ORIGINAL ARTICLE

Sufficiency of Hepatitis B Vaccine Single Booster Dose to Seroconverse Immunity to HBV Among Health Workers

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Objective: To 1) determine the proportion of health workers with prior hepatitis B vaccination history who developed immunity after single booster dose of hepatitis B vaccine, 2) evaluate positive predictive value of self-reported hepatitis B vaccination history in predicting immune response among health workers at a university hospital in Thailand.

Materials and Methods: The present study was a single-arm prospective study. The study population included 157 health workers born after 1992 who tested negative immunity as anti-HBs of less than 10 mIU/mL, at pre-placement examinations between October 2023 and September 2024, with calculated sample size of 113 participants. The research tools included vaccination history questionnaire and existing records from the Occupational Health and Safety Office. Those with prior vaccination history received single dose of recombinant hepatitis B vaccine (rDNA) (Serum Institute of India Pvt. Ltd.), and anti-HBs levels were measured 30 to 40 days after vaccination.

Results: Of the 113 participants, 50 had prior hepatitis B vaccination history, and 100% developed immunity after a booster dose. Most received the vaccine during adulthood within last five years. Among the 63 participants with no or uncertain vaccination history, 49 (77.8%) developed immunity, while 14 (22.2%) did not develop immunity after a single dose. A comparison of anti-HBs levels before and after administration of a single dose of hepatitis B vaccine across three groups was done and 1) individuals with a history of prior vaccination ($p<0.001$), 2) individuals without a history of prior vaccination ($p<0.001$), and 3) individuals with uncertain vaccination history ($p=0.018$), demonstrated a significant increase in anti-HBs levels following vaccination.

Conclusion: A single hepatitis B vaccine booster induced protective immunity in 100% of initially seronegative health workers who had prior vaccination history. Documented vaccination within five years correlated with stronger immune responses. These findings support booster dose protocols and highlight the necessity of verified vaccination records for optimal immunization strategies.

Keywords: Hepatitis B; Hepatitis B vaccine; Health worker

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Hepatitis B is a severe liver infection caused by the hepatitis B virus (HBV)[1]. The Occupational Safety and Health Administration (OSHA) Bloodborne Pathogens standard, employers must vaccinate all workers with the potential for occupational exposure[2]. In 2016, it was estimated that approximately 2.22 million individuals in Thailand were carriers of HBV, accounting for 3.48% of the population[3].

Centers for Disease Control and Prevention (CDC) and Canadian guidelines strongly recommend that individuals without documented proof of prior hepatitis B immunization complete the full vaccination series. Additionally, health workers who previously completed the three-dose hepatitis B vaccine series but did not undergo post-vaccination serologic testing should receive a booster dose to ensure adequate immunity[4,5]. In Thailand, the Expanded Program on Immunization (EPI) has been administering hepatitis B vaccinations to newborns in all hospitals since 1992. As of 2019, the Ministry of Public Health (MOPH) in Thailand recommends that individuals born after the initiation of the EPI in 1992 who had no immunity to HBV should receive a single hepatitis B vaccine dose to ensure immunity[6].

Most new health workers enrolled in hospitals were born after the EPI introduced the hepatitis B vaccination in 1992. Therefore, it is assumed that these health workers had received vaccination against hepatitis B during their infancy but there was no evidence of response to the primary hepatitis B vaccine. Most people could not remember their

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vaccination history[7]. There are still some individuals who have negative immunity. A study conducted between 2013 and 2016 at the University Hospital in Thailand showed that 23.0% had no immunity[8]. A study conducted in Thailand between 2012 and 2021 among medical students and health workers discovered that approximately 51% of participants had negative immunity status[9]. Whether health workers may produce an anamnestic response is not confirmed. In the hospital where the present study was conducted, the vaccination protocol for medical personnel still involves administering a total of three doses. The present study aimed to 1) determine the proportion of health workers who had a previous vaccination history and developed immunity to HBV after a single booster dose of the hepatitis B vaccine, and 2) evaluate the positive predictive value (PPV) of self-reported hepatitis B vaccination history in predicting immune response to a booster dose among health workers at a university hospital in Thailand.

