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# Assessment of Hepatitis B and Hepatitis C Virus Infections and Associated Risk Factors among Patients Attended Rwanda Military Hospital

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## Abstract

**Background:**Viral hepatitis is an infection affecting the liver and causing its inflammation due to viruses mostly hepatitis B and C viruses. Hepatitis B and C virus infections are serious global health issue leading to morbidity and mortality worldwide. Hepatitis B and C virus can lead to liver damage, liver cirrhosis and liver carcinoma. These infections are serologically characterized by the presence of HCV-Ab and HBsAg in serum.

**Objectives:**The objective was to assess hepatitis B and C viral infections and associated risk factors among patients attended Rwanda Military Hospital.

**Materials and methods:** This was a cross sectional study and was carried out between September 2016 and November 2016. A total of 100 participants were eligible in the research based on inclusion Criteria. HCV-Ab and HBsAg were detected using rapid diagnostic tests with immunochromatographic method and positive samples were confirmed using Cobas e411 analyzer, with electrochemiluminescence method. The results for Hepatitis B and C were statistically analyzed using SPSS 16.0.

**Results:** The results of the present study show that hepatitis B and C infections prevalence were high and several risk factors for HCV and HBV were reported. The statistics show that HCV prevalence was higher than that of HBV with 20% and 17% respectively. Age and marital status were the only significant risk factors for Hepatitis C (Age,$x^2$=17.389, df=3, p=0.001, Marital status,$x^2$=11.096, df=3 p= 0.01). The lack of vaccination against HBV was the only significant risk factor for HBV (x=4.496, df=1, p=0.034).

**Conclusion:** There was no Hepatitis B and C co-infection among the patients.Several risk factors for hepatitis B and C were reported. Education of the population about HCV and HBV infections, screening and vaccination, were urgently recommended in order to prevent and cut down the HBV and HCV infections.

  

**Keywords:** Hepatitis B virus, Hepatitis C virus, Risk factors,Cirrhosis

## 1. Introduction

Viral hepatitis is a systemic infection affecting predominantly the liver and causing its inflammation due to viruses. It may be acute (recent infection, relatively rapid onset) or chronic [1]. Viral hepatitis is caused by infection with one of the five known hepatotropic viruses, which are named as hepatitis A virus (HAV), hepatitis B virus (HBV), hepatitis C virus (HCV), hepatitis D virus (HDV), and hepatitis E virus (HEV), respectively[2].

Hepatitis B virus (HBV) infection causes a spectrum of acute and chronic liver disease, ranging from inactive chronic carrier status to progressive chronic hepatitis, leading to end-stage cirrhosis and primary liver cancer. Worldwide, two billion people have been infected with hepatitis B virus (HBV), 360 million have chronic infection, and 600,000 die each year from HBV-related liver disease or hepatocellular carcinoma[3]. In sub-Saharan Africa, over 8% of the population has chronic HBV carriage with a high risk for progressive liver disease [4].

Hepatitis C virus (HCV) infection, poses a significant global health problem. In 2012, the world health organization estimated that there are 150 million infected people globally. This accounts for 3% of the world population and there are variations according to regions, the highest prevalence being in Egypt, 20% of the word population. This virus of hepatitis C is a major cause of chronic liver disease, cirrhosis and liver cancer[5].

The pathogenesis of hepatitis B and C virus infections is characterized by permanent inflammatory processes that predispose the liver to hepatocellular carcinoma (HCC). HCV is a non-cytopathic virus that enters the liver cell and undergoes replication simultaneously causing cell necrosis by several mechanisms including immune-mediated cytolysis in addition to other various phenomena such as hepatic steatosis, oxidative stress and insulin resistance[6].

HBV along with the hepatitis C virus (HCV) can cause broad-spectrum diseases such as hepatitis, fibrosis, cirrhosis and hepatocellular carcinoma (HCC) in the setting of chronic infection [7]. HBV is non-cytopathic for infected hepatocytes. Hepatocytes are infected without any evidence of liver injury prior to the recruitment of HBV-specific T-cells into the liver [8]. Cytotoxic T lymphocytes (CTL) have been regarded as the main culprit for liver damage during acute HBV infection [9]. During acute HBV infection, HBV-specific CTLs can directly attack infected hepatocytes and participate in the pathogenesis of liver disease by orchestrating diverse components of the immune system. Necroinflammatory liver disease might be caused by secondary recruitment of mononuclear cells [10].

