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Anti-hepatitis C antibody carriage and risk of liver impairment in rural-Cameroon: adapting the control of hepatocellular carcinoma for resource-limited settings

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Abstract

Background The Viral hepatitis elimination by 2030 is uncertain in resource-limited settings (RLS), due to high burdens and poor diagnostic coverage. This sounds more challenging for hepatitis C virus (HCV) given that antibody (HCVAb) sero-positivity still lacks wide access to HCV RNA molecular testing. This warrants context-specific strategies for appropriate management of liver impairment in RLS. We herein determine the association between anti-HCV positivity and liver impairment in an African RLS.

Methods A facility-based observational study was conducted from July-August 2021 among individuals attending the "St Monique" Health Center at Ottou, a rural community of Yaounde,Cameroon. Following a consecutive sampling, consenting individuals were tested for anti-HCV antibodies, hepatitis B surface antigen (HBsAg) and HIV antibodies (HIVAb) as per the national guidelines. After excluding positive cases for HBsAg and/or HIVAb, liver function tests (ALT/AST) were performed on eligible participants (HBsAg and HIVAb negative) and outcomes were compared according to HCVAb status; with $p < 0.05$ considered statistically significant.

Results Out of 306 eligible participants (negative for HBsAg and HIVAb) enrolled, the mean age was 34.35 ± 3.67 years. 252(82.35%) were female and 129 (42.17%) were single. The overall HCVAb sero-positivity was 15.68%(48/306), with 17.86% (45/252) among women vs. 5.55%(3/54) among men [OR (95%CI) = 3.69(2.11-9.29),$p = 0.04$]. HCVAb Carriage was greater among participants aged > 50 years compared to younger ones [38.46%(15/39) versus 12.36% (33/267) respectively, OR(95%CI) = 4.43(2.11-9.29), $p < 0.000$] and in multipartnership [26.67%(12/45)vs.13.79%(36/261) monopartnership, OR (95%CI) = 2.27(1.07-4.80),$p = 0.03$]. The liver impairment rate (abnormal ALT+AST levels) was 30.39%(93/306), with 40.19%(123/306) of abnormal ALT alone. Moreover, the burden of Liver impairment was significantly with aged> 50 versus younger ones [69.23% (27/39) versus 24.72%(66/267) respectively, $p < 0.000$). Interestingly, the burden of liver impairment (abnormal AST + ALAT) was significantly higher in HCVAb positive (62.5%, 30/48) versus HCVAb negative (24.42%, 63/258) participants, OR: 3.90 [1.96; 7.79], $p = 0.0001$.

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Conclusions In this rural health facility, HCVAb is highly endemic and the burden of liver impairment is concerning. Interestingly, HCVAb carriage is associated with abnormal liver levels of enzyme (ALT/AST), especially among the elderly populations. Hence, in the absence of nuclei acid testing, ALT/AST are relevant sentinel markers to screen HCVAb carriers who require monitoring/care for HCV-associated hepatocellular carcinoma in RLS.

Keywords Hepatitis C virus antibodies (HCVAb), ASAT/ALAT, Liver impariment, Hepatotoxicity, Cameroon

Background

Hepatitis C is a liver inflammation caused by a hepatitis C virus (HCV). This virus causes acute hepatitis that evolves in majority (85%) into chronic hepatitis [1]. Chronic hepatitis C is one of the main causes of cirrhosis and primary liver cancer. Globally, the World Health Organization (WHO) estimates that an estimated 58 million people have chronic hepatitis C virus infection, with about 1.5 million new infections occurring per year [2]. In 2019, approximately 290,000 people died from hepatitis C, mostly from cirrhosis and hepatocellular carcinoma [3]. In 2016, World Health Assembly has adopted the Global Health Sector Strategy (GHSS) on viral hepatitis to eliminate hepatitis by 2030 [4] However, available evidence demonstrates that global viral hepatitis elimination by 2030 is highly unlikely especially in Low and middle income countries where rates of hepatitis B and C diagnosis are very low, averaging 8 and 18%, respectively [5]. In fact, for HCV infection, 80% of high-income countries are not on track to meet HCV elimination targets by 2030, and 67% will not meet elimination targets even if they were given an additional 20 years [6]. In contrast to HBV, there is no prophylactic HCV vaccine [7].