Materials and Methods

Study design

A single arm prospective study was conducted at a university hospital in Thailand between October 2023 and September 2024 to evaluate the immune response to a booster dose of the hepatitis B vaccine among health workers.

Study population and sample

The study population consisted of 157 individuals. A sample size of 113 participants was calculated using WinPepi version 11.65, estimating a proportion at a 95% confidence level with an acceptable difference of 0.05, assuming a proportion of 0.5 for a conservative estimate.

The study participants consisted of health workers undergoing pre-placement examinations. Inclusion criteria required participants to be born after 1992, test negative for hepatitis B surface antigen (HBsAg), antibody to core antigen (anti-HBc), and antibody to surface antigen (anti-HBs) during pre-placement examination, and be at least 20 years old. Individuals with a history of hepatitis B infection or those who had previously received accelerated hepatitis B vaccination protocols were excluded from the study. Immunocompromised individuals were also excluded.

Research tool

1) A self-administered questionnaire was adopted from the Occupational Health and Safety (OH&S) Office. A pretest was conducted to ensure the questionnaire's clarity. Feedback on comprehension and structure was collected, and responses were analyzed for inconsistencies or misunderstandings. The questionnaire was then revised to improve clarity in both wording and structure. The revised version clarified the question and provided specific examples, such as vaccination as a student or vaccination during a pre-placement examination. The questionnaire collected demographic information, including age, gender, occupation, smoking habits, and underlying medical conditions. It also inquired about the participant's hepatitis B vaccination history, categorized as had documentation of vaccine, had vaccination history but no evidence, uncertain, no vaccination history. Risk factors for HBV exposure, such as direct patient care or needle-stick injuries, were also recorded.

2) Laboratory testing for hepatitis B serological markers, including HBsAg, anti-HBc, and anti-HBs, was performed using the electrochemiluminescence immunoassay (ECLIA) method (Roche Diagnostic Cobas 6000) for all participants.

3) Existing data recorded by the OH&S Office at the Faculty of Medicine, Khon Kaen University, includes demographic information as gender, age, and occupation, and laboratory results for hepatitis B seromarkers: HBsAg, anti-HBc, and anti-HBs.

Data collection

A questionnaire was distributed to individuals who were negative immunity during pre-placement examination. Participants who were born after 1992 who had previous vaccination history were identified as negative immunity, thus, anti-HBs lower than 10 mIU/mL, and were administered a 1 mL, or 20 mcg, dose of recombinant hepatitis B vaccine (Serum Institute of India Pvt. Ltd., India). Thirty to forty days after the booster dose, participants underwent follow-up serological testing to measure anti-HBs antibody levels. Participants were classified based on their anti-HBs level after receiving a single dose of hepatitis B vaccine as negative immunity with anti-HBs of less than 10 mIU/mL while an anti-HBs level of less than 2 mIU/mL indicated a very low or undetectable level, low responders with anti-HBs between 10 and 99.9 mIU/mL, and high responders with anti-HBs of 100 mIU/mL or more.

Statistical analysis

Statistical analyses were conducted using IBM SPSS Statistics, version 28.0 (IBM Corp., Armonk,

NY, USA). Descriptive statistics were used to summarize participant characteristics, vaccination history, and serological outcomes. Frequencies and percentages were reported for categorical variables. PPV and negative predictive value (NPV) were calculated to evaluate the reliability of self-reported vaccination history in predicting immune responses. PPV represented the proportion of health workers with a history of hepatitis B vaccination who developed immunity after receiving the booster dose. NPV indicated the proportion of health workers without a vaccination history who remained negative immunity after the booster. To compare anti-HBs levels before and after receiving the booster dose, the Wilcoxon signed-rank test was applied, as the data were paired and non-normally distributed. A p-value of less than 0.05 was considered statistically significant.

