International Journal of Community Medicine and Public Health
Nyamusi MM et al. Int J Community Med Public Health. 2016 Nov;3(11):3096-3101
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20163918

Original Research Article

Seroprevalence of hepatitis B among pregnant women in Kigali, Rwanda

Mochama M. Nyamusi*, Onesmus T. Marete, Wilson R. Waweru

School of Public health, Mount Kenya University, Kigali, Rwanda

Received: 27 August 2016
Accepted: 28 September 2016

***Correspondence:**
Dr. Mochama M. Nyamusi,
E-mail: mnyamus@gmail.com

ABSTRACT

Background: Hepatitis B virus belongs to the family *Hepadnaviridae*. It is the commonest cause of chronic viral hepatitis. It is responsible for up to 80% of primary liver cancers. Despite the existence of a safe and effective vaccine, HBV infections still remain a global public health problem. Pregnant women who are carriers of the virus pose a significant risk to their unborn babies. Early diagnosis in this group can provide an avenue for prevention of mother to child transmission which will in turn lead to a reduction in the number of chronic carriers who act as a source of new infections.
Methods: The study was a multicenter, hospital based cross-sectional study. Data collection was using a questionnaire-guided interview followed by HBsAg determination using SD bioline test device. Data entry and statistical analysis was done using SPSS version 16. A p-value of less than 0.05 was considered significant.
Results: The prevalence of Hepatitis B among pregnant women in Kigali is 3.1%.The study findings also indicated that the mean age of the participants was 28.03 years with a standard deviation of 5.6 years. Majority of the women (37.4%) were between 25 and 29 years. About two thirds of the recruited women resided in urban area while a third was from rural area. Most of the women (61.3%) had attained primary level formal education with only a few with tertiary level education (7.9%). 6% of them had no formal education. Majority of these women (95%) were in marriage unions a majority of which were monogamous.
Conclusions: The findings indicate an intermediate endemicity of HBV among the pregnant women in Kigali at 3.1% prevalence, the lowest among the East African countries. This is among the first Hepatitis B prevalence studies among the pregnant women, hence it provides baseline data that can be useful in contributing to knowledge of the disease characteristics, stimulate further research on the disease and also contribute to informing policy on control measures.

Keywords: Hepatitis B, *Hepadnaviridae*

INTRODUCTION

Despite the existence of a safe and effective vaccine, Hepatitis B still remains a global public health problem. It is a major cause of morbidity and mortality in the developing countries. Chronic carriage rates in sub-Saharan Africa are high.[1] Hepatitis B carriage in pregnancy is of great public health concern. This is because it not only exposes their babies to vertical and early horizontal transmission but their close contacts and delivery care staff are at risk of horizontal transmission.

Vertical transmission is thought to be a great risk in high prevalence regions.[2] It contributes significantly to the pool of chronic HBV carriers who act as a source of infection.

Universal antenatal screening coupled with passive-active immuno-prophylaxis to neonates at birth has been shown to reduce risk of mother to child transmission by 95%.[3] In spite of this knowledge, universal ante-natal screening is not widely practiced in Africa, including Rwanda. This, combined with the fact that the current immunization for HBV starts at 6 weeks, possibly exposes a number of infants to the risk of perinatal transmission.

Many studies have suggested that transmission in sub-Saharan Africa occurs predominantly in childhood.[4] hence the need to have control measures targeted at reducing this risk including mother to child transmission. Parental HBV carriage poses a significant risk to a child.[3] Maternal HBV has been associated with adverse pregnancy and perinatal outcomes making it important to screen and manage it effectively to prevent mother to child transmission and avert the adverse outcomes.[5,6] Knowledge of local prevalence rates among pregnant women is necessary for planning for interventional programs. The study therefore intends to assess the prevalence of HBV infection among pregnant women in Kigali as a way of elucidating the importance of mother to child transmission in the area. The information obtained can be useful in informing policy on transmission prevention programs.