In Cameroun, hepatitis C is endemic and the prevalence of HCV varies widely between 1 and 23.9% depending on the study population [8–11]. WHO and The Ministry of Public Health of Cameroon have made the fight against viral hepatitis their focus through vast treatment programs for hepatitis B/C and that have now been progressively made accessible to all social layer at low cost [12]. However, the lack of national Hepatitis C screening and treatment guidelines is reflected by a diversity in diagnostic and treatment protocols across care providers, resulting in unnecessary costs and possible sub-optimal clinical outcomes. Additionally, central organisation of Hepatitis C care, insufficient technical and human capacity for HCV testing, alongside high costs associated with diagnosis and treatment (generally paid out-of-pocket), substantially limit access to HCV diagnosis and care [13]. Most PLHCV in Cameroon are unaware of their status, with a negative impact on transmission and disease progression [14–16].

In community areas, in addition to the to lack of awareness on HCV, the problem is compound by low quality of health care, poverty and underdevelopment that constitute significant obstacles to early diagnosis and adequate management of HCV cases. In those settings, many HVCAb positive patients by rapid diagnostic test are either orientated for enrolment to a distant reference hospital center or requested an expensive and time-consuming HCV RT-PCR confirmatory test from a reference laboratory. This situation increases loss to follow-up of infectious patients with sustained HBV viral load who generally get back to health facilities afterwards with complications such as cirrhosis or hepatocellular cancer. Indeed, elevated HCV viral load is described to be consistently associated with high infectivity and risk of HCC occurrence [17–19]. Thus, much efforts should foster early identification and management of infected cases. Alanine Amino transferase (ALT) is a valuable liver enzyme test to detect otherwise inapparent liver disease [20]. Its elevation is considered as an indicator of Liver Damage [20] and could also predict viremia in anti-HCV-positive patients [21]. Besides, ALT measurement affords a readily available, low-cost blood test that is utilized throughout many countries as a tool for detection of liver disease [22] .

We conducted a mass screening of HCV in Ottou village-Yaounde that aimed at determining the association between HCVAb positivity and liver impairment in an African RLS.

Materials and methods

Study design and population

A cross-sectional study was conducted during a health campaign held from the 12 July to 12 August 2021 at the "Sainte Monique-Ngonmeda" Health Center, located at Ottou-village, at the periphery of Yaounde, center region of Cameroon. Ottou is a small village not so far from Yaounde and has been choosed for its hererogeneous population and for its geographical position with the presence of health center and a private medical laboratory capable to process ALT/AST biochemical test.

After getting required administrative authorization, consenting inhabitants of Ottou aged >18 years, were enrolled consecutively at "Sainte Monique-Ngonmeda" Health Center for the health campaign. Each participant always had the choice either to participate only to the campaign or to both, the campaign and the study. Those who signed the informed consent, filled out the

structured questionnaire in presence of a member of the team were included in the study. Conversely, those who declined the invitation and/or refused to sign the informed consent form could participate to the health campaign but were excluded from the study. Equally, participants who reported the use of oral plant extract were also excluded. From each participant included in the study, blood was collected onsite by a prick on the middle finger for a rapid detection of HCV antibodies, HIV antibodies and HBsAg. In parallel, 5 ml whole blood was also collected and stored in a cooler at +4 °C before being transferred to the private laboratory "MEDIBIO-LAB" for ALT/AST dosage.

Given the current framework for HCV diagnosis, clinical and laboratory monitoring in our national health system, participant that were seropositive to HVCAb with or without abnormal ALT/AST level were directly linked to the General Hospital of Yaounde (the attached reference centre) for viral hepatitis management by a gastroenterologist according to national guidelines (prescription of HCV RNA by PCR, followed by either enrolment for treatment of PCR positive or referral for preventive service if PCR negative).

