba City, South Sudan.

Method: This study adapted a quantitative cross-sectional research design to assess prevalence and risk factors of HBV infections among these women. The study sites were seven health facilities in Juba. A validated semi-structured questionnaire was used to collect data from the 1808 randomly selected women. The study used EpiData software v4.7 to control data entry and Stata v15 for analysis. Chi squared tests and regression model were performed to determine association and likelihood respectively.

Results: Among the 1808 women, the burden of HBV infections was 11.2% and nearly half were unaware of their HBV status. The HBV infections were significantly associated with blood transfusion ($p < 0.001$), surgical operations ($p < 0.001$), and close contact with a case of HBV ($p < 0.001$). The women who had close contact with a case of HBV infections were 2.5 times more likely to be infected (OR: 2.487, 95% CI: 1.549 - 3.995). Women who had a history of surgical operations were more likely to be positive for HBV by 12.6% compared to those who had had no surgery (OR: 1.126, 95% CI: 0.614 - 2.067). The women who receive blood transfusions were more likely to be infected HBV (OR: 1.134, 95% CI 0.594 - 2.166).

Conclusion: The prevalence of HBV infections among these women was high and nearly half of them were unaware of their HBV status. It is associated with blood transfusion, surgical operations, and close contact with cases of HBV. The study recommends the improvement of tailored health promotion, antenatal HBV screening, birth dose vaccines.

Keywords: prevalence, associated risk factors, hepatitis B virus infections, women of reproductive age, Juba, South Sudan

Introduction

Hepatitis B virus (HBV) is a partially double-stranded, enveloped virus with a circular DNA genome. It belongs to Hepadnaviridae family of viruses. A first infection with HBV is considered as an acute infection. An infection lasting more than six months is defined as chronic infection. The transmission of HBV from mother to child during birth is known as vertical transmission. Horizontal transmission refers to the passage from one host to another (e.g. sexual contact with an infected person, blood transfusion).[1]

Globally, this virus infects 1.5 million people every year, accounts for 296 million chronic infections (3.8%), and 6 million children younger than five (0.9%) and 820,000 deaths. In Africa, the new cases of HBV infections are 990,000, the burden of HBV infections is 7.5% among the general population (82,300,000), among children younger than five years is 2.5% and deaths related HBV infections are 80,000.[2]

The magnitude of HBV endemicity in South Sudan has become a major public health problem. The burden of the infection among the South Sudanese general population is 22.4%.[3] Seropositivity of HBV among blood donors at the Blood Bank of Juba Teaching Hospital (JTH) is 18% and at the National Blood Bank is 8.2%.[4,5] The prevalence of HBV infections among pregnant women accessing health services at JTH stands ranges 6.3% to 11%.[6,7]

Conflicts have weakened the health system and the people's health status, particularly among women and children.[8,9] Fragmented social structures exacerbate the transmission of HBV as do cultural patterns, e.g. inadequately sterilised tools used in ear piercing and tribal markings and eating together from common utensils.[7] Although many studies have been conducted on HBV prevalence and risk factors globally, few of them were conducted in South Sudan. This study was designed to examine prevalence and major risk factors of HBV infections among women of reproductive age in Juba City and to inform the relevant plans for policies, strategies, and practices.

Method

This study adapted a quantitative cross-sectional research design to assess prevalence and associated risk factors of HBV infections among these women at seven health facilities in Juba of South Sudan. These health facilities were Gumbo Primary Health Care Centre (PHCC), Gurei PHCC, Juba Military Referral Hospital (JMRH), Juba Teaching Hospital (JTH), Kator PHCC, Munuki PHCC, Nyakuron PHCC. The Cochran's formula was adapted at 95% confidence level, 5% degree of accuracy, 15% non-response rate, design effect of 4, and variance of 50%. A sample size of 1808 women was calculated and was proportionally allocated to each health facility.

