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Prevalence of hepatitis C viral infection in Ghana: a systematic review and meta-analysis

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Abstract

Background Hepatitis C virus (HCV) infection remains a public health threat in Ghana. Current epidemiological data is imperative for shaping policy and designing evidence-driven interventions, with particular focus on advancing the STOP Hepatitis C initiative led by the Ghana Ministry of Health.

Objective This systematic review aimed to synthesize evidence on the HCV epidemiological data in Ghana from 2016 to 2025, highlighting population-level and regional variations, identifying high-risk groups, and examining changes in HCV prevalence over the years.

Methods The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines and the Joanna Briggs Institute methodology. The protocol was registered in the PROSPERO (CRD42024592505). A comprehensive search was conducted across PubMed, Embase (via Ovid), Web of Science, CINAHL and African Journals Online. Data extraction and quality assessment were performed using standardized tools**.** A total of 53 studies were used for this review with a combined sample size of 487,106 across 12 regions of Ghana.

Results Meta-analyses using random-effects models revealed an overall pooled national HCV prevalence of 6.04% (95% CI: 3.94% – 8.15%) with significant heterogeneity ($I^2 = 99.9\%$, $P < .00001$). Regional disparities were evident, with the Northern Region having the highest prevalence of 20.9% (95% CI: 10.7% – 31.1%) and the Central Region having the least (1.3%, 95% CI: 0.8% – 1.7%). Subgroup analyses indicated HCV prevalence of 10.9% (95% CI: 7.2% – 14.6%) among patients with liver diseases, 6.4% (95% CI: 5.2% – 7.4%) in blood donors, 1.9% (95% CI: 0.9% – 2.3%) in pregnant women and 1.4% (95% CI: 0.7%—2.1%) in PLHIV. Comparatively, the prevalence observed in our study (6.04%) is higher than previously reported in 2016 (3.0%).

Conclusion This systematic review provides a comprehensive update on the burden of HCV in Ghana, revealing significant regional and population-level disparities. Substantial financial intervention is required for the STOP Hep C campaign, along with the inclusion of HCV-RNA testing in the National Health Insurance Scheme (NHIS) to enhance access to diagnosis. These measures will greatly strengthen the drive towards eliminating hepatitis C by 2030.

Keywords Hepatitis C, Prevalence, Ghana, Systematic reviews, Meta-analysis

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Introduction

Hepatitis C virus (HCV) infection remains a serious public health concern worldwide [1–6]. Approximately 50 million people globally suffer from chronic HCV infection (i.e. positive anti-HCV antibody test), and more than 1.0 million new infections are reported each year [4]. Liver cirrhosis, hepatocellular carcinoma, and ascites are a few of the complications of chronic HCV infection [4, 7, 67] An estimated 17% of the 1.3 million hepatitis-related deaths that occur each year are caused by chronic HCV infection [4] Although there are regional differences in HCV prevalence, the World Health Organization's Africa region has one of the highest disease burdens, with over 8 million people living with the disease [4]. A recent study of HCV seroprevalence in Sub-Saharan Africa was estimated to be 2.30% (95% CI: 1.59–3.00) with regional variation: Africa-Southern (0.79%), Africa-Central (1.47%), Africa-Eastern (2.71%), and Africa-Western (2.88%) [8]. Furthermore, review reports in Africa also document HCV prevalence of 1.65% in Burkina Faso [9], 3.1% in Ethiopia [10] and 5.7% in Rwanda [11]. In Nigeria, HCV seroprevalence rates are 15.2%, 6.6%, and 13.8% among patients, healthcare workers, and the general population respectively [12, 13].

HCV is a bloodborne pathogen which mainly affects the liver. The virus is mostly transmitted through direct blood contact, unsafe injection practices, mother-to-child transmission, inadequate sterilization of medical equipment, unsafe sexual practices, HCV infected blood for transfusions, organ transplantation and injection drug use, just to mention a few [4]. In contrast to hepatitis B viral infection, which is preventable via vaccination, there is currently no effective vaccine against hepatitis C virus. Direct-acting antiviral medicines (DAAs) can however be used to cure more than 95% of people with hepatitis C viral infection [4].

A recent nationwide cross-sectional survey which primarily focused on hospital-based blood bank and laboratory registers in Ghana estimated a national HCV prevalence rate of about 4.6% in a population of 35 million [14]. There are however variations in the prevalence rate of HCV among the various regions with the Northern sector having the highest seroprevalence range between 8.6–14.4% [14]. Certain traditional practices, such as the scarification of the face and other body parts during the first few weeks of life for tribal and family identification, spiritual fortification, and the use of traditional medicines, are contentiously attributed to the higher infection rate in the northern regions of Ghana than southern Ghana [15–17]. Intervention such as the Screening and Treatment Opportunity Project for Hepatitis C (STOP hep C) in Ghana ought to be driven by epidemiological data to identify priority populations and geographical areas of concerns. This project was launched in March 2023 to create nationwide HCV awareness, screening and linkage of persons who test positive to free treatment with the aim of eliminating HCV in Ghana by the year 2030 [18, 19].

Two previous reviews on hepatitis C epidemiology have been done in Ghana. However, the first study by Agyeman et al. [20]was done a decade ago while the latter by Tantuoyir et al. [21] differs from this review in terms of scope and objectives.

In the light of Ghana's strategic objective of pursuing HCV micro-elimination through the prioritization of intervention programmes directed at high-risk and vulnerable populations, this review, which synthesizes data on disease prevalence assumes critical significance as an evidentiary foundation for policy formulation and programme design.

Materials and methods

The Joanna Brigg's Institute's Critical Appraisal Checklist for Analytical Cross-sectional Studies [22]was used for this study (S1). This review was also designed in line with the internationally Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines [23] (S2). It also followed the Meta-analysis of Observational Studies in Epidemiology (MOOSE) approach [23–25]. Furthermore, the protocol for this review has been registered in the PROSPERO database (CRD42024592505).

Review questions

The review addresses four questions: 1) what is the prevalence of hepatitis C infection in Ghana?, 2) are there variations in hepatitis C prevalence among sub-groups?, 3) what extent does hepatitis C prevalence differ among the sixteen [16] regions of Ghana? and 4) has the prevalence rate of hepatitis C infection changed over the years from 2016?.

Inclusion and exclusion criteria

The prevalence of hepatitis C in both the general population and different population strata were the key sources of data included in this study. Published articles and follow-up studies with an outcome related to hepatitis C prevalence in the Ghanaian population that were published between 2016 to 2025 were eligible for inclusion in this review. Additionally, conference presentations that provided sufficient information about the prevalence of hepatitis C in Ghana were considered for eligibility. There was consideration for only articles published in the English language. Multicenter research involving Ghanaian participants across various regions and districts were included only when there was sufficient statistical information on the prevalence of HCV in Ghana. Prevalence studies done in various minority groups in Ghana such

as blood donors, injection drug users (IDU), sex workers, men who sleep with men, barbers and nail cutters, healthcare workers, pregnant women and children, and persons living with hepatitis B, HIV, and syphilis were also included.

Articles considered for exclusion were clinical trials, case–control studies, qualitative or intervention studies, case reports, and case series that do not report absolute population or sub-population prevalence estimates of HCV. Furthermore, editorials, commentary, letters to the editor, author replies, animal studies, or review or modelling studies that did not provide original HCV prevalence outcomes were excluded. Systematic reviews, rapid reviews, scoping reviews, and protocols were also excluded.

Search strategy

A systematic literature search was performed in the major electronic databases and search engines; PubMed, Embase (via Ovid), Web of Science, CINAHL, and African journals online (AJOL). For grey literature, the authors scrutinized the results in advanced Google Scholar searches in addition to local thesis repositories. Furthermore, a snowballing technique was applied to analyze the bibliographies of all the eligible studies to identify additional notable publications [26]. A revised approach with search terms specifying and targeting the defined population, intervention (not applicable in this case), defined outcome of interest, and required study setting was used to screen all study titles and abstracts [23]. The search strategy (S3) used a combination of keywords such as "prevalence", "burden", "hepatitis C", "HCV" and "Ghana" linked by the Boolean operators "OR" and "AND" in our search for the articles ("Prevalence" OR "Burden") AND ("Hepatitis C" OR "HCV") AND "Ghana") [27].

The Database of Abstracts of Reviews of Effects (DARE) (http://www.library.UCSF.edu) and PROSPERO databases were also searched to check for the presence of similar articles related to the topic even before starting the journal search. The literature search, eligible study selection, data extraction, data analysis, and result reporting were done in accordance with the PRISMA guidelines [23]. The searched articles were imported to Mendeley Desktop 1.19.4, followed by the identification and removal of all duplicate reports originating from multiple sources [25]. Two independent co-authors accessed and pre-screened the articles and abstracts returned from the database queries to flag non-suitable or extraneous reports for exclusion. Subsequently, full-text reports of the pre-screened and selected studies were retrieved and scrutinized by the two co-authors who worked independently to ensure that there was conformity to the stated inclusion criteria. Any identified inconsistencies in the outcome of the independent screening were resolved by consensus between the two authors. Relevant data from selected studies was extracted into a standardized Microsoft Excel template (S4). As per the PRISMA guidelines, the reason for excluding any article during the screening process was documented and reported [25].

