Scientific Research Publishing

Journal of Biosciences and Medicines, 2023, 11, 33-44
https://www.scirp.org/journal/jbm
ISSN Online: 2327-509X
ISSN Print: 2327-5081

Prevalence and Associated Factors of Viral Hepatitis C among Burundian Population during a Screening Campaign: A Cross-Sectional Study Carried out in Burundi

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How to cite this paper: Tharcisse, N., Armstrong, N., Emmanuel, H., Theogene, I., Emile, N., Pascal, B. and Deo, H. (2023) Prevalence and Associated Factors of Viral Hepatitis C among Burundian Population during a Screening Campaign: A Cross-Sectional Study Carried out in Burundi. *Journal of Biosciences and Medicines*, **11**, 33-44.
https://doi.org/10.4236/jbm.2023.1111004

Received: September 28, 2023
Accepted: November 4, 2023
Published: November 7, 2023

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Abstract

Approximately 180 million people worldwide are affected by Viral hepatitis C, with 350,000 to 500,000 deaths yearly. The present study sought to investigate the prevalence and associated factors of viral hepatitis C (VHC) among the Burundian population during a screening campaign. A total of 629 participants took part in the study, and the prevalence of viral hepatitis C was (8.11%). The associated factors identified as statistically associated were medical and surgical history (P = 0.02) and ear and nose piercing (P = 0.01). 51% of the infected persons were females. The mean age for viral hepatitis C carriage was 46.13 ± 14.3 years and 10.40% of viral hepatitis C carriers were over 50 years old. We found a high viral hepatitis C prevalence in married (9.55%) and divorced (9.38%) participants. The majority of our participants were farmers (60.25%) with a prevalence of viral hepatitis C (7.92%) while 11.54% of the infected participants were not educated. In conclusion, the current study shows a high prevalence of Viral Hepatitis C infection in Burundi. Infection was more likely to occur in older, married, farmer, and illiterates. Unsafe medical and surgical interventions with traditional practitioners were significant risk factors for contracting VHC infection.

Keywords

Prevalence, VHC, Associated Factors, Burundi

1. Introduction

Viral hepatitis is an international public health problem, comparable to other major communicable diseases such as HIV, tuberculosis, or malaria [1] [2]. Hepatitis is considered the fourth public health priority globally by the World Health Organization (WHO) [1] [3] but, to date, there remains a lack of strategic planning for the prevention and management of viral hepatitis C in Sub-Sahara Africa despite accumulating evidence of a significant disease burden [4].

Worldwide, approximately 180 million people are affected, with 3 to 4 million newly infected patients each year and potential progression to cirrhosis or hepatocellular carcinoma, and 350 to 500 thousand deaths per year [1] [3] [5]. There is also a role of viral hepatitis C prevalence in increasing lymphoma [6] [7] prevalence. The vast majority of people infected with viral hepatitis live in African and Asian countries, where screening and access to care and treatment are not readily available [4] [8].

In 2015, viral hepatitis killed 1.45 million people, almost as many as tuberculosis (1.8 million deaths), and more than the human immunodeficiency virus (HIV, 1.1 million) with 47% of deaths caused by viral hepatitis B and 48% death due to viral hepatitis C [1] [9].

While mortality attributable to tuberculosis, HIV, or malaria follows a descending curve, that of hepatitis takes the opposite pathway [1] [10] (**Figure 1**).

In Africa, the seroprevalence of VHC varies according to the geographical areas. Thus, West Africa and Central Africa appear to be areas of high endemicity with prevalence above 8%. In the north of the continent, the seroprevalence is moderate in the Maghreb and higher in Libya. In Egypt, the prevalence of VHC is very high and sometimes exceeds 15% [11] [12] [13]; in Tanzania, an east African country, it ranges around 3.5% [14].

The hepatitis C virus is mainly transmissible parenterally [11] [15]. There is therefore considerable worldwide prevalence among people transfused with untested blood, hemophiliacs, and drug addicts who reuse dirty syringes [11]. Sexual transmission is discussed and infrequent and would be around 4% to 10% in certain risk groups such as prostitutes, people with multiple partners, and homosexuals [11] [15] [16].