Determination of minimum sample size

The minimum sample size was obtained using the standard formula:

$n = z^2.p\ (1\text{-}p)/m^2$, with "z" = the standard deviation of 1.96 (95% confidence interval); "p" = Estimated nationwide seroprevalence of HCV in Cameroonians subjects aged > 15 years reported by Bigna et al. (6.5%) [8]; "m" = error rate of (5%) and "n" = minimum sample size.

Sample collection and conservation

Eligible participants who gave their approval were subjected to rapid diagnostic testing and blood collection for further testing (ALT/AST).

Blood sampling and rapid testing "on-site"

Blood was collected in aseptic conditions. In all, One drop of whole blood was required for the "on-site" testing for each rapid detection of HCV antibodies (Cypress diagnostics Technologies Inc., USA) HIV antibodies (Determine HIV 1/2; Alere Medical Co., Chiba, Japan) and HBsAg (DiaSpot HBsAg; DiaSpot Diagnostics, USA) according to the SOP /presented to us by the manufacturer. Cypress Diagnostics® HCV Rapid Antibody Test is rapid diagnostic test for the qualitative detection of HCV antibodies in serum and whole blood. Independent evaluation reported 96.7% (90.7–98.9%) sensitivity in whole blood [23] 97.8% (94.5–99.1%) specificity [23].

Samples transportation

Antibodies testing was performed on-site, whereas whole blood collected in dry tubes were transported to MEDIBIO-LAB, located not so far, for liver enzymes (ALT/AST) dosage. All blood samples were temporarily stored between 2 and 8 °C immediately after collection. And then, directly transferred to MEDIBIO-LAB and analyzed upon arrival.

Transaminases testing

Transminases (ALT, AST) were analysed from blood samples of HBsAg and HIVAb negative participants as described previously [24]. In Brief, after centrifugation 2000 rpm/min during 5 min, transaminases level were tested in each serum samples using an autoanalyzer. The level of ALT > 33 U/L and AST > 31 U/L for females and ALT > 40 U/L and AST > 37 U/L for males were classified as abnormal [24]. Laboratory quality control will be done regularly to verify inter- and intra-assay reproducibility.

Data analysis

The analyses were performed using the software package Stat view 5.1 (SAS Institute Inc., Cary, NC, USA). The continuous variables are presented in terms of mean ± Standard deviation (Std) and categorical variables in absolute number (proportion in %). Given that data on some variables were not properly recorded for all patients, we decided to include only participants with all information. The associations between HCVAb positivity or liver impairment and demographic and clinical characteristics were investigated by Chi-Square (Pearson or for trend), Mann–Whitney, or Kruskal-W,allis tests as appropriate. Univariate and multivariate regression analyses were conducted to identify factors independently associated with the risk of liver impairment and HCVAb carriage. For $p < 0.05$, the association was considered significant.

Limitations

This study was limited on antibody testing, and conducted to generate baseline finding at community-level on this topic.

So, one limitation of this study was the absence of HCV viral load due to limited funding. Moreover, some additional parameters (NAFLD or NASH, anthropometric measures) not taken into account in this study would have provided more insights on the relevance of our findings.

Table 1 Sociodemographic Characteristics of the Study population

		Number	Percentage (%)
Sex	Female	252	82.35
	Male	54	17.65
Age	< 30	156	50.98
	[30-50[	111	36.27
	> 50	39	12.74
Matrimonial status	Single	129	42.16
	Married	168	54.90
	Widow (er)	09	2.94
Knowledge about the disease	Yes	255	83.33
	No	51	16.67
history of blood transfusion	Yes	12	3.92
	No	294	96.08
Regular use of condoms	Yes	21	6.86
	No	285	93.14
HCV history in the neighbourhood	Yes	63	20.58
	No	243	79.41
Number of sex partners	Mono-partnership	261	85.29
	Multi-partnership	45	14.71
Sterilisation of hairdressing materials	Yes	159	51.96
	No	147	48.04
Alcohol consumption	Yes	228	74.51
	No	78	25.49
History of sexually transmitted infections	Yes	129	42.16
	No	177	57.84
Clinical signs of hepatitis C	Yes	294	90.20
	No	30	9.80
Piercing	Yes	09	2.94
	No	297	97.06
Illicit Drug consumption	Yes	00	00
	No	306	100

Results

Baseline characteristics of the study population

The table 1 below presents the sociodemographic characteristics of the study population.

