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ORIGINAL ARTICLE

SEROPREVALENCE OF HEPATITIS B VIRUS INFECTION AND ASSOCIATED FACTORS AMONG MOTHERS IN GONDAR, NORTH-WEST ETHIOPIA: A POPULATION BASED STUDY

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ABSTRACT

Background*: Hepatitis B virus (HBV) is the main cause of serious liver infection. Factors that increase the risk of HBV infection include contact during child birth and different horizontal means of transmission, such as unprotected sexual exposure with an infected person and having direct contact with the blood of an infected person.*

Objectives: *The main aim of this study is to determine seroprevalence of HBV infection and associated risk factors among mothers in Gondar, Northwest Ethiopia.*

Methods: *A community based cross-sectional study was conducted on mothers in Gondar from March to November 2016. Study participants were selected using a multistage cluster random sampling technique and a total of 419 mothers were included. Sociodemographic data and exposure to associated factors (hospital admission, history of circumcision, history of contact with jaundiced family and history of abortion) were collected through a structured questionnaire. Five milliliters of blood were collected from each study participant. Serum level hepatitis B surface antigen (HBsAg) and anti-HBc were detected using sandwich and indirect ELISA, respectively. The data were entered with Epi Info 7 and analyzed using SPSS version 20. To declare the presence of association, odds ratio with 95% confidence interval and p-value $\leq$0.05 were considered statistically significant.*

Result: *A total of 419 mothers with the median age of 29 (20-58) years old were enrolled. The sero-prevalence of HBsAg and anti-HBc was 3.8% and 36.0%, respectively. Statistically significant association with HBV infection was observed for age (AOR= 6.960, 96% CI, 2.047-23.659, P= 0.002), history of hospital admission (AOR= 3.279, 95% CI, 1.054-10.195, P= 0.04), history of circumcision (AOR= 4.394, 95% CI, 1.463-13.198, P= 0.008), history of contact with jaundiced family (AOR= 3.877, 95% CI, 1.274-11.795, P= 0.017) and history of abortion (AOR= 4.867, 95% CI, 1.438-16.473, P= 0.011).*

Conclusions and recommendations*: An intermediate seroprevalence of HBV infection, which is an important public health problem in the area, was detected. Therefore, implementing strategies for routine screening and care of mothers for hepatitis B virus would be important. Further, health education on modes of transmission and precautions and immunization of HBV has to be strengthened.*

Key words: *Hepatitis B virus, Risk factors, HBsAg, Anti-HBc, Mothers, Gondar*

INTRODUCTION

Hepatotropic viruses cause most cases of hepatitis worldwide. Hepatitis B virus is one of these viruses which causes life threatening liver disease, such as hepatocellular carcinoma (HCC) (1-2).

Approximately 45% of the world's population lives in regions where HBV infection is endemic, including the Far East, parts of the Middle East, sub-Saharan Africa, and the Amazon basin. In these areas, HBV infections frequently occur in the neonatal period or during early childhood (3).

Globally, 2 billion people are infected with HBV, 350 million people are estimated to be chronically infected (4-5) and 50 million people are newly infected with hepatitis B every year (6). Almost half of HBV patients have acquired the infections either through mother-to-infant transmission (MTCT) or in early childhood, especially in countries where HBV prevalence is intermediate to high level (7-8).

The prevalence of chronic HBV infection is variable throughout the world, ranging from < 1% in areas of low endemicity to over 30% in highly endemic areas.

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Africa has the second largest number of chronic carriers of HBsAg (>8%) next to Asia and is considered to be a region of high endemicity (5, 9-10). Ethiopia, being part of this region, is ranked as an area with medium to high endemicity for HBV infection, based on previous population surveys (11-12). Worldwide, HBV infection is estimated to be the cause of 50% of reported cases of cirrhosis, 30% of liver cancer cases, and over 500,000 deaths each year (13). Most of HBV related deaths (94%) have been attributed to complications of chronic infection, such as cirrhosis and hepatocellular carcinoma, while only 6% have been attributed directly to acute hepatitis B infection (10). Cirrhosis, liver failure, and hepatocellular carcinoma develop in 15–40% of chronically HBV infected individuals (2, 8).