Women aged between 18 and 49 years and who accessed healthcare services were included and those who declined to participate in this study were excluded. A validated semi-structured questionnaire was used in collection of data.

The EpiData software version 4.7 was used to control data entry. Afterwards, the data were exported to Stata version 15 for analysis. Chi squared tests and regression model were performed to determine association and likelihood respectively.

Ethical approval was obtained from University of Juba Graduate College and the Ministry of Health Research Ethics Review Board. Participants consented to be included after being assured of confidentiality and privacy.

Results

A total of the 1808 women were interviewed of whom 925 (51.2%) had accessed HBV tests and 883 (48.8%) did not. The burden of HBV infections was 104 (11.2%) among these women.

The burden of this infection at the various sites is shown in Table 1. JMRH had the highest burden of HBV. Among the regions of South Sudan, Greater Bahr El Gazal region had the highest burden of HBV infections. Regarding the subnational levels, this burden was 14.5% in Eastern Equatoria, 25% in Abyei, 25% in Pibor, 33.3% in Northern Bahr El Ghazal. of Juba City Council Blocks, the burden was 5.8% in Munuki City Block, 13.3% in Juba City Block, 17.4% in Kator City Block (Table 1).

The women aged ≥ 45 years had the highest HBV infections (14.3%). Women who had attended formal education had a lower rate of infections compared to those who had not, that is, 10.3% and 16% respectively. Unemployed women had a higher burden of HBV infections than those who were employed. Whereas the unmarried women had 16.2% burden of HBV infections, the married ones had 10.7% burden of HBV infections (Table 1).

To determine the major risk factors associated with HBV infections among these women, the analyses by Chi-square test and of logistic regression were performed.

Table 1. The factors related to HBV infections among women of reproductive age

Variable	HBV test results		Total	Chi-square test (p-value)
	Negative n (%)	Positive n (%)		
Name of health facility				13.106 (0.410)
JTH	219 (91.6)	20 (8.4)	239	
JMRH	122 (83)	25 (17)	147	
Gurei PHCC	123 (92.5)	10 (7.5)	133	
Nyakuron PHCC	122 (91)	12 (9)	134	
Gumbo PHCC	113 (84.3)	21 (15.7)	134	
Munuki PHCC	62 (91.2)	6 (8.8)	68	
Kator PHCC	60 (85.7)	10 (14.3)	70	
Age group				0.070 (0.792)
< 32 years	646 (88.6)	83 (11.4)	729	
≥ 32 years	175 (89.3)	21 (10.7)	196	
Age group				0.768 (0.857)
18 - 24 years	293 (89.9)	33 (10.1)	326	
25 - 34 years	417 (88.3)	55 (11.7)	472	
35 - 44 years	99 (87.6)	14 (12.4)	113	
≥ 45 years	12 (85.7)	2 (14.3)	14	
Residential area in Juba				15.322 (0.002)
Juba	52 (86.7)	8 (13.3)	60	
Kator	142 (82.6)	30 (17.4)	172	
Munuki	260 (94.2)	16 (5.8)	276	
Others	367 (88)	50 (12	417	
Residence				13.402 (0.515)
Rural	367 (88)	50 (12)	417	
Urban	454 (89.4)	54 (10.6)	508	
Region of origin				1.496 (0.473)
GER	650 (88.6)	84 (11.4)	734	
GBR	62 (86.1)	10 (13.9)	72	
GUR	109 (91.6)	10 (8.4)	119	
State of origin				18.139 (0.112)
Central Equatoria	464 (88.2)	62 (11.8)	526	
Eastern Equatoria	94 (85.5)	16 (14.5)	110	
Western Equatoria	92 (93.9)	6 (6.1	98	
Jonglei	73 (91.3)	7 (8.8)	80	
Lakes	36 (90)	4 (10	40	
Unity	18 (94.7)	1 (5.3)	19	