A total of 306 participants were surveyed between 12 July and 12 August 2021 at the "Sainte Monique-Ngonmeda" Health Center, Ottou-village, at the periphery of Yaounde Cameroon. In this study, the female participants were predominant with a percentage of 82.35% ($n=252$), versus 17.65% ($n=54$) for males participants with a sex ratio (F/M) of 5/1. The mean age was 34.52 ± 3.42 years [min 18, max 72] and subjects aged under 30 years were the most represented. Moreover, more than half (54.9%) of the participants were married, and 42.16% were single and 2.94% widowed. The majority of Participants declared to have the knowledge on the disease (83.33%) and only 3.92% had a history of blood transfusion. Regular use of condoms, HCV history in the neighborhood, multi-partnership, history of sexually transmitted infections and piercing were recorded in 6.86, 20.59, 14.71, 42.16 and 2.94% of the participants respectively. Lastly, 74.50% were alcohol consumers and none was illicit drug users. In this study, 90.20% of the participants had clinical signs of hepatitis C (see Table 1).

Prevalence of HCVAb and associated factors

This table below summarized the prevalence of HCVAb according to risk factors.

According to the hepatitis C antibody rapid detection tests results, participants who tested positive were 48 of the 306, for a prevalence 15.69% [11.58 - 19.78%]. The mean age of HCVAb positive was 36.25 ± 5.9 versus 31.21 ± 4.4 years for HCVAb negative individuals. Univariate analysis shows a higher seroprevalence of HCVAb in female subjects [17.86% vs. 5.55% men, OR (95%CI) = 3.69(2.11-9.29), $p=0.04$], subjects aged

> 50 years [OR(95%CI) = 4.43(2.11-9.29), $p < 0.001$], multipartnership [26.67% vs. 13.79% monopartnership, OR (95%CI) = 2.27(1.07-4.80), $p = 0.03$] and subjects who didn't regularly sterilized their hairdressing materials [22.45% vs. 9.43%people sterilising theirs, OR (95%CI) = 2.78(1.44-5.36), $p = 0.003$] (see Table 2).

In multivariate analysis using logistic regression, only gender, age, multipartnership were found to be significantly associated to HCVAb carriage ($p < 0.000$).

Liver function of the study population

Prevalence of liver impairment

The Table 3 shows the Prevalence of liver impairment in the study population.

The prevalence of liver impairment (abnormal ALT+AST) was 30.39% (93/306) with 40.20% (123/306) of abnormal ALT (see Table 3).

Liver impairment according to risk factors

The Table 4 below shows liver impairment according to risk factors.

It comes out from Table 4 that liver impairment (abnormal ALT+AST level) was associated to Age ($p = 0.01$) with subject aged > 50 most affected as compared to younger ones [69.23% (27/39) versus 24.72% (66/267) respectively, $p < 0.000$).

Liver impairment according to hepatitis C antibodies carriage (HCVAb)

This table presents liver impairment according to hepatitis C antibodies carriage (HCVAb).

The prevalence of liver impairment (abnormal AST + ALAT) is much higher in HCVAb positive subjects (66.67% in positive subjects versus 33.87% in negative

Table 2 HCVAb carriage according to sociodemographic factors, behaviour and practices

