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Assessment of Hepatitis B Virus and Associated Risk Factors Among Pregnant Women Attending Antenatal Care at Arsi University Asella Referral and Teaching Hospital, Ethiopia

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Abstract

Hepatitis B virus is a public health problem worldwide. Vertical transmission from mother to baby is an important route of transmission for hepatitis B virus infection. Consequently, screening pregnant women and realizing the sero-prevalence of hepatitis B virus during pregnancy is vital to prevent the infection of new born baby from positive mother. The objective of this study was to assess the sero-prevalence of hepatitis B virus among pregnant women and to identify potential risk factors associated with the infection. The study was conducted from January to May, 2016 using data from pregnant women attending the antenatal care unit of Arsi University Asella Referral and Teaching Hospital, Arsi Zone,Oromia Regional State, Ethiopia. Blood samples were collected from 454 pregnant women and tested for hepatitis B surface antigen using rapid strip test which is a qualitative solid phase two site sandwich immunoassay. A pre-structured questionnaire was used to collect socio-demographic data and to find out possible risk factors. The overall study subjects with hepatitis B surface antigen positive were 44(9.7%). Most 301(66.3%) of study participants live in urban and 442(97.4%) were married. The socio-demographic status of the participants shows that high hepatitis B surface antigen positivity was among the urban 29(65.9%) and those who were house wife. All except the gestational age of 3rd trimester ($p<0.05$) the participants demographic characteristic had no significant association with Hepatitis B Virus. None of the risk factors had statistically significant association with hepatitis B virus ($P>0.05$). It can be concluded that high prevalence of hepatitis B virus among pregnant women was found in this study as compared to the previous studies in different regions of Ethiopia. This high prevalence indicates the importance of implementing preventive measures including vaccination to women in the child bearing age as they are at increased risk of acquiring HBV compared to the general population.

Key words: *Hepatitis B virus, pregnant women, prevalence, risk factors*

1. INTRODUCTIO

Hepatitis B virus is the most serious types of viral hepatitis which can lead to chronic liver disease and put people at high risk of death from cirrhosis of the liver and liver cancer. Globally, over 350

million people are affected with hepatitis B virus (HBV) infection and over 1 million die annually of HBV-related chronic liver disease (Teresa and Wright, 2006).

Although the major source of HBV is blood and blood products it is also found in semen, saliva, tears, breast milk, vaginal and menstrual secretions and amniotic fluid. Transmission occurs through contaminated blood and blood components by transfusion, needle sharing, tattooing and through very close personal contact involving the exchange of semen, saliva and vaginal secretions and child birth (Lavanchy, 2004). Population at risk include health care personnel, intravenous drug users, hemophiliacs, infants born to HBsAg positive mothers, renal dialysis patients, sexual partners of HBV carriers and individuals with multiple sexual partners (CDC, 2014).

The major mode of transmission of hepatitis B virus is mother to child (Teresa and Wright, 2006). It has been reported that 10–30% of HB_sA_g positive pregnant mother transmit the virus to their babies. However, mothers who are positive for both HB_sA_g and HB_eA_g have chance of transmitting HBV to their new born is 70-90 % (Kwon and Lee, 2011). Up to 90% of the newborns born from these mothers go on to develop chronic hepatitis B caused by HBV if they do not receive hepatitis B virus immunoglubulin and hepatitis B vaccine at birth (Apuzzia et al., 2012).

HBV is the leading cause of chronic liver disease and liver-related deaths worldwide with the majority of these causes occurring in Africa and Asia, where HBV prevalence is higher than 8 % (Hoffmann and Thio, 2007). The global prevalence of chronic HBV infection varies widely from high

(≥8%) to intermediate (2-7%) and low < 2% (Custer et al., 2004). The prevalence of HBV is estimated at 8 % in West Africa and 5-7% in Central Eastern and Southern Africa (Su, 2010).

Hepatitis B virus is endemic in Africa next to Asia, with a sero-prevalence rate of between 8 and 20% (Elizabeth and Ramsey, 2011). In Ethiopia, Hepatitis B is endemic with an average prevalence of 10.8 %. However, it is likely to be underreported due to the lack of diagnostic facilities and appropriate surveillance systems (Fassil Shiferaw et al., 2016). In Ethiopia studies have shown that wide geographic and socio-economic variation in hepatitis B prevalence, ranging between 5.7 and 10.8 % (Asfaw Negero et al., 2011). The sero-prevalence of HbsAg is found to be as high as 14.4% in blood donors (Rahlenbeck et al., 1997). Earlier hospital-based studies showed that hepatitis B accounts for 12 % of hospital admissions and 31 % of deaths in Ethiopian hospitals (Tsega, 2000).

