Research Article **OJGH (2021) 4:45**

Open Journal of Gastroenterology and Hepatology
(ISSN:2637-4986)

Prevalence of HBsAg and anti-HCV antibodies during a screening campaign in August 2019

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ABSTRACT

Introduction: Hepatitis B (HBV) and C (HCV) virus infections represent a major public health problem, with significant mortality and morbidity worldwide. The aim of this study was to determine the prevalence of HBsAg and anti-HCV antibodies, and to investigate the risk factors associated with these two infections.

Patients and methods: An analytical cross-sectional study was carried out during a free screening campaign for viral hepatitis B and C organized by the University Teaching Hospital of Yaounde from 20th to 23rd August 2019. Screening for HBsAg and anti-HCV antibodies was carried out using a rapid diagnostic test (On Site HBsAg/HCV Ab Rapid Test (CTK Inc 10110 Mesa Rim Road San Diego, CA 92121 USA) in accordance with the manufacturer's Instruction. Positive samples had a confirmatory ELISA test. A structured questionnaire was used to investigate the risk factors for viral hepatitis B and C.

Results: A total of 746 participants (412 women, 334 men) were registered. The average age of the participants was 29.6 ± 15.5 years. The prevalence of HBsAg was 10.3% (men: 14.7%; women: 7%; p = 0.002). The prevalence of HCV-Ab was 4.7% (men: 6.3%; women: 3.4%; p = 0.08). Unprotected sexual intercourse (59.4%), dental care (38.7%) and scarification (37.1%) were the main factors of HBV and HCV transmission. Male sex (OR = 2.2; IC = 1.3 – 3.6; p = 0.002), lack of vaccination (OR = 3.4; IC = 1.2 – 9.6; p = 0.01), tattoos (OR = 6.6; IC = 1.4 – 30.2; p = 0.02) and close contact with an HBV-infected person (OR = 1.7; IC = 1.01 – 2.9; p = 0.04) were the factors associated with HBV transmission

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How to cite this article:
Mathurin Pierre Kowo, Edgar Kenne Yimagou, Antonin Wilson Ndjitoyap Ndam, Charifa Fouwou Njoya, Patricia Guekam Ouamba, Larissa Pessidjo, Christelle Nouboussi Nguemo, Akhenaton Dime Ngock, Larissa Ntsama, Larry Tangie Ngek, Oudou Njoya.Prevalence of HBsAg and anti-HCV antibodies during a screening campaign in August 2019. Open Journal of Gastroenterology and Hepatology, 2021, 4:45

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Website: https://escipub.com/

Age groups ≥ 55 years (OR = 1.3; IC = 1.1 – 1.5; p < 0.0001) and [45 – 54] (OR = 1.06; IC = 1.0 – 1.1; p = 0.03) unprotected sexual intercourse (OR = 3.5; IC = 1.4 – 8.7; p = 0.003), dental care (OR = 2.3; IC = 1.1 – 4.5; p = 0.02) were associated with HCV infection.

Conclusion: The prevalences of HBsAg and HCV-Ab are high in this population. Unprotected sexual intercourse, dental care and scarification were the most common risk factors.

Keywords: Hepatitis B, Hepatitis C, Cameroon, Yaounde, Prevalence, Risk factors

Introduction

Viral hepatitis B and C is a worldwide public health problem with high mortality and morbidity, particularly in sub-Saharan Africa and East Asia [1]. They are responsible for 1.34 million deaths worldwide each year, mainly due to cirrhosis and hepatocellular carcinoma. In 2015, the World Health Organisation (WHO) estimated that 257 million people, around 3.5% of the world's population were living with viral hepatitis B. And that Approximately 71 million people were chronically infected by viral hepatitis C.[1,2]. The distribution of the prevalence of HBsAg and anti-HCV antibodies varies widely. According to the WHO, Cameroon is one of the highly endemic areas for both hepatitis B and hepatitis C with prevalences of 8% and 3.5% respectively [1]. In 2016, the World Health Assembly adopted the Global Health Sector Strategy On Viral Hepatitis (GHSS) to eliminate hepatitis by 2030. The goal is to reduce the incidence of hepatitis by 90% and annual mortality by 65% [1]. To achieve this goal, five main areas of intervention have been developed, including testing and treatment of HBV and HCV. It is in this perspective that on the occasion of World Hepatitis Day, a screening campaign for hepatitis B and C was organised. For this purpose, we conducted a cross-sectional study at the University Teaching Hospital of Yaounde with the aim to determine the prevalences of HBsAg and HCV-Ab and to to investigate the risk factors for viral hepatitis.

