Original Research Article

Prevalence of hepatitis A virus in patients attending a referral hospital in Bubanza Province, Northwest Burundi

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ABSTRACT

Background: Viral hepatitis is a public health problem wide world. Hepatitis A, transmitted by fecal-oral route, is an infectious viral disease caused by hepatitis A virus and mainly due to poor sanitation. This study aimed to determine the prevalence of hepatitis A virus and associated factors in patients attending Mpanda referral hospital in Northwest Burundi.

Methods: A cross-sectional study was done from November 2017 to January 2018 on 385 participants aged 2 years and above. Participants were recruited using a systematic random sampling technique. Data were collected using questionnaire from consented/assented participants. Five millilitres of venous blood was collected and analyzed. Anti-hepatitis A virus antibodies were screened using Enzyme Immuno Assay. Data were analyzed using Statistical Package for the Social Sciences version 16.0 software. A descriptive analysis was followed by bivariate analysis using a Chi-square test for comparison of various sub-groups with 5% statistical significance level. Odds ratio and 95% Confidence Intervals were calculated and presented.

Results: The median age of the participants was 23 years and the range 72 years. The overall prevalence of Hepatitis A virus was 60.3%. There was a significant association between age [OR=7.22 (4.04-12.93), P <0.001], lack of clean water [OR=10.07 (5.63-18.01), P <0.001], traditional latrines [OR=1.86 (1.02-3.40), P=0.04] and Hepatitis A Virus seroprevalence.

Conclusions: Present study shows high prevalence of HAV infection in patients attending Mpanda Referral Hospital. Younger age, lack of clean water and traditional latrines play roles in increasing prevalence of HAV infection in both rural and urban areas.

Keywords: Burundi, Hepatitis A virus, Prevalence

INTRODUCTION

Hepatitis A Virus (HAV) infection is an important public health problem around the world, especially in low and middle-income regions.[1] Hepatitis A is an acute infection caused by a single-stranded RNA virus of positive polarity called hepatitis A virus. It belongs to the genus hepatovirus of the *picornaviridae* family.[2] Three hepatitis A virus genotypes, I, II, and III, divided into subtypes A and B, infect humans and genotype I is the most frequently reported, while genotype II is hardly ever isolated, and its genetic diversity is unknown.[3] Globally, 1.4 million cases of HAV occur annually with a majority of the cases concentrated in the less developed countries where several risk factors facilitate transmission.[4] It is considered one of the most common illnesses transmitted through oral-faecal route specifically in children and old people.[5] The virus' transmission is facilitated by water

and/or food as well as person-to-person contact in developed countries and the endemicity is worldwide.[6,7] There is considerable variation in the rates of sero-prevalence by region, country and intra-country with marked fluctuations from time to time but in general, the underdeveloped countries bear the greatest disease burden amongst children. Coincidentally, these infections are mild to asymptomatic and most of the children attain immunity by the time they reach adolescence.[8]

It has been shown that infection rates remain high in most African countries.[9] In developed countries, HAV seroprevalence is low.[7] In Burundi, no study has been carried out to document the significance of hepatitis A and little is known about the prevalence of HAV. Although HAV infection can easily and effectively be mitigated through vaccination, this has not been fully implemented and included in national vaccination program of many countries including Burundi.[7] This study aimed at determining the HAV seroprevalence and its association with sociodemographic factors which would better understand the magnitude and help better plan for national preventive strategies including vaccination.

METHODS

This was a cross-sectional laboratory-based study carried out at Mpanda General Hospital in Burundi, a referral hospital in Mpanda District, Bubanza province, northwest Burundi (Figure 1).
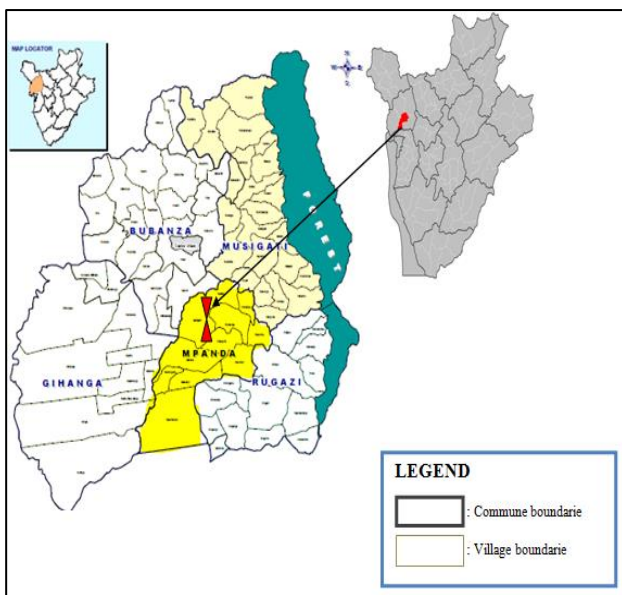
Figure 1: MPANDA geographic localization.[12]