METHODS

Study area description

Kigali province is the smallest of the five provinces in Rwanda and covers a total area of 730 square kilometers. It has an estimated total population of almost a million giving a population density of 1,165.8/km^2. The province consists of Nyarugenge, Gasabo and Kicukiro districts. For each of these districts, the main government district hospital was selected as a study site. The selected hospitals included; Muhima Hospital in Nyarugenge District, Kibagabaga Hospital in Gasabo District and Masaka Hospital in Gasabo District. The district hospitals serve people from Kigali city and its immediate environs. The population attending the ANC clinics is mostly middle and low income. Most of the women who seek ANC services are on the national social health insurance scheme *mutuelle de santé* whereby the patient pays ten percent of the total cost of services received. The clinics run daily from Monday to Friday. They are manned by qualified nurses who do the normal ANC follow-up and care. Each of the hospitals has Obstetrician/ Gynaecologist who follows up the women with any complications in pregnancy.

Study design

The study was a multicenter, hospital-based, cross-sectional survey. A questionnaire guided interview was used to capture sociodemographic characteristics and assess for risk factors for HBV infection. SD Bioline test device was used to test for HBsAg testing

Study population

The study population consisted of all pregnant women attending ANC clinics at Mihima Kibagabaga and Masaka Hospitals in Kigali during the period of study.

Inclusion criteria

- Pregnant women attending ANC clinics at the three hospitals.
- Those who gave their informed consent to participate in the study.

Exclusion criteria

Pregnant women who had received Hepatitis B vaccination in the past.

Sample size estimation

$$n = \frac{z^2 \hat{p}(1-\hat{p})}{m^2}$$

Where:

p = expected prevalence or proportion or estimated proportion of HBsAg among pregnant women. This is the prevalence that will be estimated by the study.

m= degree of precision or a tolerance error margin or width of the confidence interval (a measure precision of the estimate).

z= Z statistic for a level of confidence or is the normal distribution critical value for

a probability of $\alpha/2$ in each tail.

For a 95% CI, z=1.96

For this study, a specified the level of confidence of 95%, an error margin of ±5% was considered acceptable, based on similar studies elsewhere. The prevalence in Kenya is 9.3%.[7] With significant regional variations with prevalence ranging from 3.0% in coast general hospital to 17.3% in Eldoret. These differences could be attributed to differences in sociocultural practices and socioeconomic status.

There was no prevalence study that had been done on pregnant women in Rwanda. Owing to sociocultural and economic differences between the two countries that may impact on HBV prevalence and transmission, a prevalence of 50% was assumed in calculating the sample size. Using this information in the sample size formula above a sample of 385 was estimated as the minimal necessary to achieve sufficient precision for the estimated prevalence.

Sampling method

Consecutive sampling was used to recruit study participants until the required sample size was obtained. All the pregnant women who met the inclusion criteria were identified from the women attending ANC. After identification, the potential study participants were taken through the informed consent process whereby the study objectives, risks, benefits and study procedures were explained in the local dialect, *Kinyarwanda*. Only those who gave their consent were included in the study.

Study instrument

The data collection tool that was used is a pre-coded, pre-tested questionnaire which was also translated into the local dialect *Kinyarwanda*.

Data collection

2mls sample of venous blood was obtained from the median vein in the antecubital fossa for each of the respondents. Blood was collected using vacutainer needle gauge 21 into plain vacutainer clot activator tubes. After clotting, the serum was extracted and 20 microlitres were placed on the specimen well of the Standard Diagnostics INC Bioline HBsAg test device. The result was read after 20 minutes. A positive result was indicated by appearance of two distinct red lines, one in the C (control region) and another on the T (test) region. A single red stripe on the test region meant it was a negative. There were no inconclusive/indeterminate results.

Data management and analysis

Data was captured into the questionnaire by the principal investigator and the research assistants. The collected data was coded and entered into Statistical package for social scientists (SPSS) version 16. The results were subjected to analysis using cross tabulations to explore statistical relationships between variables. Chi square test was used to explore proportional relationship between groups. The level of statistical significance was set at $p<0.05$, providing a 95% confidence interval.

RESULTS

Three hundred and eighty five (385) pregnant women were recruited from Muhima, Masaka and Kibagabaga Hospitals ANC clinics between May and August 2013. Of the 385 participants, 76 were from Masaka Hospital, 119 from Kibagabaga Hospital and 191 from Muhima hospital.

Social demographic characteristics of the study participants

The mean age of the participants was 28.03 years with a standard deviation of 5.6 years .The ages ranged between 15 years and 46 years. Majority of the women (37.4%) were between 25 and 29 years.

