

Review

Hepatitis B control in the World Health Organization's Western Pacific Region: Targets, strategies, status

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ABSTRACT

WHO's Western Pacific Region has the highest rates of hepatitis B virus (HBV) infection in the world; most countries have >8% prevalence of HBV chronic infection in their adult population. In 2005, Member States of the Region adopted a resolution to reduce chronic hepatitis B infection prevalence to less than 2% among children by 2012 as an interim milestone toward a regional goal of less than 1% prevalence. Country commitments to hepatitis B control and successes represent a remarkable public health achievement by preventing over 1 million chronic infections and 300,000 HBV-related deaths per birth cohort. Reported here is a review of the process and strategies for translating this public health initiative into practice including such activities as setting up an Expert Resource Panel, developing implementation guidelines, focusing on facility births while supporting efforts to reach home births, providing guidance for conducting seroprevalence surveys, and establishing a verification process.

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1. Introduction

The World Health Organization's Western Pacific Region is comprised of 37 diverse countries and areas ranging in population size of 47 in Pitcairn Island in the Pacific Ocean to 1.3 billion in China. Despite their diversity, almost all countries in the region have in common hyper-endemic hepatitis B virus (HBV) with chronic infection prevalence of >8% in their adult population including up to 25–30% in many Pacific islands nations [1–3]. The Region as a whole bears a disproportionate share of global chronic hepatitis B infections being home to over half of the world's chronic infections yet only 28% of the world's population [4].

Both host and viral differences are likely reasons for the higher chronic infection prevalence in the Region compared to other parts of the world. From the viral perspective, HBV genotypes B and C are predominate in Asia and the Pacific and are associated with prolonged hepatitis B e-antigen (HBeAg) positivity, a marker for viral replication and infectivity [5]. In South-East Asia almost 90% of infants with chronic HBV infection remain HBeAg positive up to the age of 15 years compared to 10% in African, European and Mediterranean regions – although country-specific estimates are variable especially in Africa [6,7]. The prolonged period of HBeAg positivity in Asia and the Pacific extend to reproductive years facilitating perinatal transmission of the virus. Infections during birth and early childhood carry the highest risk of becoming chronic due to the immature immune system's inability to control the virus [8]. Together these factors have allowed the virus to establish a cyclic pattern leading to a population with high rates of chronic HBV infection.

Chronic HBV infection is responsible for the majority of HBV-related morbidity and mortality; approximately 15–25% of persons with chronic infection will die prematurely from cirrhosis or hepatocellular carcinoma. This translates to approximately 350,000 HBV-related deaths each year in the Region [4]. Liver cancer is the third most common cancer in the Region compared to the sixth most common globally [1,9]. Mongolia has the world's highest rate of liver cancer mortality with over 60 deaths due to hepatocellular carcinoma per 100,000 populations largely due to HBV infection, over twice the rate of that of the next highest country [10].

This public health priority was well recognized by the Region as it became the first WHO Region to adopt a time-bound target to control hepatitis B through childhood vaccination programmes. Reported here is a review of the strategies for translating the Region's hepatitis control targets into practice and the status toward reaching the Region's 2012 hepatitis B control milestone.

2. Regional hepatitis B control targets and strategies

This section covers regional control targets and three main strategies for achieving these targets including: (1) reaching at least 65% coverage of timely provision of hepatitis B vaccine at birth defined as vaccinating within 24 h of birth and hereafter referred to as "timely birth dose" and at least 85% coverage with three doses of hepatitis B vaccine hereafter referred to as "three-dose" coverage; (2) measuring impact of vaccination programmes using seroprevalence surveys, and (3) verifying achievement of reaching control targets.

2.1. Hepatitis B control targets

In 2005, Member States of the Region unanimously adopted a resolution to control hepatitis B in children through vaccination. The resolution called for reducing the prevalence of chronic hepatitis B infection to less than 2% among five year-old children by 2012 as an interim milestone toward a regional goal of less than 1% [1]. Prevalence is measured among children at least five years-old to represent those who were born after vaccine introduction in a country and who have passed through the highest risk period of acquiring chronic HBV infection, i.e., the risk of infection becoming chronic in newborns is around 90% and declines with age stabilizing at about 5–10% for persons >5 years old [8].

