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Factors associated with HCV co-infection among people living with HIV/AIDS attending Kigeme District Hospital- Rwanda

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Abstract

Epidemic co-infections with hepatitis C viruses are major sources of morbidity and mortality due to liver cancer among people living with HIV. The spread of these co-infections in sub-Saharan Africa is uncertain. This study was determined the prevalence and factors associated with HCV co-infection among people living with HIV/AIDS attending Kigeme District Hospital, Rwanda. The objective of this study is to determine the prevalence of HCV, and establish factors associated HCV co-infection among HIV-positive patients attending Kigeme District Hospital. In methodology, this study was used a cross-sectional study with a quantitative approach. A questionnaire was utilized to identify social demographic, factors associated, and patient files for the results of CD4, viral load, and HCV co-infection. The sample size were 422 people living with HIV among the 1740 total patients attending Kigeme District Hospital. The research was used systematic sampling techniques. Data collected were entered into a Microsoft Excel spreadsheet on a password-protected computer, and later it was exported into SPSS 21V for statistical analysis. Descriptive methods were used to identify social demographics. Bivariate analysis was used to measure the relationship between independent variables and dependent variables. While multivariate analysis was applied to analyze the factors associated with hepatitis C co-infection among people living with HIV, the results from this survey were used by national policymakers on viral, prevention and management in Rwanda. Overall, among 422 people living with HIV attending Kigeme district hospital. The prevalence of the hepatitis C virus was 8.5%. These findings suggest that specific behaviors and medical histories which enhance the risk of having hepatitis C co-infection. Drugs consumption (Injection, Inhalation and smoking) AOR=0.322; 95%CI=0.159-0.649; P=0.002, Tattooing (AOR=0.063; 95%CI=0.008=0.505; P=0.009), Family history of having (AOR=0.081; 95%CI=0.038-0.171; P=0.001), sexual more than two persons (AOR=9.694; 95%CI=4.034-23.294; P=0.001) are factors enhance hepatitis C virus co-infection. Public health interventions addressing these risk factors could potentially mitigate the prevalence HCV co-infections among people living with HIV. Therefore, knowledge of the overall prevalence and factors associated with it will help national policy makers on viral hepatitis prevention and management in Rwanda.

1. Introduction

HCV infection remains one of the most significant causes of acute and chronic liver disease in people living with HIV worldwide, contributing substantially to morbidity and mortality each year (World Health

Organization 2017). An estimated 110 million individuals are HCV-positive, with 80 million experiencing active viraemia, and the burden is particularly high across low- and middle-income countries, especially in Africa and Asia. HCV shares common transmission routes with HIV, including injection drug use, sexual contact, and mother-to-child transmission, making co-infection frequent among high-risk groups such as people who inject drugs, where prevalence can exceed 90% (Maina et al. 2017). The widespread use of antiretroviral therapy has improved survival among HIV-positive individuals, but liver-related complications exacerbated by HCV remain a leading cause of death (Alberts et al. 2022). Globally, HCV is particularly prevalent among intravenous drug users (72–92%), men who have sex with men (1–12%), and heterosexual populations (9–27%), with notable regional variations across Africa and other continents (Alberts et al. 2022). Infections with HCV are therefore common among individuals receiving antiviral treatment for HIV, with reported HCV co-infection prevalence ranging from 11.5% to 94% in different HIV populations (McGlynn, Petrick, and El-Serag 2021; Polaris Observatory HCV Collaborators 2022). Given these trends, understanding the prevalence and determinants of HCV co-infection in HIV-positive populations remains essential for guiding prevention, treatment, and policy interventions.

