

1 **Community engagement and chronic viral hepatitis public health interventions: a systematic**
2 **review, meta-analysis, and complementary crowdsourcing open call**

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23 **Summary**

24 **Background** Chronic viral hepatitis causes a high burden of morbidity and mortality, especially in low-
25 and middle-income countries (LMICs). While community engagement shows promise to enhance
26 hepatitis outcomes, evidence on its impact remains limited. To summarize the current state of knowledge
27 on this topic we performed a systematic review and crowdsourcing open call.

28 **Methods** The systematic review included publications that evaluated a community-engaged intervention,
29 reported chronic viral hepatitis outcomes, and included a comparator group. To ensure innovative ideas
30 from LMICs were included, we organized a complementary crowdsourcing open call using the
31 WHO/TDR practical guide. Thematic analysis identified key themes in the crowdsourced submissions.

32 **Findings** Twenty-four studies were included in the systematic review, and twenty-eight crowdsourced
33 submissions were analysed. In both the systematic review and open call, community-engaged
34 interventions included peer-based interventions, community health workers, interactive educational
35 programs, and patient advocacy. The meta-analysis, predominantly from high-income countries, found
36 community-engaged interventions significantly improved HBV vaccine completion (RR 1.95, 95% CI
37 1.23-3.09), HBV and HCV test uptake (RR 2.83, 95% CI 2.07-3.85), linkage to chronic viral hepatitis
38 care (RR 1.63, 95% CI 1.19-2.21), and HCV sustained virological response (RR 1.27, 95% CI 1.05-
39 1.52). In contrast, open call submissions, largely from LMICs, highlighted community-led interventions
40 where patients led community-based organizations to advocate for improved access to hepatitis care.

41 **Interpretation** Findings underscored the importance of community engagement in chronic viral hepatitis
42 service delivery across the care continuum. Implementing community-engaged interventions can enhance
43 chronic viral hepatitis elimination efforts.

44 **Funding** National Natural Science Foundation of China

45 **Keywords:** Community engagement; Viral hepatitis; Care continuum; Open call

46

47 **Research in context**

48 *Evidence before this study*

49 Community engagement has shown potential to improve hepatitis-related outcome and reduce health
50 inequities. A PubMed search conducted in June 2023 using the terms “hepatitis,” “community OR
51 grassroots OR local OR peer OR advocate OR engaged,” and “interventions OR trial OR campaign”
52 revealed no existing reviews evaluating how community-engaged interventions impact the hepatitis care
53 continuum. Although several high-quality original RCTs from high-income countries (HICs) have been
54 conducted over the past decade, no systematic review or meta-analysis assessed the effectiveness of
55 community-engaged interventions across the full hepatitis care continuum. Additionally, few studies have
56 been conducted in low- and middle-income countries (LMICs) which bear a disproportionate share of the
57 global hepatitis burden.

58 *Added value of this study*

59 This review indicated that community-engaged interventions significantly improved HBV vaccine
60 completion, test uptake, linkage to care, and HCV sustained virological response. The systematic review,
61 primarily composed of studies from HICs, identified patient-centered community-engaged interventions,
62 with peer support and community-driven education as key components. The open call, predominantly
63 featuring submissions from LMICs, emphasized community-led interventions where patients played an
64 active role in leading community-based organizations (CBOs) to advocate for improved access to
65 hepatitis care.

66 *Implications of all the available evidence*

67 Our findings underscore the global potential of community-engaged interventions to enhance hepatitis
68 care and outcomes. Implementing such strategies is crucial for advancing global efforts to eliminate
69 chronic viral hepatitis and address disparities in care access, particularly in LMICs.

70

71 **Introduction**

72 Hepatitis B virus (HBV) and hepatitis C virus (HCV) are significant contributors to global morbidity and
73 mortality, causing an estimated 1.4 million deaths annually due to cirrhosis and liver cancer.¹ While low-
74 and middle-income countries (LMICs) bear the highest burden of chronic viral hepatitis, most
75 interventions have primarily focused on high-income countries (HICs).²⁻⁴ The underutilization of public
76 health interventions for chronic viral hepatitis in LMICs, along with the absence of national hepatitis
77 elimination strategies, exacerbates inequities between LMICs and HICs.⁵ One way to decrease hepatitis
78 inequities is through robust community engagement.

79 Community engagement is the process of fostering relationships that allow stakeholders to collaborate in
80 addressing health-related issues and promoting well-being.⁶ This approach is crucial to addressing public
81 health challenges such as chronic viral hepatitis where limited public understanding and stigma are
82 significant barriers.⁷⁻¹⁰ Community-engaged interventions involve soliciting input and feedback from
83 individuals living with chronic viral hepatitis and other stakeholders to design and implement public
84 health strategies. By incorporating community perspectives, these interventions are more relevant to the
85 people affected, increase accountability, and enhance dissemination.⁸ The influence of social determinants
86 on the uptake of services for chronic viral hepatitis further underscores the need for community
87 engagement.¹¹⁻¹³ Strategies such as peer support, involvement of community workers or lay health
88 workers, crowdsourcing, and interactive group efforts have demonstrated their potential in improving
89 chronic viral hepatitis services.¹⁴⁻¹⁸ The World Health Organization (WHO) emphasizes the crucial role of
90 civil society and populations affected by hepatitis in fostering community engagement to eliminate
91 chronic viral hepatitis.¹⁹ However, many national hepatitis programs neglect community engagement, and
92 community led services, and existing narrative reviews on chronic viral hepatitis have not captured the
93 process or effect of community-engaged interventions on chronic viral hepatitis outcomes.^{20,21} We
94 conducted a systematic review to address this gap in the literature.