2.2. Reaching high hepatitis B vaccination coverage, including timely birth dose

Hepatitis B vaccine introduction was not uniform across the region [11]. Many countries had introduced hepatitis B vaccine into their national schedules as early as the late 1980s. By 2000, all but six countries (Cambodia, Japan, Lao PDR, Papua New Guinea, Philippines, and Vietnam) had introduced hepatitis B vaccine into their national immunization schedules. Japan has a policy of providing targeted vaccination to infants born to mothers with hepatitis B infection and does not have a universal infant hepatitis B vaccination programme. Of the remaining five countries, four, Lao PDR, Cambodia, Papua New Guinea, and Vietnam, were eligible to receive support from the GAVI Alliance and with this introduced vaccine in the early to mid 2000s. The Philippines was the last country to introduce hepatitis B vaccine nationwide in 2005. In addition to national three-dose hepatitis B vaccination policies, all countries adopted timely birth dose vaccination policies by 2007 except Japan and New Zealand.

To give countries a benchmark for hepatitis B vaccination coverage levels needed to reduce infection prevalence to <2%, a simple model was used to estimate threshold coverage levels. Details of this model are available in regional guidelines [12]; key assumptions for this model included: (1) hepatitis B surface antigen (HBsAg) of 8% among child-bearing aged women and (2) hepatitis B e-antigen (HBeAg) of 30% among HBsAg-positive women. This model estimated threshold vaccination levels to be at least 65% timely birth dose and at least 85% three-dose coverage. Actual coverage levels needed depends on country-specific epidemiology and actual prevalence of infection.

Countries in the Region annually report vaccination coverage using the WHO/UNICEF Joint Reporting Form (JRF) [13]. Vaccination coverage data used in this report were WHO/UNICEF estimates when available [14]; otherwise, country reports of administrative vaccination coverage were used. Countries report both timely birth dose and three-dose coverage. Most countries record birth and vaccination data in units of days rather than hours. Therefore, when reporting timing of birth dose vaccination it is acceptable to report timely birth dose vaccination as the same day or next day following the birth making the timely birth dose vaccination technically up to 48 h after birth.

At least 65% timely birth dose and 85% three-dose coverage have been consistently exceeded starting in 2004 (Fig. 1). Regional vaccination coverage is largely driven by China making up 77% of the Region's birth cohort; the Philippines and Vietnam make up an

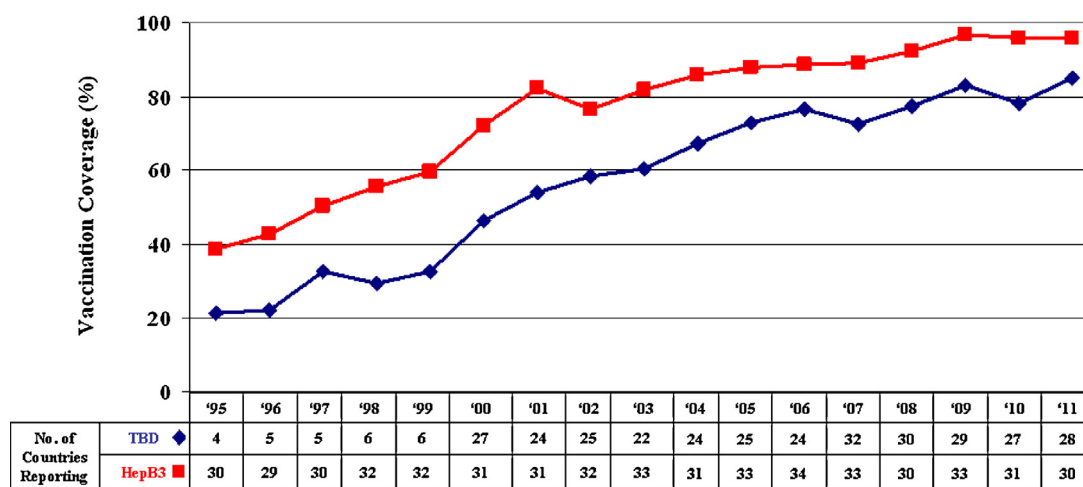


Fig. 1. Regional hepatitis B timely birth dose and three-dose vaccination coverage,^a 2000–2011.

^aBoth TBD and 3-dose coverage comes from WHO/UNICEF Joint Reporting Form (JRF) official estimates, if missing then used JRF reported administrative estimates; except for China 1995–2005 national coverage survey data was used [15]. Countries not reporting coverage data were excluded from regional coverage estimation, except if country had not yet adopted a TBD policy then TBD coverage was assumed to be 0%. TBD only: 1995–1999 came from a 2004 Questionnaire and China coverage survey [15]; 2000–2003 JRF instructions were to report BD coverage without specific reference to timing; 2004–2011 specifically refers to timely birth dose as vaccination on the same day or next day after birth.

Table 1

Hepatitis B vaccination coverage and hepatitis B surface antigen (HBsAg) seroprevalence estimates used to assess the likelihood of meeting the Regional 2012 hepatitis B control milestone.