2. Objective of the study

2.1 General objective

To determine the prevalence and factors associated with HCV co-infection among people living with HIV/AIDS attending Kigeme district hospital**.**

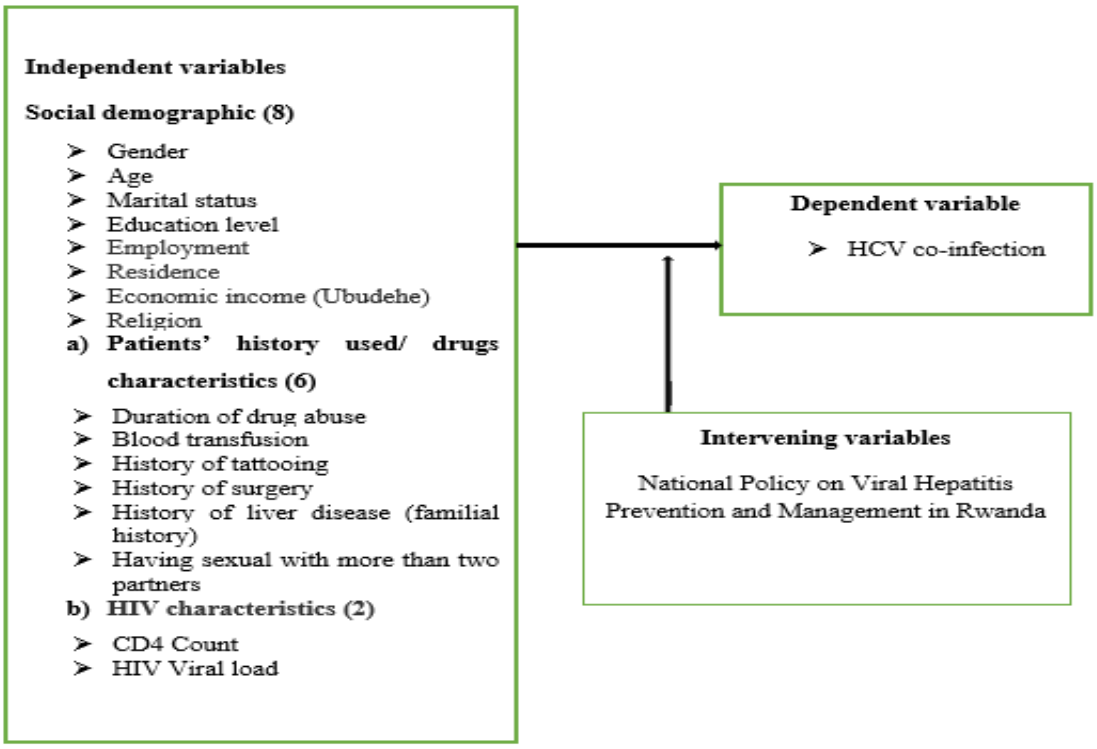
2.2 Specific objectives

a) To estimate the prevalence of HCV infection among people living with HIV/AIDS attending Kigeme District Hospital**.**

b) To establish factors associated with HCV co-infection among people living with HIV/AIDS attending Kigeme District Hospital**.**

3. Conceptual framework

As demonstrated this figure 2.1 Independent variables such as gender, age, marital status, education level, employment, residence, wealth index, religion, drugs reported having ever used, types of consumption, duration of drug abuse, blood transfusion, past incarceration, history of tattooing, history of surgery, history of liver disease, history of high-risk sexual behaviors, opportunistic infections within one year of HIV diagnosis, mode of HIV transmission, CD4 count, antiretrovirals treatment, HIV viral load. Dependent variables such as HCV. In addition, intervening variables include Rwanda's national policy on viral hepatitis prevention and care.



4. Methodology

4.1 Study design

This study was conducted quantitative cross-sectional study design. We are uses bivariate logistic regression to investigate the relationships between HCV infection and potential risk factors. The multivariate analysis was used to identify factors associated HCV co-infection in the bivariate analysis at the 0.5 significance level, in order to develop the final multivariable model utilizing a backward elimination technique.

4.2 Study setting

Kigeme district hospital is located in Kigeme district, southern province in Rwanda country. It is located between latitude 2^0 24′ and 29.48″ S and longitude 29^0 28′ and 4.69″ E. Kigeme has a total surface area of 1090 square kilometers and a population of more than 371501 people (according to the 2022 national Census). This study of prevalence HCV among HIV positive were taking place in ARV services of KIGEME district hospital. Inclusion criteria are HIV positive attend in ARV.