In highly endemic areas, perinatal and horizontal (exposure to chronically infected household members) routes are responsible for most of the disease transmission (14). Factors that increase the risk of infection include unprotected sexual contact with an infected person, sharing needles and drug injection equipment, sharing personal items such as shavers and razor with an infected person, having direct contact with the blood of an infected person, touching open wounds or needle sticks, and contact during childbirth (15). Adults infected with HBV usually develop acute hepatitis and recover, however, 5-10% become chronic carriers. Most (25-90%) infected children become chronic carriers, rarely developing acute hepatitis (16). Prevention of vertical transmission is extremely important because HBV infection in early life can result in a chronic carrier state (17).

Even though few studies have previously indicated that hepatitis B is endemic in Ethiopia with regional variation, there is little information on the prevalence of hepatitis B virus among mothers. This study was designed to investigate the seroprevalence of HBV and its associated factors among mothers in Gondar.

POPULATION AND METHODS

Study area, period, and design: A community-based cross-sectional study was conducted between March and November 2016 in Gondar, Northwest Ethiopia. The projected population size in this city based on the 2007 census was 315,857 (161,087 males and 154,770 females). The population size of women between 15-49 years of age was 31,928. The town has 21 kebeles under twelve sub city administrations. The city has eight health centers and one tertiary teaching and referral hospital, which serves the people from the city and the surrounding area.

Sample size determination and sampling techniques: A single population proportion formula was used to determine sample size by considering 7.3% prevalence of HBV [18], 95% CI, 2 design effects and a 3.5% margin of error. Accordingly, a total number of 419 study participants were enrolled to this study. A multistage random sampling technique was used to select study participants. Four sub cities were randomly selected and all kebeles in the selected sub cities were included in the study. In the final stage, households were selected by simple random sampling using the registers held at the kebele offices. The number of participants in each of the selected sub cities was allocated proportionally.

Data collection tools and procedures: A structured questionnaire was used to collect sociodemographic and other variables of the study participants through a face-to-face interview. Trained nurses administered the questionnaires and laboratory technicians collected five milliliters of venous blood from each study participant.

RESULTS

Sociodemographic characteristics: The median age of the study participants was 29 (20-58) years and the mean parity was 2.80 (SD ±1.61). The majority of study participants were housewives (52.5%) followed by employees (30.1%). One hundred ninety-nine (47.5%) participants did not attend modern education and the majority (71.6%) of participants was married. Three hundred forty-eight (83.1%) women were multi-gravida and 292 (69.7%) of the women had one lifetime sexual partner (Table 1).

Table 1. Sociodemographic characteristics of study participants (n=419)

Variables	Category	Number	Percent (%)
Age in years	20-25	86	20.5
	26-30	178	42.5
	>30	155	37.0
Ethnicity	Amhara	404	96.4
	Others	15	3.6
Marital status	Single	10	2.4
	Married	300	71.6
	Divorced	94	22.4
	Widowed	15	3.6
Education	Illiterate	189	45.1
	Nonformal education	10	2.4
	Formal education	220	52.5
Occupation	Employed	126	30.1
	House wife	220	52.5
	Merchant	73	17.4
Gravidity	Primigravida	71	16.9
	Multigravida	348	83.1
Parity	<5	390	93.1
	>5	29	6.9
Average monthly income in EBR	<1000	140	33.4
	1000-2000	141	33.7
	>2000	138	32.9

EBR= Ethiopian Birr

Associated risk factors for hepatitis B virus infection:

Multivariable logistic regression analysis was conducted to assess independent association of risk factors with HBV infection. The presence of body inscriptions like tattoos, history of previous dental and surgical procedures, history of blood transfusion, use of unsterile needles, and ear piercing were not significantly associated with HBV infection in this study (Table 3).

Mothers younger than 26 years of age were 10.5-fold more likely to be seropositive for HBsAg compared to mothers >26 years of age (AOR= 10.51, 95% CI, 2.21-50.00, P= 0.007) (Table 4). Among multigravida mothers, 132 (37.9%) were seropositive for anti-HBc. Multiple pregnancy was significantly associated with HBcAb seropositivity (p=0.046) (Table 5).

One hundred and fourteen (27.2%) women reported that they have a history of contact with HBV infected family members. Among those who had a history of contact with jaundiced family, 9 (7.9%) were positive for HBsAg and 58 (50.9%) were positive for HBcAb. This was statistically significant for both HBsAg (AOR= 3.77, 95% CI, 1.25-11.33, P= 0.018) and HBcAb (AOR = 2.38, 95% CI, 1.52-3.74, P < 0.001) sero -positivity. There was no history of hepatitis B vaccination for any of the participants included in this study. One hundred sixteen of them (27.6%) had a previous history of female circumcision. Among them, 8 (6.9%) were seropositive for HBsAg. History of female circumcision was significantly associated with HBsAg seroprevalence (AOR= 3.31, 95% CI, 1.116-9.838, P= 0.031).