HCV and HBV infections are serious global health issue leading to morbidity and mortality. Worldwide, 2 billion people (almost 1/3 of word’s population) were infected by HBV and about 300-400 million become chronic carriers[11]. About 100 million people are chronically infected with HCV [12].

Africa has the highest hepatitis C prevalence (5.3%). Egypt has the highest prevalence (17.5%) of hepatitis C in the world [13]. The World Health Organization reports 75% of HCV-infected individuals developing chronic liver disease. Among those HCV-infected patients who develop chronic liver disease, 1.6% progress to Hepatocellular carcinoma (HCC), a condition with a mortality rate >80% [14]. Prevalence of hepatitis B surface antigen (HBsAg) in the general population varies geographically, with the highest rates (>8%) measured in West Africa .HBV represents a critical threat to health in the African continent. It causes a spectrum of acute and chronic liver disease, ranging from inactive chronic carrier status to progressive chronic hepatitis, leading to end-stage cirrhosis and primary liver cancer[15].

Currently in Rwanda Hepatitis B prevalence is at 3.6%, which has now exceeded HIV prevalence at 3%. Particularly, types B and C lead to chronic disease in hundreds of millions of people and are the most common cause of liver cirrhosis and cancer. About 1.6% of blood donor units are HBV positive each year, while 2.9% of health care workers (HCWs) were positive in a recent screening study and for hepatitis C virus infection prevalence is 2.5 %. No many population-based studies

  

regarding HBV and HCV virus ' infection are available in Rwanda[16].

associated risk factors among patients attending Kanombe Military Hospital

## 2. Materials and Methods

### 2.1 Study design

This was a cross-sectional study conducted between September 2016 and November 2016. Each participant was screened for hepatitis B surface antigen (HBsAg) and hepatitis C antibody (HCV-Ab). The suspected patients were explained about the study, its benefits and risks. They signed voluntarily the consent form before responding to questionnaires that were given to them to collect bio-data from each participant. To ensure confidentiality, their data were anonymized.

### 2.2 Study population

The study was carried out at Rwanda Military Hospital (Kigali, Rwanda). The target population was patients of all ages and gender suspected for HBV and/or HCV. 100 participants were recorded and tested for HCV-Ab and HBsAg.

### 2.3 Blood sample collection and laboratory diagnosis

4 ml of peripheral venous blood was collected from each suspected patient, in a red top tube with clot activator. Blood samples were centrifuged using Humax 14 k centrifuge with 3000 rounds/min for 5 minutes to get serum. Rapid diagnostic tests were used for HCV and HBV screening. A rapid anti-HCV (Cypress Diagnostics) with a sensitivity of 95.3% and specificity of 98.7 % and One step Alere Determine HBsAg test (Alere Inc, Waltham, M.A., USA) with 96 % sensitivity and 98% specificity that are immunochromatographic qualitative tests, were used to detect HCV-Ab and HBsAg respectively. All positive samples after the use of RDTs, were analyzed using electro-chemiluminescence immunoassay (Cobas e411, Roche Diagnostics, Mannheim, Germany) & ELISA for confirmation. Prior to the run of the tests, calibrators and controls were run to be sure for the reliability of the results got. The cut-off index values below one (COI <1) were considered negative and those above one (COI >1) were considered positive.

The overall aim of this study was to assess the the frequency of HCV and HBV and their

### 2.4 Statistical analysis

After data collection, the Statistical Package for Social Sciences (SPSS), version 16.0 program was used for data analysis. To compare variables and association between HBV/HCV seropositivity and risk factors, chi-square test and frequencies were used. The p-value, $P< 0.05$ was considered statistically significant.

## 3. Results

### 3.1 Socio-demographic and socio-economic characteristics of study population

In this study the socio-demographic and socio-economic characteristics of the population were established to characterize the population. Table 1 summarizes the socio-demographics and socio-economic characteristics of the population.