4.2 Study population

The target population of the study are all HIV positive registered patients and attending in Kigeme District hospital in September 2022 to September 2023. The total number of patients registered in hospital record are 1740.

4.3. Sample size

4.4 Determination of sample size

The sample size for hepatitis C viruses among HIV patients were calculated using a single population proportion formula. For there is not previous study in the study areas. We were considering 50% proportion for estimating an appropriate sample size.

To compute sample size, the Cochran formula (Cochran 1953) was used:

$$n = \frac{z^2.P.Q}{L^2}$$

Substitution of formula

Where n = estimated sample size,
Z = z statistic at 95% confidence interval,
1.96
P = Hepatitis among HIV patients of condition under research,
Hepatitis prevalence we were estimate to be 50%.
Q = 1-P,
L = 5% allowable margin of error

$n = \frac{1.96^2 X 0.5 X (1-0.5)}{0.05^2}$ =384 patient samples were the minimal sample size
And then adding 10% of none responding 38.4 ~38
The sample size was 422 patients

4.3.2 Sampling technique

Among people living with HIV, the systematic random sampling method were applied to select patients. A sampling fraction *k* were obtained by dividing the 'total number of HIV positive to the patients with the sample size. The total number of HIV positive in Kigeme DH are 1740 patients, the value of *k* is 4. The first participant was selected randomly and the rest by subsequently adding the value of *k*, until the sample size of 422 were achieved.

4.4 Data collection methods

4.4.1 Data collection instrument

A data collection questionnaire was used from other researchers in accordance with the study's objectives and were divided into four sections: section one for sociodemographic characteristics of participants, section two for patients' history of co-infection transmission, section three HIV characteristics, and other section HCV results. Using a structured questionnaire, the interview, take about 15 minutes for participants to sign a consent form and answer questions. I were using questionnaire forenoon and then afternoon I were check HCV results in machine of ARV services by using code given from patients.

4.4.2 Procedures of Data Collection

The researchers, reach out to the target group in ARV services and explain the goal of the study after receiving ethical clearance from KIGEME Hospital. The data were collected by five (5) trained data collectors until reach to sample size with assistance from the KIGEME hospital administration and ARV support, all research activities were closely supervised and facilitated by the researcher.

Following that, individuals who decided to participate in the study were given consent forms and were asked to answer questions, and those under the age of 18 were signed consent by the hospital nurses, doctor who do follow-up or their parents.

4.4.2 Reliability and validity of instruments

Reliability

The measure of consistency for an evaluation instrument is reliability. The instrument should be producing similar results over time with similar populations and under similar conditions. To ensure dependability, the questionnaire was pre-tested before data collecting begins.

Validity

The test of validity measures the desired performance and allows suitable inferences to be derived from the results. The assessment accurately reflects the learning it was designed to measure. Content validity was ensured by taking suggestions from qualified persons. The questionnaire was modified in response to the suggestions.

4.5 Data analysis

SPSS v 21 software were used for data analysis. Hepatitis C virus prevalence and HCV co-infection proportions and 95% confidence limits were estimated separately by levels of socio-demographic. The descriptive analysis was used to describe socio-demographic variables, and prevalence by summarizing them into percentages, proportions, and frequencies as proportions. Bivariate logistic regression analysis was used to test for associations between independent variables and dependent variables. In this analysis bivariate associations were tested using Pearson's chi-square tests. The multivariate analysis was performed to determine factors that were associated with HCV co-infection in the bivariate analysis at the less than 0.5 significance level to develop the final multi-variable model were using a backward elimination method. The prevalence of HCV, among HIV positive attend in KIGEME District Hospital were estimated. The risk factors of HCV co-infection among HIV positive attending ARV services were determined from covariates fitted in the multi-variable logistic regression analysis: Gender, age, Marital status, education level, employment, residence, economic income (Ubudehe), opportunistic infections within one year of HIV diagnosis, mode of HIV transmission, ever used recreational or illicit drugs, ART categories, CD4 count, antiretrovirals treatment. P-value less than 0.05 were considered as statistically significant. After analysis, the data were presented using composite tables, histogram, graphs, and pie charts.

