Prevalence of Hepatitis B and Hepatitis C Infection and Their Associated Factors Among HIV-Infected Individuals in Same-Day Antiretroviral Therapy Initiation Program in Bangkok, Thailand

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Abstract

Background

Viral hepatitis is highly prevalent among people living with HIV (PLHIV) and can lead to chronic liver complications. Thailand started universal hepatitis B vaccination at birth in 1992. We explored prevalence rates of hepatitis B and C and associated factors among PLHIV from same-day antiretroviral therapy (SDART) service at the Thai Red Cross Anonymous Clinic, Bangkok, Thailand.

Methods

We collected baseline characteristics from PLHIV enrolled in the SDART service between July 2017 and November 2019. Multivariate logistic regression was carried out to determine factors associated with positive hepatitis B surface antigen (HBsAg) and hepatitis C antibody (anti-HCV).

Results

We included a total of 4,011 newly diagnosed PLHIV who had HBsAg or anti-HCV results at baseline. Included were 2,941 men who have sex with men (MSM; 73.3%), 851 general population (21.2%), 215 transgender women (TGW; 5.4%), and 4 transgender men (0.1%). Median age was 27 years. Overall seroprevalence of HBsAg and anti-HCV were 6.0% and 4.1%, respectively. Subgroup prevalence rates were 6.2% and 4.7% among MSM, 4.6% and 2.4% among general population, and 9.3% and 3.7% among TGW. Factors associated with HBsAg positivity were being MSM (adjusted odds ratio [aOR] 1.64, 95% confidence interval [CI] 1.13 to 2.40), being TGW (aOR 2.87, 95% CI 1.60 to 5.17), birth year before 1992 (aOR 2.32, 95% CI 1.69 to 3.16), CD4 count < 200 cells/mm³ (aOR 1.38, 95% CI 1.03, 1.86), and alanine aminotransferase ≥ 62.5 U/L (aOR 2.39, 95% CI 1.66 to 3.43). Factors associated with anti-HCV positivity were being MSM (aOR 2.11, 95% CI 1.26 to 3.55), age > 30 years (aOR 1.54, 95% CI 1.10 to 2.17), alanine aminotransferase ≥ 62.5 U/L (aOR 7.74, 95% CI 5.48 to 10.9), creatinine clearance < 60 ml/min (aOR 5.58, 95% CI 1.95 to 16.0), and having syphilis (aOR 1.95, 95% CI 1.36 to 2.78).

Conclusions

Around 5–10% of newly diagnosed PLHIV in Bangkok had hepatitis B infection after 25 years of universal vaccination. Anti-HCV positivity was found in 4–5% of PLHIV who were MSM and TGW. Every PLHIV should be routinely tested for hepatitis B and C and immediately linked to appropriate prevention and treatment interventions.

Background

Hepatitis B virus (HBV) and hepatitis C virus (HCV) infections are prevalent worldwide. In 2015, chronic HBV infection was estimated to be in 3.5% of the world population [1]. People living with HIV (PLHIV) had a higher estimated prevalence rate of 7.4% [1]. In Thailand, a study estimated that 5.1% of the general population was infected with HBV in 2015 [2]. The rates of infection were higher at 8.1% among men who have sex with men (MSM) and 8.1% among PLHIV [2]. A study conducted from 2006 to 2008 reported an infection rate of 13.8% among MSM living with HIV [3]. Worldwide hepatitis C prevalence in 2015 was 1.0%, and among PLHIV was 6.2%, though subgroup prevalence ranged from 82.4% in PLHIV who inject drugs and 6.4% in MSM living with HIV to 2.4% in PLHIV without those risk factors [1]. In Thailand, a national survey of the general population in 2014 showed hepatitis C antibody (anti-HCV) seroprevalence of 0.9% [4]. In contrast, a study focused on PLHIV found that anti-HCV seroprevalence in this population was 7.7% [5].