Table 2. Seroprevalence of HBsAg and anti-HBc (n=419).

Variables	Category	HBsAg positive n (%)	COR (95% CI)	P-value	Anti-HBc positive n (%)	COR(95%CI)	P-value
Age in years	20-25	7 (8.1)	3.35 (0.95-11.77)	0.08*	30 (34.9)	0.83 (0.48-1.43)	0.55
	26-30	5 (2.8)	1.09 (0.29-4.14)		60 (33.7)	0.78 (0.50-1.23)	
	>30	4 (2.6)	1		61 (39.4)	1	
Ethnicity	Amhara	15 (3.7)	0.54(0.07-4.38)	0.56	143(35.4)	2.09 (0.74-5.87)	0.16*
	Others	1 (6.7)	1		8 (53.3)	1	
Marital status	Single	1 (10.0)	1	0.71	4 (40.0)	1	0.76
	Married	11 (3.7)	0.34 (0.04-2.95)		109 (36.3)	0.86 (0.24-3.10)	
	Divorced	3 (3.2)	0.30 (0.03-3.16)		31 (33.0)	0.74 (0.19-2.81)	
	Widowed	1 (6.7)	0.64 (0.04-11.63)		7 (46.7)	1.31 (0.26-6.64)	
Education	Illiterate	7 (3.7)	0.90 (0.33-2.47)	0.98	65 (34.3)	0.86 (0.57-1.28)	0.72
	Nonformal education	0	-		3 (30.0)	0.71 (0.18-2.81)	
	Formal education	9 (4.1)	1		83 (37.7)	1	
Occupation	Employed	2 (1.6)	1		40 (31.7)	1	0.16*
	House wife	11 (5.0)	3.26(0.71-14.96)	0.31	78 (35.5)	1.18 (0.74-1.88)	
	Merchant	3 (4.1)	2.66(0.43-16.29)		33 (45.2)	1.77 (0.98-3.21)	
Gravidity	Primigra-vida	2 (2.8)	1		19 (26.8)	1	0.08*
	Multigra-vida	14 (4.0)	1.45(0.32-6.51)	0.63	132 (37.9)	1.67 (0.95-2.95)	
Parity	<5	14 (3.6)	1		137 (35.1)	1	0.16*
	>5	2 (6.9)	1.99(0.43-6.21)	0.38	14 (48.3)	1.72 (0.81-3.68)	
Average monthly income in EBR	<1000	6 (4.3)	1.19(0.36-4.00)	0.94	53 (37.9)	1.39 (0.85-2.29)	0.24
	1000-2000	5 (3.5)	0.98(0.28-3.46)		56 (39.7)	1.50 (0.92-2.47)	
	>2000	5 (3.6)	1		42 (30.4)	1	

COR: Crude Odds Ratio, CI: Confidence Interval, EBR: Ethiopian Birr, n: number, *: P<0.2

Previous history of hospital admission (AOR= 3.28, 95% CI, 1.06-10.12, P= 0.039) and history of abortion (AOR= 4.67, 95% CI, 1.40-15.60, P= 0.012) were also significantly associated with hepatitis B virus infection (Table 4).

Among mothers who had a history of multiple sexual partners, 57 (44.9%) were positive for HBcAb and 6 (4.7%) were positive for HBsAg. History of multiple sexual partners was significantly associated with seropositivity for HBcAb (p= 0.02) but not with seropositivity for HBsAg (p = 0.44) (Table 5).

