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Viral hepatitis screening and vaccination in the Greater Accra Region of Ghana: a report on the 2022 and 2023 world hepatitis day events

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Abstract

Background: Viral Hepatitis remains a major public health threat, affecting millions globally. For over a decade, 28th July has been observed as World Hepatitis Day, with the goal of raising awareness, sensitising, and mobilising global efforts to control and prevent viral hepatitis. In 2022 and 2023, we actively participated in and supported events marking this day by conducting awareness-raising activities and promoting the prevention and control of viral hepatitis B and C.

Objective: This study aimed to screen and vaccinate individuals who tested negative, as well as identify and link to care asymptomatic individuals who are unknowingly living with chronic hepatitis in order to prevent progression to liver cancer.

Methods: Screening and vaccination activities were conducted at Maamobi General Hospital and the Legon Campus (LC) in 2022, and at the Madina STC Yard and the LC in 2023. Individuals who provided consent were screened for HBV and HCV antigens and/or antibodies. Those eligible were vaccinated against HBV, while individuals who tested positive for HBV or HCV were referred for clinical care. Contact details for the vaccinees were captured, and follow-up calls were made to remind participants of subsequent vaccinations.

Results: In 2022, of 388 participants tested, 25 (6.4%) tested positive for HBV infection (HBsAg-positive). Forty-eight (12.4%) persons had protective antibodies (anti-HBs-positive) while 315 individuals tested negative for anti-HBs and consented to receive HBV vaccination. In all 206 (64.8%) of the 315 persons completed all three doses. In 2023, among 548 participants, 43 (7.8%) tested positive for CHB and 59 (10.8%) had protective antibodies. Across both years, we have screened 936 people and identified 68 (7.3%) CHB cases and 7 (0.7%) anti-HCV-positive persons. We were also able to fully vaccinate 317 persons. Over the two years, 722 received the first dose, 487 received the second dose, and 46 received booster shots.

Conclusion: Our community engagement activities support the Global Health Sector Strategy by identifying infected individuals for care and promoting HBV vaccination, thereby helping uncover undetected cases.

Keywords: Ghana, viral hepatitis, screening, vaccination, world hepatitis day

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INTRODUCTION

Viral hepatitis remains a major public health threat, affecting millions globally [1]. The disease is mainly caused by five unrelated viruses, namely Hepatitis A, B, C, D and E, and causes more than one million deaths every year [2]. Of these, Hepatitis B and C (HBV and HCV) yield the highest burden and mortality and can cause long-term infection. Although there has been an effective vaccine against HBV since 1982, its burden and associated

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mortality continue to rise [3]. There are 254 million people living with chronic Hepatitis B infection (CHB), and each year an estimated 1.2 million new cases occur [1]. Globally, sub-Saharan Africa is heavily burdened with the disease, whilst the entire African continent reports up to 70% of all HBV cases in children under 5 years [4]. Overall, 60 million people in Africa live with CHB, with 250,000 associated deaths, exceeding the number of deaths attributed to Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) or tuberculosis (TB) [5,6]. Despite the high burden of viral hepatitis, its management, prevention and control remain largely neglected in most African countries. The main hindrances to control include limited information about transmission, especially among the highest-risk groups; limited vaccine coverage due to cost and availability; and inaccurate estimates of disease burden resulting from imprecise records on disability-adjusted life years (DALYs) [3,7].

The 28th July has been observed as World Hepatitis Day (WHD) since 2009, with the goal of raising awareness, intensifying screening efforts, increasing vaccination coverage, and mobilising global efforts towards control of viral hepatitis. One of the main tools for HBV prevention is vaccination, but in developing countries, coverage is limited, partly due to cost [8,9]. The 3-dose regimen over a 6-month span also poses a challenge since many people tend to miss subsequent doses after the first has been taken and remain unprotected from the virus. This gap poses a significant threat to control efforts because these individuals remain susceptible to infection and may be unaware of their vulnerability. The National Viral Hepatitis Control Programme (NVHCP) in Ghana, in collaboration with other stakeholders, has developed guidelines on viral hepatitis prevention, care, and treatment to address knowledge gaps among healthcare workers and improve access to treatment for people living with viral hepatitis [10]. In Ghana and other African countries, routine vaccination is mandatory for children under 5 years, but there is no policy on adult HBV vaccination [11,12].