As shown in table 1, among 100 suspected patients, 34 (34 %) were males and 66 (66%) were females. The mean age of the population was 45.54 and the age ranged between 21 and 87 years. The suspected patients according to age groups were 22(22 %): 19-30 ,24(24 %): 29-40 ,16,16 %: 39-50 and 38(38 %) ≥ 50. The majority of the suspected patients were married. The proportions of marital status were 76(76%) married, 13(13%) single, 2(2%) divorced and 9(9%) widowers. Regarding education level, 29 (29%) patients had completed primary studies,30 (30 %) secondary studies, 25 (25%) university studies and 16 (16%) patients had never gone to school. concerning profession, 40(40%) were private ,32(32%) farmers 26(26%) civil servants and 2(2%) were students. In terms of socio-economic status of the patients, 62(62 %) were in third level,29(29%) in the second level,5(5%) in the first level and 4(4%) in the fourth level.

  

**Table1: Socio-demographic and socio-economic characteristics of study population**

| Variables | | Number | Percentages |
|---|---|---|---|
| Gender | Male | 34 | 34% |
| | Female | 66 | 66% |
| Age | 19-30 | 22 | 22% |
| | 29-40 | 34 | 34% |
| | 39-50 | 16 | 16% |
| | ≥ 50 | 38 | 38% |
| Marital status | Married | 76 | 76% |
| | Single | 13 | 13% |
| | Divorced | 2 | 2% |
| | Widower | 9 | 9% |
| Education | No | 16 | 16% |
| | Primary | 29 | 29% |
| | Secondary | 30 | 30% |
| | University | 25 | 25% |
| Socio-economic level | 1 | 5 | 5% |
| | 2 | 29 | 29% |
| | 3 | 62 | 62% |
| | 4 | 4 | 4% |
| Profession | Farmer | 32 | 32% |
| | Civil servant | 26 | 26% |
| | Private | 40 | 40% |
| | Student | 2 | 2% |
| | | 100 | 100% |

  

### 3.2 Prevalence of HBsAg and HCV-Ab infections

In this study the prevalence of HBV and HCV were determined. Table 2 summarizes the Prevalence of anti-HCV and HBsAg by age and gender.

**Table 2: Prevalence of HCV-Ab & HBsAg in suspected patients at RMH**

n=100

| | | Hepatitis B Virus (HBV) | | Hepatitis C (HCV)) | |
|---|---|---|---|---|---|
| Gender | Frequency of Patients | HBV Positive | Prevalence (%) | HCV Positive | Prevalence (%) |
| Male | 34 | 6/34 | 17.60% | 6/34 | 17.6% |
| Female | 66 | 11/66 | 16.60% | 14/66 | 21.2% |
| Average prevalence (%) | | 17 | 17% | 20 | 20% |

Among 100 suspected patients 20 patients were tested positive for HCV-Ab and the total prevalence was 20 %. Among 66 female patients, 14 (21.2%) were HCV-Ab Positive and among 34 males, 6 male patients were positive for HCV-Ab ( 17.6%). Among 100 suspected patients,17 were tested positive for HBsAg and the total prevalence was 17 %. Among 66 female suspected patients, 11(16.6%) were HBsAg positive. Among 34 male suspected patients,6 (17.6 %) were HBsAg positive.

The prevalence for HCV and HBV was high compared to the prevalence of HCV and HBV in Sub-Saharan region, which is 2-14 %. The fact that most of the patients were suspected for HBV and HCV infection could explain why the HBV and HCV prevalence was high.

In contradiction to the hypothesis that HBV infection could be higher than that of HCV, the prevalence of HCV was found to be higher than that of HBV among the suspected patients (HCV,20% > HBV,17%). This could be explained by the fact that HCV progress much slowly and that symptoms may appear after many years so that a person can be suspected and that HBV progresses quicker than HCV and can lead to mortality much quicker than HBV. Furthermore, the presence of HBV vaccine could also explain why the HCV was higher in prevalence than HBV.

### 3.3 Risk factors for HBV & HCV and their association with HBV & HCV infections

During the study, several risk factors for HBV and HCV in patients at RMH were reported. The association of socio-demographic, socio-economic, medical-related and behavioral related risk factors and HBV & HCV infections was also determined.