Methodology

This was an analytical cross-sectional study conducted during a free screening campaign for viral hepatitis B and C organised at the University Teaching Hospital of Yaounde from 20th to 23rd August 2019, as part of the activities organised during the 2019 World Hepatitis Day.

Data was collected from participants using a structured questionnaire. After verbal consent was obtained, the questionnaire was used to conduct face-to-face interviews. Socio-demographic data on gender, age, marital status and occupation were collected. Different risk factors for hepatitis B and C were sought. The various risk factors sought were: intravenous and oral drug use, history of blood transfusion, scarification, tattoos and piercings, history of unprotected sexual intercourse, dental care, surgery and acupuncture, occupational exposure, organ transplantation, haemodialysis, close contact with a person infected with hepatitis B or C. A history of hepatitis B vaccination and the presence of a family member infected with hepatitis B or C were also sought.

Screening for HBsAg and anti-HCV antibodies was carried out using a rapid diagnostic test (*On Site HBsAg/HCV Ab Rapid Test) (*CTK Inc 10110 Mesa Rim Road San Diego, CA 92121 USA). This is a lateral flow chromatographic immunoassay for the qualitative detection and differentiation of hepatitis B surface antigen (HBsAg) and hepatitis C virus antibodies in plasma or whole blood. Two drops of whole

blood were collected and deposited in the sample well, then two drops of diluents were also added. The result was read after 15 mins.

The test results (HBsAg and HCV-Ab) were considered positive when at least 2 bands appeared: one in the control area and another in the test area (either HBs Ag or HCV-Ab or both). Results were negative if a band appeared in the control area and none in the test area. Results were invalid if no bands were observed in the control area. For invalid results, the test was repeated using a new stipulation. Each participant's result was reported on a results sheet and communicated confidentially. Each participant received post-test counselling from a medical doctor. Participants who tested negative for HBsAg were invited to receive the vaccine. Those who tested positive for HBsAg or HCV-Ab received a medical report for a confirmatory ELISA (Enzyme-Linked ImmunoSorbent Assay) test. Those who tested positive for HBs Ag or HCV-Ab benefited during this campaign for free hepatitis viral load test. The data were recorded using CsPro 6.3 software and analysed using SPSS 23.0 (SPSS Inc., Chicago, IL). The odds ratio (OR) and the 95% confidence interval (IC at 95%) were calculated to assess the associations between risk factors and viral hepatitis B and C. A value of $p < 0.05$ was considered significant. All information collected from participants was and will remain confidential.

Results

Socio-demographic characteristics of the population

A total of 746 participants were registered. These included 334 men (44.8%) and 412 women (55.2%) with a sex ratio of 0.8 (Table I). The average age of the participants was 29.6 ± 15.5 years, with extremes of 1 year and 86 years. The most represented age group was between 14 and 24 years at 31.9% (Table I).