Data extraction

All relevant data was retrieved from selected full-text articles using a standardized extraction form (S5). Details of publication such as study title, author names, year of publication, study setting, study objectives, study design, study population, sample size, and key findings were documented. When one study had multiple publications, only the most informative manuscripts were retained. Moreover, where prevalence estimates were reported for the same population using the same methods across multiple time points, only data for the most recent time point was extracted [28]. All studies were assessed for potential risk of bias using the Joanna Briggs Institute validated tool for analytical cross-sectional studies [22]. The purpose of this appraisal was to determine the methodological quality of a study and to assess the extent to which the study addressed the potential risk of bias in its design, conduct, and analysis.

All articles selected for inclusion in the systematic review were subjected to rigorous appraisal by two critical independent appraisers who indicated an overall appraisal result of 'include', 'exclude' or 'seek further information'. The assessment focused on several key areas, such as the clarity of the criteria for sample inclusion, the detailed description of the study participants and setting, the validity and reliability of the exposure measurement, the use of objective, standard criteria for condition measurement, and the identification and mitigation of confounding factors. Where there were disagreements, consensus was built among the authors. Reports with scanty details was classified as "limited," and the primary investigators will be contacted for additional information.

Data synthesis and analysis

Meta-analyses for the prevalence of Hepatitis C Virus (HCV) in Ghana were conducted using random-effects models with a weighted mean difference (WMD) in Review Manager version 5.4. The I^2 statistic was used to assess the percentage of variation across studies due to heterogeneity, with values of 25%, 50%, and 75% indicating low, moderate, and high levels of heterogeneity, respectively. For statistical analysis, the odds ratios (ORs) for HCV prevalence were pooled, and the significance of the estimates was evaluated using *p*-values. *P*-values below 0.05 were considered statistically significant. The prevalence was calculated by dividing the number

of individuals in that subgroup who tested positive to HCV-antibody test by the total number of individuals in the same subgroup. This gives the proportion of the subgroup affected by HCV.

Sensitivity analyses, using the leave-one-out method, were performed to assess the impact of individual studies on the overall results and investigate the sources of heterogeneity. The sensitivity analysis was performed to evaluate the influence of each included study on the pooled HCV prevalence estimate. Each point in the figure represents the pooled prevalence after omitting one study; horizontal bars are the 95% confidence intervals. The dashed red line marks the overall pooled prevalence based on all studies.

Risk of bias assessment

The quality of each study was assessed using the Joanna Briggs Institute (JBI) Validation Tool for analytical cross-sectional studies. This tool evaluates studies across eight key criteria: sample representativeness, recruitment method, sample size adequacy, description of participants and setting, reliable HCV measurement, standardized data collection, appropriate statistical analysis, and low non-response bias. Each criterion was scored with a "Yes" for low risk of bias or a "No" for high risk of bias. The total score for each study was calculated by summing the number of "Yes" responses, with a threshold system to categorize the overall risk of bias. Studies that met 75% or more of the criteria (6–8 "Yes" responses) were classified as having a low risk of bias, while studies that met 50–74% of the criteria (4–5 "Yes" responses) were considered to have a moderate risk of bias. Studies that met fewer than 50% of the criteria (0–3 "Yes" responses) were considered to have a high risk of bias. Publication bias was assessed subjectively through funnel plots and objectively using Begg's and Egger's tests. A p-value of < 0.05 in these tests was considered indicative of significant publication bias.

Results

Study selection

We identified 1,516 records from our search across various databases: PubMed ($n = 260$), Embase ($n = 90$), Web of Science ($n = 48$), CINAHL ($n = 225$), and Google Scholar ($n = 893$). After removing duplicates ($n = 130$), 1,386 articles were screened based on their titles and abstracts. Of these, 1,087 articles were excluded based on the title and abstract review.

A total of 299 Full-text articles were assessed for eligibility. After Further review, 242 full-text articles were excluded for the following reasons: no HCV prevalence estimates ($n = 140$), unrelated study objectives ($n = 62$), no relevant outcomes of interest ($n = 20$), review articles ($n = 22$), ineligible study designs ($n = 3$), and editorials ($n = 3$). Finally, 49 articles were included for review. Additionally, 4 articles were identified through other sources, bringing the total number of studies included to 53. The reasons for the exclusion of full-text articles are detailed in Fig. 1.

Risk of bias

Based on the JBI evaluation, the overall risk of bias for the included studies were determined, with most studies falling into the low-risk category, indicating that they were generally of high quality. However, a few studies were identified with moderate risk of bias, primarily due to issues with non-response bias or lack of standardized data collection methods. The results of this assessment help to provide a clearer picture of the reliability and potential limitations of the included studies (Table 1).

Study characteristics

The characteristics of the included studies are presented in Table 1. The total sample size across all studies ranged from 89 to 162,000 participants, with a variety of study designs, including retrospective studies, cross-sectional studies, and multi-center studies. The studies were conducted across different regions in Ghana, including Central [7, 29, 30, 44, 45, 54, 57, 67], Greater Accra [31, 35–37, 43, 46, 52, 60, 61, 63, 67], Ashanti [33, 34, 56, 59, 67, 67, 67, 67], Volta [38, 50, 55, 62, 65, 67], and Northern [32, 42, 64, 66] regions. Most studies focused on specific populations, such as blood donors [14, 32, 42, 49–51, 53, 55, 56, 59, 61, 67, 67, 67, 67], people living with HIV (PLHIV) [31, 33, 44–47, 65, 67], pregnant women [38, 41, 48, 57, 67, 67], patients with liver diseases [39, 40, 52, 58, 63, 64, 66, 67, 67], barbers and mobile nail cutters [34, 67, 67], head porters and people who inject drugs (PWID) [67]. The most prevalent diagnostic tool used in these studies was HCV- antibody test while a few studies used HCV-RN [31, 37].

The reported prevalence of HCV varied widely, ranging from 0.00% to 28.00%, with some studies conducted across regions providing pooled prevalence estimates. Study sample sizes varied significantly, with the largest being a nationwide cross-sectional hospital-based study with a sample size of 162,000 using laboratory and blood bank registers. The smaller studies focused on more targeted populations, such as 90 newly diagnosed PLHIV or 200 psychiatric patients. In terms of regional distribution, a substantial number of studies were conducted in Greater Accra ($n = 11$), Central ($n = 9$), Ashanti ($n = 8$), Volta [6] and the Northern region ($n = 4$).

Table 2 summarises the prevalence rates of the 53 studies used to estimate the national pooled prevalence of HCV in Ghana. The studies also included diverse populations, such as individuals with chronic diseases (e.g., liver cirrhosis, sickle cell disease, kidney disease), vulnerable