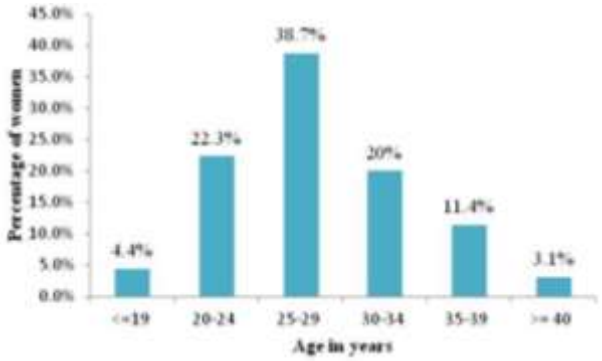

Figure 1: Age distribution of the study participants.

Of the women recruited about two thirds of them were residing in urban area while a third were from rural area. This is representative of Kigali province that has 70% urban area coverage and 30% rural area.

Most of the women (61.3%) had attained primary level formal education with only a few with tertiary level education (7.9%). 6% of them had no formal education

Majority of these women (95%) were in marriage unions a majority of which were monogamous. Never married women accounted for 3% and separated/ divorced/ widowed were 1.8%.

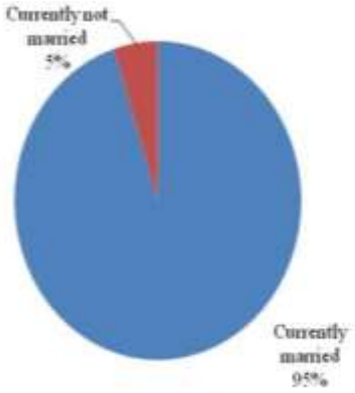

Figure 2: Marital status of study participants.

A large percentage of the women (52%) reported a monthly income of less than 10,000 Rwandan francs (15 USD), a majority of whom were not engaged in any income generating activity. 57.9% of the women are living below the poverty line of 1USD per day. This is similar to the country's economy where 50 to 60% of the general population lives below the poverty line.

The table below gives a summary of the sociodemographic characteristics of the study participants.

Table 1: Socio-demographic characteristics of the study participants.

Characteristics	n	%
Marital status		
Single	12	3.1
Married monogamous	361	94.3
Married polygamous	3	0.8
Widow	3	0.8
Separated/ divorced	4	1
Level of formal education(n=382)		
None	23	6
Primary	234	61.3
secondary	95	24.9
University/college	30	7.9
Resident of responder (n=383)		
Kicukiro	73	19.1
Nyarugenge	128	33.4
Gasabo	151	39.4
Others*	31	8.1
Responder occupation (n=349)		
Jobless	150	43
Farmer	21	6
Employed	178	51

*Includes districts of residence that are not within Kigali Province.

Obstetric characteristics of study participants

108 women (30.4%) were primigravida, while for majority (51.8%) this was their 2nd to 4th pregnancy. Grand multipar accounted for 13.2%. More than half of them (55.6%) were in their last trimester of pregnancy. Most of the women (77.7%) reported no history of previous pregnancy losses, while 3.7% reported multiple previous losses. For most women the current pregnancy was uneventful (56.4%) and for most others the reported complaints were minor mostly lower abdominal pains and morning sickness. 8 women (2.1%) reported history of gestational diabetes

Prevalence of HBsAg

Of the 385 women tested, 12 tested positive for HBsAg, giving an overall prevalence of 3.1%.

Table 2: Prevalence of HBsAg.

	Frequency	Percentage (%)
HBsAg Positive	12	3.1
HBsAg Negative	373	96.9
Total	385	100

HBsAg positivity was highest among the 35-39 years age group where the age group prevalence was 4.5%.

Higher levels of prevalence were obtained in women with higher levels of education. Those with tertiary education had 6.6% prevalence while the women with primary level education had the lowest prevalence at 1.7%. The higher prevalence among the group with tertiary education could be due to the fewer number of women in this category (7.9%). Prevalence of HBsAg among the HIV infected was 5.3%. Additionally the prevalence of HBsAg among those who previously had STs was 9% while among those who never had STIs was 2%.

Table 3: Prevalence of HBsAg among different subpopulations.