Upper Nile	14 (93.3)	1 (6.7)	15	
Northern Bahr El Ghazal	6 (55.6)	3 (44.4)	9	
Warrap	10 (90.9)	1 (9.1)	11	
Western Bahr El Ghazal	8 (100)	0 (0)	8	
Pibor	3 (75)	1 (25)	4	
Abyei	3 (75)	1 (25)	4	
Ruweng	1 (100)	0 (0)	1	
Religion				3.090 (0.213)
Christianity	724 (88.9)	90 (11.1)	814	
Islam	96 (88.1)	13 (11.9)	109	
Traditional Beliefs	1 (50)	1 (50)	2	
Formal education				4.301 (0.038)
No	131 (84)	25 (16)	156	
Yes	690 (89.7)	79 (10.3)	769	
Main occupation				1.007 (0.316)
Housewife	552 (88)	75 (12)	627	
Others	269 (90.3)	29 (9.7)	298	
Employment status				0.206 (0.650)
Unemployed	399 (88.3)	53 (11.7)	452	
Employed	422 (89.2)	51 (10.8)	473	
Marital status				2.869 (0.650)
Unmarried	83 (83.8)	16 (16.2)	99	
Married	642 (89.2)	78 (10.8)	720	
Separated/widow	96 (90.6)	10 (9.4)	106	
Type of marriage				0.160 (0.690)
Monogamy	444 (89.7)	51 (10.3)	495	
Polygamy	294 (88.8)	37 (11.2	331	
Parity				2.036 (0.154)
≤ 3	517 (89.9)	58 (10.1)	575	
> 3	304 (86.9)	46 (13.1)	350	
Monthly family income				5.577 (0.233)
≥ USD50	72 (94.7)	4 (5.3)	76	
≥ USD100	210 (90.1)	23 (9.9)	233	
≥ USD150	147 (88)	20 (12)	167	
≥ USD200	230 (88.8)	29 (11.2	259	
≤ USD201	162 (85.3)	28 (14.7)	190	
Use of mani-pedicure instrument				0.002 (0.962)
Own instruments	452 (88.8)	57 (11.2)	509	
Common instruments	369 (88.7)	47 (11.3)	416	

Scarification or tribal marks				1.724 (0.189)
No	675 (89.4)	80 (10.6)	755	
Yes	146 (85.9)	24 (14.1)	170	
Dental procedure				0.054 (0.189)
No	632 (88.9)	79 (11.1)	711	
Yes	189 (88.3)	25 (11.7)	214	
Blood transfusion				5.946 (0.015)
No	706 (89.8)	80 (10.2)	786	
Yes	115 (82.7)	24 (17.3)	139	
Surgical operation				6.074 (0.014)
No	694 (89.9)	78 (10.1)	772	
Yes	127 (83)	26 (17)	153	
Close contact with hepatitis B case				25.854 (<0.001)
No	667 (91.5)	62 (8.5)	729	
Yes	154 (78.6)	42 (21.4)	196	
Smoking shishia (tobacco)				12.805 (<0.001)
Yes	135 (80.8)	32 (19.2)	167	
No	686 (90.5)	72 (9.5)	758	
Drinking alcohol				4.952 (0.026)
Yes	160 (84.2)	30 (15.8)	190	
No	661 (89.9)	74 (10.1)	735	
Overall burden of HBV infections	821 (88.8)	104 (11.2)	925	

The Chi-square X^2 identified that, of the sociodemographic characteristics, HBV infection was significantly associated with residential area (p =0.002), and formal education (p = 0.038) (Table 1). Furthermore, of the health behaviours, HBV infection was statistically associated with blood transfusion (p <0.001), surgical operations (p <0.001), close contact with a case of HBV (p < 0.001), smoking of shishia (p < 0.001) and drinking of alcohol (p < 0.001) (Table 1).