Variables		*N* = 306	HCVAb n(%)	OR	95%CI	*p-value*
Sex	Female	252	45 (17.86)	3.69	[1.10-12.37]	0.04
	Male	54	3 (5.55)	Ref		
Age	< 30	156	24 (15.38)	Ref		0.00
	[30-50[	111	9 (8.11)	0.48	[0.22- 1.09]	
	> 50	39	15 (38.5)	3.43	[1.58-7.48]	
Matrimonial status	Single	129	24 (18.60)	1.78	[0.93-3.53]	0.12
	Married	168	21 (12.25)	Ref		
	Widow (er)	09	3 (33.33)	2.33	[0.58-3.31]	
Knowledge about the disease	Yes	255	39 (15.29)	Ref	[0.38-1.82]	0.84
	No	51	9 (17.65)	1.19	[0.53-2.63]	
history of blood transfusion	Yes	12	3 (25.00)	1.84	[0.48-7.07]	0.85
	No	294	45(15.31)	Ref		
Regular use of condoms	Yes	21	3 (14.28)	1.12	[0.32-3.98]	0.66
	No	285	45 (15.79)	Ref		
HCV history in the neighborhood	Yes	63	09 (14.28)	0.87	[0.4-1.92]	0.89
	No	243	39 (16.05)	Ref		
Number of sex partners	Mono-partnership	261	36 (13.79)	2.27	[1.07-4.80]	0.03
	Multi-partnership	45	12 (26.67)	Ref		
Sterilisation of hairdressing materials	Yes	159	15 (9.43)	Ref		
	No	147	33 (22.45)	2.78	[1.44-5.36]	0.003
Alcohol consumption	Yes	228	39 (17.10)	1.58	[0.73-3.43]	0.71
	No	78	09 (11.54)	Ref		
History of sexually transmitted infections	Yes	129	24 (18.60)	1.46	[0.78-2.70]	0.30
	No	177	24 (13.56)	Ref		
Clinical signs of hepatitis C	Yes	297	48 (16.16)	0.16		0.39
	No	09	00 (00)	Ref		
Piercing	Yes	09	00 (00)	00		0.39
	No	297	48 (16.16)	Ref		
Illicit Drug consumption	Yes	0	00	00		0.94
	No	306	48 (15.69)	Ref		

Table 3 Prevalence of liver impairment

TRANSAMINASES *N* = 306	Normal n(%)	Abnormal n(%)
ALT	183(59.80)	123 (40.20)
AST	162 (52.29)	144 (47.06)
AST + ALT	138 (45.09)	**93 (30.39)**

subjects, OR: 3.90 [1.96; 7.79], $p = 0.0001$). Besides, abnormal ALT level is also greater in HCVAb positive subjects than HCVAb negative (66.67%vs.35.27, OR: 3.67 [1.91; 7.05], $p = 0.0001$) (see Table 5).

Discussion

In order to investigate the association between HCVAb carriage and liver impairment in an African RLS, a facility-based observational study was conducted from July-August 2021 among individuals attending the "St Monique" Health Center, located at Ottou-village, a rural community of Yaounde, Cameroon. Following a consecutive sampling, consenting individuals were tested for anti-HCV antibodies, hepatitis B surface antigen (HBsAg) and HIV antibodies (HIVAb) as per the national guidelines.

Among the 306 participants surveyed in Ottou-village, at the periphery of Yaounde Cameroon, female were predominant with a percentage of 82.35% ($n = 252$), versus 17.65% ($n = 54$) for males participants [sex ratio (F/M) 5/1]. The mean age was 34.52 ± 3.42 years [min 18, max 72] and subjects aged under 30 years were the most represented (50.98%). Kamga et al. in 2018 in the same study site reported a similar female predominance of 68.63% (105/153) and their mean age was 30.4 years ±5.63 years [25]. While several studies in community settings in Cameroon have also found similar women predominance trend [26–29], contrary results were more or less reported in rural area of foreign countries including Congo [30], Egypt [31], China [32], in the USA [33]. In fact, the Cameroonian demographics reflects in general more women than men and also a relative young population. However, this huge women's predominance in this study could rely on daily activities in that community area where men in general are