#### 3.3.1 Socio-demographic, socio-economic risk factors and HCV at RMH

During this study, different socio-demographic and socio-economic risk factors for HCV were determined. The table 3 summarizes socio-demographic, socio-economic and their association with HCV.

Socio-demographic risk factors such as age, gender, marital status, education, socio-economic and profession were determined. The frequencies were gender (Male:17.6 %, Female:21 %,), age (8.3 %: 29-40, 12.5 %: 39-50, 42.1 %: ≥ 50), marital status (Married:14/76(18.4 %), single:1/14,7.1 %, widow(er): 5/8, 62.5 %), education: Primary: 8/29 (27.5 %), Secondary:7/30, 23.3 %, University:1/24(4.1%), Socio-economic level:1/5(20%), 2:8/29,27.5%,3:11/62(17.7 %) and profession (Farmer:2/32,6.25%, Civil servant; 10/26,38.4%, Private:8/40, 20%).

Among 34 male suspected patients, 6 (17.6 %) were HCV-Ab positive and Among 66 female participants, 14 (21.2%) were HCV-Ab Positive. The distribution of HCV-Ab prevalence across age groups was 2 (8.3 %): 29-40 ,2 (12.5 %):39-50 and 16 (42.1 %) ≥ 50 years. In the age 19-30 there was

  

no participants positive for HCV-Ab. In this study, Chi-square test revealed that only age and marital status were significant risk factors for HCV (Age , p =0.001, Marital status, p = 0.01).

Among 38 suspected patients in the older age group (≥ 50) ,16 (42.1%) of them were positive for HCV-Ab. HCV was lower in the age groups < 50 which was probably due to low rate of participation in the younger age groups (<50).

There was no evidence of difference between HCV prevalence in males (6,17.6%) and females (14,21.2%,) (p =0.67). There was no statistical evidence for Education, socio-economic level and profession to be associated with HCV.

**Table 3 : Socio-demographic, socio-economic risk factors and HCV at RMH**

| | | | Hepatitis C Virus (HCV) Test | | | | |
|---|---|---|---|---|---|---|---|
| Social-demographic factors | | Frequency of Patients | HCV Positive | Prevalence (%) | Chi-square ($X^2$) | Degree of freedom (df) | p.value |
| Gender | Male | 34 | 6 | 17.6% | 0.178 | 1 | 0.673 |
| | Female | 66 | 14 | 21.2% | | | |
| Age (Years) | 19-30 | 22 | 0 | 0% | 17.389 | 3 | 0.001 |
| | 29-40 | 24 | 2 | 83% | | | |
| | 39-50 | 16 | 2 | 12.5% | | | |
| | ≥ 50 | 38 | 16 | 42.1% | | | |
| Marital status | Married | 76 | 14 | 18.4% | 11.096 | 3 | 0.001 |
| | Single | 14 | 1 | 7.1% | | | |
| | Divorced | 2 | 0 | 0% | | | |
| | Widow(er) | 8 | 5 | 62.5% | | | |
| Education | No | 17 | 4 | 23.5% | 5.183 | 3 | 0.159 |
| | Primary | 29 | 8 | 27.5% | | | |
| | Secondary | 30 | 7 | 23.3% | | | |
| | University | 24 | 1 | 4.1% | | | |
| Social-economic Level (Ubudehe) | 1 | 5 | 1 | 20% | 2.032 | 3 | 0.566 |
| | 2 | 29 | 8 | 27.5% | | | |
| | 3 | 62 | 11 | 17.7% | | | |
| | 4 | 4 | 0 | 0% | | | |
| Profession | Farmer | 32 | 2 | 6.25% | 5.457 | 3 | 0.141 |
| | Civil servant | 26 | 10 | 38.4% | | | |
| | Private | 40 | 8 | 20% | | | |
| | Students | 2 | 0 | 0% | | | |

### 3.3.2 Medical related risk factors and HCV at RMH

During this research, medical related risk factors for HCV were determined. The medical related risk factors and their association with HCV are summarized in table 4.