95 Previous studies have inadequately represented LMICs, with existing research provides limited insight
96 into practices in LMICs.²²⁻²⁵ This deficiency suggests missed opportunities to document and leverage
97 community-driven efforts in LMICs for chronic viral hepatitis elimination. To address this, we conducted
98 a global crowdsourcing open call in partnership with the World Hepatitis Alliance (WHA), aiming to
99 capture community-led initiatives specifically from LMICs. Crowdsourcing is an effective strategy that
100 promotes public participation and solicits community-led solutions to address public health issues.²⁶ This
101 approach involves collecting ideas from individuals or groups to contribute to problem-solving, and then
102 shares results within the community. Compared to conventional top-down approaches, crowdsourcing can
103 identify cost-effective, locally appropriate and trusted community health campaigns.^{20,27-32} This approach
104 complements our systematic review, to solicit community-led efforts and programs with a focus on
105 LMICs.

106 **Methods**

107 The study utilized a parallel mixed-methods approach. The qualitative analysis identified and described
108 relevant community-engaged interventions. The quantitative meta-analysis summarized the impact of
109 community-engaged interventions on outcomes across the chronic viral hepatitis care continuum.

110 **Systematic Review and Meta-Analysis**

111 The systematic review was performed using the Preferred Reporting Items for Systematic Reviews and
112 Meta-Analyses (PRISMA) checklist.³³ We identified studies published between 1 January 2010 and 15
113 June 2023 that evaluated a community-engaged interventions to improve outcomes related to chronic
114 viral hepatitis. Keyword searches were conducted in the following databases: PubMed, Web of Science,
115 Scopus, OvidSP, Embase, Ebsco, CINAHL Plus, and Wiley Cochrane Library. Gray literature and
116 conference abstracts were also searched. The protocol for the systematic review was registered on Open
117 Science Framework (OSF) with registration number OSF.IO/3MSBJ. The search algorithm is shown in
118 Appendix 1 and keywords are listed in Appendix 2.

119 Six researchers (KW, HC, DE, EK, YL, DW) independently screened identified literature following
120 PRISMA guidelines. Studies featuring community-engaged interventions, targeting chronic viral hepatitis
121 outcomes, along with a comparator group, were included in the systematic review and meta-analysis

122 (Appendix 3). We extracted the following data from each included manuscript: author names, publication
123 year, title, study design, study setting, focus population, type of intervention, focus diseases (i.e. HBV vs
124 HCV), study outcomes across the continuum, study sample size and the number of events. The data was
125 extracted in parallel by authors RS and YL and reviewed by DW. Risk of bias was assessed using the
126 Cochrane Risk of Bias Tool for interventional studies³⁴ and the Newcastle-Ottawa Scale (NOS) for
127 observational studies.³⁵ Two reviewers (HC and YL) independently assessed risk of bias. Disagreements
128 were resolved by discussing with the senior author (DW).

129 To evaluate the level of community-engagement for each intervention, we adapted a scale based on the
130 WHO Community Engagement Guide⁶ and USA Health and Human Services report.³⁶ Community
131 engagement was categorized into five sequential levels: inform, consult, involve, collaborate, and
132 empower (Appendix 4). “Inform” and “consult” were considered lower-level engagement because in
133 these two categories community members provide no or minimal input and are generally passive
134 participants. “Involve”, “collaborate”, and “empower” were considered higher-level engagement because
135 in these three categories community members are more actively engaged, contributing to intervention
136 development and provided with opportunities for co-leadership.

137 We conducted a meta-analysis to estimate pooled risk ratios (RRs) and 95% confidence intervals (CIs)
138 for various outcomes associated with community-engaged interventions compared to control
139 conditions. Analyses were performed using a random-effects model. Statistical heterogeneity was
140 assessed using Cochran’s Q test and Higgins’ I^2 statistic. The denominators for each outcome were
141 based on the total number of analysed participants. For studies with multiple community-engaged
142 interventions, intervention data were extracted separately, and engagement levels were redefined
143 according to Appendix 4. If the intervention groups in one paper were reclassified as the same level of
144 engagement, we combined the intervention groups of the study into a single group.³⁷ Table 1 provides
145 definitions of chronic viral hepatitis care outcomes. The certainty of evidence across outcomes was
146 determined using the Grading of Recommendations, Assessment, Development, and Evaluations
147 (GRADE) approach.³⁸

148 We explored heterogeneity by subgroup analyses of different study designs, focus populations, and
149 focus diseases. Publication bias was assessed using Egger’s test. Additionally, we used the leave-one-
150 out method (each study was sequentially removed from the analysis to evaluate its impact on the
151 overall results) in sensitivity analyses. A significance level of 0.05 was used for all analyses, which
152 were performed using Stata (version SE 15.0).

153 **Open Call**

154 The open call was organised through a collaboration between our group at the London School of
155 Hygiene and Tropical Medicine (LSHTM) and the WHA. Following the WHO/TDR practical guide,³⁹
156 we implemented the global open call in the following steps: 1) we convened a multisectoral steering
157 committee to review and finalize the call for submissions; 2) promoted and engaged the public to
158 contribute; 3) evaluated submissions received based on pre-specified criteria; and 4) recognized
159 finalists and shared the solutions with the broader public. The call was promoted through social media,
160 hepVoice magazine, and personal/professional networks. Submissions were sought from individuals
161 with personal experience of chronic viral hepatitis and community-engaged groups in LMICs.
162 Submissions in text, image, audio, video, or infographics were accepted between 15 January 2021 and
163 30 April 2021. Guidelines for each format were provided. Priority was given to affected individuals
164 and advocates involved in ongoing or completed community-engaged interventions, and submissions

165 were accepted in six United Nations (UN) languages. More details about the open call can be found in
166 Appendix 5.