Table 4 Liver impairment according to risk factors

		N = 306	AST Abnormal (*N* = 144)	ALT Abnormal (*N* = 123)	ALT + AST Abnormal (*N* = 93)
			n(%)	n(%)	n(%)
Gender	F	252	120 (47.62)	101(40.08)	73(28.97)
	M	54	24(44.44)	22 (40.74)	20(37.04)
p-value			0.67	0.93	0.24
Age	< 30	156	55 (35.26)	53 (33,97)	33 (21.15)
	[30-50[	111	57 (51.35)	40 (70.17)	33 (29.73)
	> 50	39	32 (82.05)	30 (69,24)	27 (69.23)
p-value			< 0.001	< 0.001	< 0.001
Matrimonial Status	Célibat	129	51 (39.53)	48(37.21)	30(23.25)
	Marié	168	90 (53.57)	72 (42.86)	60(35.71)
	Veuve	09	3 (33.33)	3 (33.33)	3 (33.33)
p-value			0.06	0.68	0.06
HCV history in the neighborhood	Yes	63	30(47.62)	27(42.86)	19(30.16)
	No	243	114(59.26)	96(39.51)	74(30.45)
p-value			0.92	0.63	0.96
Alcohol consumption	Yes	228	115(50.44)	100(43.86)	75(32.89)
	No	78	29(37.18)	23(29.49)	18(23.08)
p-value			0.04	0.03	0.1
History of sexually transmitted infections	Yes	129	62(48.06)	48(37.21)	35(27.13)
	No	177	82(46.33)	75(42.37)	58(32.77)
p-value			0.76	0.36	0.29
Clinical signs of hepatitis C	Yes	297	139(46.80)	120(40.4)	90(30.30)
	No	09	5(55.56)	3(33.33)	3(33.33)
p-value			0.86	0.93	0.86

Table 5 Liver damage and seroprevalence of hepatitis C antibodies (HCVAb)

		HCVAb		OR [95%CI]	*p-value*
		Positive (*N* = 48)	**Negative (*N* = 258)**		
		n (%)	**n (%)**		
ALT	Abnormal	**32(66.67)**	91 (35.27)	3.67[1.91; 7.05]	0.0001
	Normal	16 (33.3)	167 (64.73)		
AST	Abnormal	31(64.58)	113(43.8)	2.34[1.23; 4.44]	0.009
	Normal	17 (35.42)	145 (56.20)		
ALT + AST	Abnormal	**30 (62.5)**	63 (24.4)	3.90 [1.96; 7.79]	0.0001
	Normal	15 (31.25)	123 (47.67)		

occupied in the farm while women takes care of the house and children, making them to be easily accessible for such health campaign. Globally, unlike men, women were likely much interested in health related matter. Furthermore, more than half (54.9%) proportion of the participants were married and the majority of participants declared having several sexual partners, having experienced a sexually transmitted infection once in their life already and not to regularly use condom. These results underscore the need of continuous sensitization of rural populations on the transmission routes of sexually transmitted diseases.

According to the hepatitis C antibody rapid detection tests results, participants who tested positive were 48 out of 306 (15.69%) [95% CI =11.58 - 19.78%]. HCVAb seroprevalence in Cameroon varies across regions and tribes within the same country. While some studies reported high HCVAb carriage: in the southern 12% [34], in the western 6.3% [35], numerous studies on the contrary revealed a relative much lower prevalence: 2.2% anti-HCV in the Northern [27], 0.6% in the eastern [36], 0.4% in the western [37], 4.8% in the Littoral Region [38], 1.44% in the center region [39]. Equally, various burden of anti-HCV antibodies have also been reported in community settings worldwide: 0.77% in Romania [40], 1.02% in Sudan [41], 1.2% in Madagascar [42], 2.4%in Iraq [43], 3.6% in India [44], 19.80% in Cairo [45]. It is known that anti-HCV seropositivity from population-based studies is used to compare levels of HCV infection [9]. According to WHO, countries in Africa and Asia have the highest rate of anti-HCV carriage, whereas industrialized countries in North America, Western Europe, and Australia are known to be lower endemic [46–48].

The prevalence of liver impairment (abnormal ASAT+ALAT) was 30.39% (93/306**)** with 40.20% (123/306) of abnormal ALAT. Similar studies in rural setting also portrayed high level of serum ALT: 7.1% in Uganda [49], 7.4%11.2% in Australia [50], 15% in China [51], 22.5% in North Indian [52]. Furthermore, Studies in the USA and Scandinavian revealed about 15% of chronic HCV among liver impaired participants presenting mild to moderate elevations of serum aminotransferase levels for at least 6 months [53, 54]. In fact, serum ALT measurement affords an easily accessible, low cost-effective blood test that is utilized throughout many countries as a liver disease detection tool [20]. ALT is considered as an Indicator of Liver Disease that could globally be used like a valuable screening test for inapparent liver disease, such as asymptomatic viral hepatitis and non-alcoholic fatty liver disease, that still remains largely undiagnosed worldwide [20, 21].