Table 3. Seroprevalence of HBsAg and HBcAb, and associated factors (n =419)

Variables	Re-sponse	HBsAg Positive n (%)	COR(95%CI)	P-value	Anti-HBc Positive n(%)	COR (95%CI)	P-value
History of Blood transfusion	Yes	1 (5.0)	1.35 (0.17-10.74)	0.778	11 (55.0)	2.26 (0.92-5.59)	0.08*
	No	15 (3.8)	1		140(35.1)	1	
History of Jaun-dice	Yes	2 (3.6)	0.94 (0.21-4.27)	0.94	16 (29.1)	0.70 (0.38-1.29)	0.25
	No	14 (3.8)	1		135(37.1)	1	
History of un-sterile needle use	Yes	1 (2.2)	0.53 (0.07-4.11)	0.54	17 (37.0)	1.05 (0.55-1.97)	0.89
	No	15 (4.0)	1		134(35.9)	1	
Ear piercing	Yes	15 (4.1)	2.12 (0.28-16.44)	0.47	135(36.7)	1.27 (0.68-2.38)	0.46
	No	1 (2.0)	1		16 (31.4)	1	
History of tribal marks/tattoos	Yes	12 (5.1)	2.37 (0.75-7.48)	0.14*	86 (36.3)	1.03 (0.68-1.53)	0.90
	No	4 (2.2)	1		65 (35.7)	1	
History of hospi-talization	Yes	8 (7.3)	2.99 (1.09-8.17)	0.03*	47 (43.1)	1.50 (0.96-2.35)	0.07*
	No	8 (2.6)	1		104(33.5)	1	
History of sur-gery	Yes	4 (6.1)	1.83 (0.57-5.87)	0.31	25 (37.9)	1.10 (0.64-1.89)	0.73
	No	12 (3.4)	1		126(35.7)	1	
History of dental procedure	Yes	5 (4.7)	1.36 (0.46-4.01)	0.58	47 (44.3)	1.60 (1.02-2.51)	0.04*
	No	11 (3.5)	1		104(33.2)	1	
History of con-tact with HBV infected patient	Yes	9 (7.9)	3.65 (1.33-10.04)	0.01*	58 (50.9)	2.36 (1.52-3.67)	<0.001*
	No	7 (2.3)	1		93 (30.5)	1	
History of cir-cumcision	Yes	8 (7.0)	3.56 (1.29-9.79)	0.05*	46 (40.0)	1.26 (0.81-1.96)	.30
	No	8 (2.6)	1		105(34.5)	1	
Pregnancy	Yes	2 (14.3)	4.65 (0.95-22.80)	0.06*	6 (42.9)	1.35 (0.46-3.95)	0.59
	No	14 (3.5)	1		145(35.8)	1	
History of abor-tion	Yes	6 (11.5)	4.66 (1.62-13.41)	0.004*	20 (38.5)	1.13 (0.62-2.05)	0.70
	No	10 (2.7)	1		131(35.7)	1	
History of multi-ple sexual part-ners	Yes	6 (5.0)	1.50 (0.53-4.23)	0.44	57 (44.9)	1.72 (1.12-2.63)	0.01*
	No	10 (3.4)	1		94 (32.2)	1	

COR: Crude Odds Ratio, CI: Confidence Interval *: P-value $\leq$ 0.2.

Table 4. Multivariate analysis of associated factors with HBsAg.

Variables	Response	HBsAg status Positive n (%)	Negative n (%)	AOR	95%CI	P-value
History of tribal marks/ tattoos	Yes	12 (5.1)	225 (94.9)	2.00	0.60-6.69	0.26
	No	4 (2.2)	178 (97.8)	1		
History of hospitalization	Yes	8 (7.3)	101 (92.7)	3.28	1.06-10.12	0.039**
	No	8 (2.6)	302 (97.6)	1		
History of contact with HBV infected patient	Yes	9 (7.9)	105 (92.1)	3.77	1.25-11.33	0.018**
	No	7 (2.3)	298 (97.7)	1		
History of circumcision	Yes	8 (7.0)	107 (93.0)	3.31	1.12-9.84	0.031**
	No	8 (2.6)	296 (97.4)	1		
Pregnancy	Yes	2 (14.3)	12 (85.7)	3.62	0.43-30.35	0.24
	No	14 (3.5)	391 (96.5)	1		
History of abortion	Yes	6 (11.5)	46 (88.5)	4.67	1.40-15.60	0.012**
	No	10 (2.7)	357 (97.3)	1		
Age in years	<=25	7 (8.1)	79 (91.9)	6.62	1.98-22.11	0.002**
	>25	9 (2.7)	324 (97.3)	1		

AOR: Adjusted Odds Ratio, CI: Confidence Interval, **: P-value ≤ 0.05.

Table 5 . Multivariate analysis of associated factors with HBcAb.