167 A judging panel was formed, consisting of individuals from various regions, and they included people
168 affected by chronic viral hepatitis, advocates and activists, public health researchers, and infectious
169 disease physicians who can speak one or more of the six UN languages. Submissions were screened for
170 eligibility (DW and JDT) and submissions irrelevant to the topic were excluded for further judging.
171 The judging panel then evaluated eligible submissions based on four criteria from the judging rubric
172 using a 1-10 scale: capacity for impact, relevance, feasibility, and elaboration (Appendix 5). Judges
173 abstained from reviewing submissions in which they had a potential conflict of interest, and non-
174 English submissions were assessed by native language-speaking judges. Semi-finalists with an overall
175 mean score above 7.0 received feedback to strengthen their submissions. If participants consented,
176 revised submissions were shared on the NOhep website.⁴⁰ Cash prizes were awarded to the top 10
177 submissions. Exceptional submissions led to workshops in three selected countries/regions, advocating
178 policy changes. We organized three regional workshops in the Africa region, Bangladesh, and the
179 Philippines as well as at one World Hepatitis Summit satellite event where finalists were invited to
180 share their experiences to spur policy change.

181 The demographic and characteristics of participants and submissions were analysed and presented
182 quantitatively using descriptive frequencies. All semi-finalist submissions were translated into English
183 language and coded inductively, with similar codes merged to form themes. Community-engaged
184 interventions were thematically summarized. Results are presented according to the different stages of
185 the chronic viral hepatitis care continuum.

186 Ethical approval for this open call was granted by the LSHTM ethics committee (Approval Ref: 17819).
187 Written informed consent was obtained from all participants in the open call before their submissions
188 were shared.

189 **Ethics statement**

190 This systematic review and meta-analysis utilized publicly available, de-identified data; therefore, ethical
191 approval was not required. The open call received ethical approval from the LSHTM Ethics Committee
192 (Approval Ref: 17819). Informed consent was obtained from all open call participants prior to sharing
193 their submissions.

194 **Role of the funding source**

195 The funder of the study had no role in study design, data collection, data analysis, data interpretation, or
196 writing of the report.

197 **Results**

198 **Systematic review and open call**

199 *Characteristics of included studies in the systematic review*

200 Our research identified 12,683 titles, of which 24 met criteria for inclusion in the systematic review
201 (Figure 1). Among the included studies, 19 were randomized clinical trials, one was nonrandomized
202 interventional studies, and four were observational studies with a comparison (Table 2). Twenty-one
203 (87.5%) were conducted in HICs: 16 in the United States and one in Canada, the United Kingdom,
204 Australia, Norway, and Spain, respectively (Table 2). Three (12.5%) were conducted in middle-income

205 countries: two in China and one in Pakistan. No studies identified through the systematic review were
206 conducted in low-income countries. Study sample size ranged from 33 to 25,960. The risk of bias of
207 included studies is presented in Table 2.

208 The focus populations involved in included studies were people who use drugs (n=7), immigrants (n=10),
209 men who have sex with men (MSM) (n=1), mothers of children 12-23 months of age (n=1), baby
210 boomers born between 1945-1965 (n=1), men experiencing homelessness (n=1), people living with
211 chronic HCV (n=1), people with diabetes (n=1), and general primary care patients (n=1).

212 *Characteristics of the submissions in the open call*

213 We received a total of 119 submissions, of which 34 were excluded because they were not relevant to
214 chronic viral hepatitis (n=30) or in a UN language (n=4). The 85 eligible submissions were from 27
215 countries, 75.3% (64/85) of which were from middle-income countries and 17.6% (15/85) of which
216 were from low-income countries. There were 16 submissions from 10 African countries: Egypt, Sudan,
217 Nigeria, Benin, Cameroon, Congo, Democratic Republic of the Congo, Uganda, Burundi and Tanzania.
218 Twenty-eight submissions (34.1%) were selected as semi-finalists with a score of ≥ 7.0 . Semi-finalist
219 submissions were from 13 countries, 85% of which were LMICs. Appendix 6 shows the distribution of
220 mean scores. Appendix 7 summarizes characteristics of submissions to the open call.

221 The 28 semi-finalist submissions were submitted by affected persons (n=16), their family members (n=1),
222 friends and colleagues or by community organizations actively providing hepatitis services (n=15). It is
223 important to note that some affected individuals also led community organizations, resulting in an overlap
224 between categories. Certain populations were also highlighted in the submissions as in need of
225 prioritization: babies born to mothers living with HBV infection (n=3), persons exposed to non-sterile
226 needles (n=5), individuals living in communal or incarcerated settings (n=1), and persons co-infected with
227 chronic viral hepatitis and other infectious diseases (n=3).

228 *Interventions identified in the systematic review and open call*

229 The community engagement strategies identified from the systematic review and the open call illustrated
230 comprehensive approaches across the hepatitis care continuum (Table 3).