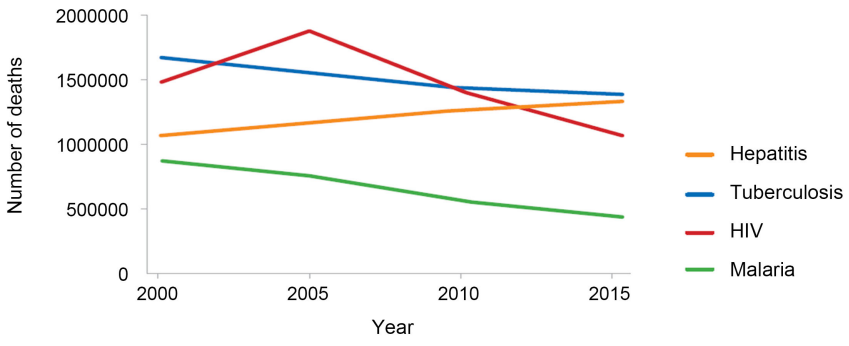

Figure 1. Global annual mortality from hepatitis, HIV, tuberculosis, and malaria, 2000-2015: unlike HIV, tuberculosis, and malaria, the trend in mortality from viral hepatitis is increasing [10].

Maternal-fetal transmission represents 3% of cases of infections in newborns, but only in viraemic mothers [12]. However, certain risk factors, particularly those related to co-infection with HIV, may be the cause of a high transmission rate [12] [16]. There is also a potential risk of contracting HCV among health-care personnel, through Blood Exposure Accidents (BEA). Studies on BEA have indeed shown a prevalence of anti-HCV antibodies varying between 0% and 10% [16] [17].

Hepatitis C progresses in 80% of cases to a chronic phase. This chronicity can lead to cirrhosis in 20% of cases and to liver cancer in 20% of cirrhosis [11] [12] [16].

In Burundi, the epidemiological situation of hepatitis is little known. It is difficult to have reliable data to have a solid basis for the fight against viral hepatitis. Some fragmentary studies show that the prevalence of viral hepatitis C is around 10%, and increases with age [18] with a prevalence of 3.89% among blood donors [19].

The objective of this study is to investigate the prevalence and associated factors of viral hepatitis C among Burundians population attending the screening campaign carried out in June 2022.

Findings from this study would help country leaders and decision policy makers understand the bottleneck about the prevalence and associated factors of viral hepatitis C and therefore to institute awareness programs to improve diagnosis, prevention, treatment, and control measures.

2. Materials and Methods

2.1. Study Design, Area, and Population

A community-based cross-sectional study was conducted in three Cities such as Cankuzo (East), Gitega (Center), and Rumonge (South) of Burundi where a screening campaign of VHC took place in June 2022. The study involved 629 volunteers and consenting individuals who attended the screening sites during the period of the screening campaign.

2.2. Socio-Demographic and Associated Factors Characteristics

A standardized questionnaire form was used in place during the screening campaign by data collectors, with good communication skills, who have been trained on this activity. The questionnaire included first socio-demographic characteristics such as age, sex, marital status, level of education, occupation, and province of residence. Second, it encompasses associated factors to the VHC including HIV status, history of surgical operation, history of blood transfusion, history of family contact with VHC, history of multiple sexual exposure, exposure to a traditional operation practice, and history of sharing sharp materials.

2.3. Data Processing and Analysis

Data forms were checked, validated, coded, entered into a data base created, and

compared for quality control. Data were analyzed using STATA 12 software packages (version 12.0, College Station, TX) and presented using tables. Qualitative variables were described using frequencies and percentages. Chi-square tests or Fisher's exact test, where applicable, were used to compare proportions between groups and quantitative variables as mean ± standard deviation (SD).

A multivariate logistic regression model with included backward stepwise procedure was performed to determine independent risk factors associated with viral hepatitis C infection.

Variables included in the first multivariate model were those with a P-value ≤ 0.25 in the univariate model. The level of significance for all the statistical analyses was set at 0.05.