Ethical approval

The present study has been approved by Khon Kaen University Ethics Committee for Human Research on July 18, 2023 (HE661336). The objective, expected outcome, benefit, and risk of the study were provided to all subjects before signing the consent form. The study results were presented in overview data that cannot be specific to the study population.

Results

Personal characteristics of the participants

One hundred thirteen participants born after 1992 without immunity to hepatitis B were included. Most were female, at 74.3%, aged 20 to 25 years at 70.8%. The majority were nurses at 30.1%, followed by doctors at 25.7%. Additionally, the majority of participants, 55.8%, either had no history of vaccination or were uncertain, had no underlying diseases at 84.1%, and those with underlying conditions had allergic rhinitis, asthma, hypertension, obstructive sleep apnea, or polycystic ovary syndrome. None had chronic hepatitis B infection, and most, 97.3%, were non-smokers.

Fifty participants (44.2%) had a vaccination history and most were doctors at 56.0% followed by nurses at 32.0%. Most of those with a history of vaccination had received their most recent dose less than five years, with a median time of four years (IQR 2.25). Within this group, 13 participants (26.0%) were exposed to HBV. Additionally, 72.0% of them were between 20 and 25 years old, meaning they were born 7 to 12 years after the EPI was introduced. Among 63 participants without a vaccination history, or uncertain, most participants (65.1%) worked in direct patient care roles, nurses in 28.6%, and patient care assistants in 23.8%. Most participants (69.8%) were aged 20 to 25 years and were born 7 to 12 years after EPI. Notably, none had prior HBV exposure, and the majority (87.3%) had no underlying diseases and were non-smokers in 95.2% (Table 1).

Description of anti-HBs level before and after receiving a single dose of hepatitis B vaccine

Among 50 participants with a prior vaccination history, all 50 (100%) developed immunity after receiving a booster dose. While 63 participants with no documented vaccination history or uncertain status, 49 (77.8%) developed immunity to hepatitis B, while 14 (22.2%) remained negative immunity to hepatitis B after receiving a single dose of the hepatitis B vaccine (Figure 1).

Overall, 99 out of 113 participants (87.6%) (95% CI 80.6 to 92.7) developed immunity to HBV after the single dose. The other 14 participants (12.4%) (95% CI 7.2 to 19.5) remained negative immunity after single dose.

Prior to the booster, 88 participants (77.9%) had anti-HBs levels below 2 mIU/mL. Following booster dose, 76 participants (67.2%) achieved anti-HBs levels of 100 mIU/mL or greater. This high-response group comprised 46 individuals with a vaccination history (60.5%), 26 without (34.2%), and four who were uncertain (5.3%).

Among the 50 participants with a vaccination history, all 50 developed immunity after receiving the booster. Before the booster, 27 participants had anti-HBs levels below 2 mIU/mL, after the booster, 46 participants exhibited levels exceeding 100 mIU/mL. Before the booster, most participants without a documented vaccination history had very low anti-HBs levels, indicating a lack of immunity. After receiving the booster, a significant portion developed immunity, with many showing a strong antibody response (Table 2). Among participants with a prior vaccination history, the median anti-HBs level significantly increased from 1.0 mIU/mL before the booster to 1,001.0 mIU/mL after the booster dose ($p<0.001$). It should be noted that the assay's upper quantification limit was 1,000 mIU/mL, which may have led to an underestimation of actual antibody levels in high responders. In participants without a vaccination history, the median anti-HBs level significantly increased from 1.0 to 79.9 mIU/mL ($p<0.001$). Similarly, those with uncertain vaccination status demonstrated a significant increase from 1.0 to 78.8 mIU/mL ($p=0.018$) (Table 3).