231 In the systematic review, several interventions were identified along the continuum of hepatitis care. For
232 testing and linkage to care, peer support workers acted as patient liaisons,^{41,42} helping individuals navigate
233 treatment and stay engaged with care. Community-driven educational materials, created with community
234 input⁴¹⁻⁴³ using accessible language and culturally appropriate content^{41,44,45} and were delivered through
235 both digital and in-person engagement activities.⁴⁶ Community leaders played a key role in enhancing the
236 reach of these programs.^{41,42} Regarding treatment adherence, peer education provided information and
237 support to patients regarding treatment adherence.⁴⁷ For viral suppression and post-treatment follow-up,
238 interventions incorporated mobile phone communication^{48,49} with peer supporters and provided
239 incentives^{48,50} to encourage appointment attendance. Community health workers also played a key role,
240 with strategies such as Syringe Service Programs (SSPs) engaging people who inject drugs and offering
241 flexible appointment scheduling.⁵¹ Other interventions included the formation of multidisciplinary teams,
242 including psychologists for mental health support,^{48,52} and the promotion of shared decision-making,
243 allowing patients to choose their treatment plans in collaboration with healthcare providers.⁵³

244 In the open call submissions, community-based organizations (CBOs) played a major role in addressing
245 barriers to hepatitis care.⁴⁰ For testing and linkage to care, The CBOs led a variety of interventions,
246 including hepatitis testing awareness campaigns, improving information accessibility, and initiatives to

247 combat misinformation and stigma against individuals living with hepatitis. Additionally, CBOs provided
248 emotional support, legal aid, and initiated and implemented hepatitis screening, testing, referral, and
249 treatment programs, particularly for priority populations. These efforts were often driven by local
250 advocacy strategies and initiatives. In terms of treatment adherence, CBOs focused on raising awareness
251 about available treatment options for viral hepatitis, offering subsidized or free hepatitis care services in
252 local communities, and engaging with governments and health authorities to secure funding and promote
253 hepatitis care initiatives. These organizations also worked to ensure continued access to HBV and HCV
254 treatments, particularly during emergencies such as the COVID-19 pandemic. Regarding viral
255 suppression and post-treatment follow-up, personal stories and voices from individuals who had been
256 cured of hepatitis were shared to inspire hope for cure or viral suppression. Peer counsellors were also
257 actively involved in awareness-raising campaigns, and patients themselves became advocates by
258 establishing CBOs, partnering with stakeholders, and mobilizing resources for hepatitis elimination.
259 These advocates also worked to ensure patients' rights to equal access to care, treatment and work.

260 In summary, the systematic review primarily highlighted patient-centred activities, with peer support and
261 community-driven education playing a prominent role in enhancing engagement with hepatitis services.
262 In contrast, the open call submissions emphasized community-led interventions, where patients
263 themselves played a more active role, leading CBOs and advocating locally to improve access to hepatitis
264 care and services.

265 ***Level of Engagement***

266 Among the 24 publications identified in the systematic review, community-engaged interventions varied
267 significantly in terms of level of community engagement. None of the identified interventions reached
268 “empowerment,” the highest level of engagement. Three studies reached the level of “collaborate” as
269 community members worked alongside researchers and healthcare workers in the design, development,
270 and implementation processes to enhance hepatitis testing and awareness.⁵³⁻⁵⁵ Fifteen studies reached the
271 level of “involve” as study participants were directly involved in counselling or treatment discussions
272 through two-way interaction with an educator, counsellor or a multidisciplinary team.^{41,42,45,47,49-52,56-62}
273 Three studies reached the “consult” level, where researchers gathered information or feedback from the
274 community without establishing two-way interactions.^{43,46,48} Three studies were classified as “inform”
275 because they only informed participants about intervention contents without direct engagement of
276 participants.^{44,63,64} The open call identified many empowerment level engagement efforts, with a focus on
277 LMICs, because community leadership and advocacy were the main approaches at the grassroots level.

278 **Meta analysis**

279 Community engaged interventions significantly improved HBV vaccine completion (RR 1·95, 95% CI
280 1·23-3·09; I²=89·9%; 5 RCTs, 6,447 participants; moderate certainty evidence), HBV/HCV test uptake
281 (RR 2·83, 95% CI 2·07-3·85; I²= 99·2%; 10 RCTs and 3 non-RCTs, 6,447 participants; moderate
282 certainty evidence for RCTs and low certainty for non-RCTs), linkage-to-care (RR 1·63, 95% CI 1·19-
283 2·21; I²= 72·6%; 6 RCTs, 1,671 participants; high certainty evidence), and sustained virological response
284 (SVR) to HCV treatment (RR 1·27, 95% CI 1·05-1·52; I²=86·3%; 4 RCTs and 1 non-RCT, 1,671
285 participants; moderate certainty evidence for RCTs and low certainty for Non-RCT) compared to control
286 groups. HCV treatment adherence was not improved by community engaged interventions (RR 1·10,
287 95%CI 0·95-1·29; I²=0%; 1 RCT and 1 non-RCT; 211 participants; moderate certainty evidence for RCT
288 and low certainty for Non-RCT) (Figure 2). Publication bias was observed in studies where HBV vaccine
289 completion was an outcome (Appendix 8).

290 Lower-level community-engaged interventions did not increase linkage-to-care (RR 1·25, 95% CI 0·96-
291 1·62; 1 RCT, 90 participants; moderate certainty evidence) or HCV treatment SVR (RR 1·24, 95% CI
292 0·92-1·68; 1 RCT, 90 participants; moderate certainty evidence) (Figure 2). Higher level engagement was
293 significantly associated with a better HCV treatment SVR outcome (RR 1·28, 95% CI 1·04-1·57; I²=
294 89·6%; 3RCTs and 1 non-RCT, 674 participants; moderate certainty evidence for RCTs and low certainty
295 evidence for non-RCT). The forest plots depicting various outcomes can be found in Appendix 8.
296 Furthermore, the sensitivity analysis demonstrated the RR results for various outcomes were robust across
297 both lower and higher levels of community engaged intervention (Appendix 9).