In a study that was done to define the mode of transmission of HBV infection in Ethiopia showed that 5% of pregnant women were reported to be positive for HBsAg (Tsega et al., 1988). In another study which was done to determine the sero prevalence of HBsAg and its risk factors among pregnant women in Jimma southwestern Ethiopia was 3.7% (Mohammed Awole and Solomon Gebresilasie, 2005). Recent studies at public hospitals in Ethiopia by Tsegaye Yohanes et al.(2016) and Yeshi Metaferia et al. (2016) showed that the prevalence of HBV infection among pregnant women was intermediate (2-7.8 %).

Apart from a dearth of information, concerning the prevalence of HBV infection

among pregnant women in Ethiopia, the existing data are also differing from region to region. In addition, viral hepatitis screening services are not widely available except for the occasional mandatory medical checkups for work or travel purposes. The magnitude of the problem is so high that over 5.2% million people are estimated to be living with chronic HBV infection among the general population of Ethiopia (Ott et al., 2012). Knowing the prevalence of HBV specifically during pregnancy is vital for the reason that major mode of transmission is prenatal and the best way of assessing the prevalence in general population is its prevalence in pregnant mothers. So screening of all pregnant mothers is critical to know the burden of the problem and to indicate the prevalence of HBV in Ethiopia including the central regions of the country.

By considering the existing scarcity of information about HBV infection in highly risk groups especially pregnant women the current study was conducted to determine the prevalence of HBV among pregnant women and risk factors associated with hepatitis B infection among pregnant women attending antenatal care at Arsi University, Asella Referral and Teaching Hospital, Central Ethiopia.

2. MATERIALS AND METHODS

2.1. Study area

The research was conducted at Arsi University Asella Referral and Teaching Hospital, Ethiopia. Asella is found in Oromia Regional State, central Ethiopia, at a distance of 178 km southeast of capital city Addis Ababa. According to CSA (2007), Asella town has a total population of 74,268 of whom 37,337 are male and 36,931 are females. The hospital is a referral and teaching

hospital serving people coming from all over 22 weredas in Arsi zone. It gives antenatal care service for more than average 20 pregnant women daily. The hospital is with two laboratory rooms, one for MCH and the other for the other patients attending the hospital.

2.2. Study population and design

A cross sectional hospital based study was conducted among pregnant women attending antenatal care at Arsi University, Asella Referral and Teaching Hospital and voluntary to participate in the study by giving blood sample for screening HBV infection and to respond questionnaires during study period. Sampling size was calculated with single proportion formula by taking Hepatitis B surface antigen prevalence from other studies conducted among pregnant women 4.5% (Kothari,2004) 2% error of margin and 10 % non -response rate

$$N=\frac{(Z\alpha/2)^2 P(1-P)}{d^2},$$

(Where N=sample size; P = Proportion of HBsAg prevalence reported in similar study noted above (4.5%); d=2% error of margin; Z α/2 =Standard normal probability for 95% CI (1.96).

2.3. Data collection and laboratory investigation

A pre-tested structured questionnaire was delivered to volunteer pregnant women to obtain socio-demographic information including maternal age, gestation age, occupation, educational status, living area and other information on risk factors for transmission of HBV including a history of previous blood transfusion, place of previous birth, any surgical procedure, tattooing, and hospital admission by data collectors. The questionnaires were first prepared in English then translated into

Afan Oromo and Amharic.

After completion of the questionnaire, about 5ml of blood sample was aseptically collected by venipuncture from each participant into sterile plane bottle. The blood samples were left to form clots at room temperature, after which they were centrifuged for 10 minutes at 200 revolutions per minute (rpm) to separate serum or plasma from clot. Sample testing was done using rapid strip test which is one step test that utilizes the principle of rapid chromatographic immunoassay for the qualitative detection of Hepatitis B surface antigen in serum or plasma (Blumberg, 1971).