Prevalences of HBsAg and HCV-Ab

Among the 746 people tested, 77 people tested positive for HBsAg giving a prevalence of 10.3% (14.4% in men and 7% in women) for hepatitis B of and 35 people tested positive for HCV-Ab giving a prevalence of 4.7% (6.3% in men and 3.4% in women). (Table II) for hepatitis C

Table I: Socio-demographic characteristics of the study population

Characteristics	Number (n)	Percentage (%)
Gender		
Male	334	44.8
Female	412	55.2
Age groups (years)		
Average age (29.6 ± 15.5 years)		
< 20	183	24.5
20 – 49	467	62.6
≥ 50	96	12.9
Marital status		
Single	535	71.7
Married	181	24.3
Divorced	8	1.1
Widow(er)	22	2.9

Table II: Prevalences of HBs Antigen positivity and HCV-Ab

Variables	Overall (n = 746)	< 20 yrs (n =183)	20 – 49 yrs (n = 467)	≥ 50 (n=96)	***p*** value
HBsAg					
▪ Positive (%)	77 (10.3)	10 (5.5)	60 (12.8)	7 (7.3)	0.01
▪ Negative (%)	669 (89.7)	173 (94.5)	407 (87.2)	89 (92.7)	
HCV-Ab					
▪ Positive (%)	35 (4.7)	0 (0)	16 (3.4)	19 (19.8)	<0.0001
▪ Negative (%)	711(95.3)	183 (100)	451 (96.6)	77 (80.2)	

Overall HBs Ag prevalence: 10.3% (95% CI: 8.2 – 12.7%)

Overall HCV-Ab: 4.7% (95% CI: 3.3 – 6.5 %)

Risk factors for HBV and HCV infection

Several risk factors for viral hepatitis B and C were identified among the participants. Unprotected sexual intercourse (59.4%), a history of dental care (38.7%), scarification (37.1%) and a history of surgery (18.6%) were the main risk factors identified. About14.7% of the study participants had received at least one dose of the hepatitis B vaccine. The different risk factors for viral hepatitis B and C infection are summarised in Table III.

Table III: Risk factors for HBV and HCV infection

Risk factors	Number (n)	Frequency (%)
Intravenous drug use (IVDU)	6	0.8
Blood transfusion	46	6.2
Scarification	277	37.1
Unprotected sexual intercourse	443	59.4
Dental care	289	38.7
Surgery	139	18.6
Piercing	31	4.2
Tattoos	7	0.9
Acupuncture treatments	7	0.9
Occupational exposure	58	7.8
Organ transplantation	1	0.1
Haemodialysis	9	1.2
Vaccination against hepatitis B	110	14.7
Close contact with a person infected with hepatitis B	146	19.6
Close contact with a person infected with hepatitis C	87	11.7
HBsAg positive family member	145	19.4
HCV-Ab positive family member	78	10.5

Factors associated with carrying HBsAg

Male sex (OR = 2.2; IC = 1.3 – 3.6; *p* = 0.002), tattoo (OR = 6.7; IC = 1.4 – 30.6; *p* = 0.02), close contact with an HBV-infected person (OR = 1.7; IC = 1.01 – 2.9; *p* = 0.05) and a family history of hepatitis B (OR = 1.6; IC = 0.9 – 2.7; p = 0.04) were factors associated with carrying HBsAg. Vaccination against HBV appeared to be a protective factor against infection (OR = 0.2; IC = 0.1 – 0.8; *p* = 0.006) (Table IV).

Table IV: Factors associated with carrying HBV

Variables	Positive	Negative	OR (IC at 95%)	*P*
Gender				
Female	29	383	1	
Male	48	286	2.2 (1.3 – 3.6)	0.002
Age groups				
< 20	10	173	1	
20 – 49	60	407	0.39 (0.19 – 0.78)	0.007
≥ 50	7	89	0.73 (0.27 – 1.99)	0.6
Risk factors				
IVDU	0	6	1.1 (1.1 – 1.1)	1
Blood transfusion	7	39	1.6 (0.6 – 3.7)	0.3
Scarification	30	247	1.09 (0.6 – 1.7)	0.7
Unprotected sexual intercourse	51	392	1.4 (0.8 – 2.3)	0.2
Dental care	26	263	0.7 (0.4 – 1.2)	0.3
Surgery	7	132	0.4 (0.2 – 0.9)	0.02
Piercing	2	29	0.5 (0.1 – 2.4)	0.7
Tattoos	3	4	6.6 (1.4 – 30.2)	0.02
Acupuncture treatments	0	7	1.1 (1.0 – 1.1)	1
Occupational exposure	10	48	1.9 (0.9 – 3.9)	0.1
Organ transplantation	0	1	1.1 (1.0 – 1.1)	1
Haemodialysis	1	8	1.07 (0.1 – 8.6)	1
Vaccination against hepatitis B	4	73	0.2 (0.1 – 0.8)	0.01
Contact with an HBV-infected person	22	124	1.7 (1.01 – 2.9)	0.05
HBsAg positive family member	21	124	1.6 (0.9 – 2.7)	0.09