2012 milestone category	Country/area	Timely birth dose (%)					3-Dose (%)					HBsAg prevalence estimate
		'07	'08	'09	'10	'11	'07	'08	'09	'10	'11	
Verified: Has met the milestone or goal (n = 7)	China	86	91	93	92.2	95.1	92	95	95	99.5	99.6	<1%
	Hong Kong	95	95	96	95	95	95	95	NR	95	95	<1%
	Macao	100	100	100	NR	100	90	91	NR	NR	93.6	<1%
	Malaysia	90	99	95	95	95	90	95	95	NR	95	<1%
	Mongolia	87	94	98	95.2	96.2	98	96	97	96.1	99.2	<1%
	Rep of Korea	94	94	95	95	NR	91	94	94	94	98.7	<1%
	Tonga	100	100	99	99	99.9	100	98	99	99	99.8	<2%
Likely: Has prevalence data indicating that milestone may be met (n = 14)	Am Samoa	100	100	100	NR	NR	90	89	NR	NR	NR	<1%
	Australia	NR	NR	NR	NR	NR	94	94	92	91.6	91.6	<1%
	Brunei Dar.	NR	100	100	95.8	95	NR	96	99	95.8	93	<1%
	Cambodia	25	46	55	56.8	68	82	91	91	91.8	94	<2%
	Cook Islands	100	100	100	99	97	106	100	82	99	93	<1%
	Fiji	81	100	NR	NR	60.8	84	99	99	87.2	84.3	<2%
	Japan	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<1%
	Lao PDR	6	9	20	NR	NR	50	61	67	74	78.3	<2%
	Marshall Is.	90	NR	98	99.3	73.6	93	NR	93	97.1	NR	<2%
	N Mariana Is	97	100	100	100	100	80	96	NR	83	97.4	<2%
	New Zealand	NA	NA	NA	NA	NA	88	NR	93	90.2	94.6	<1%
	Palau	100	67	100	100	100	91	92	69	80	91.1	<1%
	Singapore	99	NR	NR	NR	NR	95	96	97	96.4	NR	<1%
	Vietnam	27	24	40	21.4	55	67	87	94	87.5	95.2	<2%
Likely: Has met vaccination thresholds ^a but lack prevalence data (n = 9)	Fr Polynesia	100	NR	NR	NR	NR	NR	99	NR	99	99	
	Guam	100	99	100	NR	NR	NR	NR	NR	NR	NR	
	Micronesia	86	90	88	80	81	90	90	88	88	83	
	Nauru	100	100	100	100	NR	100	100	99	100	NR	
	N Caledonia	99	99	99	99	99	98	98	NR	98	98	
	Niue	99	100	100	55	100	99	100	99	100	99	
	Tokelau	100	100	100	100	100	100	97	NR	98	98	
	Tuvalu	100	100	100	98.8	97.9	97	99	92	89.3	96.1	
Wallis and Futuna	100	NR	100	100	100	91	NR	NR	NR	NR		
Pending: Has not met vaccination thresholds, ^a lack prevalence data (n = 6)	Kiribati	58	59	52	63	66	96	83	86	91	95	
	PNG	29	27	27	35	31	59	56	64	89	61	
	Philippines	9	21	34	37	40	88	83	85	77	76	
	Samoa	98	81	75	91.4	100	71	38	72	87.3	91	
	Solomon Is	83	80	45	62.2	74.8	79	77	81	78.7	87.6	
	Vanuatu	79	73	55	63	73.2	76	NR	59	90	91.7	

Note: There are 37 countries and areas in the Region; Pitcairn Island not represented here. NR, no report; NA, not applicable.

^a >65% timely birth dose coverage (within 24 h) and >85% 3-dose coverage, WHO/UNICEF Joint Reporting Form.

additional 16%. **Table 1** provides timely birth dose and three-dose coverage for each country for 2007–2011. Vaccination coverage in 2007 is a relevant reference point because this cohort turns 5 years old in 2012 thereby representing the youngest cohort of which to measure prevalence for the Regional milestone. In 2007, 27 countries had at least 65% timely birth dose coverage and 25 countries had at least 85% three-dose coverage. By 2011, an additional 2 countries had reached threshold birth dose coverage levels and an additional 6 countries had reached the threshold three-dose levels.

Several countries in the Region have been identified as priorities because of challenges in reaching threshold vaccination coverage levels. These include Cambodia, Lao PDR, Papua New Guinea, Philippines, and Vietnam and four island countries Kiribati, Samoa, Solomon Islands, and Vanuatu. Cambodia and Vietnam have shown recent gains in coverage as noted in **Table 1**. Timely birth dose coverage and reaching home births present significant challenges for Lao PDR, Papua New Guinea and the Philippines [6].