The Hepatitis-Malaria (HEPMAL) research group at the Noguchi Memorial Institute for Medical Research (NMIMR), funded by the European and Developing Countries Clinical Trials Partnership (EDCTP), marked WHD by organising viral hepatitis awareness activities, screening, and free vaccination. This initiative was aimed at drawing attention to viral hepatitis, while providing an opportunity for the public to know their status and take the appropriate preventive and control action. The team collaborated with the Ghana Health Service (GHS), Maamobi General Hospital (MGH), and Madina Health Directorate (MHD) to conduct community screening activities at MGH, Madina STC lorry park, and the University of Ghana, Legon campus (LC) in 2022 and 2023, respectively. This report covers the WHD screening and vaccination exercises and offers findings and recommendations to boost HBV vaccine uptake in adults.

MATERIALS AND METHODS

Outreach sites

In 2022, our medical outreach was held at MGH and LC, while in 2023, it took place at the Madina STC yard and LC; both locations are suburbs in Accra, Ghana. At MGH, both community members and hospital staff were screened, whereas at STC in Madina, only community members were screened. At LC, both staff and students participated in screening and vaccination activities (Figure 1).

Community education, pre-counselling and consenting

On screening days, participants were educated on the causes, transmission and prevention of HBV and HCV by the public health personnel from the GHS. This was done periodically as participants were conducted through the various mounted stations. The need to get tested and vaccinated if required, and to test for seroconversion afterwards, was highlighted, with clear instructions on how to seek these services. Additionally, participants were encouraged to take the freely available vaccine if they tested negative for HBV and also engage in peer education in their communities. Outreach activities were explained clearly to participants individually, and those who consented were administered a structured questionnaire to collect basic demographic information, HBV vaccination status, and other infection risk factors.

Sample testing

For each consented participant, 2 mL of venous blood was collected into EDTA vacutainer tubes for analysis. The Advanced quality one-step rapid HBV profile kit (Intec Products Inc., Xiamen, China) was used to test for the presence of HBV antigens – surface (HBsAg), and e (HBeAg) antigens, as well as antibodies to the surface (anti-HBs), core (anti-HBc) and e (anti-HBe) antigens. In addition, all samples were tested for HCV antibodies using the Advanced Quality rapid anti-HCV test kit from InTec Products, Inc., China (Figure 1). Participants who tested negative for all HBV antigens and antibodies were eligible for vaccination. Those who consented to receiving the vaccine were administered the first dose and issued a vaccination card with dates for subsequent doses (one and six months after the initial dose). Qualified public health nurses administered the 3-dose HBsAg recombinant vaccine (GeneVac-B, Serum Institute of Pune, India) at 1 and 6 months after the first dose. To ensure participants receive the three shots of the vaccine, there was active follow-up of vaccinees for the subsequent vaccinations through phone calls a week and a day before the scheduled day.

Those who tested positive only for anti-HBs were immune due to self-reported previous vaccination, whereas those whose bands were faintly positive and had their vaccination more than 10 years ago were given booster shots. HBsAg-positive participants were counselled and referred to either the MGH or the University Hospital, Legon, for care. In Ghana, clinics for liver diseases that provide Hepatitis care