298 The subgroup meta-analysis (Appendix 10) showed community-engaged interventions improved HBV
299 vaccine completion rates across different study designs and focus populations, except for HBV vaccine
300 completion among men experiencing homelessness. Community-engaged interventions also demonstrated
301 significant improvements in HBV/HCV test uptake across various study designs and target diseases. For
302 linkage-to-care, a positive effect was observed when the focus was on HCV and people who use drugs.
303 However, no significant differences were identified in adherence to HCV treatment between intervention
304 and control groups, regardless of study design, target disease, or focus population.

305 **Discussion**

306 In this study, we conducted a systematic review and leveraged a crowdsourcing initiative to identify
307 community-engaged interventions for chronic viral hepatitis. We aimed to uncover both documented
308 strategies and grassroots efforts not yet captured in the literature.

309 The systematic review and meta-analyses found that community-engaged public health interventions were
310 associated with higher rates of HBV vaccination, HBV/HCV test uptake, linkage to chronic viral hepatitis
311 care and HCV SVR. Notably, most original studies were from high-income countries, and that
312 community-engaged interventions significantly enhanced the uptake of hepatitis care services,
313 particularly in vaccination and testing. However, the impact of community-engaged intervention on
314 treatment adherence was not significant, likely due to the limited number of studies addressing this
315 outcome.^{47,53} Several interventions concentrated on the initial stages of hepatitis care, specifically testing
316 and linkage to care, showing improvements in early uptake of health services. These findings highlight
317 that community-engaged hepatitis intervention efforts facilitate earlier entry into the care continuum.⁶¹

318 In contrast to the systematic review data most of which represented HIC settings, the open call described
319 interventions mostly from LMICs. Both sources highlighted the peer support, and culturally appropriate
320 communication, emphasizing the role of community leaders and advocates in enhancing the reach and
321 effectiveness of hepatitis programs. However, interventions identified in the systematic review were
322 largely engaging patients in health research activities. Conversely, the open call identified advocacy
323 activities, with community members leading initiatives to engage government and health authorities to
324 create patient demand and generate hepatitis-focused health programs in LMICs, but these initiatives are
325 rarely scientifically evaluated or documented. This provided valuable insights for developing future
326 community-led strategies, particularly in LMICs.

327 We identified significant gaps and opportunities in community engagement efforts across the chronic
328 viral hepatitis care continuum. In testing and linkage to care, while existing literature focuses on
329 community engagement for education and service delivery, the open call identified diverse community-
330 led initiatives in low-resource settings addressing awareness, misinformation, stigma reduction, and
331 emotional and legal support. Community-led efforts to enhance testing and linkage to care in LMICs

332 remain underrepresented in academic literature²⁵, indicating missed opportunities to empower
333 communities. Regarding treatment adherence, research has primarily centered on using peer health
334 workers to improve service access. However, grassroots communities in LMICs are vital in tackling
335 structural challenges, such as initiating new services, securing government funding, and maintaining
336 treatment during emergencies. For viral suppression and post-treatment follow-up, evidence indicates that
337 higher levels of community engaged interventions can improve SVR and cure rates. Grassroots initiatives
338 aimed at raising public awareness and addressing stigma are prevalent in LMICs, yet more robust
339 evaluation and documentation of these efforts are needed and recommended.

340 Our study has several strengths. First, it employs a mixed-methods approach, which combines
341 quantitative and qualitative data to provide a more comprehensive understanding of the community-
342 engaged interventions and advocacy efforts to eliminate the hepatitis. Second, the study uniquely
343 integrates findings from published studies with complementary data from an open call, enabling broader
344 stakeholder participation and the inclusion of diverse perspectives. This study also has limitations. First,
345 systematic review data were largely from HICs, and the open call submissions were mainly from LMICs.
346 However, the combined data complementary insights on community-engaged interventions for hepatitis
347 care across settings with diverse resources and healthcare infrastructure. Second, the review identified
348 heterogeneity in hepatitis care interventions and outcome measures, but our evidence synthesis provided
349 information about the impact of community engaged interventions on hepatitis care outcomes stratified by
350 community levels.

351 In conclusion, our systematic review and open call submissions both demonstrate that community-
352 engaged interventions and local advocacy strategies significantly enhanced chronic viral hepatitis care
353 across the continuum, from testing to treatment and to suppression or cure. This has implications for
354 practice and policies providing evidence that community-engaged strategies can be implemented to
355 support effective delivery of chronic viral hepatitis care services, especially in resource limited settings,
356 and highlighting the need for supportive policies to aid implementation. Importantly, Asia and Africa—
357 regions bearing the highest burden of chronic viral hepatitis infection and liver disease—require more
358 tailored interventions to meet local needs in hepatitis service delivery. Additionally, more research is
359 needed to examine impact and sustainability of the strategies in LMICs.

360

361 **Contributors**

362 DW conceived the idea. YL, EK, DE, HC, KW, RS and DW conducted systematic review and meta-
363 analysis. HC, DW, JT and EK managed the open call process. YL, EK, DE and HC wrote the draft. TF,
364 JT, PM, DA, YZ and all other co-authors provided constructive feedback on the manuscript. All authors
365 reviewed and approved the final version of the manuscript.

366 **Data sharing statement**

367 The data supporting this article are included within the article itself and in the supplementary material.

368 **Declaration of interests**

369 The authors declare no conflicts of interest.

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379 and insights through the open call.