  

**Table 4 : Medical Related Risk factors and their association with HCV at RMH**

| Medical related factors | | Frequency of Patients | HCV Positive | Prevalence (%) | Chi-square ($X^2$) | Degree of freedom (df) | p.value |
|---|---|---|---|---|---|---|---|
| | | | Hepatitis C Virus (HCV) Test | | | | |
| History of blood transfusion | Yes | 4 | 1 | 25% | 2.754 | 1 | 0.098 |
| | No | 96 | 19 | 19.7% | | | |
| Surgical treatment | Yes | 32 | 7 | 21.8% | 0.103 | 1 | 0.748 |
| | No | 68 | 13 | 19.1% | | | |
| Dental treatment | Yes | 59 | 15 | 25.4% | 2.966 | 1 | 0.085 |
| | No | 41 | 5 | 12.1% | | | |
| Medical field blood esposure | Yes | 7 | 1 | 14.2% | | 1 | 0.695 |
| | No | 93 | 19 | 20.4% | 0.154 | | |
| Hospital in the last 2 years | Yes | 25 | 7 | 28% | 1.658 | 1 | 0.198 |
| | No | 75 | 13 | 17.30% | | | |

Medical related risk factors such as blood transfusion history, surgical treatment, dental treatment, medical blood exposure and hospitalization were reported. The frequencies were 1/4, 25% for blood transfusion,7/32(21.8%) for surgical treatment,15/59(25.4%) for dental treatment,1/7(14.2%) for blood exposure and 7/25(28 %) for hospitalization.

### 3.3.3 Behavioral related risk factors and HCV at RMH

Behavioral related risk factors for HCV were reported in this study. The behavioral related risk factors and their association with HCV are summarized in table 5.

**Table 5: Behavioral related risk factors and HCV transmission**

| Behavioral related risk factors | | Frequency of Patients | HCV Positive | Prevalence (%) | Chi-square ($X^2$) | Degree of freedom (df) | p.value |
|---|---|---|---|---|---|---|---|
| | | | Hepatitis C Virus (HCV) Test | | | | |
| Ears pierced | Yes | 24 | 2 | 8.3% | 2.686 | 1 | 0.101 |
| | No | 76 | 18 | 23.6% | | | |
| Injury with used piercing meterial | Yes | 58 | | 18.9% | 0.92 | 1 | 0.761 |
| | No | 42 | 9 | 21.4% | | | |
| Lived with person who has HCV | Yes | 14 | 3 | 21.4% | 0.021 | 1 | 0.885 |
| | No | 86 | 17 | 19.7% | | | |
| Had or been treated for STIs | Yes | 12 | 2 | 16.6% | 0.095 | 1 | 0.758 |
| | No | 88 | 18 | 20.4% | | | |

Behavioral related risk factors for HCV such as ear piercing, injury with used sharps, having had or treated for STIs and living with HCV infected person were determined. The frequencies for the risk factors were 2/24(8.3%) for ear piercing, 11/58(18.9%) for injury with used sharps,3/14( 21.4%) for living with HCV infected person and 2/12(16.6%) for having or been treated for STIs.

  

There was no evidence of association between behavioral related risk factors and HCV (p-value> 0.05). This could be the results of previous efforts made by sensitizing to the citizens about good care of hygienic and safe-care utensils and the use of preservatives to prevent STIs. (The results are presented in the table 5).

### 3.3.4 Socio-demographic, socio-economic risk factors and HBV at RMH

In this study, Different risk factors for HBV were reported. Table 6 summarizes the socio-demographic, socio-economic risk factors and their association with HBV.

Socio-demographic and socio-economic risk factors for HBV such as gender, age, marital status, education and profession were determined.

The frequencies were gender (Male: 6/34(17.6%), Female:11/66(16.6%,), age(3/22,13.6%,19-30,6/24(25%):29-40, 4/16(25%):39-50, 4/38(10.5%):≥50), marital status, Married:15/76(19.7%), Single: 2/14(14.2%), education (No:2/17(11.7%), Primary: 9/29(32 %), Secondary: 3/30,10 %, University: 3/24(12.5%), Socio-economic level, 1: 2/5(40 %) , 2: 4/29(13.7 %), 3: 10/62(16.1%), 4:1/4(25 %) and profession: Farmer: 3/32(9.3%) , Civil servant: 7/26(26.9%), Private: 7/40(17.5 %).