The separated serum was allowed to equilibrate to room temperature (15-30^{0}C).To perform the laboratory test the foil pouch was opened and remove the strip. The strip was deepened in to the serum for at least 5 seconds until it was thoroughly wet and reaches the level indicated by the arrows on the strip. The strip was removed from the specimens and placed on a flat dry surface until the red lines appeared. The result was read in 15 minutes. Interpretation of the result was made as follows. **Positive**: Two distinct red lines appear, one line should be in the control region(C) and another line should be in the test region (T). **Negativ**e: one red line appears in the control region (C).No apparent red or pink line appears in the test region (T). **Invalid**: control lines failed to appear due to insufficient specimen volume or incorrect procedural techniques. In that case the procedure was repeated with a new test strip.

2.4 Data analysis

The sero-prevalence of HBsAg was expressed in percentages in the study group and results were presented in tables. Data was entered and analyzed using the

statistical software SPSS version 21. Chi-square test and bivariate logistic regression analysis were used to determine the association between dependent variables and the independent variables. The result was considered statistically significant at P<0**3.**

3. RESULTS

3.1 The Socio-demographic characteristics of the participants

This study included 454 pregnant women attending the antenatal care unit of Arsi University Asella Referral and Teaching Hospital during the period of January, 2016 to May, 2016. Out of the total participants, 197 (43.4%) were in the age group 23-27, followed by 125 (27.5%) in the age group 28-32, 96 (21.16%) in the age group 18-22, 29 (6.4%) in the age group 33-37 and 7 (1.5%) were in the age group 38-42(Table.1).

Most of the study subjects were from urban 301(66.3%) and almost near to the total number of the study participants were married 443 (97.5%). The majority of the study participants were house wives 77(17.0%) and about half of these women had an education level of less than secondary school (Table 1).

3.2 The risk factors of HBV infection

The risk factors included in this study were history of blood transfusion, hospital admission, surgical procedure, multiple sexual practice, female genital mutilation and body tattooing. Most of the participants 408(89.9%) had no history of blood transfusion. Of the total, 333(73.3%) were not admitted in hospital. Of the total, only 36(7.9%) of the pregnant women had history of surgical procedure. But majority of the participants 439(96.7%) had no history of

multiple sexual practice. Similarly, 282(62.1%) of the pregnant women had no genital mutilation and only 25(5.5%) had tattoo on their body (Table 2).

Table 1. The socio-demographic characteristics of pregnant women attending the antenatal unit at Arsi University Asella Referral and Teaching Hospital, 2016.

Socio-demographic characteristics	**Frequency**	**Percentage (%)**
Age group		
18-22	96	21.1
23-27	197	43.4
28-32	125	27.5
33-37	29	6.4
38-42	7	1.5
Resident		
Urban	301	66.3
Rural	153	33.7
Marital status		
Single	11	2.4
Married	443	97.5
Educational status		
Illiterate	71	15.6
1-8	157	34.6
9-12	142	31.3
Diploma	65	14.3
Degree and above	19	4.2
Gestational age		
1st trimester	46	10.1
2nd trimester	104	22.9
3rd trimester	304	67.0
Abortion status		
Yes	87	19.2

No	367	80.8
Place of previous delivery		
No birth	197	43.4
Home	80	17.6
Health institution	177	39
Screened for HBV		
Yes	274	60.4
No	180	39.6
Vaccination for HBV		
Yes	19	4.2
No	435	5.8

Total=454(100%) under each variable

Table 2. The risk factors characteristics of the participant women attending the antenatal unit at Arsi University Asella Referral and Teaching Hospital, 2016

Variables	Frequency	Percent
History of blood transfusion		
Yes	46	10.1
No	408	89.9
Hospital admission		
Yes	121	26.7
No	333	73.3
Surgical procedure		
Yes	36	7.9
No	418	92.1
Multiple sexual activity		
Yes	15	3.3
No	439	96.7
Body tattooing		
Yes	25	5.5
No	429	94.5

Female genital mutilation		
Yes	172	37.9
No	282	62.1

3.3. Sero-prevalence of HBV in pregnant women by socio - demographic characteristics

Among 454 pregnant women tested for HBsAg, 44(9.7%) were positive for HBsAg (Table 3). The sero-prevalence of HBsAg in relation to age showed that the highest prevalence of HBsAg 15(34.1%) were in the age group of 23-27, followed by 14 (31.8%) in the age group of 28-32, and 12 (27.3%) was in the age group of 18-22. Majority of pregnant women 29(65.9%) positive for HBV were in urban and all of 44(100%) positive mothers were married. High number of HBsAg positive 27(61.3%) were in elementary and high school educated. With regard to occupation HBsAg positivity was highest 29 (65.9%) among house wife and most 24(54.5%) of HBsAg positive mothers were on 3rd trimester followed by 12 (27.3%) on 2nd trimester (Table 3).