Bubanza province is located in the plain of Imbo with a rainy season from September to May of each year. Mpanda community is predominantly rural with a small urban area and a population of 58,913.[10]

The level of poverty is estimated at 72.5% of the households.[11] The majority of households (89%) use traditional latrines and only 22% of these latrines meet acceptable standards.[11] The hospital has a patient volume of approximately 60 people per day mainly from Mpanda district and receives patients referred from facilities of other districts.

Study population

Patients were randomly sampled based on the average of patients received per day for a period of 3months. All consenting and assenting participants attending the facility were recruited in the study. The sample size was estimated by taking 0.50 proportion since national prevalence for HAV is lacking. A total of 385 patients of 2years and above were recruited and blood samples taken for analysis.

Data on socio-demographics

Questionnaires were administered to all participants at the study site. The questionnaire items included residence area, age, family size, human waste disposal methods, water sources for human consumption and the clinical features.

Specimen collection

Five millilitres of venous blood was collected from all enrolled participants and transported to the laboratory where the plasma was separated and stored at - 80ºC until use.

Specimen processing

Samples were screened for anti-HAV (IgM and IgG) antibodies using a qualitative Enzyme Immuno Assay kit ''MONOLISA anti-HAV IgM/IgG'' (Bio-Rad Laboratories, Inc., Marnes-la-Coquette-France) according to the manufacturer's instructions. The results were scored as positive or negative according to the standard recommended procedures (Bio-Rad Laboratories, Inc., Marnes-la-Coquette-France).

Statistical analysis

Data were coded, entered, cleaned, and analyzed using SPSS version 16.0 software (SPSS, Inc., Chicago, IL). A descriptive analysis was followed by bivariate analysis using a Chi-square test for comparison of various sub-groups with 5% statistical significance level. Odd Ratios and 95% confidence Intervals were calculated to establish the strength of association between sero-prevalence and sociodemographic factors.

Ethical considerations

Authorization to carry out this study was obtained from the Burundi Ministry of Health; the study protocol was

approved by the Burundi National Ethical Committee. Informed consent/assent was obtained from the patients before they were enrolled into the study.

RESULTS

Characteristics of the participants

A total of 385 study participants were recruited. The proportion of hepatitis A Virus infection in relation to socio-demographic characteristics of the subjects is given in Table 1. Males accounted for 142 (36.9%) while females constituted 243 (63.1%) of the study participants. Most 332 (86.2%) of the participants were from rural area. The median age of the study participants was 23

years and the range 72 (2-74) years. Of the all collected samples, patients aged >17 years accounted for the majority 213 (55.3%), children aged 2-5 years accounted for 114 (29.6%) with the least age group being those 6-17 years accounting for 58 (15.1%). Most of the study participants 200 (52%) used tap water for human consumption, followed by 136 (35.3%) and 49 (12.7%) who used water from streams and wells respectively. When grouped into three, 271 (70.4%) of the study participants lived in families of 5-10 members while 97 (25.2%) lived in families of less than 5 members and the rest, 17 (4.4%) lived in families of more than 10 members. The majority 336 (87.3%) of the study participants used traditional latrines while 49 (12.7%) used modern latrines for human waste disposal.

Table 1: Seroprevalence of HAV among patients attending Mpanda general hospital in relation to socio-demographic characteristics.