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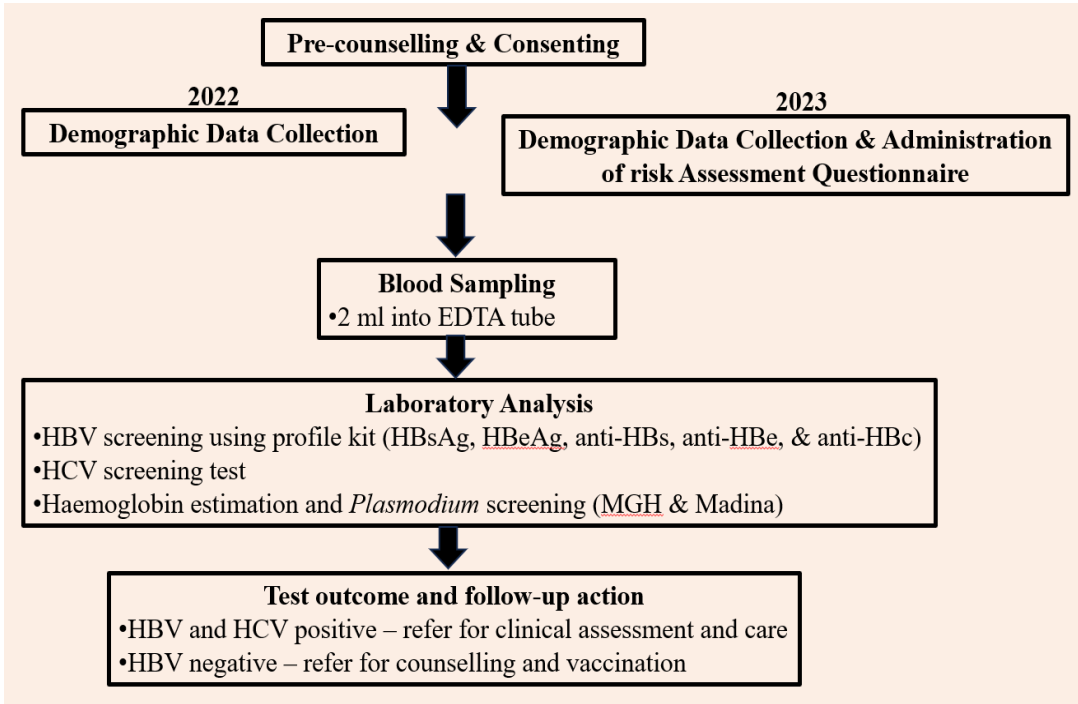

Figure 1. Workflow for community engagement activities

are limited to a few facilities, and are usually inaccessible to many from distant communities. Through this community outreach initiative and the contribution of other key stakeholders, a liver clinic was established at MGH to serve the community.

Data analysis

Patient information and laboratory results were entered into a Microsoft Excel workbook and saved under encryption. The HBV antigen and antibody results were displayed as proportions in tables prepared in Microsoft Excel, and GraphPad 10.0 was used to prepare figures.

RESULTS

Outreach participants

In 2022, 388 individuals were screened: 281 (72.4%) from MGH and 107 (27.6%) from LC. At MGH, 94 (33.5%) were male and 186 (66.2%) female; at LC, 50 (46.7%) were male and 56 (52.4%) female. Ages ranged from 12 – 72 years at MGH and 16 – 66 years at LC (Table 1). In 2023, 548 individuals were screened: 435 (79.4%) aged 5 – 78 years from Madina STC yard and 113 (20.6%) aged 20 – 62 years from LC. At Madina, 211 (48.5%) were male and 222 (51.0%) female; at LC, 50 (44.2%) were male and 63 (55.8%) female. Across both years, most participants had at least a secondary education, and except for 2022, where 35 reported prior vaccination, none had been previously vaccinated (Table 1).

Hepatitis B virus antigen/antibody profile and Hepatitis C virus detection

In 2022, 25 (6.4%) out of 388 participants tested positive for HBV (positive HBsAg test) (Figure 2). Of these, 4 (3.7%) were from LC and 21 (7.5%) from MGH. All HBV-positive individuals also had a positive anti-HBc and anti-HBe test, except one person from MGH, who had a positive HBeAg but not an anti-HBe test. In 2023, 43 (7.8%) of the 548 participants tested positive for HBV, 3 (2.7%) from LC and 40 (9.2%) from Madina (Figure 2). All these individuals also had a positive anti-HBc test, while 17 (3.1%) were positive for anti-HBe (3 (2.7%) from the LC group and 14 (3.2%) from Madina. Among all participants, only 1 (0.2%) person from Madina tested positive for HBeAg (Figure 2).