More than 70% of people infected with HCV and less than 6% of people who acquired HBV as an adult could turn into chronic carriers [1, 6]. Twenty per cent of chronic carriers could develop cirrhosis and hepatocellular carcinoma which are life threatening [1]. Having cofactors such as HIV infection and alcohol use can also accelerate the development of end-stage liver diseases [1, 6]. HBV and HCV are not only transmitted from mother to child but also sexually transmitted and share routes of transmission: percutaneous and mucosal exposures [6, 7]. Having unprotected sex, multiple partners, injection drug use, and a history of other sexually transmitted diseases are important factors associated with HBV acquisition [6]. HCV is transmitted mainly through unsafe healthcare settings and injection drug use [1]. However, sexual transmission of HCV among PLHIV and MSM has been observed [6, 8–12]. MSM and transgender women (TGW) are prone to HCV infection due to the high prevalence of needle sharing either for illicit drugs or cosmetic injections and mucosal trauma associated with anal intercourse [9, 13–16].

Unlike HCV infection, HBV infection is a vaccine-preventable disease. Universal hepatitis B vaccination at birth was integrated into Thailand's Expanded Program on Immunization (EPI) in 1992 [17]. In 2014, a difference in HBV infection rate was seen among population born before 1992 (4.5%) and population born after 1992 (0.6%) [17]. The program reached over 95% coverage in 1999. Nonetheless, in 2014, 55.2% of population born after 1992 still had negative hepatitis B surface antibody, and thus were susceptible to HBV infection [17]. National HIV treatment guidelines recommended baseline screening of newly diagnosed PLHIV with hepatitis B surface antigen (HBsAg) and anti-HCV, as HBV and HCV coinfections are commonly found and play a role in selecting antiretroviral therapy regimens [18].

The Thai Red Cross Anonymous Clinic (TRCAC) is the largest testing center for HIV and sexually transmitted infections in Bangkok, Thailand. Eligible clients who test positive for HIV are included in the same-day antiretroviral therapy (SDART) service [19]. Because this service includes a mixed population consisting of general population, MSM, TGW, and TGM, this study aimed to explore prevalence rates and associated risk factors of HBV and HCV seropositivity among PLHIV in the SDART service and prompt providers to consider management plans according to the risk factors.

Methods

This study is a cross-sectional descriptive study collecting demographic and laboratory data of clients in the SDART service from 13 July 2017 to 30 November 2019. Included in this study were PLHIV newly diagnosed at TRCAC who tested for either HBsAg or anti-HCV at baseline. Demographic data included gender, age, birth year, educational level, residential location, and level of income. Persons born in or after 1992 were classified as “born after EPI,” and persons born before 1992 were “born before EPI.” This translates to the age of 25 years for individuals who tested in 2017, 26 in 2018, and 27 in 2019. Baseline laboratory tests included HBsAg, anti-HCV, CD4 count, alanine aminotransferase (ALT), creatinine clearance (CrCl), treponemal test, and nontreponemal test. A severe decrease in CD4 count was defined as a CD4 count of less than 200 cells/mm³ [20]. Regarding ALT, a cutoff of 62.5 U/L calculated from 1.25 times the upper normal limit of the local laboratory was used to indicate a mild increase [20]. Creatinine clearance was calculated with the Cockcroft-Gault equation and categorized as severely decreased if less than 60 ml/min [20]. Syphilis was diagnosed when the treponemal test (enzyme immunoassay, chemiluminescent microparticle immunoassay, rapid immunochromatographic assay, or treponema pallidum hemagglutination assay) and nontreponemal test (either rapid plasma reagin or venereal disease research laboratory) were both positive. Clients who did not initiate antiretroviral therapy at TRCAC might not have all baseline laboratory test results.

Data analysis

Data were analyzed using Stata Version 15.0. Continuous parameters were presented as median with interquartile range (IQR). Categorical parameters were expressed in frequency and percentages. The prevalence rates of positive HBsAg and anti-HCV were calculated. Univariate and multivariate analyses were carried out to determine factors associated with positive HBsAg and anti-HCV. Univariate analysis comparing HBsAg-positive PLHIV with HBsAg-negative using the simple logistic regression model was tested. Factors with p value of less than 0.2 were carried over to the multivariate analysis. Multivariate analysis with a stepwise multiple logistic regression model including associated factors related to positive HBsAg or anti-HCV was tested and reported with an adjusted odds ratio (aOR) and a 95% confidence interval (CI). A p value of less than 0.05 was considered significant.