4.6 Ethical consideration

Ethical approval and Permission of extraction data was obtained from Kigeme District Hospital. To ensure data confidentiality, the patients' hospital files were kept within the Kigeme District Hospital's Anti-Retrovirus (ARV) service, and only the investigators, have access to the hospital files for the objectives of the study. Individual patient names and hospital registration numbers, not be included on the data collection form. Filled forms were housed in secure drawers, backup copies were saved on an external hard drive, and access were limited to the lead investigators.

The findings of the present study were shared with the Rwandan Rwanda Biomedical Center ARV service, and Kigeme District Hospital through presentations, seminars, conferences and publications

5. The findings

5.1 Description of independent variables

Table 4. 1: Social-demographic characteristics of people living with HIV attending in Kigeme District, Rwanda in 2024(n=422)

Variables (N=422	Frequency(n)	Percent (%)
Ages		
1-20 age	4	0.9
21-40 age	68	16.1
Above 41	350	82.9
Sex		

Female	202	47.9
Male	220	52.1
Marital status		
Single	72	17.1
Married	313	74.2
Others	37	8.8
Education level		
No education and Primary	224	53.1
Secondary and Tertiary	198	46.9
Occupation		
Farmers	91	21.6
Businessman/Businesswomen and Employed	300	71.1
Unemployed	31	7.3
Residence		
Rural	233	55.2
Urban	189	44.8
Wealth index (Ubudehe)		
Cat 1 and Cat 2	180	42.7
Cat 3 and Cat 4	242	57.3
Religion		
Catholic	180	42.7
Protestant, Adventist and Islam	234	55.5

Source: Primary data, 2024

This table 4.1 present social-demographic characteristics of people living with HIV in Kigeme District, Rwanda. The most participant ages in this study are HIV positive above 41 years old with 350(82.9%). In gender the female is more participating in this study with 202(47.9%). In marital status married is more participant in this study 313(74.2%). In education level, non-education and primary is more participant in this study with 53.1%. For occupation the businessman/women and employed are more participating in this study 300(71.1%). In residence people living in rural is more participating in this study 233(55.2%). In wealth index (Ubudehe), category 3 and category 4 are more participating in this study 242(57.3%. In religion Protestant, Adventist and Islam are more participating in this study 234(55.5) compare with the others.

These demographics highlight a predominantly older, male population with a majority being married, having a lower level of education, and residing in rural areas. The majority is engaged in business or is employed, with a notable proportion in higher wealth categories. The religious affiliation shows a slight majority of Protestants, Adventists, and Muslims over Catholics.

5.1.2 Description of patients related factors of people living with HIV attending Kigeme District hospital

Table 4. 2: Description of patients related factors of people living with HIV at Kigeme District, Rwanda 2024 (n=422)

Variables (n=422)	Frequency(n)	Percent (%)
Drugs abuse use		
Yes	102	24.2
No	320	75.8
Types of consumption		
Injection, Inhalation and Smoking	95	22.5
None	327	77.5
Years of use drug abuse		
1-10 Years	55	13.0
11-20 Years	29	6.9
No	338	80.1
Blood transfusion		
Yes	19	4.5
No	403	95.5
Drugs abuse use		
Yes	103	24.4
No	319	75.6
Have history of live disease in their family		
Yes	50	11.8
No	372	88.2
Have history of live disease in their family		
Yes	51	12.1
No	371	87.9
Have sexual intercourse with more than two persons		
Yes	65	15.4
No	357	84.6
CD4 Count		
Above 500	368	87.2
Less 500	54	12.8
Viral load		
Above 1000	40	9.5
Less 1000	203	48.1
Less 200	179	42.4