Additionally, 48 (12.4%) participants in our 2022 cohort and 59 (10.8%) in our 2023 cohort tested positive for anti-HBs, indicating immunity against HBV infection. Among the 2022 group, 28 were from MGH and 20 from LC, while in the 2023 group, 8 were from Madina and 51 from LC (Figure 2). All the anti-HBs-positive 2022 LC participants were negative for all other markers, indicating immunity from vaccination, whereas three of the anti-HBs-positive MGH participants also tested positive for anti-HBc and anti-HBe, indicating immunity from previous infection. Within the 2023 cohort, all anti-HBs-positive persons tested negative for all other markers, indicating immunity from vaccination. Furthermore, two participants were

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positive for anti-HBe and anti-HBc only and 11 were positive for anti-HBc only, requiring further testing to ascertain whether these could be occult infections. Only one of the 2022 participants and six of the 2023 participants tested positive for HCV antibodies, indicating either a past or ongoing HCV infection (Figure 2). All the HBV-infected persons were referred for clinical care at the Mamobi General and Legon Hospitals.

Vaccination Outcomes

Out of a total of 363 participants who tested negative for HBV, 48 had protective antibodies. The remaining 315 (232 from MGH & 83 from LC) were eligible for HBV vaccination. Among the MGH participants, all 232 (100%) consented and received the first dose of vaccine; 195 (84.1%) received the second dose, and 148 (63.8%) received the third dose (Table 2). In all, 84 (36.2%) did not attend subsequent vaccine doses despite repeated follow-up calls. When grouped by MGH staff and Maamobi community members, a higher proportion of vaccination dropouts were MGH staff (Table 2). At LC, 82 (98.9%) received the first dose, 77 (92.8%) received the second dose, and 58 (75.3%) returned for the third dose, representing full vaccination. A total of 25 (30.1%) did not turn up for subsequent vaccine doses despite our repeated follow-up calls (Table 2). Similarly, within our 2023 cohort, 505 participants tested negative for HBV (110 from LC and 395 from Madina). Out of this 505, 59 (51 from LC and 8 from Madina) had protective antibodies, leaving 446 (59 from LC and 387 from Madina) participants eligible for HBV vaccination. In the LC group, 44 opted for and received the first dose of the vaccine, of whom 4 returned for the second dose and 3 for the third dose. This resulted in 3 (6.8%) of 44 participants being fully vaccinated, and 41 (93.2%) were lost to follow-up. For our Madina cohort, 364 opted for and received the first dose of HBV vaccine. Subsequently, 211 and 108 returned for the second and third doses, respectively. A total of 108 (29.7%) of 364 were fully vaccinated, and 256 (70.3%) were lost to follow-up despite follow-up (Table 3).

HBV infection risk assessment amongst our 2023 participants

A total of 375 of our 2023 participants responded to our infection risk assessment questions. From the responses received, the majority of our participants (304 out of 375) indicated that they engaged in unprotected sex, of which 193 of the people engaged in sexual activity with multiple partners. In contrast, injection drug use and tattoo/piercing history were rare (Figure 3).