Table 1. Personal characteristics of the participants (n=113)

Characteristics	Total (n=113); n (%)	Had vaccination history (n=50); n (%)	No/uncertain vaccination history (n=63); n (%)
Sex			
Female	84 (74.3)	34 (68.0)	50 (79.4)
Male	29 (25.7)	16 (32.0)	13 (20.6)
Age (years)			
20 to 25 (7 to 12 years after EPI)	80 (70.8)	36 (72.0)	44 (69.8)
26 to 30 (2 to 6 years after EPI)	31 (27.4)	14 (28.0)	17 (27.0)
>30 (1 year after EPI)	2 (1.8)	0 (0.0)	2 (3.2)
Median 24 IQR 4			
Job title			
Direct contact to patient			
• Doctor (ISCO 2211)	29 (25.7)	28 (56.0)	1 (1.6)
• Nurse (ISCO 2221)	34 (30.1)	16 (32.0)	18 (28.6)
• Nursing assistant (ISCO 3221)	6 (5.3)	2 (4.0)	4 (6.3)
• Patient care assistant (ISCO 3256)	18 (15.9)	3 (6.0)	15 (23.8)
• Other	2 (1.8)	1 (2.0)	1 (1.6)
Non-direct contact to patient	22 (19.5)	0 (0.0)	22 (34.9)
Department			
Medicine	26 (23.0)	17 (34.0)	9 (14.3)
Surgery	19 (16.8)	10 (20.0)	9 (14.3)
Emergency	6 (5.3)	3 (6.0)	3 (4.8)
Pediatric	7 (6.2)	4 (8.0)	3 (4.8)
Other	55 (48.7)	16 (32.0)	39 (61.8)
Having chronic hepatitis B infection			
Yes	0 (0.0)	0 (0.0)	0 (0.0)
No	113 (100)	50 (100)	63 (100)
Having underlying disease			
Allergic rhinitis	10 (8.8)	5 (10.0)	5 (7.9)
Asthma	2 (1.8)	1 (2.0)	1 (1.6)
Hypertension	3 (2.7)	2 (4.0)	1 (1.6)
Obstructive sleep apnea	2 (1.8)	2 (4.0)	0 (0.0)
Polycystic ovary syndrome	1 (0.9)	0 (0.0)	1 (1.6)
No	95 (84.1)	40 (80.0)	55 (87.3)
Cigarette smoker			
Yes	3 (2.7)	0 (0.0)	3 (4.8)
No	110 (97.3)	50 (100)	60 (95.2)
Current medication			
Yes	9 (8.0)	6 (12.0)	3 (4.8)
No	104 (92.0)	44 (88.0)	60 (95.2)
Having history exposed to HBV			
Yes	13 (11.5)	13 (26.0)	0 (0.0)
No	100 (88.5)	37 (74.0)	63 (100)
Body mass index (kg/m^2)			
<18.5	20 (17.7)	7 (14.0)	13 (20.6)
18.5 to 22.9	65 (57.5)	29 (58.0)	36 (57.1)
23.0 to 24.9	11 (9.8)	6 (12.0)	5 (8.0)
≥25.0	17 (15.0)	8 (16.0)	9 (14.3)
Median 20.3, IQR 4.17			
Time since vaccination history			
<5 years since last vaccination	-	31 (62.0)	-
≥5 years since last vaccination	-	19 (38.0)	-
Median 4, IQR 2.25			

EPI=Expanded Program on Immunization; HBV=hepatitis B virus; IQR=interquartile range