Source: Primary data, 2024

In the description of factors related, among the patients attending this study, 102 (24.2%) were using drug abuse, and among those using abuse, they used different types of consumption: **Injection, Inhalation, and Smoking** are 95 individuals (22.5%). The years use of drugs 1-10 years is 55(13%) more compare with other age's group. The person who are transfused blood participating in this study are 19(4.5%). The participant of this study 50(11.8) have history of family liver disease. In sexual intercourse with more than two people 65(15.4%) are participating in this study. CD4 Count above 500 people having 368(87.2%) is participating in while people having less than 500 are 54(12.8%). The viral load of the participant in this study; above 1000 are 40(9.5%), less than 1000 are 203(48.1%), while less than 200 are 179(42.4).

5.2 Presentation of findings

5.2.1.0 First Objective

5.2.2.2 Prevalence of HCV among people living with HIV

The prevalence of HCV among people living with HIV attending Kigeme district, Rwanda described in figure 4.2.

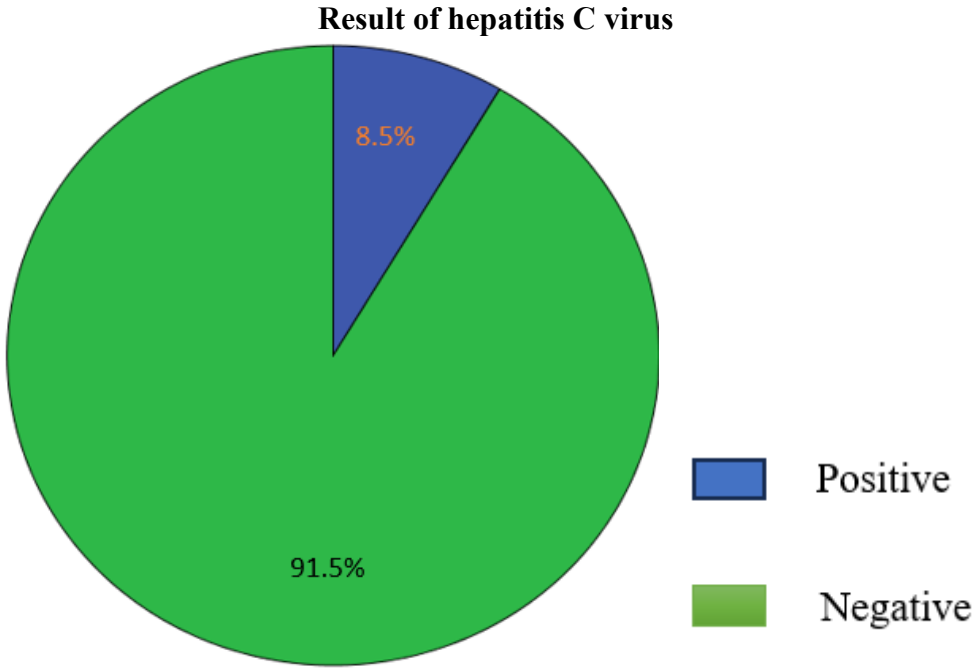


Figure2: Prevalence of HCV among people living with HIV

Sources: Research 2024

The pie chart 4.2, shows the prevalence of HCV among the people living with HIV attending in this survey are 36/422(8.5%).

This histogram chart 4.1, show the prevalence of HCV co-infection among patients attending in this survey are 6/422(1.4%).

Table 5. 3: Bivariate analysis of factors associated with HCV among people living with HIV attending Kigeme District Hospital

Variables	Category	Positive (%)	Negative (%)	X^2	P-value
Ages					
	1-20 age	2(50.0)	2(50.0)	11.608	**0.003**