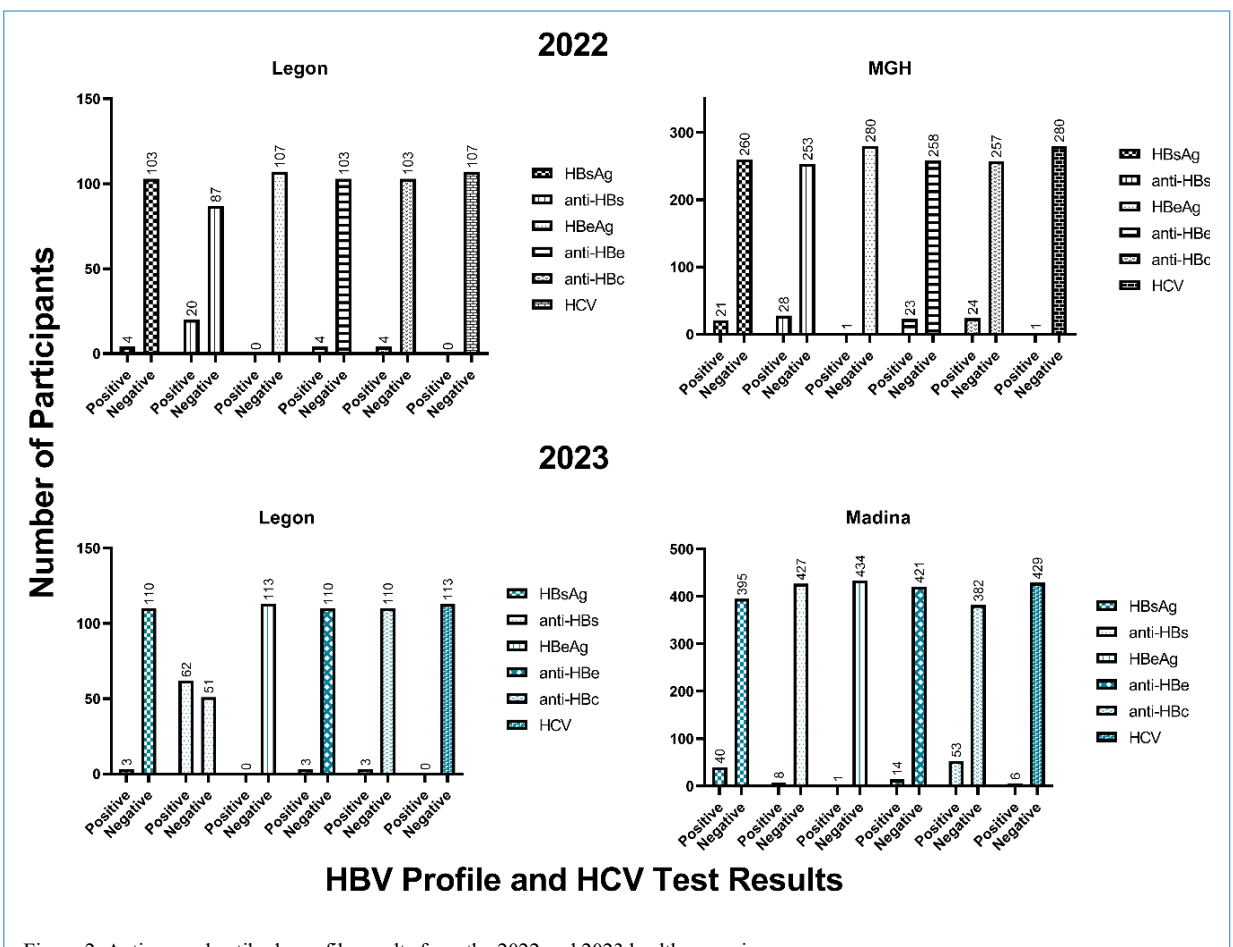

Figure 2. Antigen and antibody profile results from the 2022 and 2023 health screening

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Table 1. Demographic information of participants

Parameter		2022 (n=388)	
		MGH (n=281) n (%)	LC (n=107) n (%)
Age	Range	12 -72 years	16 - 66 years
	Mean	39 years	32 years
Sex	Male	94 (33.5)	50 (46.7)
	Female	186 (66.2)	56 (52.4)
	No response	1 (0.3)	1 (0.3)
Formal Education	None	30 (10.7)	0 (0)
	Primary	37 (13.1)	0 (0)
	Secondary or higher	214 (76.2)	105 (98.1)
	No response	0 (0)	2 (1.9)
Previous vaccination*	Yes	35 (12.5)	NA
	No	246 (87.5)	NA
		2023 (n=548)	
		Madina (n=435) n (%)	LC (n=113) n (%)
Age	Range	5 – 78 years	20 - 62
	Mean	32 years	27 years
Sex	Male	211 (48.5)	50 (44.2)
	Female	222 (51.0)	63 (55.8)
	No response	2 (0.5)	0 (0)
Formal Education	None	73 (16.8)	0 (0)
	Primary	76 (17.5)	0 (0)
	Secondary or higher	286 (65.7)	113 (100.0)
	No response	0 (0)	0 (0)
Previous vaccination*	Yes	0 (0)	0 (0)
	No	466 (100)	113 (100)