Variable	Frequency (%) N=385	Anti-HAV positive (%) n=232	OR	95% CI	P-value
Age					
2-5years	114 (29.6%)	97 (85.1%)	7.22	4.04-12.93	<0.001
6-17years	58 (15.1%)	41 (70.7%)	3.05	1.63-5.71	<0.001
>17years	213 (55.3%)	94 (44.1%)			Ref.
Sex					
Female	243 (63.1%)	154 (63.4%)	0.74	0.46-1.07	0.10
Male	142 (36.9%)	78 (54.9%)			Ref.
Residence					
Rural	332 (86.2%)	205 (61.7%)	0.64	0.36-1.15	0.14
Urban	53 (13.8%)	27 (50.9%)			Ref.
Water source					
Stream	136 (35.3%)	119 (87.5%)	10.07	5.63-18.01	<0.001
Well	46 (12.7%)	31 (63.3%)	2.48	1.30-4.73	<0.001
Tap	200 (52.0%)	82 (41.0%)			Ref.
Latrine type					
Pit	336 (87.3%)	209 (62.25)	1.86	1.02-3.40	0.04
Toilet	49 (12.7%)	23 (46.9%)			Ref.
Family size					
<5 members	97 (25.2%)	61 (62.9%)	0.87	0.54-1.40	0.75
5-10 members	271 (70.4%)	160 (59.0%)	1.10	0.37-3.23	0.86
>10 members	17 (4.4%)	11 (64.7%)			Ref.

N- The total number of samples, n- The number of anti-HAV positive samples, Ref.- Reference group, OR- Odd Ratio, CI- Confidence Interval.

Prevalence of HAV and associated factors

A total of 232 (60.3%) samples were anti-HAV antibody positive. The overall prevalence of HAV was thus determined at 60.3%. The prevalence of HAV was significantly associated with the age of participants and increased with younger age; HAV prevalence in participants with age of 2-5years (85.1%) was significantly higher than that in participants with age more than 17years (55.3%) [OR=7.22 (4.04-12.93), P <0.001]. The majority of participant (87.3%) used

traditional toilets (pit) at home for human waste disposal with a high proportion of HAV sero-prevalence (62.2%) compared to (46.9%) obtained from participants with modern toilets. These findings showed that HAV prevalence was significantly associated with the latrine's type used in households [OR=1.86 (1.02-3.40), P=0.04]. In terms of water usage, the infection was high among participants who reported using water from streams and wells accounting for 87.5% and 63.3% respectively in comparison with those who used tap water with a proportion of 41.0%. There was a significant association

between HAV infection and source of drinking water [OR=10.07 (5.63-18.01), P <0.001]. Regarding the association between HAV and family size, the prevalence of HAV was (62.9%) in participants who lived in families of less than 5 members, 59% in participants with 5-10 members and 64.7% in those with more than 10 members. Statistical analysis showed that there was no significant association between HAV prevalence and participant's family size [OR=0.87 (0.54-1.40), P=0.14]. In the same manner, the prevalence of HAV was (61.7%) in participants from rural areas compared to 50.9% in participants from urban areas with no significant association [OR=0.64(0.36-1.15), P=0.14]. According to the sex of participants, no significant difference was observed between male (54.9%) and female (63.4%) [OR=0.74(0.46-1.07), P=0.10]. These findings show that HAV prevalence was not significantly associated with the gender of participants.

DISCUSSION

In this study, we determined the prevalence of HAV in patients attending a referral hospital in Bubanza province, Northwest Burundi. The factors associated with HAV infection were younger age, non-availability of safe water source and traditional latrines. The prevalence of HAV infection (60.3%) was found to be high. However, it was also found to be lower than those obtained from other African countries such as Liberia 80%, Senegal 100%, and Cameroun 90%.[13,14] However, still in overall, our result indicated that HAV poses a significant health problem in the study population. Age of the participants significantly affected the HAV prevalence with children of 2-5years being more susceptible to HAV infection. The difference between age group could be attributed to their health seeking behaviour whereby, children are at a great risk of becoming exposed to the virus in their playing areas and chances of faecal oral contamination are also high in children than in adults. The initial increase in children may be due to increased contact with one another, beginning with enrolment in preschool day-care centers. In high endemic areas, most individuals are infected with HAV in childhood, usually with an asymptomatic clinical presentation.[6] On the other hand, in low or non-endemic areas where people do not have natural immunity against HAV, they are susceptible to be infected with this virus and the manifestations can be more symptomatic or even fatal.[6] In areas with poor sanitary conditions and living standards, greatest exposure is expected early in life leading to natural immunity in the majority of children.[6] The seropositivity among adolescents represents infection acquired during young childhood. The prolonged shedding of HAV before and after the onset of symptoms, in association with the lack of good hygienic practices and the sharing of objects in the domiciliary environment, may contribute to a more suitable scenario for person-to-person HAV transmission.[15,,16] Adolescents actively mix with different social groups outside of their family circle, may participate in activities which increase the risk of