	21-40 age	9(13.2)	59(86.8)		
	Above 41	25(7.1)	325(92.9)		
Gender					
	Female	14(6.9)	188(93.1)	0.184	0.668
	Male	13(5.9)	207(94.1)		
Marital status					
	Single	8(11.1)	64(88.9)	1.160	0.560
	Married	24(7.7)	289(92.3)		
	Others	4(10.8)	33(89.2)		
Education levels					
	No education and Primary	20(8.9)	204(91.1)	0.097	0.756
	Secondary and Tertiary	16(8.1)	182(91.9)		
Occupation					
	Farmers	7(7.7)	84(92.3)	1.448	0.485
	Businessman/Businesswomen and Employed	28(9.3)	272(90.7		
	Unemployed	1(3.3)	30(96.7)		
Residence					
	Rural	11(4.7)	222(95.3)	2.443	0.118
	Urban	16(8.5)	173(91.5)		
Wealth index					
	Cat 1 and Cat 2	16(8.9)	164(91.1)	0.052	0.820
	Cat 3 and Cat 4	20(8.3)	222(91.7)		
Religion					
	Tradition/No religion	1(12.5)	7(87.5)	0.784	0.676
	Catholic	13(7.3)	167(92.7)		
	Protestant, Adventist and Islam	22(9.4)	212(90.6)		
Types of consumption					
	Injection, Inhalation and Smoking	16(16.8)	79(83.2)	10.853	**0.001**
	None	20(6.1)	307(93.8)		
Years of use drugs					
	1-10 Years	10(18.2)	45(81.8)	15.019	**0.001**
	11-20 Years	6(20.7)	23(79.3)		
	No	20(5.9)	318(94.1)		
Blood transfusion					
	Yes	3(15.8)	16(84.2)	2.930	0.087
	No	24(6.0)	379(94.0)		
Tattooing					
	Yes	2(5)	38(95)	38.566	**0.023**
	Not	25(6.5)	357(93.5)		
Surgery					

Yes	3(13.1)	20(86.9)	1.794	0.175
Not	24(6.1)	375(93.9)		
Family history of having HCV				
Yes	6(11.8)	45(88.2)	2.790	0.950
Not	21(5.7)	350(94.3)		
Sexual intercourse with more than two persons				
Yes	19(29.2)	46(70.8)	66.886	**0.004**
Not	8(2.2)	349(97.8)		
CD4 count				
<500cell/ul	19(5.2)	349(94.8)	7.325	**0.007**
>500cells/ul	8(14.8)	46(85.2)		
Viral load				
Above 1000	4(10.0)	36(90.0)	0.658	0.720
Less 1000	19(9.4)	184(90.4)		
Less 200	13(7.3)	166(92.7)		

Source: Primary data, 2024

Table 4.4 presents a bivariate analysis of Hepatitis C Virus (HCV) status in relation to various socio-demographic characteristics among people living with HIV attending Kigeme District Hospital. Here's how to interpret the table:

In ages group p = 0.003, indicating a significant association between age and HCV positivity, with a higher rate of HCV infection observed in the younger age group (1-20 years). In gender p = 0.668, showing no significant difference in HCV positivity between genders. Marital status p = 0.560, indicating no significant association between marital status and HCV positivity. Education level p = 0.756, showing no significant association between education level and HCV positivity. Occupation p = 0.485, indicating no significant association between occupation and HCV positivity. Residence p = 0.118, showing no significant association between residence and HCV positivity. Wealth index (Ubudehe) p = 0.820, indicating no significant association between wealth index and HCV positivity. Religion p = 0.676, showing no significant association between religion and HCV positivity. The use difference types of drug consumption p = 0.001, showing a significant association between drug consumption methods and HCV positivity. Years of drug use p = 0.001, indicating a significant association between the number of years of drug use and HCV positivity. Blood transfusion p = 0.087, showing a borderline significant association between blood transfusion and HCV positivity. Tattooing p = 0.023, indicating a significant association between tattooing and HCV positivity. Surgery p = 0.175, showing no significant association between surgery and HCV positivity. Family history of HCV p = 0.950, indicating no significant association between family history of HCV positivity. Sexual intercourse with more than two persons p = 0.004, showing a significant association between having sexual intercourse with multiple partners and HCV positivity. CD4 count p = 0.007, indicating a significant association between CD4 count and HCV positivity, with higher HCV positivity observed in those with a higher CD4 count. Viral load p = 0.720, showing no significant association between viral load and HCV positivity.