Table 2. Number of HBV vaccine recipients for 2022

Location	Vaccine dose	Vaccinated n (%)	Not-vaccinated n (%)
	First Dose	90 (100)	0
MGH staff (n=90)	Second Dose	74 (82.2)	16 (17.8)
	Third Dose	53 (58.8)	21 (23.3)
	First Dose	142 (100)	0 (0)
Maamobi Community (n=142)	Second Dose	121 (85.2)	21 (14.8)
	Third Dose	95 (66.9)	26 (18.3)
	First Dose	82 (98.8)	1 (1.2)
Legon campus (n=82)	Second Dose	77 (92.8)	5 (6.0)
	Third Dose	58 (75.3)	19 (24.7)
Overall (n=314)	Fully vaccinated	206 (65.6%)	
	Lost to follow-up	108 (34.4%)	

Table 3. Number of HBV vaccine recipients for 2023

Location	Vaccine dose	Vaccinated n (%)	Not-vaccinated n (%)
Legon Campus (n=44)	First Dose	44 (74.6)	-
	Second Dose	4 (9.1)	40 (90.9)
	Third Dose	3 (6.8)	1 (2.3)
Madina (n=364)	First Dose	364	-
	Second Dose	211 (58.0)	153 (42.0)
	Third Dose	108 (51.2)	103 (48.8)
Overall (n=408)	Fully vaccinated	111 (27.2)	
	Lost to follow-up	297 (72.8)	

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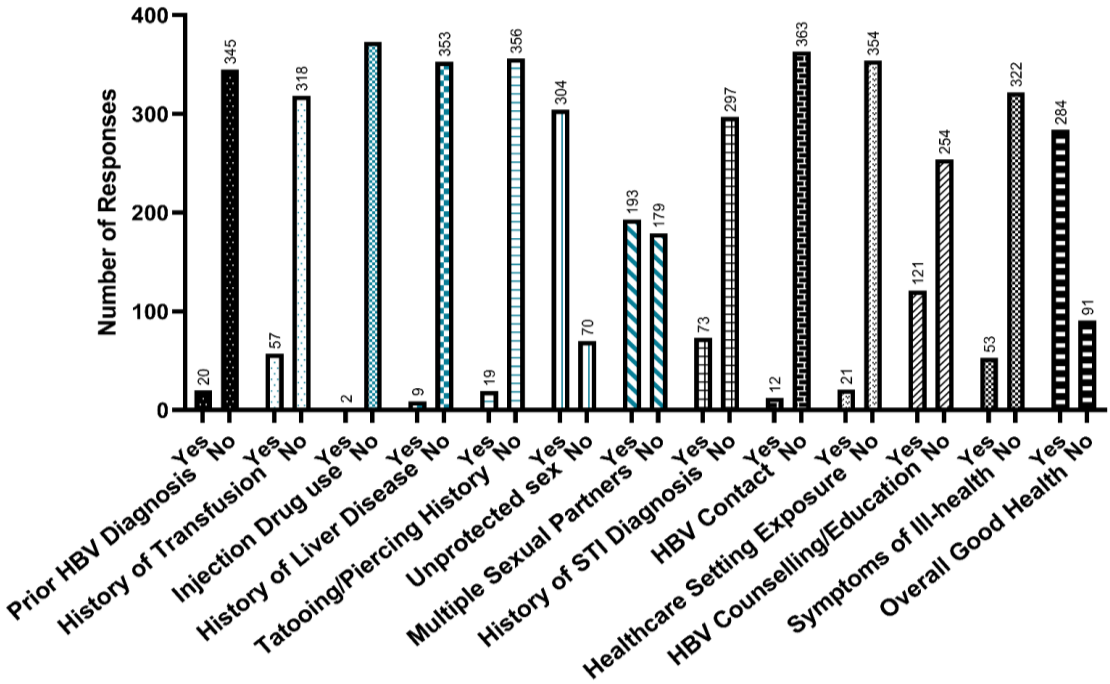