Results

The total number of PLHIV who had HBsAg or anti-HCV results at baseline was 4,011 out of 6,037. Specifically, all of 4,011 tested for HBsAg, while 3,990 tested for anti-HCV. Most of them were MSM (73.3%), followed by general population (21.2%), TGW (5.4%), and transgender men (TGM, 0.1%). Median age was 27 years (IQR 23–34). Sociodemographic and laboratory characteristics are shown in Table 1. Of the included clients, 46.0% were born after EPI, 25.9% had a CD4 count of less than 200 cells/mm³, and 19.3% had syphilis diagnosed at baseline.

Table 1
Distribution of HIV-Positive Individuals by Sociodemographic and Laboratory Characteristics

Characteristic	Total n (%) or value	HBsAg Positive n (%) or value	Anti-HCV Positive n (%) or value
Sociodemographic data			
Gender	4011	242	164
MSM	2941 (73.3)	182 (75.2)	136 (82.9)
General population	851 (21.2)	39 (16.1)	20 (12.2)
TGW	215 (5.4)	20 (8.3)	8 (4.9)
TGM	4 (0.1)	1 (0.4)	0 (0.0)
Age (years), median (IQR)	27 (23–34)	31 (26–37)	29 (24–37)
Age (years)	4011	242	164
≤ 20	438 (10.9)	13 (5.4)	8 (4.9)
21–30	2112 (52.7)	107 (44.2)	81 (49.4)
31–40	1016 (25.3)	89 (36.8)	51 (31.1)
41–50	349 (8.7)	27 (11.2)	19 (11.6)
> 50	96 (2.4)	6 (2.5)	5 (3.0)
Birth year	4011	242	164
< 1992	2167 (54.0)	176 (72.7)	105 (64.0)
≥ 1992	1844 (46.0)	66 (27.3)	59 (36.0)
Educational level	2320	138	112
High school or below	794 (34.2)	49 (35.5)	27 (24.1)
College or above	1526 (65.8)	89 (64.5)	85 (75.9)
Residential location	2019	116	99
Bangkok	1381 (68.4)	75 (64.7)	66 (66.7)
Outside Bangkok	638 (31.6)	41 (35.3)	22 (33.3)
Monthly income (baht)	1337	78	62
≤ 10,000	256 (19.1)	7 (9.0)	8 (12.9)

HBsAg, hepatitis B surface antigen; anti-HCV, hepatitis C antibody; MSM, men who have sex with men; TGW, transgender women; TGM, transgender men; ALT, aspartate aminotransferase; CrCl, creatinine clearance.

Characteristic	Total n (%) or value	HBsAg Positive n (%) or value	Anti-HCV Positive n (%) or value
> 10,000	1081 (80.9)	71 (91.0)	54 (87.1)
Laboratory data			
HBsAg	4011	-	164
Positive	242 (6.0)	-	12 (7.3)
Negative	3769 (94.0)	-	152 (92.7)
Anti-HCV	3990	221	-
Positive	164 (4.1)	12 (5.4)	-
Negative	3826 (95.9)	209 (94.6)	-
CD4 count (cells/mm ³)	4004	240	163
< 200	1038 (25.9)	86 (35.8)	37 (22.7)
≥ 200	2966 (74.1)	154 (64.2)	126 (77.3)
ALT (U/L)	3976	219	162
< 62.5	3623 (91.1)	177 (80.8)	98 (60.5)
≥ 62.5	353 (8.9)	42 (19.2)	64 (39.5)
CrCl (ml/min)	3923	213	160
< 60	29 (0.7)	0 (0.0)	5 (3.1)
≥ 60	3894 (99.3)	213 (100.0)	155 (96.9)
Syphilis	3972	225	163
Positive	767 (19.3)	54 (24.0)	54 (33.1)
Negative	3205 (80.7)	171 (76.0)	109 (66.9)
HBsAg, hepatitis B surface antigen; anti-HCV, hepatitis C antibody; MSM, men who have sex with men; TGW, transgender women; TGM, transgender men; ALT, aspartate aminotransferase; CrCl, creatinine clearance.			

The overall prevalence of positive HBsAg was 6.0%. TGW had a prevalence of 9.3%, followed by MSM, 6.2%. People born after the EPI (in or after 1992) had a prevalence of 3.6% as compared to 8.1% in people born before the EPI.