These findings highlight the importance of addressing drug use, sexual behavior, and tattooing as key areas in the prevention and management of HCV among people living with HIV.

5.2.4.5 Multivariate association of factors with HCV among people living with HIV

Table 5. 4: Multivariate association of patient-related factors with HCV Kigeme District Hospital, Rwanda 2023 (n=422)

Variables	AOR	95% Confidence Interval (CI)		P-value.
		Lower limit	Upper limit	
Ages				
1-20 age	Reference			
21-40 age	5.568	0.487	63.594	0.167
Above 41	9.690	0.940	99.857	0.056
Mode of consumption				
Injection, Inhalation and Smoking	0.322	0.159	0.649	**0.002**
None	Reference			
Years of drugs use				
1-10 Years	1.484	0.355	6.212	0.589
11-20 Years	1.516	0.307	7.479	0.609
No	Reference			
Tattooing				
Yes	0.063	0.008	0.505	**0.009**
No	Reference			
Family history of having hepatitis				
Yes	0.081	0.038	0.171	**0.001**
No	Reference			
Sexual more than two persons				
Yes	9.694	4.034	23.294	**0.001**
No	Reference			
CD4 count				
<500cell/ul	1.148	0.363	3.627	0.814
>500cells/ul	Reference			

Source: Primary data, 2024

The multivariate analysis offers a nuanced understanding of factors influencing the outcome of interest by evaluating various predictors with adjusted odds ratios (AOR), confidence intervals (CI), and p-values. Age was analyzed across three categories: 1-20 years, 21-40 years, and above 41 years. The results indicated that individuals aged 21-40 years had an AOR of 5.568 (95% CI [0.487, 63.594], p-value = 0.167), suggesting higher odds of the outcome compared to the reference group, though this was not statistically significant. For those older than 41 years, the AOR was 9.690 (95% CI [0.940, 99.857], p-

value = 0.056), approaching statistical significance and hinting at a potential increased risk but not meeting the conventional threshold for significance.

Mode of consumption was a notable predictor, with individuals using injection, inhalation, or smoking methods showing an AOR of 0.322 (95% CI [0.159, 0.649], p-value = 0.002). This result indicates a significant reduction in the odds of the outcome, suggesting that these consumption methods are associated with a lower risk. In contrast, years of drug use did not reveal significant associations. The AORs for drug use durations of 1-10 years and 11-20 years were 1.484 (95% CI [0.355, 6.212], p-value = 0.589) and 1.516 (95% CI [0.307, 7.479], p-value = 0.609), respectively, indicating no substantial impact on the outcome.

The presence of tattooing was significantly associated with the outcome, with an AOR of 0.063 (95% CI [0.008, 0.505], p-value = 0.009), suggesting that having tattoos is linked to significantly lower odds of the outcome. These finding points to a potential protective effect associated with tattooing. Similarly, a family history of hepatitis was a strong predictor, with an AOR of 0.081 (95% CI [0.038, 0.171], p-value = 0.001), indicating significantly lower odds of the outcome for those with such a history. This result is intriguing and may warrant further investigation to understand its implications.

Finally, sexual behaviour showed a strong association, with an AOR of 9.694 (95% CI [4.034, 23.294], p-value = 0.001) for individuals with more than two sexual partners, highlighting a markedly higher risk of the outcome. On the other hand, CD4 count did not have a significant effect, with an AOR of 1.148 (95% CI [0.363, 3.627], p-value = 0.814), suggesting that CD4 count within the studied range does not significantly impact the outcome. Overall, the analysis underscores the importance of factors like mode of consumption, tattooing, family history of hepatitis, and sexual behaviour, while age and CD4 count do not appear to be significant determinants in this context.