Figure 3. Responses to risk assessment for HBV infection amongst our 2023 participants

DISCUSSION

Since 2009, the world has observed WHD on 28th July, instituted by the World Health Organisation (WHO) in honour of Dr Baruch Bloomberg, who discovered HBV and contributed to its diagnostics and vaccine development. [10]. WHD commemoration involves education on viral hepatitis while mobilising stakeholder support for prevention and control. As part of this effort, the WHO, together with member states, civil society organisations and other stakeholders, has set up the Global Health Sector Strategy (GHSS) on Viral Hepatitis with the aim of reducing the global burden of viral hepatitis by 2030 through a series of key interventions and targets [11]. Two of the five key strategies proposed are the need for information to support focused action and intervention for impact—both advocate active case-finding, improved clinical care, and increased access to HBV vaccination. Our community engagement activities align with this agenda and contribute to the control efforts in Ghana. Following our successful campaign to raise awareness, screen, and vaccinate or recommend persons for CHB infection management in 2021 [12], we sought in 2022 and 2023 to continue this HBV control and prevention exercise by expanding our geographical reach and implementing some of the lessons learnt from the 2021 outreach.

Over the two years, we recorded a CHB prevalence of 7.3%, which is slightly higher than the 6.5% reported by the Ghana Health Service (GHS) for the Greater Accra Region [13]. The majority (75%) of the CHB individuals were unaware of their infection status prior to this exercise. Not only are such persons at risk of developing liver cirrhosis without clinical care, but they also serve as potential sources for transmission. These persons were referred to the University Hospital, Legon, for confirmatory testing and care. Cumulatively, Ghana's CHB prevalence ranges from 6.5% to 22.7% depending on the region of the country, with the highest burden found in Northern Ghana [13,14]. An active case search through a robust surveillance system is much needed to inform control policies and interventions. Moreover, it is difficult to estimate the timing of HBV infection, as HBsAg first appears in the blood during acute infection and can persist for years. Consequently, it is impossible to determine how long an individual has been infected, which makes it difficult to trace contacts for testing and further highlights the need for active case search to enable timely intervention and curb transmission. Only two of the HBV-infected persons tested positive for HBeAg, a marker of an actively replicating virus. These individuals are at elevated risk of adverse clinical outcomes in the absence of appropriate care and represent a significant source of ongoing infectivity [15].

We fully vaccinated 317 (41.7%) of our 761 vaccine-eligible participants, with 722 (94.9%) receiving at least 1 dose and 46 (6.0%) receiving boosters. This is lower than the 79.1% reported in another study in a Ghanaian hospital, which found that 79.1% of those who started HBV vaccination completed the schedule [16]. However, this is

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similar to findings by other studies, which reported completion rates of 47.8% and 26.3%, respectively [17,18]. Losses during the third dose administration were higher than those recorded during the second dose administration. A major contributing factor was discomfort during the injections, which discouraged some participants from returning for subsequent doses. Additionally, the relatively long span between the second and third doses may be another reason many vaccinees forgot to return for the third dose. To address this, vaccine cards with clearly specified vaccination schedules were distributed.