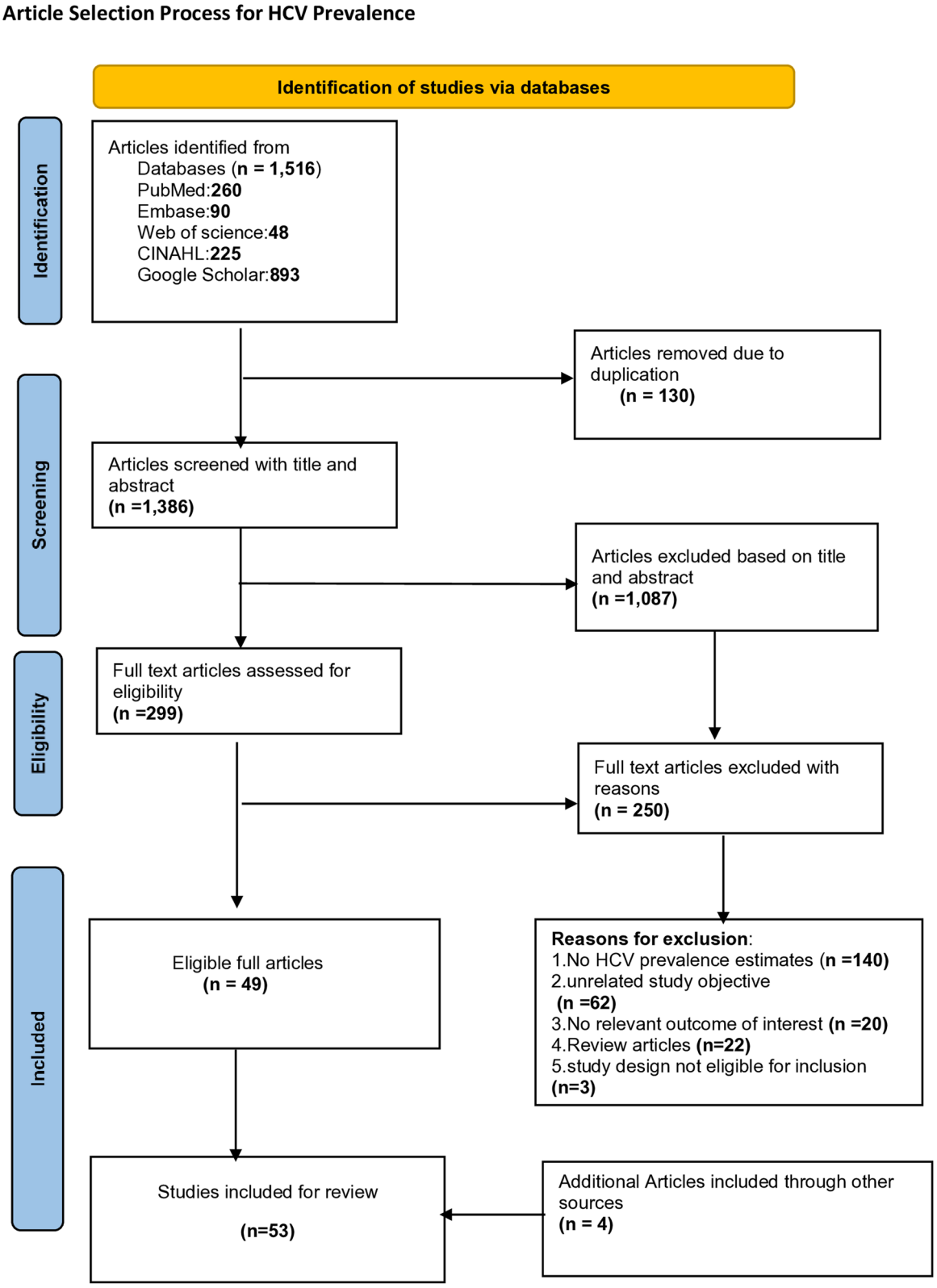

Fig. 1 Article selection process using the PRISMA flowchart for prevalence of HCV in Ghana

Table 1 Characteristics of included studies on HCV prevalence in Ghana

Author (Year)	Study Design	Sample Size (n)	Population Type	Region	HCV Diagnostic method	Risk of Bias
Adanusa M et al. (2023) [29]	Retrospective Study	6006	General Patients of Cape Coast Teaching hospital	Central Region	HCV Antibody test	Low
Tawiah BO et al. (2019) [30]	Cross-sectional study	200	Psychiatric Patients	Central Region	HCV Antibody Test	Low
Torpey K et al. (2021) [31]	Cross-sectional study	4023	PLHIV	Greater Accra	HCV-RNA Test	Low
Muktar AT et al. (2023) [32]	Multi-centre Retrospective study	123,152	Blood donors	Northern Region	HCV Antibody Test	Low
Boateng R et al. (2019) [33]	Cross-sectional study	400	PLHIV	Ashanti Region	HCV Antibody Test	Moderate
Berko D et al. (2022) [34]	Descriptive cross-sectional study	300	Barbers & Mobile Nail Cutters	Ashanti Region	HCV Antibody Test	Low
Birjandi MM & Oroe M (2020) [35]	Cross-sectional study	728	Out-patient clinic at a polyclinic	Greater Accra	HCV Antibody Test	Moderate
Nartey YA et al. (2023) [14, 19]	Multi-centre cross-sectional study	103,609	Records from Blood donors and public labs	Nationwide	HCV Antibody Test	Low
Duedu KO et al. (2021) [36]	Cross-sectional study	200	Children attending PMC Hospital	Greater Accra	HCV Antibody test	Low
Mawuli G et al. (2022) [37]	Cross-sectional Study	141	Patients with Sickle cell disease	Greater Accra	HCV- RNA Test	Low
Abuku VG et al. (2023) [38]	Cross-sectional retrospective study	250	Pregnant women	Volta Region	HCV Antibody test	Low
Nartey YA et al. (2022) [7, 39, 40]	Cross sectional retrospective study	174	Patients who died from liver cirrhosis and HCC	Central Region	HCV Antibody test	Low
Volker F et al. (2017) [41]	Cross-sectional study	180	Pregnant women	Western Region	HCV Antibody test	Low
Frempong MT et al. (2019) [76]	Cross-sectional study	248	PLHIV	Brong Ahafo Region	HCV Antibody test	Low
Nlankpe AM et al. (2021) [42]	Retrospective study	8605	Blood donors	Northern Region	HCV Antibody test	Moderate
Yakass MB et al. (2016) [43]	Retrospective cohort study	229	People with infertility	Greater Accra	HCV Antibody test	Low
Pappoe F et al. (2019) [44]	Cross-sectional study	394	PLHIV	Central Region	HCV Antibody test	Moderate
Anabire NG et al. (2019) [45]	Retrospective cross-sectional study	90	Newly diagnosed PLHIV	Central Region	HCV Antibody test	Low
Annison L et al. (2022) [46]	Cross-sectional study	500	PLHIV	Greater Accra Region	HCV Antibody test	Low
KwofieTB et al. (2021) [47]	Longitudinal study	200	PLHIV	Volta & Oti Regions	HCV Antibody test	Low
Kuugbee ED et al. (2023) [48]	Cross-sectional study	246	Pregnant women	Upper West Region	HCV Antibody test	Low
Walana W et al. (2023) [49]	Retrospective study	6094	Blood donors	Oti, Greater Accra, Northern & Upper West	HCV Antibody test	Low
Lokpo SY et al. (2017) [50, 51]	Retrospective study	11,436	Blood donors	Eastern Region	HCV Antibody test	Low
Lokpo SY et al. (2017) [50, 51]	Retrospective study	4180	Blood donors	Volta Region	HCV Antibody test	Moderate
Siaw A et al. (2024) [108108]	Cross-sectional study	1769	General population	Upper East Region	HCV Antibody test	Low
Agbozo WK et al. (2022) [52]	Retrospective study	247	Patients with liver cirrhosis	Greater Accra	HCV Antibody test	Low
Boakye FO et al. (2023) [53]	Retrospective study	6847	Blood donors	Brong-Ahafo Region	HCV Antibody test	Low
Nartey YA et al. (2020) [39]	Observational cross-sectional study in a hepatology clinic	575	Patients at hepatology OPD clinic	Greater Accra, Ashanti & Central	HCV Antibody test	Low
Amoah S et al. (2023) [54]	Retrospective study	21,716	First year University students	Central Region	HCV Antibody test	Moderate
Hadfield PY et al. (2024) [55]	Retrospective study	6339	Blood donors	Volta Region	HCV Antibody test	Low
Wahab A et al. (2023) [106]	Retrospective study	2588	Blood donors	Volta Region	HCV Antibody test	Low
Guure C et al. (2022) [78]	Cross-sectional study	323	PWUD & PWID	Greater Accra, Ashanti, Western & Northern	HCV Antibody test	Low

Table 1 (continued)

Author (Year)	Study Design	Sample Size (n)	Population Type	Region	HCV Diagnostic method	Risk of Bias
Nartey YA (2022) [7, 39, 40]	Nationwide cross-sectional retrospective study	162,000	Mixed population	Nationwide	HCV Antibody test	Low
Nkansah C et al. (2020) [56]	Retrospective study	3306	Blood donors	Ashanti Region	HCV Antibody test	Moderate
Duah A et al. (2018) [68]	Cross-sectional hospital-based study	149	Patients with liver cirrhosis	Greater Accra	HCV Antibody test	Low
Messersmith LJ et al. (2021) [69]	Mixed method	221	PWID	Ashanti Region	HCV Antibody test	Moderate
Tetteh AK et al. (2020) [57]	Prospective study	258	Pregnant women	Central Region	HCV Antibody test	Low
Ephraim R et al. (2022) [67]	Retrospective hospital-based study	89	Patients with ESRD undergoing hemodialysis	Central Region	HCV Antibody test	Moderate
Osei S et al. (2021) [72]	Cross-sectional study	200	Pregnant women	Ashanti Region	HCV Antibody test	Low
Duah A et al. (2020) [58]	Prospective study	167	Patients who mortality from hepatic encephalopathy	Eastern Region	HCV Antibody test	Low
Korang FK et al. (2024) [107]	Cross-sectional study	340	Street barbers and beauticians	Eastern Region	HCV Antibody test	Low
Awuah M et al. (2019) [59]	Retrospective study	1922	Blood donors	Ashanti Region	HCV Antibody test	Low
Quaye L et al. (2020) [60]	Cross-sectional prospective study	125	Head porters "Kayayi"	Greater Accra	HCV antibody test	Low
Sosu SQ et al. (2024) [61]	Retrospective cross-sectional study	1439	Blood donors	Greater Accra	HCV Antibody test	Low
Adu-Poku F et al. (2020) [62]	Retrospective study	3173	Blood donors	Volta Region	HCV Antibody test	Low
Duah A & Nkrumah KN (2019) [63]	Cross-sectional study	103	In-patients with cirrhotic ascites	Greater Accra	HCV Antibody test	Moderate
Aidoo M & Mohammed BS (2020) [64]	Retrospective cross-sectional study	180	In-patients with chronic liver disease	Northern Region	HCV Antibody test	Low
Akyar E et al. (2018) [70]	Cross-sectional study	312	Patients attending STI clinic	Ashanti Region	HCV Antibody test	Low
Tawiah BO (2019) [30]	Cross-sectional study	200	Psychiatric patients	Central Region	HCV Antibody test	Low
Okyere K (2017) [71]	Prospective cohort study	155	Patients with liver diseases	Ashanti Region	HCV Antibody test	Moderate
Adigbli D (2016) [65]	Cross-sectional study	200	PLHIV	Volta Region	HCV Antibody	Moderate
Alomatu H et al. (2024) [75]	Prospective cross-sectional study	426	Blood donors	Eastern Region	Missing	Moderate
Mohammed BS & Aidoo M (2020) [66]	Missing	152	Patients with liver cirrhosis	Northern Region	Missing	Low