Variables	Response	Anti-HBc Positive n (%)	AOR	(95%CI)	P-value
Ethnicity	Amhara	143 (35.4)	0.41	0.14-1.19	0.10
	Others	8 (53.3)	1		
Occupation	Employed	40 (31.7)	1		0.36
	House wife	78 (35.5)	1.22	0.74-2.02	
	Merchant	33 (45.2)	1.59	0.84-2.98	
Gravidity	Primigravida	19 (26.8)	1		0.046**
	Multigravida	132 (37.9)	1.82	1.01-3.29	
Parity	<5	137 (35.1)	1		0.072
	>5	14 (48.3)	2.05	0.94-4.49	
History of blood transfusion	Yes	11 (55.0)	2.19	0.85-5.62	0.10
	No	140 (35.1)	1		
History of hospitalization	Yes	47 (43.1)	1.33	0.83-2.13	0.23
	No	104 (33.5)	1		
History of dental procedure	Yes	47 (44.3)	1.36	0.84 2.19	0.22
	No	104 (33.2)	1		
History of contact with HBV infected patient	Yes	58 (50.9)	2.38	1.52-3.74	<0.001**
	No	93 (30.5)	1		
History of multiple sexual partners	Yes	57 (44.9)	1.66	1.07-2.58	0.02**
	No	94 (32.2)	1		

AOR: Adjusted Odds Ratio, CI: Confidence Interval; **: P-value ≤ 0.05.

DISCUSSION

Hepatitis B surface antigen (HBsAg) is the main marker indicating prevalence as well as endemicity of HBV active infection in the general population of a particular geographical area (14). In the present study, we observed 3.8% (95% CI, 1.9-5.7) and 36.0% (95% CI, 31.5-40.8) seroprevalence for HBsAg and anti-HBc, respectively. Mothers who were positive for both HBsAg and HBcAb are considered to have HBV infection and those positive for only anti-HBcAb are presumed to have had HBV infection in the past.

Mothers who were positive for HBsAg in the present study were also positive for anti-HBc, which is a similar phenomenon observed in a study conducted in Nigeria (19). Even though IgM and IgG levels of anti-HBc were not determined separately, the prevalence of total anti-HBc combined with HBsAg might reveal the total seroprevalence of HBV infection. The prevalence of HBcAb (36.0%) in this study was consistent with anti-HBc prevalence observed in a study conducted on the general population of Addis Ababa (36.6%) (11), but lower than anti-HBc prevalence observed in another study conducted in Brazzaville (65.7%) (20). Based on the WHO classification, the prevalence of HBV infection among mothers in this study would be classified as "intermediate" which is in the range of 2-8% (21). Limitations of this study for such extrapolation are small sample size and geographic restriction.

The prevalence of chronic HBV infection (HBsAg positivity) in this study was similar with reports from studies conducted in Democratic Republic of Congo (2.9%) (22), Tanzania (3.9%) (23), and different regions of Ethiopia namely Addis Ababa (4.9%) (11) and (3.0%) (24), Jimma (3.7%) (25), Arba Minch (4.3%) (26), Dessie (4.9%) (4), Bahir Dar (3.8%) (27) and (4.4%) (28) and Debre-Tabor (5.3%) (29). However, the prevalence of chronic HBV infection in the current study was lower than what was reported in studies conducted in Yemen (15.7%) (30), in some parts of Nigeria (12.5%) (31), (8.3%) (23), (7.9%) (32) and (7.1%) (33), Brazzaville (8.7%) (20). Eastern Sudan (8.2%) (34), Addis Ababa, Ethiopia (6.2%) (35), Eastern Ethiopia (6.9%) (36), and in Gondar area (7.3%) (18). The lower prevalence of chronic HBV infection in this study as compared to that reported in a study conducted in Gondar might be due to methodological variation. In contrast, the HBV prevalence we observed was higher than what was reported in studies from Japan (0.8%) (5), Iran (1.56%) (8) and Malaysia (2.1%) (9). These differences might be due to different cultural practices, behavioral divergences for the risk factors, and the degree of HBV endemicity, which often correlates with the predominant mode of transmission. In endemic areas, perinatal and horizontal (exposure to chronically infected household members) routes are responsible for most disease transmission. Furthermore, the variation in HBV infection prevalence observed between our study and other studies might also be due to different study designs and assays used for HBV infection detection.