Telephone calls were made to each participant twice, a week and a day before their scheduled time to receive the second or third vaccine doses, and these were expected to reduce losses to follow-up. For the 2022 activities, losses to follow-up were higher among MGH staff (41.1%) compared to Maamobi community members (37.1%). While this is concerning, it is not surprising, as there is growing evidence of vaccine hesitancy among Health Care Workers (HCWs) [19–21]. This underscores the need for enhanced education among healthcare workers (HCWs), who are occupationally at risk of acquiring HBV infection. Vaccine-hesitant HCWs may also influence vaccination decisions by recommending vaccines less frequently to patients and undermining confidence, thereby contributing to vaccine hesitancy in the general population [19]. Furthermore, adopting a house-to-house vaccination approach, as implemented for polio vaccination in Ghana, could further reduce losses to follow-up. Ghana has successfully implemented infant HBV vaccination for newborns since 2002, but there is no specific policy for adult vaccination. Consequently, higher HBV prevalence has been reported among adults compared to children [13]. Apart from perinatal HBV transmission, horizontal transmission from relatives within the first five years of life is a major HBV transmission route [1]. Establishing a vaccination policy for adults will complement newborn vaccination and significantly accelerate control measures.

Among the 936 persons screened over the two years, only seven tested positive for anti-HCV antibodies, indicative of either current or past HCV infection. Positive individuals were referred for confirmatory testing to distinguish past from current infection. The prevalence of possible HCV infection in this study was much lower than that for HBV, consistent with previously reported findings [22,23]. For HCV infection, however, an effective treatment regimen is freely available at health facilities in Ghana for a complete cure, and identified persons were directed to appropriate facilities to access this service. Another challenge to HBV/HCV control is the limited number of easily accessible clinics for care, with only a few available in some hospitals [24]. Peripheral health facilities lack trained physicians for HBV/HCV care and the capacity for routine tests, such as viral quantitation [13,14]. Patients are often required to travel long distances to receive care, which discourages healthcare utilisation. Moreover, hospital-based HBV/HCV care is costly and unaffordable for many patients [25]. Experience from this and previous campaigns, together with support from the Ghana Association for the Study of Liver and Digestive Diseases (GASSLID) and goodwill from other stakeholders, has led to the establishment of an HBV/HCV Care Clinic at MGH to serve the community and neighbouring areas. We advocate for decentralisation of hepatitis care and subsidisation of diagnostic tests and medications, similar to existing models for HIV and TB. We also recommend administering a post–first-dose questionnaire to assess recipients' experiences and how these influence completion of subsequent doses. These measures will increase the likelihood of achieving the GHSS targets within the stipulated timeframe.

Conclusion

Our screening activities identified 68 (7.3%) CHB and 7 HCV-positive individuals, who have been referred for confirmatory testing and clinical management. We also fully vaccinated 317 (41.7%) of the 761 eligible participants. Our findings emphasise the need for active case-finding, especially amongst adults, as this is vital for controlling viral hepatitis, identifying undiagnosed cases, and reducing transmission. Furthermore, comprehensive surveillance requires funding to accurately assess the nationwide burden of HBV, and private partnerships have significant potential to provide such support, particularly in local settings.

DECLARATIONS

Ethical consideration

Ethical clearance for the community screening and vaccination was obtained from the Noguchi Memorial Institute for Medical Research Institutional Review Board (NMIMR-IRB, protocol number 059/21-22). Permission to collaborate with health personnel at the screening sites was obtained from the District Health Directorate for Maamobi General Hospital (2022) and the Madina Polyclinic, Rawling Circle (2023) via the Regional Health Directorate.

Consent to publish

All authors agreed on the content of the final paper.

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Competing Interest
The authors declare no conflict of interest

Author contribution
JHKB, KAK, LEA, and DAA conceptualised the study and acquired funding. DAA, RAL, SPS, BA, FO, LBE, DTA, and RAM curated the data, and DAA and YAL performed formal analysis. EM, NYAA, GA, TB, NAOK, JI, LA, DAO, AD, and NAA carried out the investigation, with SPS, LBE, FO, TB, and CY contributing to methodology. SPS, JHKB, and KAK managed the project and provided supervision. DAA, KAK, and JHKB drafted the manuscript, and DAA, SPS, FO, LEA, KAK, and JHKB reviewed and edited the manuscript.

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Availability of data
Data is available upon request to the corresponding author

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