Factors associated with carrying HCV-Ab

Table V shows the factors associated with hepatitis C infection. The risk of HCV infection increased with age. Hence, people whose age was 50 or older were 1.24 times more likely to be infected than other age groups (OR = 1.24; IC = 1.12 – 1.37; *p* < 0.0001). History of dental care (OR = 2.4; IC = 1.2 – 4.9; *p* = 0.01), unprotected sexual intercourse (OR = 3.5; IC = 1.4 – 8.4; *p* = 0.004) were also associated with carrying HCV-Ab.

Table V: Factors associated with carrying HCV

Variables	Positive	Negative	OR (IC at 95%)	*P*
Gender				
Female	14	398	1	
Male	21	313	1.9 (0.9 – 3.8)	0.08
Age groups				
< 20	0	183	1	
20 – 49	16	481	1.03 (1.01 – 1.05)	0.009
≥ 50	19	77	1.24 (1.12 – 1.37)	< 0.0001
Risk factors				
IVDU	0	6	1.05 (1.03 – 1.06)	1
Blood transfusion	4	42	1.98 (0.6 – 5.8)	0.2
Scarification	15	262	1.2 (0.6 – 2.4)	0.5
Unprotected sexual intercourse	30	413	3.5 (1.4 – 8.7)	0.003
Dental care	21	268	2.3 (1.1 – 4.5)	0.02
Surgery	8	131	1.2 (0.5 – 2.8)	0.5
Piercing	1	6	3.3 (0.3 – 28.6)	0.2
Tattoos	1	6	3.3 (0.3 – 28.6)	0.2
Acupuncture treatments	1	6	3.3 (0.3 – 28.6)	0.2
Occupational exposure	4	54	1.5 (0.5 – 4.4)	0.5
Organ transplantation	0	1	1.04 (1.03 – 1.06)	1
Haemodialysis	2	7	5.9 (1.1 – 29)	0.06
Contact with an HCV-infected person	4	83	0.9 (0.3 – 2.7)	1
HCV-Ab positive family member	3	75	0.7 (0.2 – 2.5)	1

Discussion

Viral hepatitis B and C represent a major public health problem in the world in general and in developing countries in particular. Cameroon is one of the highly endemic areas for hepatitis B and C, with prevalences above 8% and 3.5% respectively [1]. On the occasion of World Hepatitis Day, a screening campaign for hepatitis B and C was organised at the Yaounde University Teaching Hospital. For this purpose, we conducted a study to determine the prevalence of HBsAg and HCV-Ab and to investigate the risk factors associated with hepatitis B and C.

During this study, we registered 746 participants with a female predominance (55.2%) and a mean age of 29.6 ± 15.5 years. The most represented age group was young adult, between 20 and 49 years old.

Prevalence of HBsAg

Among the 746 participants tested, 77 were positive for HBsAg given a prevalence of 10.3% for viral hepatitis B. This result shows that Cameroon is a highly endemic area [1]. Several studies conducted in Cameroon on the prevalence of HBsAg have reported high prevalences. Indeed, in 2017 in a meta-analysis conducted by Bigna et al. [3], the reported

prevalence of HBsAg was 11.8%. Similarly, in 2016 among blood donors at the Central Hospital of Yaounde, Ankouane et al. [4] had found an HBsAg prevalence of 12.6%.