2.4. Ethical Consideration

We sought permission and ethical issues to carry out this research from the Ministry of Public Health and the Fight against AIDS with the approval number 633/427/DGSSLS/2022 June 2022. This study followed the Helsinki Declaration guidelines (revised in 2013) for the study protocol. Each respondent gave informed consent to ensure their voluntary participation. Each respondent gave informed consent to ensure their voluntary participation.

3. Results

The prevalence of viral hepatitis C carriage was 8.11% (51/629) (Table 1). Of all participants, 57.71% (363/629) were females, while 42.29% (266/629) were males (Table 1). The mean age of the participants was 40.69 ± 15.14.

The participants were from Rumonge 241 (38.31%), Gitega 210 (33.39%) and Cankuzo 178 (28.30%). According to the level of education, 36.25% (228/629) had a primary level, 198, 31.58% (198/31.58) had a secondary level, and 7.5% (47/629) had a university level, while, 24.8% (156/629) were not educated.

Concerning marital status, 70.06% (440/629) were married, 15.92% (100/629) were single, 8.92% (56/629) were widowed and 5.10% (32/629) were divorced. Regarding occupation, the majority of the participants were farmers 60.25% (429/629) followed by Government employees, 30.80% (200/629) (Table 1).

Of the 8.11% (51/629) infected subjects, 51% (26/51) were females while 49% (25/51) were males and the mean age was 46.13 ± 14.3 years. The prevalence of viral hepatitis C was significantly different with age (P = 0.007), marital status (P = 0.02), and traditional practices (P = 0.02) (Table 2).

In multivariate analysis, the significantly associated factors with the prevalence of VHC were medical and surgical history (P = 0.02) and ear and nose piercing (P = 0.01) (Table 3).

4. Discussion

The present study depicts the prevalence and associated factors of the viral hepatitis C transmission among the Burundian population attending the screening

campaign. To our knowledge, this is the first study to assess risk factors associated with VHC prevalence in the Burundian population.

The prevalence of viral hepatitis C infection was (8.11 %) and associated factors such as medical and surgical history (P = 0.02), and ear and nose piercing (P = 0.01) were significantly contributing to its transmission.

Table 1. Socio-demographic characteristics.

Variables	Frequency (%)
Sex (female)	363 (57.71)
Age (yr, mean ± SD)	40.69 ± 15.14
Age (Years)	
<18	22 (3.50)
18 - 30	166 (26.39)
30 - 40	114 (18.12)
40 - 50	125 (19.87)
>50	202 (31.11)
Residence	
Gitega	210 (33.39)
Rumonge	241 (38.31)
Cankuzo	178 (28.30)
Level of education	
University	47 (7.50)
Secondary	198 (31.58)
Primary	228 (36.25)
Illiteracy	156 (24.80)
Marital status	
Single	100 (15.92)
Married	440 (70.06)
Divorced	32 (5.10)
Others	56 (8.92)
Occupation	
Famer	379 (60.25)
Government employee	200 (30.80)
Healthcare workers	14 (2.23)
NGO employee	13 (2.07)
Others	23 (3.66)
Viral Hepatitis C	51 (8.11)

Table 2. Characteristics of participants stratified by viral hepatitis C status.