In this study, there was no evidence of association between socio-demographic and economic risk factors with HBV (p-value >0.05).

**Table 6: Socio-demographic, socio-economic risk factors and HBV at RMH**

| | | Hepatitis B Virus (HBV) Test | | | | | |
|---|---|---|---|---|---|---|---|
| Socio-demographic factors | | Frequency of Patients | HCV Positive | Prevalence (%) | Chi-square ($X^2$) | Degree of freedom (df) | p.value |
| Gender | Male | 34 | 6 | 17.6% | 0.015 | 1 | 0.902 |
| | Female | 66 | 11 | 16.6% | | | |
| Age (Years) | 19-30 | 22 | 3 | 13.6% | 2.61 | 3 | 0.456 |
| | 29-40 | 24 | 6 | 25% | | | |
| | 39-50 | 16 | 4 | 25% | | | |
| | ≥ 50 | 38 | 4 | 10.5% | | | |
| Marital status | Married | 76 | 15 | 19.7% | 2.525 | 3 | 0.471 |
| | Single | 14 | 2 | 14.2% | | | |
| | Divorced | 2 | 0 | 0% | | | |
| | Widow(er) | 8 | 0 | 0% | | | |
| Education | No | 17 | 2 | 11.7% | 5.8 | 3 | 0.122 |
| | Primary | 29 | 9 | 32% | | | |
| | Secondary | 30 | 3 | 10% | | | |
| | University | 24 | 3 | 12.5% | | | |
| Social-economic Level (Ubudehe) | 1 | 5 | 2 | 40% | 1.946 | 3 | 0.584 |
| | 2 | 29 | 4 | 13.7% | | | |
| | 3 | 62 | 10 | 16.1% | | | |
| | 4 | 4 | 1 | 25% | | | |
| Profession | Farmer | 32 | 3 | 9.3% | 1.41 | 3 | 0.702 |
| | Civil servant | 26 | 7 | 26.9% | | | |
| | Private | 40 | 7 | 17.5% | | | |
| | Student | 2 | 0 | 0% | | | |

  

### 3.3.5 Medical related risk factors and HBV at RMH

Medical related risk factors for HBV were also determined during the study. Medical related risk factors and their association with HBV are presented in table 7.

Medical related risk factors for HBV including blood transfusion history, surgical treatment, dental treatment, blood exposure, hospitalization and lack of vaccination were determined. The frequencies were 5/32(15.6%) for surgical treatment,12/59(20.3%) for dental treatment,2/7(28 %) for blood exposure, 7/25(28 %) for hospitalization and 17/82(20.7%) for lack of vaccination.

The lack of vaccination against HBV was the only significant medical related risk factor for HBV ( p=0.03). Among 82 suspected patients who were not vaccinated 17 (20.7%) of them were positive for HBsAg while among all 18 vaccinated participants none of them was infected, showing that vaccination is protective of HBsAg.

The large proportion of unvaccinated people, which is a major risk factor, is probably due to that the vaccine against HBV in Rwanda is somewhat expensive, still not available on many health institutions for the citizens and that it has been introduced recently.

There was no evidence of association between Other medical related risk factors with the HBV infection. This is probably due to the improvement of medical care safety at different health institutions. (The results are presented in table 7).

**Table 7: Medical Related Risk factors and HBV at RMH**

| | | Hepatitis B Virus (HBV) Test | | | | | |
|---|---|---|---|---|---|---|---|
| Medical related factors | | Frequency of Patients | HBV Positive | Prevalence (%) | Chi-square ($X^2$) | Degree of freedom (df) | p.value |
| History of blood transfusion | Yes | 4 | 1 | 0% | 1.078 | 1 | 0.299 |
| | No | 96 | 19 | 17.7% | | | |
| Surgical treatment | Yes | 32 | 7 | 15.6% | 0.063 | 1 | 0.802 |
| | No | 68 | 13 | 17.6% | | | |
| Dental treatment | Yes | 59 | 15 | 20.3% | 1.332 | 1 | 0.248 |
| | No | 41 | 5 | 12.1% | | | |
| Medical field blood esposure | Yes | 7 | 1 | 28.5% | 0.714 | 1 | 0.398 |
| | No | 93 | 19 | 16.1% | 1.658 | | |
| Hospitalization in the last 2 years | Yes | 25 | 7 | 28% | 3.313 | 1 | 0 |
| | No | 75 | 13 | 13.3% | | | |
| Vaccination | Yes | 18 | 0 | 0% | 4.496 | 1 | 0.034 |
| | No | 82 | 17 | 20.7% | | | |