Characteristics	N	No. of positives	Prevalence
Age group (n=385)			
20-24 years	86	2	2.3
25-29 years	149	5	3.4
30-34 years	77	3	3.9
35-39 years	44	2	4.5
Study site (n=385)			
Kibagabaga	119	5	4.2
Masaka	76	1	1.3
Muhima	191	6	3.1
Residential area (n=385)			
Urban	251	10	4
Rural	134	2	1.5
Level of formal education (n=382)			
None	23	1	4.3
Primary	234	4	1.7
Secondary	95	5	5.2
University/college	30	2	6.7
HIV status (n=350)			
Negative	331	9	2.6
Positive	19	1	5.3
Not done	35	2	5.7
Previous history of STIs (n=366)			
No	328	9	2.7
Yes	38	2	5.3

DISCUSSION

The results of the study showed that the prevalence of HBsAg among pregnant women attending government ANC facilities was 3.1%. According to WHO Kigali has intermediate endemicity of HBV infection. The results are identical to those found by Rwanda Biomedical Centre in the countrywide surveillance done in 2012 in government health centers. This intermediate endemicity means that most infections could occur in infants and children as a result of maternal-neonatal transmission or close childhood contact, although percutaneous exposure with contaminated needles or following unsafe injections is also a possibility. Considering the status of these women is usually unknown prenatally, the health care workers especially the delivery staff are also at risk of percutaneous infection.This calls for more control measures in addition to the existing childhood

vaccination offered from six weeks by the expanded program of immunization.

Although this prevalence of HBV is similar to the prevalence of HIV in the general population which stands at 2.9% according to UNAIDS 2012 estimates, the HIV/HBV co-infection rates were low with only one patient(0.26%) having both HIV and HBV. This corroborates what other studies have found (Mali 0.38%) and explains why on further analysis, HIV status was not related to HBsAg positivity.[8]

This 3.1% HBV prevalence among pregnant women in Kigali is lower than what other studies done on pregnant women in East Africa have reported. In Kenya studying pregnant women attending various government ANC facilities found countrywide prevalence of 9.3%, with regional variations.[7] Rift Valley had the highest prevalence of 17.8% in Eldoret while Coast province had the lowest prevalence at 3.0%. In Sudan found 5.6% prevalence in 2007 reported a prevalence of 4.3% in Tanzania in 1994 in 2007 reported 4.9% in Uganda.[9-11]

Studies from West Africa have also generally reported higher prevalence's of HBV among pregnant women compared to those of East Africa.[12] in Nigeria found 8.3% in 2011, while in Mali reported a prevalence of 8.0% in 2012.[8] The difference in the prevalence of hepatitis B between different countries is probably indicative of the disparate rates of contact with risk factors. This lower prevalence in Kigali could be due to differences in sociocultural practices that have been linked to HBV transmission, most notably the absence of female genital mutilation in Rwanda that is practiced widely in Western and Eastern African communities. Also the majority of the study participants in this study were in monogamous marriages making them a low risk group. The other East African studies were carried out more than seven years prior to this study and this may explain the lower prevalence which may be due to a general downward trend of HBV with control measures having been increasingly adopted.

The demographic characteristics of the study populations are similar to other populations that have been studied elsewhere. Most of the studies report the mean age of the study subjects to be between 25 to 28 years. This is expected because majority of women in the child bearing age are in their twenties .The highest prevalence in this study was reported in the 25-29 age group which is higher than what found in Nigeria to be the 20-24 age group but identical to the ages reported by also in Nigeria.[12,13] He also noted that higher HBV prevalence occurred in women of low parity, an observation that is also made in this study.

The higher prevalence in those residing in urban area compared to rural residents is in contrary to findings in South Africa where rural residents tend to have higher prevalence than urban residents as observed by.[14] Different rural living conditions could explain the differences with South African rural inhabitants living in overcrowded villages where risk factors thrive, hence exposing the inhabitants. Rural areas of Rwanda are less populated compared to urban areas hence transmission is higher in the urban set up.