Variables	Viral Hepatitis C			
	Overall (n = 629)	Yes (n = %)	No (n = %)	P-value
Sex (female)	363 (57.71)	26 (7.16)	337 (92.84)	0.31
Age (yr, mean ± SD)	40.69 ± 15.14	46.13 ± 14.3	40.21 ± 15.48	**0.007**
Age (Years)				0.18
<18	22 (3.50)	0 (0)	22 (100)	
18 - 30	166 (26.39)	8 (4.82)	158 (95.18)	
31 - 40	114 (18.120	11 (9.65)	103 (90.35)	
41 - 50	125 (19.87)	11 (8.80)	114 (91.20)	
>50	202 (31.11)	21 (10.40)	181 (89.60)	
Residence				0.82
Gitega	210 (33,39)	19 (9.09)	191 (90.95)	
Rumonge	241 (38.31)	18 (7.47)	223 (92.53)	
Cankuzo	178 (28.30)	14 (7.87)	164 (92.13)	
Level of education				0.28
University	47 (7.50)	2 (4.26)	45 (95.74)	
Secondary	198 (31.58)	16 (8.08)	182 (91.92)	
Primary	228 (36.25)	15 (6.58)	213 (93.42)	
Illiteracy	156 (24.80)	18 (11.54)	138 (88.46)	
Marital status				**0.05**
Single	100 (15.92)	2 (2)	98 (98)	
Married	440 (70.06)	42 (9.55)	398 (90.45)	
Divorced	32 (5.10	3 (9.38)	29 (90.63)	
Others	56 (8.92)	4 (7.14)	52 (92.86)	
Occupation				0.78
Farmer	379 (60.25)	30 (7.92)	349 (92.08)	
Government employee	200 (30.80)	17 (8.50)	183 (91.50)	
Healthcare workers	14 (2.23)	1 (7.14)	13 (92.86)	
NGO employee	13 (2.07)	2 (15.38)	11 (84.62)	
Others	23 (3.66)	1 (4.35)	22 (95.65)	
HIV positive	35 (5.56)	2 (5.71)	33 (94.29)	0.44
Medical and surgical history	460 (73.13)	43 (9.35)	417 (90.65)	0.06
Blood transfusion history	45 (7.15)	2 (4.44)	43 (95.56)	0.27
Traditional practices				0.14
Ear piercing	73 (11.61)	11 (15.07)	62 (84.93)	
Nose piercing	12 (1.91)	0 (0)	12 (100)	
Tattoo	17 (2.70)	1 (5.88)	16 (94.12)	
Ear and nose piercing	7 (1.11)	1 (14.29)	6 (85.71)	
None	520 (82.67)	38 (7.31)	482 (92.69)	
Piercing instrument sharing	339 (53.90)	29 (8.55)	310 (91.45)	0.65

Table 3. Univariate and multivariate analysis.

	Hepatitis C					
	Univariate analysis			Multivariate analysis final model		
	OR	95% CI	P	*OR*	95% CI	P
Sex (female)	1.3	[0.7 - 2.3]	0.3			
Age (yr)	0.9	[0.9 - 1]	0.08			
Age (Years)						
<18	1					
<18 - 30	2.2	[0.9 - 5.3]	0.05			
31 - 40	1	[0.5 - 2.3]	0.8			
41 - 50	1.2	[0.5 - 2.5]	0.6			
>50	NA					
Residence						
Gitega	1					
Rumonge	1.2	[0.6 - 2.4]	0.5			
Cankuzo	1.1	[0.5 - 2.3]	0.6			
Level of education						
University	1					
Secondary	0.5	[0.1 - 2.2]	0.3			
Primary	0.6	[0.1 - 2.8]	0.5			
Illiteracy	0.3	[0.07 - 1.5]	0.1			
Marital status						
Single	1					
Married	0.1	[0.04 - 0.8]	0.02			
Divorced	0.1	[0.03 - 1.2]	0.08			
Others	0.2	[0.04 - 1.4]	0.1			
Occupation						
Farmer	1					
Government employee	0.9	[0.4 - 1.7]	0.8			
Healthcare workers	1.1	[0.1 - 8.8]	0.9			
NGO employee	0.4	[0.1 - 2.2]	0.3			
Others	1.8	[0.2 - 14]	0.5			
HIV positive	1.4	[0.3 - 6.3]	0.5			
Medical and surgical history	2	[0.9 - 4.5]	0.06	2.1	[1.1 - 5.5]	**0.02**
Blood transfusion history	0.5	[0.1 - 2.1]	0.3			
Sexual partners	NA					
Multiple Partner						

Continued

Polygamous						
Polyandry						
One partner						
None						
Traditional practices						
Ear piercing	1			1		
Nose piercing	NA			NA		
tattoo	2.8	[0.3 - 23]	0.3	3.7	[0.4 - 33.6]	0.2
Ear and nose piercing	2.2	[1 - 4.6]	0.02	2.5	[1.1 - 5.7]	**0.01**
None	1	[0.1 - 9.7]	0.9	1	[0.1 - 10.4]	0.9
Piercing instrument sharing	1.1	[0.6 - 2]	0.6			

Our results are comparable to the prevalence of viral hepatitis C found in West and Central Africa (8%) but lower than viral hepatitis C prevalence in Egypt (15%) [11] [12] [16]. Furthermore, research conducted among the migrant population from Sub-Saharan Africa found a very high prevalence of viral hepatitis C (31.2%) [20].