In this study, sociodemographic variables like residence, marital status, occupation and educational status of mothers as well as parity were not significantly associated with the risk of acquiring HBV infection ($p > 0.05$). However, age of participants was significantly associated with HBsAg positivity. Mothers younger than 26 years of age were about 10.5 times more likely to be positive for HBsAg than their counterparts. The high prevalence among this age group was consistently reported in other studies (38-40). This might be due to the fact that women in this age group are more vulnerable to risky sexual behaviors such as early marriage, multiple sexual partners, and unprotected sexual practice.

Interestingly, there was no HBsAg detected in the serum of women aged 35–58 years. A similar finding was also reported in Nigeria (39) and in Jimma, Ethiopia (25). Multi-gravidity was found to be significantly associated with anti-HBc positivity ($p=0.046$). This might be due to multiple exposures to unsterile instrumentation during delivery at home or in health facilities.

In this study, mothers who had a history of contact with HBV infected family members were 3.7 times more likely to be HBsAg sero-positive ($p= 0.018$) and 2.3 times more likely to be anti-HBc positive ($p< 0.001$). This might be due to sharing of various HBsAg contaminated personal and household materials, which might have led to the transfer of HBV from infected individuals to other family members. This is in agreement with other studies (19, 28**,** 41-42). A study done in Zahedan revealed that the prevalence of transmission of infection in families where carriers are present was 11 to 57% (43).

In this study, the seroprevalence of HBV infection was significantly higher in participants who had previous history of hospitalization than those who had no history of hospitalization ($p = 0.039$). This finding is concordant with study conducted in Yemen (44). This might be due to poor sanitary practices with

In the present study, mothers who had a history of female circumcision were 3.3 times more likely to be HBsAg positive (p= 0.031). The significant association of female circumcision with HBsAg has been shown in a study conducted in Nigeria (45). The high prevalence of HBsAg among circumcised female might be attributed to the use of unsterilized instruments in which the same instrument might be shared among multiple girls without proper sterilization of the equipment. Female circumcision in most parts of Ethiopia was a common practice. As this study indicated, circumcision is among the main associated risk factors for the transmission of HBV infection. The Ethiopian Ministry of Health should strengthen health education and mobilize communities to eliminate female circumcision.

Among the potential risk factors assessed in this study, abortion was found to have a significant association with HBsAg positivity (p = 0.012). Mothers who had previous history of abortion were 4.8 times more likely to be HBsAg positive. This was similar to the findings in Jimma and Addis Ababa, Ethiopia (25, 35), where abortion was reported as a significant risk factor for HBV infection among pregnant women. The association of HBV infection and abortion might be due to the use of unsterile equipment in abortion centers.

In this study, mothers who had a history of multiple sexual partners were 1.6 times more likely to be anti-HBc positive and all HBV markers tested (p= 0.02) with the exception of HBsAg. This suggests that most of them had cleared HBV infection and developed immunity.

There was no statistically significant difference in the overall seropositivity of HBV markers, particularly of HBsAg, between pregnant and nonpregnant women in this study. This might suggest that pregnancy is not a potential risk factor for HBV infection. This might be due to similar sociodemographic factors among pregnant mothers and nonpregnant mothers, and almost equal exposure to the potential risk factors.

The limitations of this study are our inability to test the spouses of participants and use of limited HBV markers. We were not able to check markers of viral replication, such as HBe antigen or HBV DNA. Therefore, we might be underestimating HBV prevalence in this group of participants. For this reason, it is not possible to any conclusion based on the results of this study.

Conclusion

Intermediate level prevalence of HBV infection was observed among mothers in Gondar. Considering that mothers are among vulnerable population groups and horizontal transmission of this virus is still possible, this figure raises great public health concern. Therefore, implementing strategies for routine screening of mothers for HBV would be important. Abortion, circumcision, history of contact with jaundiced family members, and hospitalization appear to play a significant role in the transmission of the virus from infected to healthy individuals. Thus, health education about the mode of transmission and prevention of HBV with emphasis on the above mentioned risk factors would be an important public health measure.

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Author's contribution

MG conceived the idea, carried out the proposal writing, participated in the data collection, data analysis and drafted the manuscript. EA, FM, EY and GA participated in data analysis and interpretation of the findings. AA, EA, FM, AM and RH participated in the interpretation of the findings and final write-up of the paper. All authors reviewed the manuscript and approved for publication.

Conflict interest

The authors have no conflicts of interest.

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