Regarding HCV infection, the overall anti-HCV seroprevalence was 4.1%. MSM carried the highest prevalence among all study population (4.7%). People aged over 30 years had a prevalence of 5.2%, while it was 3.5% among people younger than 30 years. Of 3,990 who tested for both HBsAg and anti-HCV, 12 (0.3%) were positive for both. They were counted toward the HBsAg-positive and anti-HCV-positive groups according to their viral hepatitis profile. Overall and age-stratified prevalence of HBsAg and anti-HCV are shown in Table 2.

Table 2
Overall and Age-Stratified Prevalence of Hepatitis B Surface Antigen and Hepatitis C Antibody

Age (Years)	HBsAg		Anti-HCV	
	No. of HBsAg+ / No. of Tested	%	No. of Anti-HCV+ / No. of Tested	%
Overall	242/4011	6.0	164/3990	4.1
≤ 20	13/438	3.0	8/435	1.8
21–30	107/2112	5.1	81/2106	3.8
31–40	89/1016	8.8	51/1007	5.1
41–50	27/349	7.7	19/346	5.5
> 50	6/96	6.3	5/96	5.2
HBsAg, hepatitis B surface antigen; anti-HCV, hepatitis C antibody				

Factors found significant at the 95% confidence level from the univariate analysis were carried over to the multivariate analysis as presented in Table 3 and Table 4. Factors associated with positive HBsAg were being MSM (adjusted odds ratio [aOR] 1.64, 95% CI 1.13 to 2.40, $p = 0.010$), being TGW (aOR 2.87, 95% CI 1.60 to 5.17, $p < 0.001$), being born before 1992 (aOR 2.32, 95% CI 1.69, 3.16, $p < 0.001$), CD4 count < 200 cells/mm³ (aOR 1.38, 95% CI 1.03 to 1.86, $p = 0.031$), and ALT ≥ 62.5 U/L (aOR 2.39, 95% CI 1.66 to 3.43, $p < 0.001$). Factors associated with positive anti-HCV were being MSM (aOR 2.11, 95% CI 1.26 to 3.55, $p = 0.005$), age > 30 years (aOR 1.54, 95% CI 1.10 to 2.17, $p = 0.012$), ALT ≥ 62.5 U/L (aOR 7.74, 95% CI 5.48 to 10.9, $p < 0.001$), CrCl < 60 ml/min (aOR 5.58, 95% CI 1.95 to 16.0, $p = 0.001$), and syphilis positive (aOR 1.95, 95% CI 1.36 to 2.78, $p < 0.001$).

Table 3

Hepatitis B Surface Antigen Prevalence in HIV-Infected Individuals and Associated Factors Assessed by Univariate and Multivariate Analyses

Factor	No. of HBsAg+ / No. of Tested	%	Univariate		Multivariate [†]	
			Crude OR (95% CI)	p	Adjusted OR (95% CI)	p
Gender	4011					
General population	39/851	4.6	Reference		Reference	
MSM	182/2941	6.2	1.37 (0.96 to 1.96)	0.079	1.64 (1.13 to 2.40)	0.010
TGW	20/215	9.3	2.14 (1.22 to 3.74)	0.008	2.87 (1.60 to 5.17)	< 0.001
TGM	1/4	25.0	6.94 (0.71 to 68.3)	0.097	5.77 (0.57 to 58.7)	0.138
Birth year	4011					
< 1992	176/2167	8.1	2.38 (1.78 to 3.18)	< 0.001	2.32 (1.69 to 3.16)	< 0.001
≥ 1992	66/1844	3.6	Reference		Reference	
Monthly income (baht)	1337					
≤ 10,000	7/256	2.7	Reference			
> 10,000	71/1081	6.6	2.50 (1.14 to 5.50)	0.023		
Residential location	2019					
Bangkok	75/1381	5.4	Reference			
HBsAg, hepatitis B surface antigen; CI, confidence interval; anti-HCV, hepatitis C antibody; ALT, alanine aminotransferase; CrCl, creatinine clearance.						
[†] n = 3974						