transmission and travel more in different regions, including regions of high HAV endemicity. As a result, this age group has now become a group at high risk of HAV infection. These results are in agreement with what has been reported in south Tunisia in 2017 and elsewhere.[16] Improvement in hygienic and good sanitation practices would reduce the transmission of the virus from person-to-person. On the contrary, developed countries are characterized by low antibody seroprevalence of HAV during childhood.[7] The type of toilet used in households influences HAV infection.[17] A high proportion of those sero-positives for HAV was obtained from subjects with traditional toilets (pit) at home (62.2%) compared to those obtained from participants with modern toilets at home for human waste disposal (46.9%). This clearly shows that there is a very high relationship between the method of human waste disposal and HAV transmission. The relationship between sewage disposal and HAV seropositivity has been described by Afegbuaa SL et al, in their study conducted in 2013 in Nigeria.[6] In a study conducted among acute hepatitis patients at Kenyatta National Hospital in Nairobi, Kenya, it was found that all those positive for anti-HAV and anti-HEV antibodies used pit latrines in their households.[16] This has been also reported previously in Northern Africa and elsewhere.[18] Hepatitis A virus is spread through food and water contaminated by the feces of people infected with hepatitis A virus.[14] The improvement of the sewage disposal facilities would help to mitigate the spread of HAV infection in the community. This study showed that the absence of tap water supply at home is significantly associated with HAV infection. Notably, HAV infection was significantly related to absence of tap water in household of participants. The differences in anti-HAV sero-prevalence across subcategories of source of drinking water may have been affected by factors such as quality of treatment methods, methods of storage, sanitary conditions, and personal hygiene. This demonstrates that the level of hygiene is low in places where people use water from wells, streams and rivers since the chances of faecal contamination from these sources is usually high. As a result, it leads to increased risks of diseases transmitted via faecal-oral route, including Hepatitis A. The results of our study show that the seroprevalence of HAV infection did not differ significantly between males and females. That may be due to hygienic and sanitation practices which are the same in male and female subjects. These results are in agreement with those found in a study conducted in Yemen in 2013.[6] However, the findings of a study conducted in Nigerian in 2017 showed that HAV is more in males than in females.[1] Several studies have shown that the number of family members was not associated with the prevalence of HAV.[19,20] These are in agreement with the findings of our study which may be explained by the small size of the participants who lived in families of more than 10 members. Gender, residence and number of persons in the household did not significantly predict having HAV infection as previously reported.[20-22] The findings of our

study demonstrated that there was no significant difference in Hepatitis A prevalence between rural and urban participants. That may be due to small sample size in participants from urban areas. Similar HAV infection trends in rural and urban residences have been reported previously in Mexico.[19] However, some studies have shown that there is a significantly higher proportion of HAV infection in rural areas than in urban areas.[23,24] According to the findings of our study, to use clean water and proper sewage disposal were found to be protective against HAV infection. That has been reported previously in other studies.[25,26]

In the view of present study findings recommended that the provision of clean water, proper sewage disposal should be considered as a supplement to improved sanitation and creation of public awareness through public health education on the dangers, risks, and how to prevent hepatitis A infection. Despite the limitations in terms of sample size, resources and time-scale, it can be said with some confidence that the results of this study provide a baseline for more research and closer work in establishing the magnitude of Hepatitis A in Burundi, if health is to be improved.

This study revealed that the majority of the study subjects were anti-HAV antibody positive (60.3%). As indicated in previous studies in Africa and elsewhere, our results support the idea that some factors, like younger age, lack of clean water and traditional latrines may play roles in increasing prevalence of HAV infection in both rural and urban areas.

ACKNOWLEDGEMENTS

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