The prevalence of viral hepatitis C in our study is high according to its prevalence in some neighbouring countries such as Tanzania (2.7%), the Democratic Republic of the Congo (2.1%), but also in a recent study conducted in Burundian blood donors (3.89%) [19] [21]. In a study conducted in a developed country like Canada, the prevalence ranges around 1% [22]. The likely explanation for this high prevalence is the self-selected nature of voluntary participants where individuals who had reason to suspect that they had viral hepatitis may have come forward for testing.

The mean age of the viral hepatitis C infected subjects was 46.13 ± 14.3 years and the majority of them were in the age interval of >50 years (10.40%). The same trend of increasing viral hepatitis C with age was found in a community-based study conducted in Cameroon [23] [24] and the Burundian strategic plan against Viral hepatitis [18]. This finding is also in line with the result from two studies conducted in Ethiopia and Iran [25] [26] and another one conducted in Rwanda [27].

It is possible that old age persons have to be exposed most of their lives to potential risk factors, such as surgical history, Ear and nose piercing, blood transfusion, and medical and therapeutic procedures performed with insufficient standard precautionary measures.

According to the education level, our study highlights a high prevalence of viral hepatitis C in non-educated participants (11.54%). The same results were found in Ethiopia (7.7%) [25] [28]. This can be explained by the lack of knowledge on the viral hepatitis C prevention measures in livelihood.

Continuing with marital status, we found an almost equal prevalence among

married (9.55%) and divorced (9.38%) subjects. Ameha Z *et al.* and Umumarangu E *et al.* found similar results in divorced marital status (6.8%) in their studies [25] [27].

On the other hand, the Prevalence of viral hepatitis C was highest in single and widowed groups and lowest in married patients [26]. These differences with our study could be explained by the diverse methods used in this study and different targeted populations in different countries and regions. Concerning participant's occupation, farmers are highly viral hepatitis C infected (59%) in our study. Similar results were found in Ethiopia and Iran [25] [26].

Medical and surgical history of the participants subjects were more represented (73%) in this study with a high risk of viral hepatitis C contamination in our study (84%) (**Table 2**).

The associated factors to the VHC infection were medical and surgical history (OR = 2.1, 95% CI = [1.1 - 5.5], P = 0.02), ear and nose piercing (OR = 2.5, 95% CI = [1.1 - 5], P = 0.01 (**Table 3**). In Sub-Saharan Africa, practices such as dental surgery, therapeutic injection, intravenous drug, and age have been similarly reported as major risk factors associated with viral hepatitis C infection [27] [29].

5. Study Limitation

This study's limitation relates to the selection mode of the participants and the few provinces included in the study. Therefore, the findings of this study should be interpreted with caution when generalizing to general population.

6. Conclusions and Recommendations

The current study shows a high prevalence of VHC infection in Burundi. Infection was more likely to occur in older persons than younger ones. Unsafe medical and surgical interventions with traditional practitioners were significant risk factors for contracting VHC infection.

This study indicates the need for a larger study to ascertain the extent of **prevalence and associated factors of viral hepatitis in the general Burundian population** and institution of awareness program to improve diagnosis, prevention, treatment, and control measures.

Furthermore, advanced molecular-level testing, including PCR and sequencing analyses, should be done to better understand the high prevalence of viral hepatitis C infection and its transmission in Burundi.

Acknowledgements

We wish to thank:

1) The representative of the National Association of Biomedical Technologists at the national and provincial levels for their contribution to the preparation of this screening campaign.

2) The Ministry of Public Health and the Fight against AIDS through the Office of Health Provinces for their facility to carry out this research.

3) The local authorities for technical and administrative support throughout the study.

4) The ALCHEM Burundi for their logistical support.

Informed Consent

The authors obtained verbal and written informed consent from each respondent before data collection.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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