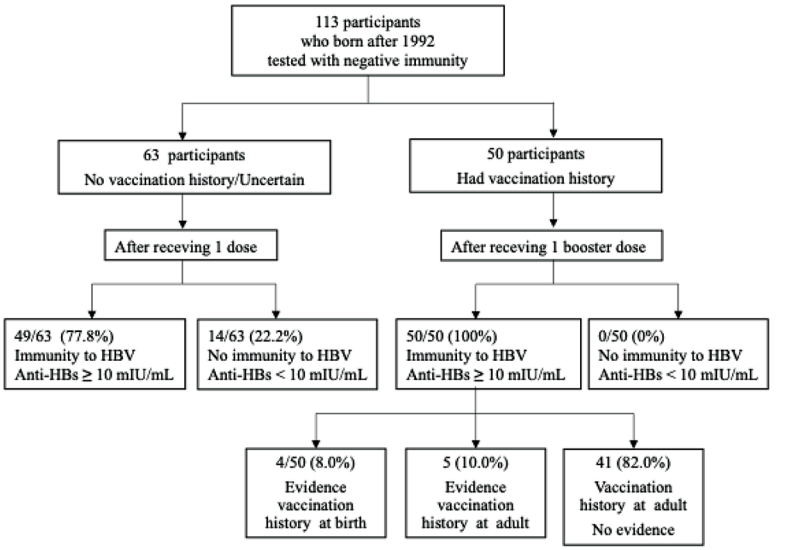

Figure 1. Immunity status after receiving a single dose of hepatitis B vaccine.

Table 2. Proportion of HW who had anti-HBs before and after receiving a single dose of hepatitis B vaccine (n=113)

Vaccination history	Immunity status (before receiving a single dose) (mIU/mL); n (%)		Immunity status (after receiving a single dose) (mIU/mL); n (%)					Total; n (%)
			Negative		Positive			
	<2	2 to 9.9	<2	2 to 9.9	10 to 99.9	≥100 to 1,000	>1,000	
Had vaccination history	27 (23.9)	23 (20.4)	0 (0.0)	0 (0.0)	4 (3.6)	19 (16.9)	27 (23.8)	50 (44.2)
Had the evidence of vaccination in adult	1 (0.9)	4 (3.5)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.9)	4 (3.5)	5 (4.4)
Had the evidence of vaccination at birth	3 (2.7)	1 (0.9)	0 (0.0)	0 (0.0)	1 (0.9)	2 (1.8)	1 (0.9)	4 (3.5)
Had the vaccination in adult, no evidence	23 (20.4)	18 (15.9)	0 (0.0)	0 (0.0)	3 (2.7)	16 (14.2)	22 (19.4)	41 (36.3)
No history of previous vaccination	53 (46.9)	1 (0.9)	10 (8.8)	1 (0.9)	17 (15.0)	19 (16.5)	7 (6.2)	54 (47.8)
Uncertain	8 (7.1)	1 (0.9)	2 (1.8)	1 (0.9)	2 (1.8)	2 (1.8)	2 (1.8)	9 (8.0)
Total	88 (77.9)	25 (22.1)	12 (10.6)	2 (1.8)	23 (20.4)	40 (35.4)	36 (31.8)	113 (100)
			14 (12.4) 95% CI 7.2 to 19.5		99 (87.6) 95% CI 80.6 to 92.7			

CI=confidence interval

Table 3. Comparison of anti-HBs levels before and after receiving a single dose of hepatitis B vaccine (n=113)

Vaccination history	n	Median anti-HBs before receiving a single dose (mIU/mL)*	Median anti-HBs after receiving a single dose (mIU/mL)*	p-value
Had vaccination history	50	1.0	1001.0	<0.001
No history of previous vaccination	54	1.0	79.9	<0.001
Uncertain vaccination history	9	1.0	78.8	0.018

HBs=hepatitis B surface

* Anti-HBs values >1,000 mIU/mL were assigned as 1,001 mIU/mL due to the assay's upper detection limit and if anti-HBs values <2 mIU/mL were assigned as 1 mIU/mL

Description of health workers who had no immunity to hepatitis B after receiving a single dose of hepatitis B vaccine

Among the 14 participants (12.4%) who remained negative immunity after the single dose, most reported no vaccination history. Their initial anti-HBs levels were below 2 mIU/mL and remained low after the single dose. Five (35.7%) were nurses and four (28.6%) were nursing assistants. Other roles included nutrition staff, engineers, pharmacists, and