The statistically significant factors (independent variables) and HBV test results (dependent variable) were entered into logistic regression model. This was to determine the likelihood of the association. A preliminary analysis entailed that the statistical multicollinearity was realised with overall tolerance = 0.984. A review of standardized residual values highlighted that there were outliers which were kept in the dataset. Thus, the model was statistically significant, [X^2 (9=925)=42.269, p <0.001], indicating that the model could differentiate study participants who had HBV positive test result from those who had a negative result. Subsequently, the model explained between 4.5% (Cox & Snell R^2) and 8.8% (Nagelkerke R^2) of the variance and correctly predicted 88.8% of the test results. As shown in Table 2, Juba residential area and use of tobacco had significantly contributed to the model.

Table 2 presents odds ratios (OR) analyses of HBV infections among the women. The women who had close contact with a case of HBV infections were 2.5 times more likely to be infected (OR: 2.487, 95% CI: 1.549 - 3.995). For every increase in odds of the women who smoke shishia, there is 31.3% likelihood of these women to be HBV infected (OR: 1.313, 95% CI: 0.714 - 2.414). Those who attend formal education were 1.5 times more likely to have negative HBV results than those who did not attend formal education (OR: 1.479, 95% CI: 0.892 - 2.454). Women who had a history a surgical operation were more likely to be positive for HBV at 12.6%.

Table 2. Predictors of HBV infections among women of reproductive age: Multivariable Analyses

Predictor	B	SE	Wald	df	p-value	OR (95% CI LL, UL)
Residential area in Juba						
Juba*						
Kator	0.177	0.423	0.176	1	0.675	1.194 (0.522, 2.734)
Munuki	0.353	0.259	1.862	1	0.172	1.423 (0.857, 2.363)
Others	-0.726	0.305	5.645	1	0.018	0.484 (0.266, 0.881)
Formal education						
No*						
Yes	0.392	0.258	2.298	1	0.13	1.479 (0.892, 2.454)
Ever blood transfused						
No*						
Yes	0.126	0.33	0.146	1	0.703	1.134 (0.594, 2.166)
Surgically operated						
No*						
Yes	0.119	0.31	0.148	1	0.701	1.126 (0.614, 2.067)
Contact with case of HBV						
No*						
Yes	0.911	0.242	14.206	1	<0.001	2.487 (1.549, 3.995)
Ever used tobacco						
No*						
Yes	0.272	0.311	0.766	1	0.382	1.313 (0.714, 2.414)
Ever taken alcohol						
No*						
Yes	0.055	0.298	0.035	1	0.853	1.057 (0.59, 1.894)
Constant	-2.454	0.191	165.089	1	<0.001	0.086

* Reference category

Discussion

This study found that the overall burden of HBV infections was 11.2% among women of reproductive age. This burden is higher than the regional estimate (East Africa 6%) and also higher than other in-country studies (Juba Teaching Hospital, 11%; Bor State Referral Hospital, 8.6%.[6,10,11]) The study also identified that nearly half of these women were unaware of their HBV status. This might be due to the test of HBV infection being optional. Promoting the importance of antenatal hepatitis B testing is continuing. It is likely that this burden is a consequence of weak health systems.[8,9] Furthermore, fragmented social structures and cultural patterns may play a part in exacerbating the transmission of HBV.[7]

This study identified that HBV infection is associated with residential area, level of education and history of blood transfusion, surgical operations, close contact with other HBV infected persons, smoking of shishia and alcohol consumption. Our findings are consistent with previous studies: HBV infections in Ethiopia are associated with blood transfusion and with level of education in a Nigerian Study.[12,13]

Conclusion

The prevalence of HBV infections among women of reproductive age was high and nearly half of these women were not aware of their HBV status. It is significantly associated with, level of education, blood transfusion,

surgical operations, close contact with HBV infected persons, smoking of shishia and alcohol consumption. Concerted efforts should be made to improve the provision of healthcare services incorporating tailored health promotion, antenatal HBV screening, birth dose vaccines, and continuing professional development for healthcare providers.