Factor	No. of HBsAg+ / No. of Tested	%	Univariate		Multivariate [†]	
			Crude OR (95% CI)	p	Adjusted OR (95% CI)	p
Outside Bangkok	41/638	6.4	1.20 (0.81 to 1.77)	0.372		
Educational level	2320					
College or above	89/1526	5.8	Reference			
High school or below	49/794	6.2	1.06 (0.74 to 1.52)	0.743		
Anti-HCV	3990					
Negative	209/3826	5.5	Reference			
Positive	12/164	7.3	1.37 (0.75 to 2.50)	0.311		
CD4 count (cells/mm ³)	4004					
< 200	86/1038	8.3	1.65 (1.25 to 2.17)	< 0.001	1.38 (1.03 to 1.86)	0.031
≥ 200	154/2966	5.2	Reference		Reference	
ALT (U/L)	3976					
< 62.5	177/3623	4.9	Reference		Reference	
≥ 62.5	42/353	11.9	2.63 (1.84 to 3.75)	< 0.001	2.39 (1.66 to 3.43)	< 0.001
CrCl (ml/min)	3923					
< 60	0/29	0.0	-			
HBsAg, hepatitis B surface antigen; CI, confidence interval; anti-HCV, hepatitis C antibody; ALT, alanine aminotransferase; CrCl, creatinine clearance.						
[†] n = 3974						

Factor	No. of HBsAg+ / No. of Tested	%	Univariate		Multivariate [†]	
			Crude OR (95% CI)	p	Adjusted OR (95% CI)	p
≥ 60	213/3894	5.5	-	-		
Syphilis	3972					
Negative	171/3205	5.3	Reference			
Positive	54/767	7.0	1.34 (0.98 to 1.84)	0.067		
HBsAg, hepatitis B surface antigen; CI, confidence interval; anti-HCV, hepatitis C antibody; ALT, alanine aminotransferase; CrCl, creatinine clearance.						
[†] n = 3974						

Table 4
Hepatitis C Antibody Prevalence in HIV-Infected Individuals and Associated Factors Assessed by
Univariate and Multivariate Analyses

Factor	No. of Anti-HCV+ / No. of Tested	%	Univariate		Multivariate [†]	
			Crude OR [95% CI]	p	Adjusted OR [95% CI]	p
Gender	3990					
General population	20/849	2.4	Reference		Reference	
MSM	136/2923	4.7	2.02 (1.26 to 3.25)	0.004	2.11 (1.26 to 3.55)	0.005
TGW	8/214	3.7	1.61 (0.70 to 3.71)	0.263	1.78 (0.74 to 4.30)	0.199
TGM	0/4	0.0	-	-	-	-
Age	3990					
≤ 30	89/2541	3.5	Reference		Reference	
> 30	75/1449	5.2	1.51 (1.10 to 2.06)	0.011	1.54 (1.10 to 2.17)	0.012
Monthly income (baht)	1330					
≤ 10,000	8/256	3.1	Reference			
> 10,000	54/1074	5.0	1.64 (0.77 to 3.49)	0.199		
Residential location	1999					
Bangkok	66/1367	4.8	Reference			

Anti-HCV, hepatitis C antibody; CI, confidence interval; ALT, alanine aminotransferase; CrCl, creatinine clearance.

[†]n = 3901

Factor	No. of Anti-HCV+ / No. of Tested	%	Univariate		Multivariate [†]	
			Crude OR [95% CI]	p	Adjusted OR [95% CI]	p
Outside Bangkok	33/632	5.2	1.09 (0.71 to 1.67)	0.706		
Educational level	2301					
College or above	85/1514	5.6	Reference	0.022		
High school or below	27/787	3.4	0.60 (0.38 to 0.93)			
CD4 count (cells/mm ³)	3985					
< 200	37/1027	3.6	Reference			
≥ 200	126/2958	4.3	1.19 (0.82 to 1.73)	0.360		
ALT (U/L)	3975					
< 62.5	98/3623	2.7	Reference		Reference	
≥ 62.5	64/352	18.2	7.99 (5.71 to 11.2)	< 0.001	7.74 (5.48 to 10.9)	< 0.001
CrCl (ml/min)	3923					
< 60	5/29	17.2	5.03 (1.89 to 13.3)	0.001	5.58 (1.95 to 16.0)	0.001
≥ 60	155/3894	4.0	Reference		Reference	
Syphilis	3965					
Negative	109/3203	3.4	Reference		Reference	
Anti-HCV, hepatitis C antibody; CI, confidence interval; ALT, alanine aminotransferase; CrCl, creatinine clearance.						
[†] n = 3901						