Table 4. Characteristics of participants who remained anti-HBs <10 mIU/mL following a single dose of hepatitis B vaccine

No.	Sex	Age (years)	Job title	Smoking	Underlying disease	Obesity	Vaccination history	History of exposure to HBV	Immunity status (before booster dose) (mIU/mL)	Immunity status (after booster dose) (mIU/mL)
1	Male	29	Engineer	No	No	Obesity	No	Unexposed	<2	<2
2	Female	21	Nurse	No	No	No	Uncertain	Unexposed	<2	<2
3	Female	22	Nurse	No	No	No	Uncertain	Unexposed	<2	9.33
4	Female	25	Nursing assistant	No	No	No	No	Unexposed	<2	<2
5	Male	23	Nursing assistant	No	No	No	No	Unexposed	<2	<2
6	Female	22	Nurse	No	No	No	No	Unexposed	<2	<2
7	Female	25	Nursing assistant	No	No	No	No	Unexposed	<2	6.07
8	Female	20	Nursing assistant	No	No	No	No	Unexposed	<2	<2
9	Female	25	Administration officer	No	Allergic rhinitis	No	No	Unexposed	<2	<2
10	Female	23	Nurse	No	No	No	No	Unexposed	<2	<2
11	Male	29	Pharmacist	No	No	Obesity	No	Unexposed	<2	<2
12	Female	20	Nutritionist	No	No	Obesity	No	Unexposed	<2	<2
13	Male	21	Nutritionist	No	No	No	No	Unexposed	<2	<2
14	Female	22	Nurse	No	No	No	Uncertain	Unexposed	<2	<2

HBV=hepatitis B virus

Table 5. Positive predictive value of vaccination history in predicting immune response to a booster dose

Self-reported history of vaccination	Immunity status		
	Immunity to HBV	No immunity to HBV	Total
Had history of vaccination	50	0	50
No vaccination history/uncertain	49	14	63
Total	99	14	113
Positive predictive value (PPV)	100.0% (95% CI 92.9 to 100)		
Negative predictive value (NPV)	22.2% (95% CI 18.9 to 25.9)		

HBV=hepatitis B virus; CI=confidence interval

administrative staff. All had no history exposed to HBV, no smoking, most had no underlying disease (Table 4).

PPV and NPV of self-reported hepatitis B vaccination history in predicting immune response to a booster dose

There were 50 health workers with both vaccination history and immunity, 49 with immunity but no vaccination history, 0 with vaccination history but no immunity, and 14 without vaccination history and immunity. The PPV was 100% (95% CI 92.9 to 100), and NPV was 22.2% (95% CI 18.9 to 25.9) (Table 5).

Discussion

A robust response to booster vaccination was observed in the present study as 100% of participants developed protective immunity with anti-HBs of 10 mIU/mL or greater. Current studies revealed 90.5% to 95% immunity in highly developed countries[10,11]. The current study showed higher immunity than reported in a South African study showing a 44% response[12] and higher than reported in a 2011 Thai study on medical student that found an immunity of 60.9% after receiving one booster dose of the hepatitis B vaccine[7]. The results differed from the study in Thailand, which may be due to the increased coverage of the hepatitis B vaccine following the EPI program or because the participants received the vaccine again as adults. The variation in response rates may reflect differences in study populations and vaccination histories. Additionally, the shift from plasma-derived to recombinant hepatitis B vaccines may have impacted long-term immunity patterns[13]. The present study utilized a recombinant hepatitis B vaccine, or hepatitis B vaccine rDNA. The seroprotection rates observed were comparable to those of the Engerix-B vaccine[14]. The effectiveness of vaccine is influenced by several factors including age at vaccination, with younger age associated with better response[15].