groups (e.g., street barbers, nail cutters, head porters, PLHIV, PWID), and specific groups (e.g., first-year university students, psychiatric patients). Studies retrieved according to year of publication indicated significant variability with the highest number of publications [9] in 2020 and lowest [2] in 2018. Overall, these studies aimed to assess the prevalence of HCV among different subgroups of the Ghanaian population, contributing to a more comprehensive understanding of the disease's spread within the country.

Sensitivity analysis

The leave-one-out sensitivity analysis showed that the overall pooled prevalence estimate was robust. Excluding individual studies one at a time did not substantially alter the pooled results, and the confidence intervals consistently overlapped with the main estimate. This indicates that no single study exerted undue influence on the overall findings as shown in the Fig 2.

Overview of HCV prevalence in Ghana

The HCV prevalence data was extracted from 53 studies conducted in 12 regions of the Ghana with a combined sample size of 487,396. At the regional level, 11 studies examined HCV prevalence in Greater Accra, 8 studies in Ashanti, 4 studies in Northern Ghana, 9 studies in Central Region, 6 studies in Volta Region, and 4 studies in Eastern Region. There were 2 nationwide studies [7, 14] conducted, and 5 studies conducted across two or more regions [40, 41, 64, 67, 67, 79]. One study was retrieved for Upper East [108], Western [47], Brong Ahafo [67] and Upper West [67] regions. No studies were retrieved for 4 regions namely Savanna, Ahafo, North-East and Bono East region. Additionally, subgroup analyses focused on specific populations, with 5 studies assessing HCV prevalence among pregnant women, 9 studies among individuals with liver disease, 8 studies among people living with HIV (PLHIV), and 15 studies evaluating HCV prevalence among blood donors in Ghana. These studies provide a comprehensive overview of HCV distribution across

Table 2 Summary of studies assessing HCV prevalence in Ghana

Study	Positive Cases	Sample Size	Prevalence (%)	95% CI
Adanusa M et al. (2023) [29]	56	6006	0.93	0.71% – 1.21%
Tawiah BO et al. (2019) [30]	4	200	2.0	0.55% – 5.04%
Torpey K et al. (2021) [31]	20	4023	0.5	0.3% – 0.77%
Muktar AT et al. (2023) [32]	34,483	123,152	28.0	27.75% – 28.25%
Boateng R et al. (2019) [33]	22	400	5.5	3.48% – 8.21%
Berko D et al. (2022) [34]	139	300	46.33%	40.58% – 52.16%
Birjandi MM & Oroe M (2020) [35]	12	728	1.65	0.85% – 2.86%
Nartey YA et al. (2023) [14, 19]	2715	103,609	2.62	2.52% – 2.72%
Duedu KO et al. (2021) [36]	1	200	0.5	0.01% – 2.75%
Mawuli G et al. (2022) [37]	8	141	5.67	2.48% – 10.87%
Abuku VG et al. (2023) [38]	9	250	3.6	1.66% – 6.72%
Nartey YA et al. (2022) [7, 39, 40]	12	174	6.9	3.61% – 11.74%
Volker F et al. (2017) [41]	2	180	1.11	0.13% – 3.96%
Frempong M.T et al. (2019) [76]	30	248	12.1	8.31% – 16.82%
Nlankpe AM et al. (2021) [42]	1094	8605	12.71	12.02% – 13.44%
Yakass MB et al. (2016) [43]	1	229	0.44	0.01% – 2.41%
Pappoe F et al. (2019) [44]	2	394	0.51	0.06% – 1.82%
Anabire NG et al. (2019) [45]	0	90	0.0	0% – 4.02%
Annison L et al. (2022) [46]	1	500	0.2	0.01% – 1.11%
Kwofie TB et al. (2021) [47]	3	200	1.5	0.31% – 4.32%
Kuugbee ED et al. (2023) [48]	2	246	0.81	0.1% – 2.91%
Walana W et al. (2023) [49]	299	6094	4.91	4.38% – 5.48%
Lokpo SY et al. (2017) [50, 51]	664	11,436	5.81	5.38% – 6.25%
Lokpo SY et al. (2017) [50, 51]	77	4180	1.84	1.46% – 2.3%
Siaw A et al. (2024) [108]	149	1769	8.42	7.17% – 9.82%
Agbozo WK et al. (2022) [52]	12	247	4.86	2.54% – 8.33%
Boakye FO et al. (2023) [53]	130	6847	1.9	1.59% – 2.25%
Nartey et al. (2020) [105]	58	575	10.09	7.75% – 12.84%
Amoah S et al. (2023) [54]	195	21,716	0.9	0.78% – 1.03%
Hadfield PY et al. (2024) [55]	317	6339	5.0	4.48% – 5.57%
Wahab A et al. (2022) [107]	26	2588	1.0	0.66% – 1.47%
Guure C et al. (2022) [79]	19	323	5.88	3.58% – 9.03%
Nartey YA (2022) [7, 39, 40]	8132	162,000	5.02	4.91% – 5.13%
Nkansah C et al. (2020) [56]	387	3306	11.71	10.63% – 12.85%
Duah A et al. (2018) [69]	10	149	6.71	3.27% – 12.0%
Messersmith LJ et al. (2021) [70]	4	221	1.81	0.5% – 4.57%
Tetteh AK et al. (2020) [57]	7	258	2.71	1.1% – 5.51%
Ephraim et al. (2022) [68]	6	89	6.74	2.51% – 14.1%
Osei S et al. (2021) [73]	5	200	2.5	0.82% – 5.74%
Duah A et al. (2020) [58]	10	167	5.99	2.91% – 10.74%
Korang FK et al. (2024) [107]	16	340	4.71	2.71% – 7.53%
Awuah M et al. (2019) [59]	42	1922	2.19	1.58% – 2.94%
Quaye L et al. (2020) [60]	8	125	6.4	2.8% – 12.22%
Sosu SQ et al. (2024) [61]	22	1439	1.53	0.96% – 2.31%
Adu-Poku F et al. (2020) [62]	133	3173	4.19	3.52% – 4.95%
Duah A & Nkrumah KN (2019) [63]	9	103	8.74	4.07% – 15.94%
Aidoo M & Mohammed BS (2020) [64]	39	180	21.67	15.88% – 28.41%
Akyar E et al. (2018) [71]	15	312	4.81	2.72% – 7.81%
Tawiah BO (2019) [30]	4	200	2.0	0.55% – 5.04%
Okyere K (2017) [71]	18	155	11.61	7.03% – 17.73%
Adigbli D (2016) [65]	3	200	1.5	0.31% – 4.32%
Alomatu H et al. (2024) [75]	34	426	7.98	5.59% – 10.97%
Mohammed BS & Aidoo M (2020) [66]	30	152	19.74	13.73% – 26.96%