6. Discussion

This study examines the prevalence and factors associated with hepatitis C infection among patients. In this study, the overall prevalence of HCV among people living with HIV was 8.5% (95% confidence interval). The findings from this study are lower than those reported by Munyemana et al. (2021), where the prevalence of HCV among HIV-positive individuals in Kigali was 12.5%. HCV infection was more common among adults aged 41–50 and 51–60, with prevalence rates of 3.6% and 4.6%, respectively. Additionally, five underlying illnesses were reported among the participants in that study (Munyemana et al., 2021). While sub-Saharan Africa has a generally low prevalence of hepatitis C antibodies, they were detected in 0.4% of 15,336 HIV patients tested in a multi-country study. Mozambique reported a higher prevalence (1.15%) than Malawi (0.5%), Uganda (0.24%), and Kenya (0.22%) (Loarec et al. 2019). A Malaysian study by Akhtar et al. (2022) found that among 708 individuals living with HIV, 16.1% were infected with HCV. HCV was more prevalent in males (17.2%) than females (1.1%). The most common mode of transmission among HIV-HCV co-infected individuals was heterosexual contact (13.8%), followed by homosexual relationships (0.4%) (Akhtar et al., 2022).

This study also examined factors associated with HCV infection among people living with HIV attending Kigeme District Hospital. Participants aged 1–20 years (AOR = 0.009; 95% CI: 0.001–0.083; p = 0.001) had significantly lower odds of infection compared to those over 41 years, while individuals aged 21–40 years (AOR = 0.579; 95% CI: 0.059–5.653; p = 0.639) did not differ significantly from the reference group. Regarding religion, participants with no religion or traditional beliefs (AOR = 0.060; 95% CI: 0.005–0.747; p = 0.029) had significantly lower odds of infection compared to Protestant, Adventist, or

Muslim participants, while Catholics showed no significant difference (AOR = 0.509; 95% CI: 0.084–3.077; p = 0.462). Individuals who used drugs had a significantly higher likelihood of HCV infection (AOR = 0.061; 95% CI: 0.007–0.527; p = 0.011). Receiving a transfusion (AOR = 3.774; 95% CI: 0.402–35.405; p = 0.245) and undergoing surgery (AOR = 1.515; 95% CI: 0.228–10.072; p = 0.668) showed no significant association with HCV infection. Having a family history of hepatitis was significantly associated with infection (AOR = 2.101; 95% CI: 0.488–9.052; p = 0.032). Engaging in sexual activity with more than two partners increased the likelihood of infection (AOR = 3.828; 95% CI: 0.996–14.702; p = 0.041). A CD4 count below 500 cells/µl was associated with a reduced likelihood of infection (AOR = 0.396; 95% CI: 0.086–1.821; p = 0.023). These findings are consistent with those reported by Kafeero et al. (2021), who identified several behavioral and demographic predictors of hepatitis infection in East Africa.

In this study, there was no statistically significant association between HCV infection and APRI scores ($p > 0.05$) across age, sex, marital status, education, occupation, residence, socioeconomic status, drug use, and duration of drug use. Similarly, viral load did not show a significant relationship with HCV infection, consistent with findings from Rana et al. (2019), who reported no significant difference in APRI in follow-up assessments of individuals living with HIV and HCV.

7. Conclusion and recommendation

7.1 Conclusion

This study identified an HCV prevalence of 8.5% among people living with HIV at Kigeme District Hospital. Tattooing, multiple sexual partners, and family history of hepatitis were significant factors associated with HCV infection, while drug-use associations require further investigation due to unexpected patterns. These findings highlight the need for targeted prevention strategies and continued monitoring to reduce HCV transmission in this population.

7.2 Recommendations

1. **Strengthen screening and prevention:** Expand HCV screening for individuals with tattooing history and promote safe tattooing practices through public awareness and regulation.
2. **Address high-risk behaviors:** Implement education on safer sexual practices and sustain harm-reduction programs for drug-using populations.
3. **Improve clinical monitoring:** Ensure regular immunological follow-up and routine HCV testing for people living with HIV to support early detection and timely care.

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