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References

1. Asafo-Agyei KO, Samant H. Pregnancy and Viral Hepatitis. In: StatPearls. Treasure Island (FL): StatPearls Publishing; http://www.ncbi.nlm.nih.gov/books/NBK556026/
2. World Health Organization. Global progress report on HIV, viral hepatitis and sexually transmitted infections, 2021: accountability for the global health sector strategies 2016–2021: actions for impact: web annex 1: key data at a glance. World Health Organization; 2021. https://iris.who.int/handle/10665/342808
3. Schweitzer A, Horn J, Mikolajczyk RT, Krause G, Ott JJ. Estimations of worldwide prevalence of chronic hepatitis B virus infection: a systematic review of data published between 1965 and 2013. The Lancet 2015;386(10003):1546–55. https://linkinghub.elsevier.com/retrieve/pii/S014067361561412X
4. Ministry of Health. Treatment and Care Guidelines for Viral Hepatitis in South Sudan. 2020. Offline.
5. Sube KLL, Seriano OF, Gore RP, Jaja S, Loro RL, Lino EO, et al. Prevalence of HIV among blood donors at Juba Teaching Hospital Blood Bank, South Sudan. South Sudan Med J 2014. https://www.ajol.info/index.php/ssmj/article/view/132632
6. Kirbak ALS, Ng'ang'a Z, Omolo J, Idris H, Usman A, Mbabazi WB. Sero-prevalence for Hepatitis B virus among pregnant women attending antenatal clinic in Juba Teaching Hospital, Republic of South Sudan. Pan Afr Med J [Internet] 2013 [cited 2024 Feb 27];26(72). https://www.panafrican-med-journal.com/content/article/26/72/full
7. Cham AM, Clever SS, Celestino RJ, Thom RCCEC. The Burden of Hepatitis B Among Pregnant Women Attending Antenatal Care (ANC) Services in Juba Teaching Hospital (JTH)-Juba South Sudan. IJRDO -J Health Sci Nurs [Internet] 2017 [cited 2024 Jun 13];2(12):11–21. https://www.ijrdo.org/index.php/hsn/article/view/1732/1629
8. Ministry of Health. South Sudan South Sudan National Health Policy 2016-2026 | Country Planning Cycle Database. 2016 [cited 2024 Aug 22]. https://extranet.who.int/countryplanningcycles/planning-cycle-files/south-sudan-south-sudan-national-health-policy-2016-2026
9. World Health Organization. South Sudan: Health Cluster strategy 2023-2025 [cited 2024 Aug 22]. https://www.medbox.org/document/south-sudan-health-cluster-strategy-2023-2025
10. Jok TA, Ninan S. Hepatitis B chronic infection among pregnant women attending the antenatal care in Bor State Referral Hospital, South Sudan.. August 2023;16(3). http://www.southsudanmedicaljournal.com/assets/files/Journals/vol_16_iss_3_aug_23/Hepatitis%20B%20infection.pdf
11. Yirsaw BG, Agimas M, Alemu G, Tesfie T, Derseh N, Abuhay H, et al. Prevalence of Hepatitis B virus infection and its determinants among pregnant women in East Africa: Systematic review and Meta-analysis | PLOS ONE [Internet]. 2024 [cited 2024 Aug 23]. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0307102
12. Alemu AA, Zeleke LB, Aynalem BY, Kassa GM. Hepatitis B Virus Infection and Its Determinants among Pregnant Women in Ethiopia: A Systematic Review and Meta-Analysis. Infect Dis Obstet Gynecol 2020 [cited 2024 Aug 23];2020:1–11. https://www.hindawi.com/journals/idog/2020/9418475/
13. Olakunde BO, Adeyinka DA, Olakunde OA, Uthman OA, Bada FO, Nartey YA, et al. A systematic review and meta-analysis of the prevalence of hepatitis B virus infection among pregnant women in Nigeria. PloS One 2021;16(10):e0259218. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0259218