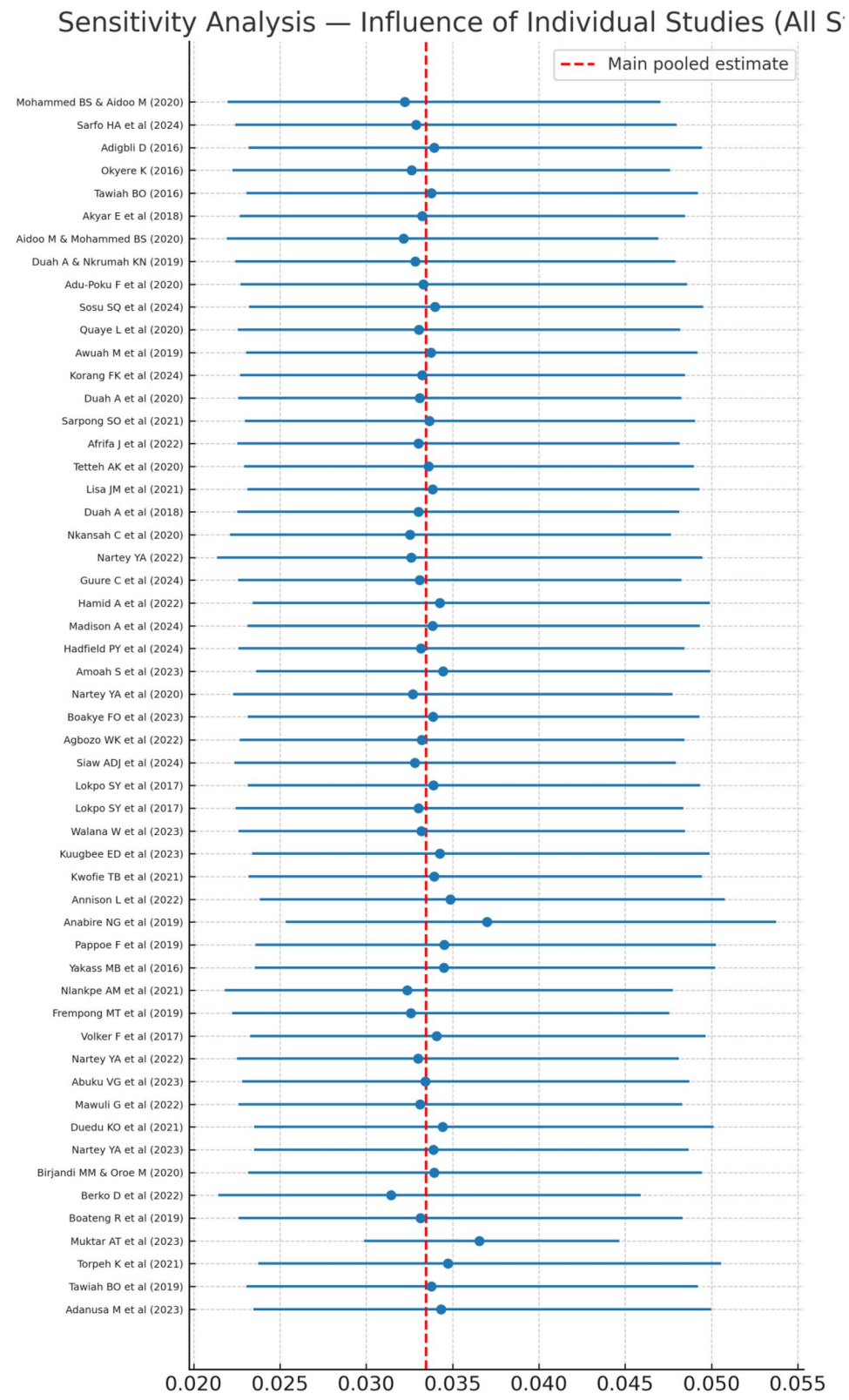

Fig. 2 Forest plot of sensitivity analysis

different regions and population groups. Due to the presence of substantial heterogeneity among the included studies, the random-effects model was used to estimate the pooled prevalence. A national-level meta-analysis was conducted to estimate the overall prevalence of hepatitis C virus (HCV) in Ghana. The pooled prevalence of HCV was 6.04% (95% CI: 3.94% – 8.15%), with very high heterogeneity ($I^2 = 99.9\%$, $P < 0.00001$), reflecting significant variability across studies. This can be seen in figure 3 showing the forest plot of HCV prevalence in Ghana.

Regional prevalence of HCV in Ghana

The pooled HCV prevalence rate of the various regions was estimated from studies conducted in these regions over the period from 2016 to 2025. Fig 4. Funnel plot of HCV prevalence in Ghana. Eight (8) studies were retrieved from the Ashanti Region with a combined sample size of 6,816. A meta-analysis of these studies was done using the random effect model yielded a pooled prevalence rate of 4.7% (95% CI: 2.5% – 6.9%), with substantial heterogeneity ($I^2 = 97.6\%$, $P = 0.0000$), reflecting significant variability across studies. Nine (9) studies were also retrieved from the Central Region with a total sample size of 32, 285. A meta-analysis of these studies yielded a pooled prevalence rate of 1.3% (95% CI: 0.8% – 1.7%) with moderate heterogeneity ($I^2 = 78.5\%$, $p = 0000$). Four (4) studies were retrieved from the Eastern Region with a combined sample size of 12,369. A meta-analysis of HCV prevalence in the Eastern Region yielded a pooled prevalence rate of 5.9% (95% CI: 5.4% – 6.2%), with low heterogeneity ($I^2 = 16.9\%$, $P = 0.00000$), suggesting consistency across studies. The HCV prevalence rate for the Greater Accra Region was estimated from eleven (11) studies used with a combined sample size of 7,884. A meta-analysis of these studies in the Greater Accra Region yielded a pooled prevalence of 2.1% (95% CI: 1.1% – 4.0%), with substantial heterogeneity ($I^2 = 90.1\%$, $P = 0.00000$) reflecting significant variability across the various studies. Four (4) studies were retrieved from the Northern Region with a combined sample size of 132,089. Meta analysis of these studies in Northern region yielded a pooled prevalence estimate of 20.9% (95% CI: 10.7% – 31.1%), with high heterogeneity ($I^2 = 97.7\%$, $P < 0.00001$), indicating considerable variability across studies. Six (6) studies were compiled from the Volta Region with a total sample size of 16,730. A meta-analysis of HCV prevalence in the Volta Region produced a pooled prevalence rate of 2.9% (95% CI: 1.3% – 4.4%) using a random effect model. High heterogeneity was observed across the included studies ($I^2 = 97.2\%$, $P = 0.0000$), suggesting considerably very high