### 3.3.6 Behavioral related risk factors and HBV at RMH

Behavioral risk factors for HBV were also determined in this study. Behavioral related risk factors and their association with HBV are summarized in table 8.

Behavioral related risk factors for HBV such as ear piercing, living with a person infected with HBV, treated or had STIs, and injury with sharps were determined in this study. The frequencies for the risk factors were 4/24(16.6%) for ear piercing,11/58(18.9 %) for injury with used sharps

  

and piercing materials,3/14(21.4 %) for living with a person infected with HBV and 3/12(25 %) for having had or having been treated for STIs.

In this study, there was no evidence for significant association between behavioral related risk factors and HBV (p-value>0.05). This could also be explained by recent efforts made in Rwanda by sensitizing to the citizens about good care of hygienic and safe-care utensils and the use of preservatives to prevent STIs. (The results are summarized in table 8).

**Table 8: Behavioral Related Risk factors and HBV at RMH**

| | | Hepatitis B Virus (HBV) | | | Test | | |
|---|---|---|---|---|---|---|---|
| Bihavioral Related factors | | Frequency of Patients | HBV Positive | Prevalence (%) | Chi-square ($X^2$) | Degree of freedom (df) | p.value |
| Ears pierced | Yes | 24 | 4 | 16.6% | 0.002 | 1 | 0.96 |
| | No | 76 | 13 | 17.1% | | | |
| Injury with used piercing material | Yes | 58 | 11 | 18.9% | 0.378 | 1 | 0.539 |
| | No | 42 | 6 | 14.2% | | | |
| Lived with person who has HBV | Yes | 14 | 3 | 21.4% | 0.226 | 1 | 0.634 |
| | No | 86 | 14 | 16.2% | | | |
| Had or been treated for STIs | Yes | 12 | 3 | 25% | 0.619 | 1 | 0.432 |
| | No | 88 | 14 | 15.9% | | | |

## 4. Discussion

### 4.1 Prevalence of HBV and HCV

Hepatis C and B are common cause of liver disease world wide. Researchers mostly study these two viruses because of their capacity to co-infect within one person. In the present study, the prevalence of HCV was found to be higher than that of HBV among the suspected patients (HCV,20% > HBV,17%). This could be explained by the fact that HCV progress much slowly and that symptoms may appear after many years so that a person can be suspected and that HBV progresses quicker than HCV and can lead to mortality much quicker than HBV. Furthermore, the presence of HBV vaccine could also explain why the HCV was higher in prevalence than HBV. This study is not far from the study conducted in Sub-Saharan region, where the prevalence of HCV and HBVwere 2-14 % [17]. The fact that most of the patients were suspected for HBV and HCV infection could explain why the HBV and HCV prevalence was high.

### 4.2 Factors associated with HCV and HBV infection

Different risk factors associated with HCV and HBV infections were assessed and those factors incliding social demographic and economic factors, medical risk factors and behavioral risk factors.

### 4.3 Demographic and economic risk factors of HCV and HBV infection

Demographic and economic risk risk factors association was only seen on HCV infection for age and maritial status as risk factors with $x^2$=17.389, df=3, P=0.001 and $x^2$=11.096, df=1, P=0.011 respectively. There no statistical significance for any factor with HBV infection. The highest HCV prevalence 5/8(62.5%) among widow(er)s is probably due exposure to extra marital sexual intercourses.