3.4. The Association between prevalence and risk factors of hepatitis B virus

The expected risk factors associated with exposure to HBsAg were determined by comparing the significant association ($P<0.05$) of HBsAg detection for study participant as shown in Table (4). None of the risk factors had been found to be associated with HBsAg sero-positivity ($P>0.05$). However, almost most of the study participants were exposed to at least one HBV infection risk factors. Among 454 pregnant women tested 172 (37.9%) had history of female genital

mutilation of these 20(45.5%) were positive for HBsAg which was the highest prevalence among risk factors. Out of 121(26.6%) who were admitted to hospital 14 (31.8%) were positive for HBV. A total of 46(10.1%) had history of blood transfusion of these 3(6.8%) were positive for HBsAg, 36 (7.9%) had surgical procedure of these only 2(4 .5%) were positive for HBsAg. 15(3.3%) had multiple sexual activity out of these only 3(6.8%) were positive. Pregnant women who had body tattoo were 25(5.5%) among these only 2(4.5%) were positive for Hepatitis B surface antigen.

Table 3. Sero-prevalence of hepatitis B virus (HBsAg) by socio-demographic characteristics of the participant women attending the antenatal unit at Arsi University Asella Referral and Teaching Hospital, 2016.

Variables	BsAg positivHBsAG (+)		HBsAg (-)		X^2	P value
	Freq.	freq. %)	Freq.	(%)		
Age						
18-22	12	27.3	84	20.5		
23-27	15	34.1	182	44.4		
28-32	14	31.8	111	27.1	2.589	0.912
33-37	2	4.5	27	6.6		
38-42	1	2.3	6	1.5		
Resident						
Urban	29	65.9	272	66.3	0.003	0.433
Rural	15	34.1	138	33.7		
Marital status						
Single	0	0	11	2.7	1.323	0.998
Married	44	100	398	97.1		
In relationship	0	0	1	0.24		

Educational status						
Illiterate	11	25	60	14.6		
1-8	14	31.8	143	34.9	3.829	0.132
9-12	13	29.5	129	31.5		
Diploma	4	9.1	61	14.9		
Degree & above	2	4.5	17	4.1		
Occupation						
Employed	7	15.9	70	17.1		
House wife	29	65.9	281	68.5		
Daily labor	2	4.5	11	2.7	0.678	0.806
Student	1	2.3	8	2		
Self employer	5	11.4	40	9.8		
Gestational age						
1st trimester	8	18.2	38	9.3	4.643	
2nd trimester	12	27.3	92	22.4		0.011
3rd trimester	24	54.5	280	68.3		
Abortion status						
Yes	13	29.5	74	18.1	3.390	0.119
No				82		
Place of previous	31	70.5	336			

Birth						
No birth	20	45.5	177	43.2	6.424	0.137
Home	13	29.5	67	16.3		
Hospital	11	25	166	40.5		
Screened for HBV					2.182	0.101
Yes	22	50	252	61.5		
No	22	50	158	38.8		
Vaccination for HBV					2.128	
Yes	0	0	19	4.6		0.998
No	44	100	391	95.4		

Total sample=454(100%), positive=44(100) Negative=410(100) under each variables

Table 4. Bivarate assessment of risk factors for hepatitis B virus (HBsAg) positivity

Variables	**Frequency (%)**	**HBsAg. +ve (%)**	**X^2**	**P-value**
History of blood transfusion	46(10.1)	3(6.8)	0.588	0.156
History of multiple sexual activity	15 (3.3)	3(6.8)	1.665	0.998
Surgical procedure	36(7.9)	2(4.5)	0.764	0.188
Hospitalization	121(26.7)	14(31.8)	0.665	0.063
Female genital mutilation	172(37.9)	20(45.5)	1.186	0.243
Body tattooing	25(5.5)	2(4.5)	10.160	0.330
No risk factor	40(8.8)	0(0)		
Total	**454(100)**	**44(100%)**		