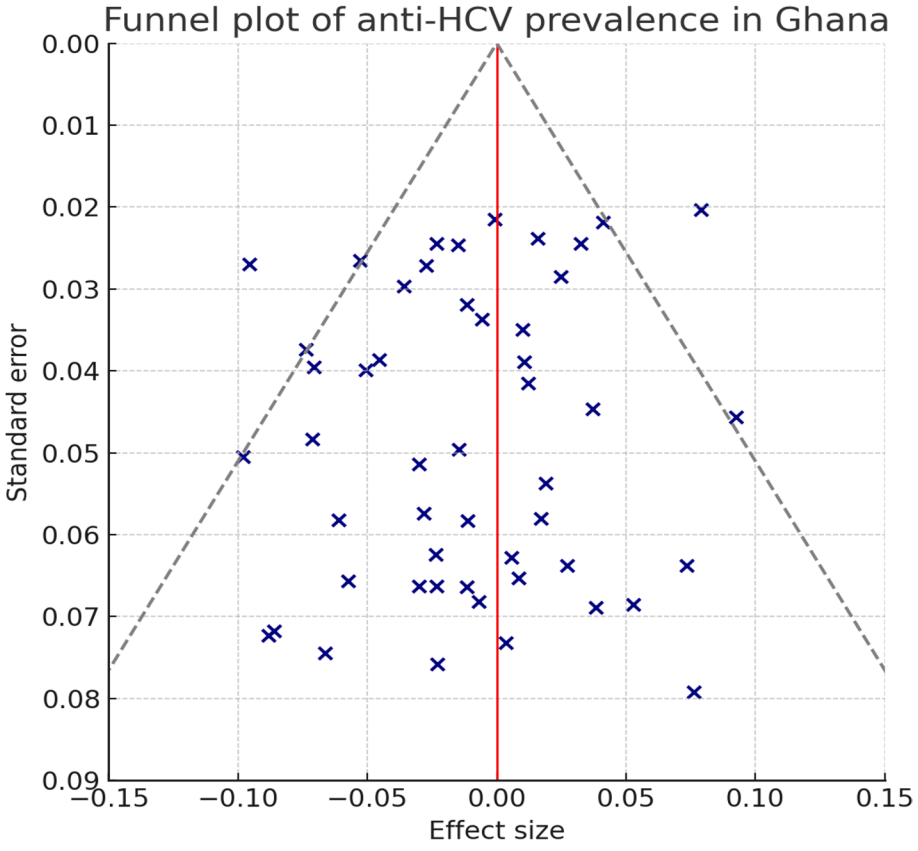

Fig. 3 Forest plot of national HCV prevalence in Ghana

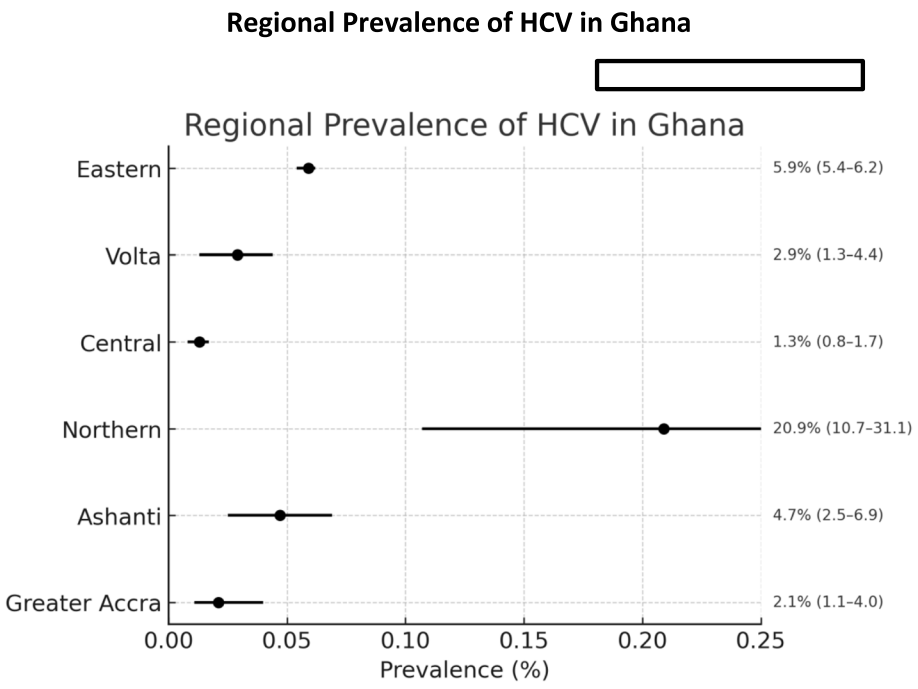

Fig. 4 Funnel plot of HCV prevalence in Ghana

variability in prevalence estimates. The forest plot displaying the various regional HCV rates is shown in Fig. 5. A graphical representation of the regional distribution of HCV prevalence has been designed using the photoshop software as seen in the Ghana map in Fig. 6.

Table 3 summaries the studies used to assess the regional prevalence of HCV in Ghana.

HCV prevalence among the sub-groups in Ghana

Sub-group analysis was conducted for 4 sub-populations to estimate the burden of HCV infection. These sub-populations were PLHIV, pregnant women, people with liver diseases and blood donors. HCV prevalence among pregnant women was estimated using 5 studies conducted across 5 regions of Ghana with a total sample size of 1,134. A meta-analysis of HCV prevalence among pregnant women in Ghana estimated a pooled prevalence of 1.9% (95% CI: 0.9%–2.3%). Heterogeneity was moderate ($I^2 = 43.2\%$, $P < 0.001$), suggesting some variation across studies but within an acceptable range. HCV prevalence among people living with liver diseases was done using 9 studies conducted across 5 regions of Ghana with a combined sample size of 1,902, also yielded 10.9% (95% CI: 7.2% – 14.6%). Prevalence of HCV among PLHIV was estimated to be 1.4% (95% CI: 0.7% – 2.1%). This was estimated from 8 studies extracted across 6 regions of Ghana with a combined sample size of 6,055. Fifteen (15) studies retrieved from 7 regions of Ghana with a total sample size of 286,476 used to estimate the HCV prevalence among blood donors yielded a pooled prevalence of 6.4% (95% CI: 5.2% – 7.4%). Figure 7 shows the forest plot indicating the HCV prevalence among the sub-groups.

Assessment of publication bias and small study effects

The potential publication bias was assessed in studies reporting hepatitis C virus (HCV) prevalence in Ghana using both visual and statistical methods. The funnel plot (see Fig. 4) showed noticeable asymmetry, particularly among smaller studies that tended to report higher prevalence estimates. This pattern may suggest possible publication bias or reflect heterogeneity across studies in terms of population, location, or methodology. The funnel plot was used to assess publication bias across included studies. No significant publication bias was detected visually, as studies were symmetrically distributed around the pooled estimate. Statistical confirmation through Begg's test ($P = 0.42$) and Egger's test ($P = 0.19$) further supported the absence of small-study effects, suggesting that the meta-analysis findings are robust and not influenced by selective reporting as shown in Fig. 3.

Meta regression- analyses of HCV prevalence

The meta-regression analysis showed that study-level characteristics explained a substantial proportion of the heterogeneity across studies. HCV prevalence was significantly higher among patients with liver disease and among blood donors than in pregnant women. Although prevalence in PLHIV was lower compared to pregnant women, the difference was less pronounced than in the liver disease and blood donor groups. In addition, lower

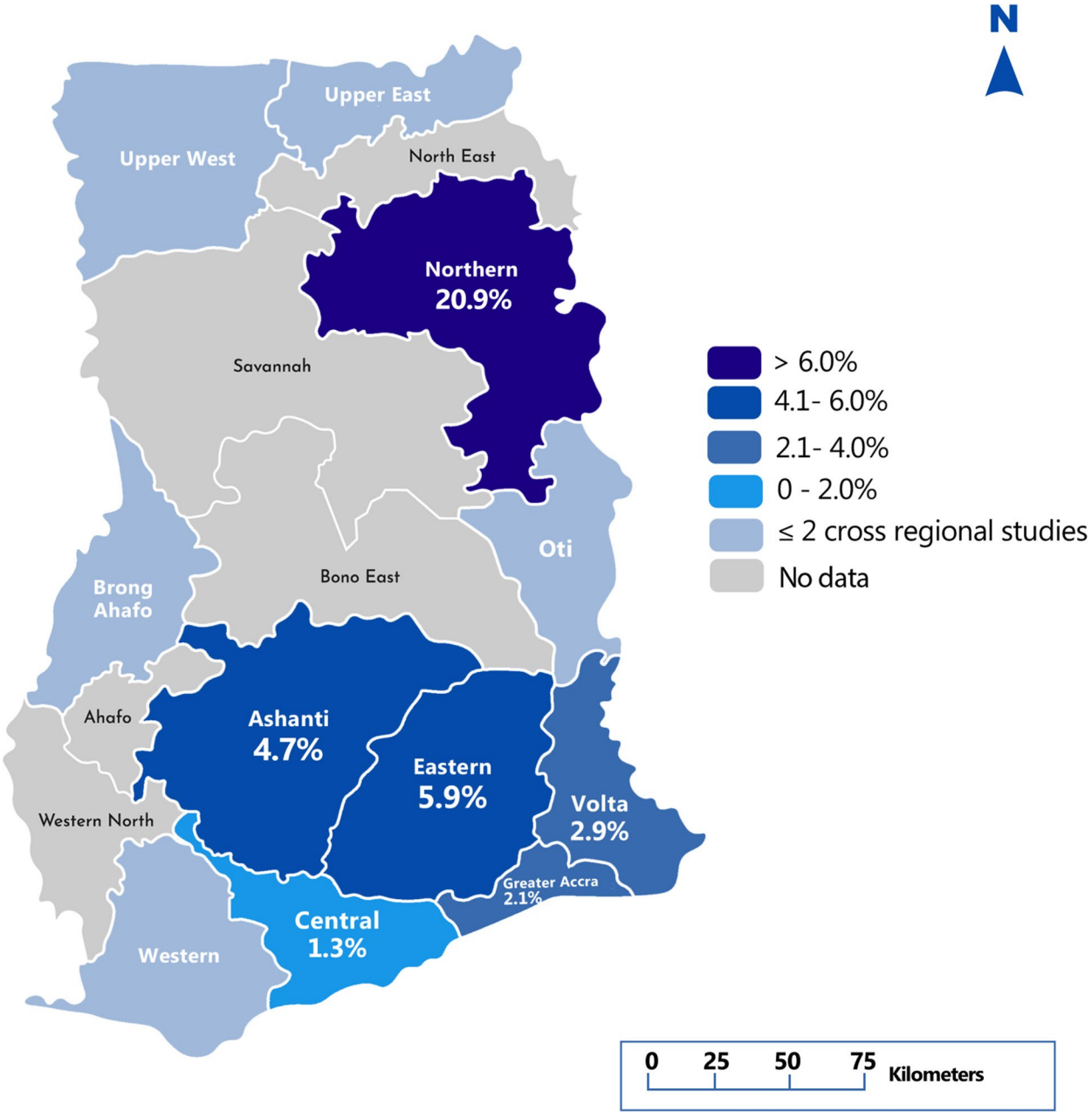

Fig. 5 Forest plot of regional HCV prevalence in Ghana

risk-of-bias studies tended to yield more stable and conservative estimates, whereas high-risk studies produced more variable results. Studies with larger sample sizes also contributed to reducing variability. Together, these findings indicate that differences in population type and study quality were the main drivers of heterogeneity in prevalence estimates across Ghanaian studies. The meta regression analysis is shown in Table 4.