380

Figures

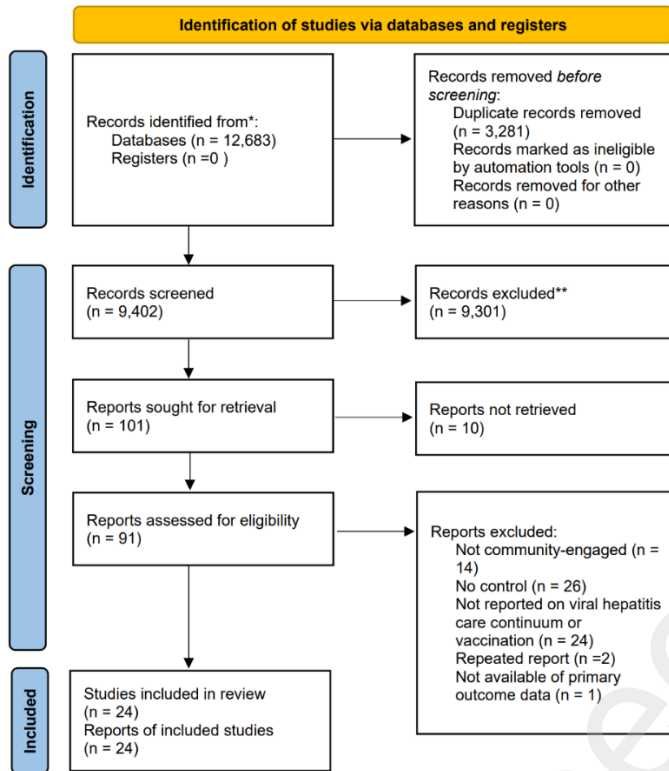
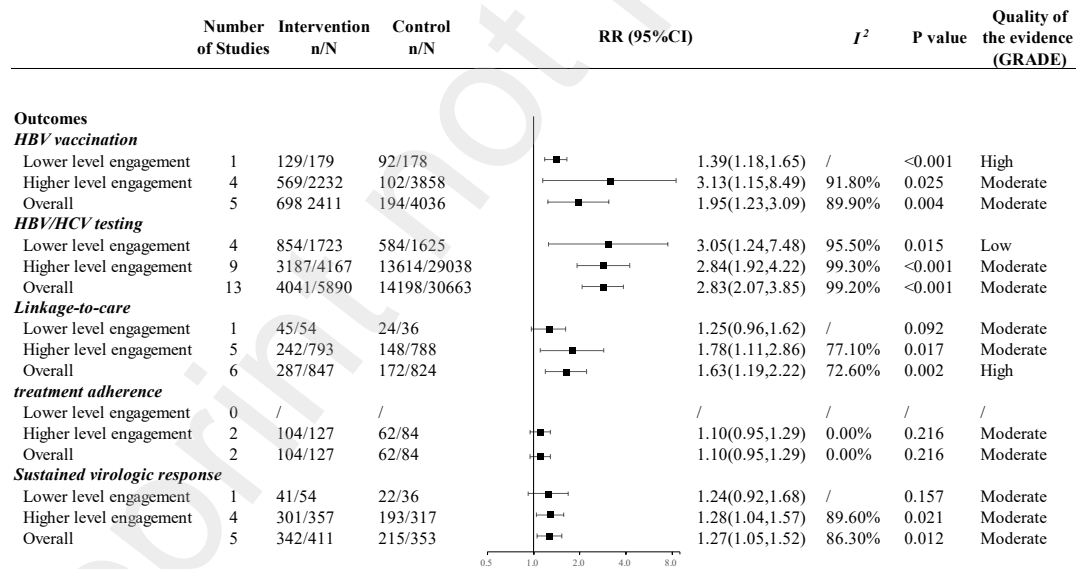


Figure 1: Steps of citation screening flow diagram



*Only the GRADE assessments for RCTs are presented in this figure.

Figure 2: Effectiveness of community-engaged interventions on HBV vaccination, HBV/HCV testing, linkage to care, treatment adherence, and sustained virologic response (SVR)

Tables

Table 1: The definition of outcomes and the details of control group's intervention in the meta-analysis section

Outcomes†	Definition in the included studies
Vaccination rate	Completed a series of three HBV vaccinations and this were followed up for series completion over 12 months after their first HepB vaccine dose. This outcome was assessed by the vaccine tracking system or EPI-issued (or another health facility-issued) vaccination card.
Testing uptake	Self-reported receipt of HBV/HCV testing at 1 to 6 months follow-up. When both HBV and HCV testing data were reported, the extracted data were calculated as having either HBV or HCV screening.
Linkage to care	World Health Organization (WHO) recommended that linkage to care is defined as the duration of time starting with diagnosis and ending with enrolment in care or treatment. In the included studies, this is defined as: a. engagement with clinical hepatitis services i.e., three engagements within 6 months of the first booked clinical appointment; b. participants who received therapy or initiated treatment for HBV/HCV between 3 months to 12 months follow-up.
Treatment adherence	Adherence is defined by the WHO as “the extent to which a person’s behaviour—taking medication, following a diet, and/or executing lifestyle changes— corresponds with agreed recommendations from a health care provider”. Daily adherence was extracted, which means participants received credit if doses were taken on the specified day. This outcome is focused on HCV treatment adherence.
Sustained virologic response	SVR was defined as an undetectable HCV RNA at 12 or more weeks after completion of treatment. The denominator of SVR is the number of analysed participants rather than the number of accepting treatment participants in each group.

†The outcomes of the included studies were reclassified according to the WHO definition and the definition's descriptions in the papers.