The finding that 100% of participants with a prior vaccination history developed immunity after a single booster dose aligned with previous research showing strong anamnestic responses in previously vaccinated individuals[14-20]. The PPV was 100%, indicating that

all workers who reported prior vaccination developed immunity after the booster dose. Self-reported vaccination history in the current study was a reliable predictor of positive immune response to a booster dose. This may be because most participants in the present study had their vaccinations as adults with most receiving their last vaccination less than five years prior to this study, often administered upon entering studies or before internships. The present study found that immunity to hepatitis B declined even within a shorter time frame of less than five years post-vaccination. This result differed from other studies, which typically report a significant decrease in immunity over longer periods, such as 10 to 20 years[16-18]. The rapid decline observed in the present study may be attributed to various factors, including differences in individual immune responses, variations in the timing and quality of booster doses, or differences in initial vaccine regimens[19].

However, while 63 participants with no documented vaccination history or uncertain status, 49 (77.8%) developed immunity to hepatitis B after receiving a single dose of the hepatitis B vaccine without a clear vaccination history thus might be attributed to unrecognized childhood vaccinations follow the EPI. By 2004, vaccination coverage for the complete three-dose hepatitis B vaccination series under the EPI had reached 97.3% and 41.6% had positive anti-HBs[20]. Natural infection and subsequent immunity could also explain some cases. Some individuals might have been exposed to the HBV without exhibiting symptoms, leading to the development of natural immunity[12]. However, none of the participants had a documented history of exposure to hepatitis B. Additionally, the three-dose hepatitis B vaccine series was known to produce a protective antibody response in approximately 30% to 55% of healthy adults under 40 years of age after the first dose[4]. This mechanism might also explain part of the observed response in this group. The NPV was notably low at 22.2% (95% CI 18.9 to 25.9), confirming that a lack of vaccination history is a poor predictor of non-response to the booster dose. This statistically significant finding highlights that many individuals without documented vaccination still developed immunity, highlighting the limitations of using vaccination records alone to assess immune response.

In those without immunity after single dose of hepatitis B vaccine, 12.4% of our population, this could be due to never been vaccinated. The current study reported no vaccination history or were uncertain the group that was born 7 to 12 years after EPI with few that were born three years after EPI. The CDC reported that approximately 90% to 95% of healthy adults under 40 years old developed protective antibody levels after completing the three-dose series, leaving about 5% to 10% as non-responders[4]. The lack of a documented vaccination history prevents attributing non-response to specific factors. It is unclear whether participants completed the initial three-dose series required to accurately classify HBV non-responder. The study also revealed that most who had no immunity after booster had consistently low antibody levels of less than 2 mIU/mL, both before and after boosting, aligning with previous findings about predictors of vaccine response[13,22].

As 100% of participants developed protective immunity, it demonstrated the effectiveness of the single-dose booster approach. The single booster dose approach used in the present study offers several practical advantages, requiring fewer doses and clinic visits, improved cost-effectiveness, higher compliance rates due to simplified scheduling, and avoiding the need for a complete revaccination series. Based on the present study's findings, work fitness can be effectively managed using a single booster dose approach, offering a practical balance between safety and workforce efficiency. Health workers who develop immunity after the booster dose can be fit for work after one month, reducing workforce limitations while maintaining safety standards.

Conclusion

A single hepatitis B vaccine booster induced protective immunity in 100% of initially seronegative health workers who had prior vaccination history. Documented vaccination within five years correlated with stronger immune responses. A comparison of anti-HBs levels before and after administration of a single dose of hepatitis B vaccine demonstrated a statistically significant increase in anti-HBs levels following vaccination. These findings support booster dose protocols and highlight the necessity of verified vaccination records for optimal immunization strategies.

Recommendation

Results from the present study could indicate that the flowchart outlines the management of hepatitis B vaccination and immunity for health workers born after 1992, based on their vaccination history.