Trend analysis of HCV prevalence in Ghana from 2016 to 2025

The trend of Hepatitis C Virus (HCV) prevalence from 2016 to 2025 was assessed as illustrated in Fig. 8. Four studies were conducted in 2016 across 4 regions of Ghana with a prevalence range of 0.4% to 11.6%. In 2017, 3 studies were conducted across 3 regions of Ghana with a prevalence range of 1.1% to 6.7%. Two (2) studies were retrieved for 2018 across 2 regions with prevalence range of 4.8% to 6.7%. Seven (7) studies were retrieved for 2019 across 3 regions with an HCV prevalence range of 0.0% to 12.0%. In 2020, 9 studies were conducted across 6

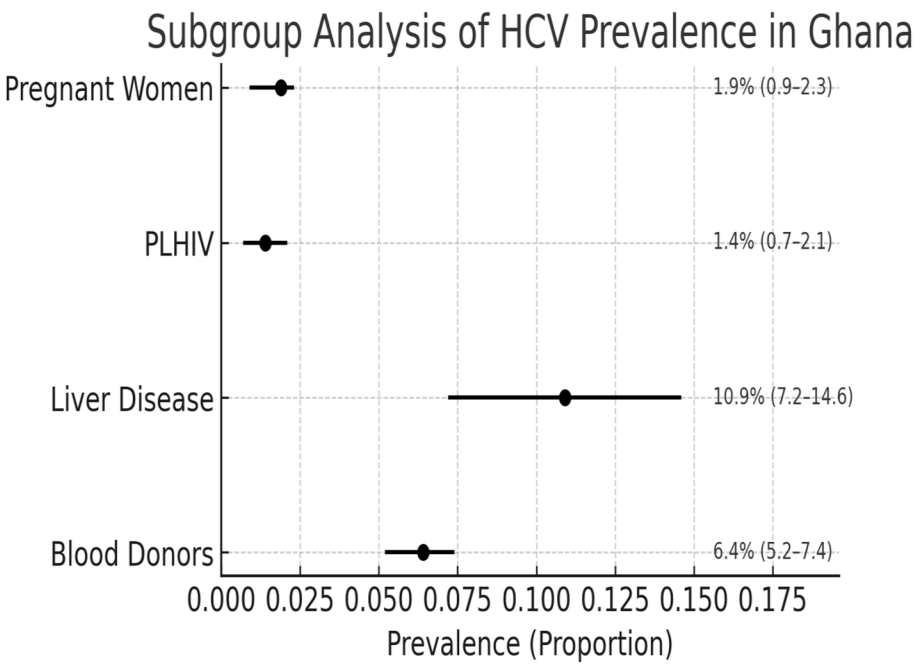

Fig. 6 Map of Ghana with HCV regional prevalence rates

Table 3 Regional pooled HCV prevalence estimates (random-effects, logit transform). Notes: Random-effects Der Simonian–Laird on logit-transformed proportions with continuity correction (0.5 when x = 0 or x = n). 95% CIs back transformed to proportion scale. Heterogeneity tested with Cochran's Q; I^2 reported as percentage

Region	Studies (k)	Pooled Prevalence (%)	95% CI	I2 (%)	Heterogeneity p-value
ASHANTI	8	4.70	2.5% – 6.9%	98.4	0.0
CENTRAL	9	1.30	0.8% – 1.7%	91.6	0.0
EASTERN	4	5.90	5.4% – 6.2%	30.6	0.22855
GREATER ACCRA	11	2.10	1.1% – 4.0%	91.2	0.0
NORTHERN	4	20.90	10.7% – 31.1%	99.7	0.0
VOLTA	6	2.90	1.3% – 4.4%	95.8	0.0

regions of Ghana with an HCV prevalence range of 1.6% to 21.0%. Six (6) studies were conducted across 5 regions of Ghana with a prevalence range of 0.5% to 12.7% in 2021. A total of 8 studies were done across 14 regions with a prevalence range of 0.2% to 21% in 2022. In 2023 and 2024, eight and seven studies were conducted across 7 and 8 regions respectively resulting in an HCV prevalence range of 0.8% to 28.0% and 1.5% to 8.4% respectively. There was no study retrieved for 2025.

Discussion

This study documents the prevalence of HCV infection in Ghana, with particular emphasis on national prevalence, regional prevalence and the prevalence among subgroups. In this study, the national pooled prevalence rate of HCV was estimated at 6.04%. There were marked variations in prevalence among the regions with the highest prevalence of 20.9% recorded in the Northern Region and the lowest in the Central Region (1.3%). Subgroup analysis resulted in a pooled HCV prevalence estimate of 1.9% in pregnant women, 6.4% in blood donors, 10.9% in people with liver disease, with HIV-HCV co-infection estimated at 1.4%.

We found a moderately high prevalence rate of 6.04% of chronic HCV infection in Ghana. This rate is significantly higher than the previous national review prevalence of 3.0% [20]. The reported increase from the last review may be due to the non-availability of effective medications and lack of targeted programme against HCV such as the STOP Hep C Ghana Project [19]. Increase in activities such as religious and tribal scarifications [15, 16] tattooing among the youth [67, 67] and a rise in the population of high-risk groups such as MSM [67] and PWID [67] in Ghana may also contribute to this high national prevalence of HCV. This result is however similar to reviews done in Pakistan (6.2%) and Cameroon (6.5%) respectively [67, 67] but higher than 4.8% in Somalia [67], 1.6% in Burkina Faso [9], 2.0% in Ethiopia [27] 2.9% in Congo [67] and 2.5% in Sudan [67].

The pooled prevalence of chronic HCV infection among pregnant women in Ghana was estimated to be 1.9% which is far lower than the 4.6% recorded for the last national review [20]. Reported global prevalence of HCV among pregnant women is 6.4% [67]. Some studies done in Africa report higher HCV prevalence among pregnant

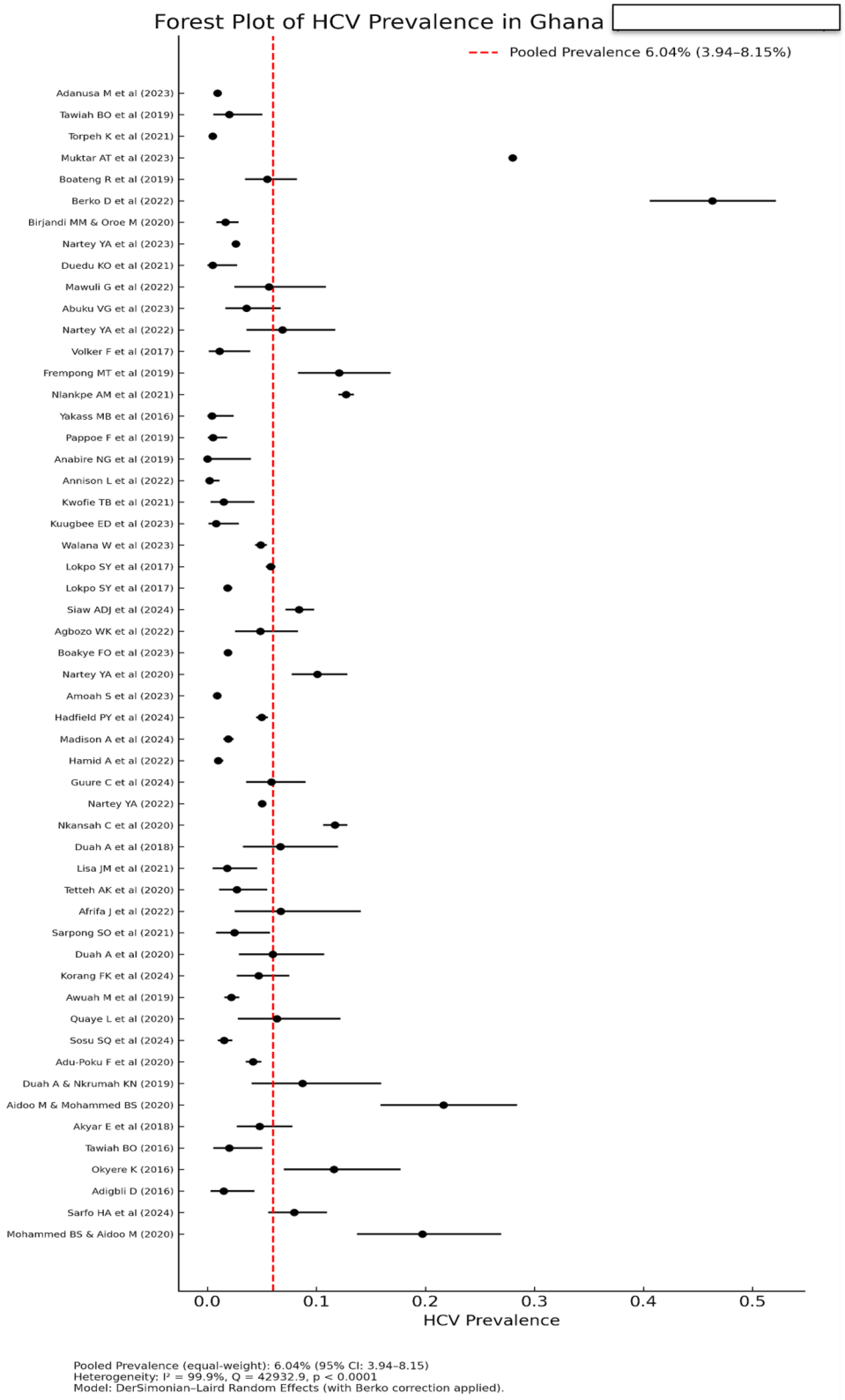

Fig. 7 Forest plot of HCV prevalence among sub-groups in Ghana

Table 4 Meta regression analysis

Moderator	Beta (pp)	SE (pp)	CI low (pp)	CI high (pp)	z	p
Intercept	−15.97	5.40	−26.56	−5.39	−2.96	0.0030
pop_Blood donors	3.34	3.71	−3.92	10.61	0.90	0.3670
pop_Liver disease	7.09	2.45	2.30	11.89	2.90	0.0040
pop_PLHIV	0.54	2.57	−4.50	5.58	0.21	0.8350
des_Longitudinal	−0.69	4.40	−9.31	7.93	−0.16	0.8750
des_Other	11.91	5.41	1.30	22.52	2.20	0.0280
des_Prospective	0.43	2.93	−5.32	6.18	0.15	0.8830
des_Retrospective	2.17	2.33	−2.40	6.74	0.93	0.3520
risk_Low	−12.88	5.14	−22.96	−2.80	−2.50	0.0120
risk_Moderate	−12.08	3.94	−19.80	−4.35	−3.06	0.0020
year_c	0.01	0.31	−0.60	0.62	0.03	0.9790
logn	7.66	2.15	3.45	11.87	3.57	0.0000