Table 2: Characteristic of included studies of the systematic review and meta-analysis (n=24)

	Study (Year)	Level of Engagement	Study design	Setting	Population	Community-engaged Intervention	Intervention in control group	Type of hepatitis focused	Study outcomes across the continuum	Sample size	Risk of bias	Grade
1	Owais et al. (2011) ⁶³	Lower level engagement (Inform)	RCT	Pakistan	Mothers of children 12-23 months of age	Three targeted pictorial messages regarding vaccines administered by trained community health workers.	General health promotion messages available from federal agencies.	HBV	Vaccine	178 in control 179 in intervention	RCT: llllhl	high
2	Taylor et al. (2013) ⁴⁴	Lower level engagement (Inform)	RCT	USA	Immigrants	Educational flipchart, motivational Khmer language DVD delivered by lay health workers (LHWs).	The intervention focused on physical activity.	HBV	Testing	104 in control 95 in intervention	RCT: llllhl	moderate
3	Bastani et al. (2015) ⁶⁴	Lower level engagement (Inform)	Cluster-Randomized clinical Trial (CRCT)	USA	Immigrants	Single-session small-group discussion on liver cancer and HBV testing in church.	The intervention focused on nutrition and physical activity.	HBV	Testing	580 in control 543 in intervention	CRCT: hhllhl	moderate
4	Ward et al. (2019) ⁴⁸	Lower level engagement (Consult)	RCT	USA	People who use drugs (people lived with HIV who use drugs)	Usual care (UC) involving clinical visits and calls delivered by a nurse-led multidisciplinary team plus Peer mentoring	UC	HCV	Linkage-to-care & SVR	36 in control 54 in intervention	RCT: llllhl	moderate
5	Nyamathi et al. (2015) ⁵⁶	Higher level engagement (Involve)	RCT	USA	Homeless men	Intensive peer coaching and nurse case management (description of the three groups)	UC intervention received the encouragement by a nurse to complete the three-series HAV/HBV vaccine	HBV	Vaccine	114 in control 231 in intervention	RCT: llllhl	moderate
6	Juon et al. (2016) ⁴⁵	Higher level engagement (Involve)	RCT	USA	Immigrants	A list of resources by mails for where to get free vaccinations as well as reminder calls for vaccinations from trained LHWs.	Received only list of resources by mail	HBV	Vaccine	87 in control 100 in intervention	RCT: llllhl	moderate

7	Ma et al. (2017) ⁴¹	Higher level engagement (Involve)	CRCT	USA	Immigrants	Interactive group education, patient navigation, and the engagement of health care providers, church leadership and church members in the medical field	General cancer education and preventive care	HBV	Testing	1193 in control 1061 in intervention	CRCT: lhllhhl	moderate
8	Ma et al. (2017) ⁴²	Higher level engagement (Involve)	CRCT	USA	Immigrants	Interactive group education, navigation services, and the engagement of community leadership and health care providers in advocacy and referrals.	General cancer education and preventive care	HBV	Testing & Vaccine	"testing: 714 in control and 916 in intervention"	CRCT: hhlhhl	moderate
9	Akiyama et al. (2019) ⁴⁷	Higher level engagement (Involve)	RCT	USA	People who use drugs (PWID)	Education, psychosocial support from peers and providers	Self-administered individual treatment (SIT) intervention, all medications were self-administered at home.	HCV	Treatment adherence & SVR	vaccine: 17 in control and 332 in intervention"	RCT: lhllhhl	moderate
10	Fitzpatrick et al. (2019) ⁵⁷	Higher level engagement (Involve)	RCT	China	Men who have sex with men	Community co-developed intervention and sharing/forwarding materials	The standard healthcare services without any promotional materials and only received the baseline and follow-up surveys	HBV/HCV	Testing	51 in control 99 in intervention	RCT: lllhhl	high
11	Broad et al. (2020) ⁵⁸	Higher level engagement (Involve)	RCT	Canada	People who use drugs (PWID)	Peer outreach workers with lived experience of HCV, educate and deliver POC testing	UC	HCV	linkage to care	243 in control 227 in intervention	RCT: lllhhl	moderate
12	Chen et al. (2013) ⁵⁴	Higher level engagement (Collaborate)	RCT	USA	Immigrants	LHW intervention for testing promotion designed by Hmong leaders and researchers	Nutrition and physical activity educational sessions	HBV	Testing	185 in control 195 in intervention	RCT: hhlhhl	moderate

13	Stagg et al. (2019) ⁵⁵	Higher level engagement (Collaborate)	RCT	UK	Chronic hepatitis C patients	One-to-one manner peer advocacy	Standard of care, their test results and notification of their study participation were sent to their primary care practitioner	HCV	Linkage-to-care	112 in control 105 in intervention	RCT: lhlhlhl	moderate
14	Hochstatter et al. (2021) ⁴⁹	Higher level engagement (Involve)	RCT	USA	People who use drugs (Opioid drug users)	Medications for addiction treatment (MAT) plus educational information, private messages and a public discussion forum.	MAT	HCV	Testing	38 in control 58 in intervention	RCT: llhhlll	moderate
15	Litaker et al. (2021) ⁵⁰	Higher level engagement (Involve)	Cross-sectional study	USA	Baby boomers born between 1945-1965	Outreach, education, and incentive	No education, outreach, or incentive	HCV	Testing	179 in control 185 in intervention	NOS: 12120122; total=5·5	low
16	Martro et al. (2022) ⁶⁰	Higher level engagement (Involve)	Observational	Spain	Immigrants	Education, screening and simplified access to treatment.	UC	HCV	Testing	795 in control 840 in intervention	NOS: 10221121, total=5·5	low
17	Norton et al. (2021) ⁵³	Higher level engagement (Collaborate)	Prospective cohort study	USA	People who use drugs (PWID)	Directly observed therapy (mDOT), Group treatment (GT)	SIT	HCV	SVR & Treatment adherence	25455 in control 505 in intervention	NOS:11122221, total=7	low
18	Chu et al. (2022) ⁴⁶	Lower level engagement (Consult)	Cross-sectional study	USA	Immigrants	Multimedia campaign, educational information, screening	Standard of care	HBV	Testing	33 in control 28 in intervention	NOS: 11112121, total=6	low
19	Eckhardt et al. (2022) ⁵¹	Higher level engagement (Involve)	RCT	USA	People who use drugs (PWID)	Simplified access to treatment, prevention	UC	HCV	Linkage-to-care; SVR	809 in control 857 in intervention	RCT: lhhlllll	moderate
20	Fadnes et al. (2021) ⁵²	Higher level engagement (Involve)	RCT	Norway	People who use drugs (PWID)	Integrated treatment, testing, counselling	Standard treatment	HCV	Linkage-to-care & SVR	83 in control 82 in intervention	RCT: llllllll	high