Higher prevalence for HCV in the older age group might have been due to that before 1992 high sensitive tests for HCV were not yet available, meaning that people might have been carriers of the infections for years infecting among others without knowing they were infected. Also, longer exposure

  

to the inappropriate reuse of supplies such as use of injections for malaria by unqualified health care workers in last 15 or 20 years, could explain the higher prevalence in older aged participants. These findings correlate to other results in the reports on HCV infection's prevalence and risk factors such as reports from Antananarivo by Ramarokoto et al, from Nigeria by Ayolabi et al, from across Asia, Australia and Egypt by Sievertet al where by Gender was not a significant risk factor for the HCV infection but higher prevalence increased with older age[18,19]. The study conducted by belo et al showed that factors like education level, socio-economic level and profession were significnant to the high prevalence of HCV infections, which makes contraction to this study where The insignificance of risk factors such as education level, socio-economic level and profession was reported, the same study of Belo et al reported that there is statistical significance between demographic and economic factors and the prevalnce of HBV infection which makes a contraduction to this study where level of education, socio-economic status and profession were reported insignificance to the prevalence of HBV[20]. (table 3, 6).

### 4.4 Medical risk factors associated withHCV and HBV infection at RMH

Medical risk factors could be risk of not only Hepatitis but also other different infections. For HCV and HBV infections the assessed factors including transfusion history, surgical treatment, dental treatment, medical field exposure, Hospitalization in last 2 years, and vaccination. Results of the study show that there is no any medical related factor associated with HCV infection among participants. This is in contradiction with the study carried out by Rehermann, B., & Nascimbeni[21] where by risk factors such as previous procedure involving therapeutic injections, injectable drug use, dental procedure were significantly associated with HCV antibodies. This was probably due to the improved materialvigilance in different hospitals and health institutions while treating patients. (table 4).

However, vaccination has been a significantly show the association with HBV infection among participants with $X^2$=4.496, df=1, P>0,05, P=0.034. The large proportion of unvaccinated people, which is a major risk factor, is probably due to that the vaccine against HBV in Rwanda is somewhat expensive, still not available on many health institutions for the citizens and that it has been introduced recently.

The large proportion of unvaccinated people, which is a major risk factor, is probably due to that the vaccine against HBV in Rwanda is somewhat expensive, still not available on many health institutions for the citizens and that it has been introduced recently.

These findings are in accordance with other results in the study by Kateera et al done in Rwanda at University Teaching Hospital of Butare, where by lack of vaccination against HBV was a significant risk factor for HBV infection [22]. There was no evidence of association between Other medical related risk factors with the HBV infection. This is probably due to the improvement of medical care safety at different health institutions. (table7).

### 4.5 Behevioral risk factors of HCV and HBV infections

Behavioral factors were thought to be associated with HCV and HBV infections. Factors under considerration were ear pierced, injury with used sharps, Living with a person infected with HCV or HBV, and histotical treatment of STIs. However the findings showed that there is no association between both HCV and HBV infections(p-value>0.05). This could also be explained by recent efforts made in Rwanda by sensitizing to the citizens about good care of hygienic and safe-care utensils and the use of preservatives to prevent STIs. (table5&8). Mentioned factors were not thought randomly even if results showed no significant, but they can be among cause but not main ones.ear pierced should be a source of HCV and HBV infections, it can be also classified among sharp instrument. Infection can invade during the process of ear piercing if one of person acting in this action is infected and passes infections to ear piercing object. Injury with used sharp are known spread infection if shared. Living with infected perosn facilitate infection spreading in different ways and historical treatment of sexual transmitted infections can be a risk of HCV and HBV infection due to immunosuppression.

  

### 4.6 Limitations

This is study was limited by the time given to conduct it and only people coming at the hospital were considered.

## 5. Conclusion and recommendation

Assessment of HCV and HBV virus' infections and associated risk factors has been carried out on suspected patients attending RMH. There was no evidence of significant association of these risk factors with the HCV and HBV infections. No HBV and HCV co-infection was reported. Significant risk factors were marital status and older age for HCV while for HBV the lack of vaccination was the only significant risk factor. Mass education of the population and sensitization campaigns about the prevention of HBV and HCV infections is recommended to the government. Increasing accessibility and availability of HBV vaccine is urgently recommended to the Ministry of health. Citizens can get screened for HCV & HBV and get vaccinated for HBV. HCV and/or HBV patients can get tested for viral load and to adhere on given medications. Further researches including prospective studies regarding HCVand HBV can be done.


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