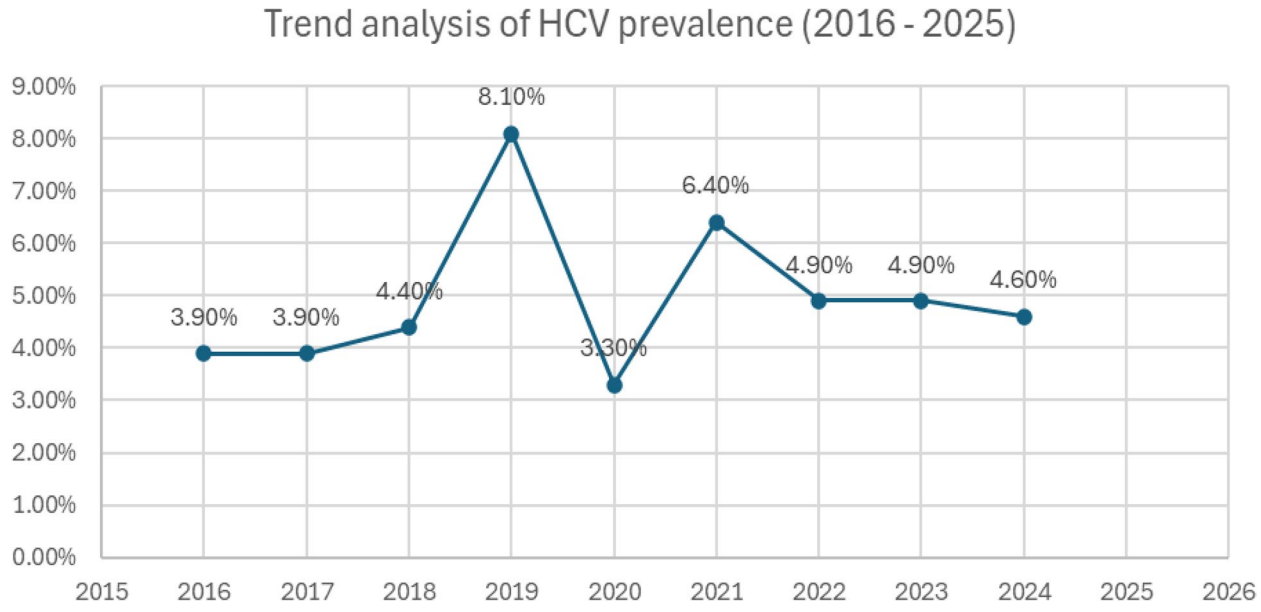

Fig. 8 Trend analysis of HCV prevalence in Ghana

women [67, 67, 67]. These include 3.0% in Cameron [67], 3.3% in DR Congo [67] and 14.2% in Nigeria [67]. The main cause of maternal HCV infection is through blood transfusion [38, 48] as about 50% of persons who receive blood transfusion in Ghana are pregnant women due to high prevalence of anaemia in pregnancy in Ghana [67].

The pooled prevalence of HCV infection among PLHIV (HIV-HCV co-infection) was estimated to be 1.4%. This is significantly lower than the 2.8% recorded in the last review [20]. This lower prevalence could be due to improved transfusion services [49] and increased testing and counselling and possibly death of most of these patients due to the high fatality rate [39]. This national prevalence is similar to review estimates of 0.84% in India [67] and 2.2% in Spain [67]. The prevalence of HCV-HIV co infection is however higher in other countries of the world such as 4.7% in Nigeria [67], 4.0% in Ethiopia [27] and 4.9% in United Kingdom [67]. In Sub-Saharan Africa, it is estimated that 2.3 million PLHIV are coinfected with the HCV [2]. The risk of HCV infection is six times higher in people living with HIV [67, 67, 67].

The pooled HCV prevalence rate among blood donors was estimated to be about 6.4%. This is higher than the last national review estimate that quoted a prevalence of 2.6%. The difference in prevalence estimates could be due to an increase the prevalence of HCV among the general population and a rise in the number of paid blood donor due to the harsh economic situation in the country [49] (Walana et al., 2023). This review estimate is similar to findings in Gabon (4.0%) and Nigeria (4.6%) [67, 67] but far higher than that of southern Africa (1.0%), India (0.42%), Malaysia (0.1%), China (0.15%), Ethiopia (0.93%) and Qatar (0.6%) [67, 67, 67, 67, 67, 67]. According to the World Health Organization Global Database on Blood Safety, 1.6 million units out of 92 million units blood

donated worldwide are discarded due to the presence of markers for transfusion transmitted infections [67].

The regional disparities were evident, with the Northern Region having the highest prevalence of 20.9% (95% CI: 19.0% – 22.0%), while Eastern Region had the 2nd highest burden of 5.9% (95% CI: 5.4%–6.2%) followed by Ashanti Region 4.7% (95% CI: 2.5% – 6.9%), and Volta Region 2.9% (95% CI: 1.3%– 4.4%). Greater Accra Region recorded an HCV prevalence of 2.1% (95% CI:1.1%–4.0%) with Central Region having 1.3% (95% CI: 0.8% – 1.7%). This high prevalence of HCV in the northern region could be due to socio-cultural, religious and traditional practices, such as the scarification of the face and other body parts during the first few weeks of life for tribal and family identification, spiritual fortification, and the use of traditional medicines [15–17].

Conclusions

There is a significant increase in the national HCV prevalence from the last review with the current burden of HCV infection in Ghana considered to be moderately high. In this study, we have confirmed the significant regional disparities in the burden of HCV infection across the country with the Northern Region demonstrating the highest HCV seroprevalence. There is the need for massive funding for the STOP Hep C campaign with particular emphasis on public awareness and educational programs across all media to improve knowledge of the disease. There should also be targeted mass HCV testing/screening in high-risk populations, communities, churches and mosques, in saloons and barbering shops especially in Northern Ghana. Furthermore, famous individuals and celebrities could be used as Hepatitis C ambassadors to promote awareness and testing campaigns. The Ministry of Health, Ghana Health Service and the National Health Insurance Authority should also consider putting HCV-RNA testing on the insurance scheme to improve access of diagnosis. Strategies and policies should be put in place to improve access to the medications. This will significantly improve our efforts towards eliminating hepatitis C viral infection by 2030.

Limitations

Most of the studies used anti-HCV antibody testing to conduct the screening. This method is unable to distinguish between acute and chronic HCV infections and so it is possible that some acute infections would have been captured for these studies. This review was submitted in June 2025 and so potentially relevant studies published afterwards will not be captured. There were not enough studies focusing on the vulnerable populations as only one study focused on children, MSM and IDU.

Abbreviations

HCV	Hepatitis C virus
HCV – RNA	Hepatitis C virus ribonucleic acid
STOP	Screening and treatment opportunity project
PRISMA	Preferred reporting items for systematic review and meta-analysis
JBI	Joanna Briggs Institute
DAA	Direct-acting antiviral
MOOSE	Meta-analysis for observational studies in epidemiology
PLHIV	People living with HIV
PWID	People who inject drugs
WHO	World health organization

Supplementary Information

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Supplementary Material 1

Supplementary Material 2

Supplementary Material 3

Supplementary Material 4

Supplementary Material 5

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Authors' contributions
PKF, CAA and GTH—Conceptualization PKF and CAA—Writing Original draft GTH, CAA, FA and RACR—Methodology RACR, GTH, FA and PA—Review & editing PA, CAA and PKF—Analysis, Figures and tables All authors contributed equally to preparing the Manuscript and approved of the content.

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Data availability
All relevant data have been provided within the manuscript and the supporting information files.

Declarations

Ethics approval and consent to participate
There was no need for ethical approval since only secondary data was used.

Consent for publications
Not applicable.

Competing interests
The authors declare no competing interests.

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