Assessment of various risk factors for HBV infection in this study did not show any statistically significant correlations. This is not surprising as studies on epidemiological assessment of risk factors for HBV infection in low resource set ups seem to yield different results. The lack of association between HBV infection and known risk factors for infection was also the case in the Malian study by and in Sudan, both studying women attending ANC clinics.[8,9] On the contrary, in south East Nigeria found that increasing parity, higher number of sexual partners, polygamy and history of previous STIs were positively associated with HBV in pregnancy (p value<0.001).[15] In addition, studies from India and Singapore have reported positive association with older age, gravida two or more, a history of blood transfusion, history of HBV infection in family member, history of tattooing, previous surgical procures including dilatation and curettage for miscarriage and history of blood transfusion.[16,17]

CONCLUSION

This study was set out to determine the prevalence of HBV infection among pregnant women in Kigali. The findings indicate an intermediate endemicity of HBV among the pregnant women in Kigali at 3.1% prevalence, the lowest among the East African countries. This is among the first Hepatitis B prevalence studies among the pregnant women, hence it provides baseline data that can be useful in contributing to knowledge of the disease characteristics, stimulate further research on the disease and also contribute to informing policy on control measures.

ACKNOWLEDGEMENTS

Author would like to express sincere gratitude to his co-authors for their immense contribution.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Maynard E. Hepatitis B: global importance. Vaccine. 1990;8:S18-20.
2. Chowdhury D, Eapen CE. 2012: Perinatal transmission of Hepatitis B: Reviwe article Available at http://www.hepatitisbannual.org. Accessed on March 21,2012.

3. Nazan D. Congenital Hepatitis B Virus (HBV) Infection Review. J Ped Inf. 2007;1:63-7.
4. Kiire F. The epidemiology and prophylaxis of hepatitis B in sub-Saharan Africa: A view from tropical and subtropical Africa. Gut. 1996;38:S5-12.
5. Tse Y, Ho L, Lao T. The impact of maternal HBsAg carrier status on pregnancy outcomes: A case–control study. J Hepatolo. 2005; 43;771-5.
6. Lao T, Chan C, Leung W. Maternal hepatitis B infection and gestational diabetes mellitus. J Hepatology. 2007;47:46-50.
7. Okoth F, Mbuthia J, Gatheri Z Murila F, Kanyingi F, Mugo F, et al. Seroprevalence of Hepatitis B markers in Pregnant Women in Kenya. East Afr Med J. 2006;83(9):485-593.
8. MacLean B, Hess RF, Bonvillain E, Kamate J, Dao D, Cosimano A, et al. Seroprevalence of hepatitis B surface antigen among pregnant women attending the Hospital for Women & Children in Koutiala, Mali. S Afr Med J. 2012;102:47-9.
9. Elsheikh RM, Daak AA, Elsheikah MA. Hepatitis B virus and Hepatitis C virus in pregnant Sudanese women. Virol J. 2007;4:104.
10. Pellizzer G, Blè C, Zamperetti N, Stroffolini T, Upunda G, Rapicetta M, et al. Serological survey of hepatitis B infection in Tanzania. Public Health. 1994;108(6):427-31.
11. Pirillo F, Bassani L, Germinario P. Seroprevalence of hepatitis B and C viruses among HIV infected pregnant women in Uganda and Rwanda. J Med Virol. 2007;79:1797-801.
12. Eke C, Eke U, Okafor I, Ezebialu U, Ogbuagu C. Prevalence, correlates and pattern of hepatitis B surface antigen in a low resource setting. Virology Journal. 2011;8:12.
13. Mbamara SU, Obiechina. Seroprevalence and risk factors of hepatitis B Surface Antigen among antenatal clinic attendees in a private specialist hospital in Onitsha, Southeast Nigeria. Niger Med J. 2010;51(4):152-4.
14. Kew M. Progress towards the comprehensive control of hepatitis B in Africa: A view fro South Africa. Gut. 1996;38:S31-6.
15. Obi N, Onah E, Ezugwu O. Risk factors for Hepatitis B infection during pregnancy in a Nigerian population. Int J Obstetric Gynecolo. 2006;26(8):770-2.
16. Shamsuddin K, Marmuji LZ. 2010: Weighted analysis of prevalence and risk factors hepatitis B infection among antenatal mothers in Ipoh. Singapore Med J. 2010;51(10):800-5.
17. Dwivedi M, Misra S.P, Misra V, Pandey A, Pant S, Singh R, et al. Seroprevalence of hepatitis B infection during pregnancy and risk of perinatal transmission. Indian J Gastroenterol. 2011; 30(2):66-71.

Cite this article as: Nyamusi MM, Marete OT, Waweru WR. Seroprevalence of hepatitis B among pregnant women in Kigali, Rwanda. Int J Community Med Public Health 2016;3:3096-101.