This study portrayed higher prevalence of abnormal level of both ALT + AST as well as abnormal ALT in anti-HCV positive as compared to anti-HCV negative (OR: 3.90 [1.96; 7.79], $p = 0.0001$ and OR: 3.67 [1.91; 7.05], $p = 0.0001$ respectively). Namme et al. in 2015 in Douala, Cameroon found 55.1% (246/444) of ALT above upper limit of normal among anti-HCV positive patients [20]. Also, Raheem et al. in Nigeria in 2021 found that ALT values were significantly elevated in HCV seropositivity [55]. Equally, Méndez-Navarro et al. in Mexico reported 82.6% (289/350) abnormal ALT vs. 17.4% (61/350) normal ALT in 350 consecutive patients with anti-HCV positive between 2003 and 2005 [56]. Many others findings reported higher elevated serum ALT level in anti-AHCV positive individual [57–59]. In fact, the screening for HCV is routinely strongly recommended in patients with elevated ALT levels and vice-versa [60]. On one side, HCVAb are a commonly available serological marker of HCV infection and on other side, it has been shown that high ALT is a marker for liver disease detection [61]. Chronic hepatitis C is likely associated with variable ALT levels, ranging from normal to high and it is reported that persistently normal levels of ALT in patients with hepatitis C correlates with good prognosis notably lower progression and occurrence of complications like cirrhosis [62]. Furthermore, even though an estimated proportion (25%) of HCV patients have persistently normal ALT levels [63], high ALT *level* remains an excellent tool in predicting viremia in anti-HCV-positive patients after excluding other causes of liver disease [8]. This study prompts the reinforcement of the follow up and management of anti-HCV positive individuals with high ALT level in community setting.

Conclusion

This study highlights a highly endemic HCVAb rate as well as a concerning burden of liver impairment in this rural health facility. Interestingly, HCVAb carriage is associated with abnormal liver levels of enzyme (ALT/

AST), especially among the elderly populations. Hence, in the absence of nuclei acid testing, ALT/AST are relevant sentinel markers to screen HCVAb carriers who require monitoring/care for HCV-associated hepatocellular carcinoma in RLS.

Abbreviations

ALT	Alanine transaminase
AST	Aspartate Aminotransferase
HBsAg	Hepatitis B Surface Antigen
HCC	Hepatocellular Carcinoma
HCVAb	Hepatitis C Antibody
HCV RT-PCR	Hepatitis C Virus Retrotranscriptase Polymerase Chain Reaction
HIVAb	Human Immunodeficiency Virus Antibody
PLHCV	People Living with Hepatitis C
MEDIBIO-LAB	Medical Biology
RLS	Resource-Limited Setting
WHO	World Health Organization

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Authors' contributions
Designed the study: RKW, GPT, LAKS, EPTL, DB, JF; Planned and performed the experiments: RKW, GPT, DPDD, GFMT, DB; Analysed and interpreted the data: GPT, DPDD, CIYW; Initiated the manuscript: RKW, GPT, LAKS, DPDD, CIYW, DB, JF; Revised the manuscript: All the authors; Approved the final version of the manuscript: All the authors.

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Availability of data and materials
The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
The study was conducted in accordance with the Declaration of Helsinki. The research proposal was evaluated and ethical clearance was obtained from the Regional Ethics Committee for Research involving Humans of the Center Region Cameroon (CRERSHC, N°: CE01132/CRERSHC, on May 10th, 2021). Additionally, we obtained administrative authorization from the directors of "Sainte Monique" Health Center (Ref N°115/2021/CSGPSM/RS) and MEDIBIO-LAB (N°2021/10/MEDIBIO-LAB/LR) where the study was conducted. An information note was given to all the eligible participants, who then provided their written informed consent before enrollment into the study. The confidentiality of study participants was secured via the use of identification codes.

Consent for publication
Not applicable

Competing interests
The authors declare no competing interests.

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