21	Khalili et al. (2022) ⁴³	Lower level engagement (Consult)	CRCT	USA	Immigrants	A hepatitis app providing interactive video education combined with a printout (Provider Alert) and a Provider Panel Notification. The intervention was developed following consultation with community members and CBOs	A mobile application delivering nutrition and physical activity education and a Provider Panel Notification	HBV	Testing	150 in control 148 in intervention	CRCT: lllllll	high
22	Berenbrok et al. (2023) ⁶²	Higher level engagement (Involve)	Non-randomized controlled cluster trial	USA	Diabetic	Pharmacist-led MI intervention: patient education through a conversation to recommend HBV vaccination and provision of education materials	General information on immunizations	HBV	Vaccine	132 in control 228 in intervention	RCT: hhhllll	moderate
23	Wong et al. (2022) ⁶¹	Higher level engagement (Involve)	RCT	China	General primary care patients	Promotion of HBV, HCV testing using digital tools	The standard healthcare services without any promotional materials	HBV/HCV	Testing & linkage to care	3640 in control 1569 in intervention	RCT: lhhllll	moderate
24	Xiao et al. (2021) ⁵⁹	Higher level engagement (Involve)	RCT "pilot study"	Australia	Immigrants	CBOs supported recruitment of participants, community outreach through multi-lingual fieldworkers, online advertisement through university student noticeboard, WeChat and a Chinese language radio broadcast Intervention: Education package (comprised of a leaflet and in-person one-on-one educational session)	Liver cancer prevention information	HBV	Testing	332 in control 310 in intervention	RCT: llhllll	moderate

Table 3: Community-engaged intervention from systematic review and open call across hepatitis care continuum

Hepatitis care continuum	Community-engaged interventions from the systematic review	Community-engaged interventions from open call
Testing and linkage-to-care	<ul style="list-style-type: none"> • Patient-led care pathways and peer support workers to act as patient liaisons for service delivery • Educational materials created by and with community members • Accessible language and culturally appropriate materials • Digital and in person engagement activities • Community leaders' role to improve the reach of hepatitis testing programs 	<ul style="list-style-type: none"> • Efforts to reduce perceived obstacles to testing and promote entry into care continuum. • Enhancing Information accessibility about testing services and providing reliable information • Tackling misinformation about viral hepatitis including that from medical providers (Yiyou Charity Liver Center in China) • Stigma reduction and tackling discrimination against people living with hepatitis • Pioneering hepatitis testing awareness campaigns (Yiyou Charity Liver Center in China) • Initiation and implementation of hepatitis screening, testing, referral, and treatment programmes for priority populations (Community Network for Empowerment (CoNE) in India) • Providing emotional support and legal aid (Delhi Network of Positive People in India)
Treatment and adherence	<ul style="list-style-type: none"> • Peer support workers or mentors helped improve access to treatment and treatment adherence • Peer education on treatment and adherence 	<ul style="list-style-type: none"> • Provision of affordable/free consultations and medications (Zakat Fund of National Liver Foundation, Bangladesh) • Ensure access to HBV and HCV treatments during emergencies like the COVID-19 pandemic (CoNE) • Advocate and initiation of awareness campaigns on treatment options and resources • Engaging with government and health authorities to fund hepatitis treatments and encourage newly diagnosed patients to seek care.
Viral suppression/cure and aftermath	<ul style="list-style-type: none"> • Using mobile phones for communicating with peer supporters before, during and after treatment • Participants received incentives designed to reinforce visit attendance behaviours and were not based on pill count or HCV RNA response • Utilizing Syringe Service Programs (SSPs) as potential sites for community-based treatment because of high levels of engagement with people who inject drugs • Relying on flexible appointment scheduling and a supportive harm reduction framework • Integrated treatment is provided through multi-disciplinary teams including psychologists for providing mental health treatment (psychosocial approaches) • Patients with providers, chose which intervention to receive (shared decision-making) 	<ul style="list-style-type: none"> • Their advocacy efforts included creating partnerships with the government and other stakeholders, working as peer counsellors and participating in awareness raising campaigns • Patients became advocates for hepatitis elimination through establishing CBOs and lending their voices to give others hope • Leading the advocacy efforts for the establishment of the National Control Programs against Viral Hepatitis (ASOJEDEC in DRC) • Promoting the abolition of HBV check program for school admissions and entry physical examination for HBV for employment (Yiyou Charity Liver Center in China)

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