The study of the prevalence of HBsAg according to age showed that the young age group (20– 49 years) had the highest prevalence (12.8 %). African series have also reported a high prevalence of HBsAg in the young age group [5–7]. These can be the result of vertical transmission of hepatitis B during the delivery or the feeding. HBsAg has been found in 5.5 % of people below the age of 20. This could be the result of vertical and horizontal transmission of HBV or the lack of vaccination against HBV. The hepatitis B vaccine was introduced in 2005 in the Expanded Program on Immunization (EPI) in Cameroon, which had 84% vaccination coverage in 2015 [8]. Vaccination has been shown to be a protective factor against hepatitis B (OR = 3.4; p = 0.01). This demonstrates the effectiveness of this vaccine, which needs to be further developed to improve vaccination coverage nationwide

The prevalence of HBsAg was higher in men than in women. Indeed, 14.4% of men were HBsAg carriers. An association between carrying HBsAg and gender was found (OR = 2.2; p = 0.002). As men are most of the time subjected to different factors such as drugs, alcohol and unprotected sexual intercourse, this could explain this association. This result is in perfect agreement with those obtained by Groc et al. [5] in Gabon, Sbai et al. [6] in Morocco and Ankouane et al. [4] in Cameroun, who reported a predominance of the male sex. Meanwhile, other authors including Bhate et al. [9] in India and Ashraf et al. [10] in Bangladesh reported higher HBsAg seroprevalence in women than in men. This could be explained by the fact that, in both India and Bangladesh, certain factors such as piercings and tattoos are a common practice among women and could therefore favour HBV transmission, especially if prior asepsis measures are not respected.

Prevalence of HCV-Ab

The prevalence of anti-HCV antibodies in our study population was 4.7%. The seroprevalence of HCV infection remains a major concern in our country. This study confirms Cameroon's status as a highly endemic area for viral hepatitis C [1]. Although no data on the national prevalence of HCV in Cameroon is available, several studies have been conducted on different populations. Bigna et al. [11] in 2017 in a meta-analysis of 31 studies involving 36407 individuals, reported a prevalence of 6.5% of HCV-Ab. Similarly, Kowo et al. in 2019 found a prevalence of 4.4% in the Douala prison population. This high prevalence is explained by the presence of numerous risk factors for HCV transmission such as scarification, piercings and dental care. However, this result is lower than that reported by Njouom et al. [12] which was 2.5%. In fact, Njouom's study concerned a population aged 15 to 59 years, excluding those over 60 years of age, which seem to be the most affected by HCV.

The prevalence of HCV-Ab increases with age. In fact, this prevalence was higher in the age group over 50 years with a frequency of 19.8%. Kowo et al. [13] reported in 2019 a risk 4 times higher in people over the age of 50. Similar results have been reported by several African literatures, including Baha et al. [14] in Morocco, Elzouki et al. [15] in Libya and Kandeel et al. [16] in Egypt. Increasing prevalence of HCV-Ab with age could be explained by the continuous exposure to infection during a lifetime (cohort effect). Transfusion of blood or blood products without screening before the administration could not be excludes. The use of multiple-use syringes was a common practice for the administration of therapeutic injections during mass vaccination campaigns before single-use syringes were sufficiently available and could also explained this high prevalence of HCV-Ab in people over the age of 50.

The male sex was the most affected by HCV (6.3%), without a significant association being found. Kowo et al. [13] also found HCV infection to be more prevalent among men than women.

Kowo et al.'s study of the prison population in which the majority of prisoners are men (86.7%), could explain their results. Elzouki et al. [15] in Libya in 2013 have found a higher frequency of HCV-Ab in women, without any statistically significant association.