4. DISCUSSION

In this study the overall prevalence of HBsAg in pregnant women was 9.7%. According to HBV prevalence classification of WHO (2011), the finding of this study has showed high endemicity of HBV infection (≥8%) among tested pregnant women. This investigation implies that the pregnant women are at high risk for transmission of the disease. The seroprevalence found in this study was comparable with the findings of previous studies in Sub-Saharan countries such as 10.2% in Cameron (Noubiap et al., 2015), 8.2% in northeast Nigeria (Olokoba et al., 2011) and in Mali 8% (Maclean et al., 2012). Contrary to these, it was higher than the study conducted in different regions of Ethiopia in Addis Ababa 3% (Dessie Tegegne et al., 2014), in Jimma , southwest Ethiopia 3.7% (Mohammed Awole and Solomon Gebresilasie, 2005), in Bahir-dar , northwest Ethiopia 3.8% (Yohanis Zenebe et al., 2014), Arba minch general hospital 4.3% (Tsegaye Yohanes et al.,2015) and in Addis Abeba in three teaching hospitals 4.5% (Sisay Kirba, 2014).

However, it was lower than the study reported in university of Benin, Nigeria in which the prevalence of HBV infection among pregnant women was 12.5% (Ugbebor et al., 2011), in Zaria 18.2% (Luka *et al.*, 2008), in Makurdi, Nigeria 11% (Mbaawuage, 2008) and in Taiwan 15.5% (Lin, 2008). The difference in prevalence might be due to geographic variations and different sample populations (Vazquez-Martinez et al., 2003), difference in socioeconomic status and traditional practices.

In developed nation where regular screening and vaccination of HBV is provided for pregnant

women low prevalence rate (<2%) was reported (0.14 %-0.97%) in USA (Euler et al., 2003), (1.65%) in Mexico (Vazquez –Martinez, 2003) and (1.6%) in Saudi Arabia (Alrowaily et al., 2008). A study conducted by Ding et al. (2013) indicates that the prevalence of HBsAg among pregnant women in Shenyang, China was lower than the overall prevalence in China because the transmission from mother to child can be prevented by administration of immunoprophylaxis with HBIG and HBV vaccine.

The present study also revealed that the socio-demographic characteristics of the pregnant women did not show significance association with the prevalence of HBV infection except the gestational age (P= 0.011). The highest sero-prevalence of HBV infection was found in those pregnant women at the third trimester as compared to first and second trimesters. This was similar with other studies conducted elsewhere in Ethiopia (Zelalem Desalegn et al. 2016; Yeshi Metaferia et al., 2016).

In this study, age was found to have no significant associations with HBV infection. However, other studies showed higher prevalence among women between the ages of 23 to 32 (Tsegaye Yohanes et al., 2016; Nyamusi et al., 2017). This is expected because majority of women in the child bearing age are in their twenties. Moreover, though not significant higher prevalence of HBsAg 29(65.9%) was reported from urban area which is similar to in Sudan (Abdallah et al., 2011) and in Rwanda (Nyamusi et al., 2017). However, contrary to this other study in southern Ethiopia (Yeshi Metaferia et al., 2016) showed higher prevalence of HBsAg among pregnant mothers from

rural area than the urban counterparts.

This study revealed that none of the expected risk factors were significantly associated with sero-positivity for HBsAg (Table 4). However the female genital mutilation was the highest in the percentage of the prevalence of HBsAg 20 (45.5%) which indicates that traditional practicing of unsterilized instruments for genital mutilation may increase the risks of infection than other risk factors. Elsewhere in the previous reports, other factors such as blood transfusion, body tattooing, multiple sexual activity and surgery were potential risk factors for HBV infection (Yohanis Zenebe et al.,2014: Yeshi Metaferia et al., 2016). This variation might be attributing to cultural, being aware on prevention and transmission, educational and behavioral differences for the risk factors of HBV infection.

5. CONCLUSION

In conclusion, in this study, the prevalence of HBsAg among pregnant mothers attending Arsi University Asella Teaching Hospital was high according to WHO criteria. All of the demographic characteristics of the participants had no significant association with HBV infection except for the gestational age which shows the significant prevalence in the 3rd trimester compared to other factors. The high prevalence of HBsAg among pregnant women in this study indicates the importance of implementing preventive measures, including vaccination to women in the child bearing age as they are at increased risk of acquiring HBV compared to the general population.

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