Factor	No. of Anti-HCV+ / No. of Tested	%	Univariate		Multivariate [†]	
			Crude OR [95% CI]	p	Adjusted OR [95% CI]	p
Positive	54/762	7.1	2.16 (1.55 to 3.03)	< 0.001	1.95 (1.36 to 2.78)	< 0.001
Anti-HCV, hepatitis C antibody; CI, confidence interval; ALT, alanine aminotransferase; CrCl, creatinine clearance.						
[†] n = 3901						

Discussion

Among PLHIV who were newly diagnosed at the largest HIV testing center in Bangkok, we found 6% prevalence of HBV and 4% prevalence of anti-HCV positivity. Being MSM, TGW, and born before the inclusion of universal hepatitis B vaccination in Thailand's EPI were associated with HBV infection. Moreover, being MSM and having syphilis increased the chance of being anti-HCV positive.

More than 70% of our population were MSM, and 5% were TGW, reflecting proportions of new HIV infections in Thailand as projected by the AIDS Epidemic Model [21]. We found the HBV prevalence to be highest among TGW (9%), followed by MSM (6%). The anti-HCV seroprevalence was highest among MSM (5%), followed by TGW (4%). These data confirmed findings from previous studies which demonstrated higher prevalence rates of HBV and HCV among PLHIV who were MSM and TGW than those who were general population [1, 15, 22–25]. The HBV prevalence shown in our population is quite concerning as almost half of them were born after EPI, indicating that the HBV epidemic is still ongoing. Nevertheless, the prevalence of HBV and HCV found in our study were slightly lower than that of the global and Thai reports among PLHIV [1, 2, 5], likely due to the younger age of our population. Apart from viral hepatitis, almost 20% of our clients had syphilis at baseline, showing higher burden than what was reported in general MSM population by World Health Organization (WHO; 6%) in 2018 [26].

MSM and TGW had 1.6 and 2.9 times higher odds of HBV infection than the general population, respectively, which could be explained by sexual practices and routes which are more prone to mechanical trauma [27]. Consistent with the national survey [17], we saw a contrast of HBV prevalence between people who were born before and after EPI (8% vs. 4%). PLHIV who were born before EPI had 2.3 times higher odds of having HBV infection. Another explanation of the association to birth year would be that younger people had less time exposed to the infection than older people. Nonetheless, this study exhibited that HBV infection was not completely eliminated by the EPI. Some newborns might be born to an HBV-infected mother, not complete the full course of the immunization, not respond to HBV vaccination, or be unvaccinated. Regarding PLHIV who do not have immunity to HBV, it is advised to

immunize all PLHIV regardless of CD4 level [18], even though the lower CD4 count is one of the factors affecting the effectiveness of the HBV immunization [28–30].

We found that being MSM and having syphilis each increases the risk of having positive anti-HCV by around two times in our study. There are many reports of the HCV epidemic among MSM living with HIV in major cities of the world in Europe, Asia-Pacific, and Thailand [8–10, 31–37], and many findings demonstrated an upward trend of HCV infection [9, 31–37]. For example, a study in Thailand found that HCV incidence increased from 0.7–1.1 per 100 person-years in 2014–2016 to 4.5 per 100 person-years in 2018 [31]. HCV infection is widely known as associated with recreational drug use [9, 10, 31, 32, 36, 38–41], as some MSM utilize recreational drugs to improve their sexual pleasure, so-called chemsex [43, 44]. Studies on people who did not use injection drugs found that HCV infection was still associated with recreational drug use and syphilis [34, 36, 45], suggesting transmission of HCV associated with sexual encounter. Unfortunately, we did not collect data on substance use and chemsex systematically in our study and could not look at these potential associations. However, as MSM and syphilis were key factors associated with HCV infection among our clients, we hypothesized that HCV acquisition in our HIV-positive MSM population was likely linked to sexual transmission and possibly in the chemsex context.