Risk factors

Unprotected sexual intercourse, scarification, a history of surgery, dental care, history of HBV and HCV infection, close contact with HBV and HCV-infected persons, were the main risk factors for viral hepatitis B and C. Scarification is a real factor in the transmission of viral hepatitis. They are a common practice in traditional African treatments; practitioners very often use instruments such as razor blades, snake hooks, fish teeth and others, all at the risk of a defect or insufficient asepsis. In this study, 3.9% of tattooed people had HBV. Tattooing is an act in which a pigment is introduced under the dermis using a pointed object or needles to obtain a permanent design. This act is a possible route of transmission of HBV, provided that the material used is sterilised. An association between tattooing and HBV infection has also been reported by several authors [6,17].

This study indicates that close contact with a person infected with hepatitis B is a risk factor associated with HBV transmission even without sexual contact. This association between HBV infection and close contact with an HBV-infected person has been shown in several factors [6,15,18]. Since HBV can survive on environmental surfaces for more than a week, indirect exposure to the virus can occur through contaminated objects. The risk of sharing objects lies on the possibility that contaminated personal used objects (toothbrushes, hairbrushes, razors and combs) can damage the skin or mucous membranes and transmit HBV. This type of transmission occurs mainly in areas of high endemicity and under poor hygenic conditions. It can occur at home or in boarding schools, sports camps, hence the need for vaccination of people living in the same household, boarding schools and sports camps.

Unprotected sexual intercourse was reported as a risk factor associated with HCV transmission in our study. Sexual intercourse represents a route of transmission with an extremely low risk in heterosexual relationships. The risk of transmission increases with multiple sexual partners, a history of sexually transmitted infection , sexual practices associated with a high risk of trauma and bleeding, and without the use of condoms [19]. However, HCV transmission is known to occur among men who have sex with men. Hence, Kowo et al. [13] in a study of risk factors for hepatitis C in the prison population reported that sex between men increased the risk of HCV infection 17-fold.

In this study, no association was found between blood transfusion and the transmission of HBV and HCV. Blood transfusion is a medical procedure that is beneficial to health, but may be responsible for many accidents including the transmission of infections such as viral hepatitis B and C. The prevalence of HBsAg and HCV-Ab is very high among blood donors. In a study conducted by Ankouane et al. [20] among blood donors, the prevalence of HBsAg and HCV-Ab was 12.6% and 3.2% respectively. Several studies have reported an association between blood transfusion and the transmission of HBsAg and HCV [6,15,18,21]. Our results are different from those found by previous authors. The transmission of HBV and HCV via blood transfusion is virtually eliminated because blood donors are screened before any transfusion, which could explain this result on the one hand. On the other hand, the small proportion of people who have already been transfused in our study could explain this result. Haemodialysis has been reported as a risk factor not associated with HCV transmission. The prevalence of HCV infection is high in haemodialysis as reported by Ali et al. [22]. The risk of transmission in haemodialysis is related to blood transfusions, the duration of dialysis and the prevalence of HCV infection in the haemodialysis unit. However, HCV transmission during haemo-dialysis has decreased with the systematic

screening of blood donors and the different measures of asepsis during the different medical procedures.

Conclusion

HBV and HCV infections are a real public health problem with a high prevalence of HBsAg and HCV-Ab. Several risk factors are implicated in the transmission of viral hepatitis B and C. Unprotected sexual intercourse, dental care and scarification are the most frequent risk factors.

DECLARATIONS

Administrative authorization and consent to participate

We obtained administrative approval from the General Managers of YUTH and verbal consent to participate from participants or their guardians

For the purpose of confidentiality, participant's data were processed using specific unique identifiers

Consent for publication

Not applicable

Availability of data and material

The datasets generated during the current study are available from the corresponding author on request.

Competing Interests

The authors declare that they have no competing interests.

Funding

None

Authors Contributions

Authors MPK, EKY, AWNN, CFN, PGO, LP,CNN, ADN contributed to the study design and data collection. Authors MPK, EKY, CFN, LTN contributed in data analysis and editing the first draft of the manuscript. Authors MPK, ON supervised all the activities and approved the final version to be submitted for publication. All authors have read and approved the manuscript.

Acknowledgments

We thank all the nurses who took part to the activities organised during the 2019 World Hepatitis Day in Yaounde University Teaching Hospital

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