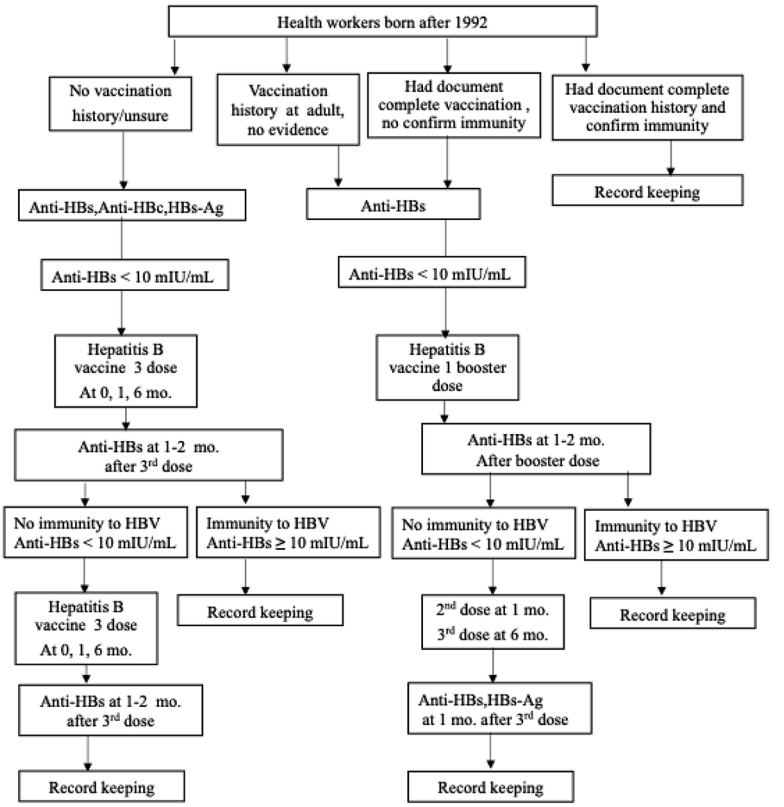

Figure 2. The recommendation protocol for the health workers in different HBV immunity status.

1) For those health workers with no vaccination history or uncertainty, a full 3-dose vaccine schedule, at months 0, 1, and 6, is recommended.

2) For health workers who had vaccination history as adults but no documentation evidence and less than five years since last vaccination, and health workers who had documented full vaccination but no confirmed immunity, only anti-HBs levels are required. Then a single booster dose is recommended.

3) For workers with documented complete vaccination and confirmed immunity, no further actions are required as immunity is already established, and records are maintained.

A documentation system is essential. Institutions should strengthen their vaccination record-keeping to track immunization histories and post-vaccination testing results throughout a worker's career. The recommended protocol is presented in Figure 2.

Limitation

Data collection challenges included potential recall bias in vaccination history reporting, limited the ability to verify historical vaccination records. Additionally, there is limited information about historically used vaccine types. These limitations suggest the need for longer follow-up periods to better understand the factors influencing hepatitis B vaccine response.

What is already known about this topic?

CDC and Canadian guidelines recommend that individuals without documented proof of prior hepatitis B immunization complete the full vaccination series. Additionally, those who completed the three-dose hepatitis B vaccine series but did not undergo post-vaccination serologic testing should receive a one booster dose of hepatitis B vaccine.

As of 2019, the MOPH in Thailand recommend that individuals born after the initiation of the EPI in 1992 who had no immunity to HBV should receive a one booster dose of hepatitis B vaccine.

What does this study add?

This study provides evidence that a hepatitis B vaccine booster significantly improves immunity in health workers born after 1992 who had no immunity to HBV, especially those with a prior vaccination history. For individuals with no documented

vaccination or uncertain status, completing a full three-dose series is recommended. These findings highlight the importance of maintaining vaccination records and demonstrate that booster doses effectively sustain adequate antibody levels in healthcare settings.

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Conflicts of interest

The authors declare no conflicts of interest.

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