There were a few limitations in this study. This study was conducted at one site and two-thirds of our PLHIV clients lived in Bangkok. Thus, our study population might not represent the overall population of PLHIV in Thailand. We could not retrieve hepatitis B vaccination history from original medical records, and therefore needed to use PLHIV clients' birth year as a surrogate. We did not record substance use and chemsex data and could not explore their associations with HBV and HCV infections in our study. Lastly, we did not perform HCV RNA in anti-HCV-positive clients; therefore, the observed anti-HCV seroprevalence may be higher than the actual infection rate.

WHO aimed to eliminate hepatitis B and C infections by 2030 [46]. To achieve this, a country must target the areas determined to have beneficial impacts as described in Table 5 [46, 47]. In Thailand, HBV vaccination has reached 95% coverage since 1999 [17]. However, Thailand's diagnosis and treatment coverage of HBV and HCV are far from the target [47]. From the results of this study, HBV and HCV screening of everyone living with HIV regardless of age would uncover a high proportion of undiagnosed infections and be a chance to bring them to treatment. Testing more undiagnosed PLHIV would also bring in more undiagnosed people living with HBV and HCV. PLHIV without HBV infection should be assessed for the need of HBV vaccination or booster. Costs of HCV genotyping and treatment have been high, but the voluntary licensing of pan-genotypic direct-acting antiretroviral (DAA) medications is becoming implemented in Thailand [48]. However, the current restriction to only start DAA in individuals with fibrosis METAVIR Stage F2 means that individuals with HCV can continue to transmit the virus to others. Future studies will need to explore strategies to timely and efficiently test and treat HCV, especially among PLHIV, to contribute to the elimination of HCV.

Table 5
Global Baseline and Thailand's Progress Toward the Elimination of Hepatitis B and C by 2030

Target Area	Global Baseline 2015	Thailand Estimates 2019	WHO Target 2030
HBV birth dose	38%	99%	90%
HBV 3 + doses	82%	97%	90%
Blood safety	89%	100%	100%
Injection safety	5%	100%	90%
Syringes per PWID [†]	20	24	300
HBV diagnosed	< 5%	7%	90%
HBV treated	< 1%	1%	80%
HCV diagnosed	< 5%	36%	90%
HCV treated	< 1%	11%	80%
WHO, World Health Organization; HBV, hepatitis B virus; PWID, person who injects drugs; HCV, hepatitis C virus			
[†] Number of sterile needles and syringes provided per person who injects drugs per year			

Conclusions

Thailand's EPI has successfully reduced HBV infection. However, the infection rate among newly diagnosed PLHIV remained at around 5–10%. Hepatitis C infection was found in 4–5% of PLHIV who were MSM and TGW. These findings highlight the need for routine HBV and HCV screening for all PLHIV regardless of age, along with immediate linkages to appropriate prevention and treatment interventions.

List Of Abbreviations

aOR, adjusted odds ratio

CI, confidence interval

CrCl, creatinine clearance

ALT, alanine aminotransferase

Anti-HCV, hepatitis C antibody

DAA, direct-acting antiretroviral

EPI, Expanded Program on Immunization

HBsAg, hepatitis B antigen

HBV, hepatitis B virus

HCV, hepatitis C virus

IQR, interquartile range

MSM, men who have sex with men

PLHIV, people living with HIV

SDART, same-day antiretroviral therapy

TGW, transgender women

TRCAC, Thai Red Cross Anonymous Clinic

WHO, World Health Organization

Declarations

Ethics approval and consent to participate

The Same-Day Antiretroviral Therapy Initiation protocol (NCT04032028) was approved by the Institutional Review Board of the Faculty of Medicine, Chulalongkorn University with Approval Number 158/56. Institutional Review Board of the Faculty of Medicine, Chulalongkorn University has waived the informed consent for the study. All methods were carried out in accordance with relevant guidelines and regulations.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

ST, TC, SA, TP, AA, PP, RR, and NP contributed to the design and concept of the study. ST, TC, SA, and MS contributed the data. JP and SA extracted and prepared the data. ST and JP analyzed the data. ST wrote the manuscript. TC, PS, AA, MA, and NP assisted in interpretation of the data, provided intellectual input, and provided edits. All authors have reviewed and approved the final version.

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