2.3. Measuring impact with seroprevalence surveys

Global and regional recommendations are in place for countries to use nationally representative hepatitis B seroprevalence surveys for measuring impact of hepatitis B immunization programmes and documenting achievement of control targets [12,15]. Presence of hepatitis B surface antigen (HBsAg) is the recommended marker for infection.

Further efficiencies for obtaining a nationally representative prevalence estimate can be obtained by using a multi-stage cluster design [12]. This means that not all parts of the country will need to be surveyed but rather a selection of geographic regions with the probability of being selected proportionate to population size [15]. The sample size required for such surveys are dependent on the assumed prevalence in the target population. For example, assuming HBsAg prevalence of 2% among a 5-year-olds, precision of $\pm 0.5\%$ around the prevalence estimate, design effect of 2, and confidence interval of 95% yields a sample size of 6024; those same assumptions except assuming 1% HBsAg prevalence yields a sample size of 3043.

For purposes of verifying achievement of prevalence targets, the Regional verification guidelines offer some flexibility given that it may not be feasible or reasonable for all countries to conduct such surveys. For example, some countries have serologic data indicating historically low prevalence such as Australia, New Zealand and Japan [4]. Twenty-one countries have relevant seroprevalence data indicating they have <2% prevalence among children (**Table 1**). Only a few countries have published data [16–22]; most data are in unpublished reports or are pending publication.

2.4. Verifying achievement of control targets

A regional verification process was established to ensure a standard and independent mechanism for assessing achievement of the hepatitis B control targets. In 2007, ten independent international experts were nominated to serve as country-specific verification panel members; these members make up the WHO Western Pacific Region's Hepatitis B Expert Resource Panel (ERP). To initiate the Regional verification process, a country should have at least five years of high hepatitis B vaccination coverage, preferably beyond the estimated threshold coverage levels, and a national serologic survey indicating target prevalence levels have been reached. Once verification is requested by national health authorities, WHO convenes a country-specific verification panel made of three ERP members. Evaluation criteria and reference points have been developed to standardize the process and ensure consistency

across verification panels. The verification process takes approximately three months.

Eight countries have been officially verified to reach the 2012 milestone: China, Republic of Korea, Macao, Mongolia, Hong Kong, Malaysia, New Zealand and Tonga. These countries, except for Tonga, were also verified to have reached the <1% goal. This process is ongoing as several countries have verification panels in session or plan to submit verification packages in 2012 and 2013.

3. Status and impact of hepatitis B control

It is estimated that 30 of 36 countries and areas (excluding Pitcairn Island) are likely to meet the 2012 milestone of <2% hepatitis B prevalence in children. Countries were considered likely to meet the milestone if they had prevalence data indicating such or surpassed the vaccination coverage thresholds in 2007 (**Table 1**).

To illustrate the dramatic impact of vaccination programmes, **Fig. 2** shows chronic infection prevalence in children before and after vaccine introduction in the Region. Pre-vaccine chronic infection prevalence has been estimated previously [4]. Post-vaccine prevalence estimates come from serosurvey data and when these data were not available, prevalence was estimated using a mathematical model inputting 2007 vaccination coverage data [4,13]. Similar to **Table 1**, this map shows 30 countries likely have <2% chronic infection prevalence in children.

Applying country-specific prevalence estimates to the Region's 2007 birth cohort of 24.7 million, indicates the Region as a whole has achieved the milestone of <2% chronic infection prevalence in children. Reducing chronic hepatitis B prevalence from a conservative 7% down to 2% represents a remarkable public health achievement by preventing over 1 million chronic infections and 300,000 HBV-related deaths per cohort.

4. Lessons learned

4.1. Set targets

Setting a regional hepatitis B control target has been instrumental for placing and maintaining high level awareness and prioritization of hepatitis B prevention activities. This is particularly important given the multitude of public health priorities and especially considering that the countries challenged with controlling hepatitis B are the same countries struggling with other important public health concerns.

In this Region, experience with hepatitis B control has differed from that of the measles elimination or polio eradication initiatives because hepatitis B control has not yet been established as an elimination or eradication initiative. Therefore, the process and standards have been balanced to reflect this and minimizes the public health resources needed for measuring impact and for verification. For example, the verification process is largely designed to use existing reports and publication rather than requiring a special verification report. An important emphasis of the country verification process is for the expert panels to make recommendations to further strengthening country programmes.

4.2. National commitment and financial support

Countries of the Region have shown high level political commitment toward hepatitis B control. In 2005, China's Ministry of Health identified hepatitis B control as one of the country's top four disease priorities along with HIV/AIDS, schistosomiasis, and tuberculosis. This important distinction supported the provision of resources and focus needed for control efforts including removing financial barriers to vaccination by making vaccine available

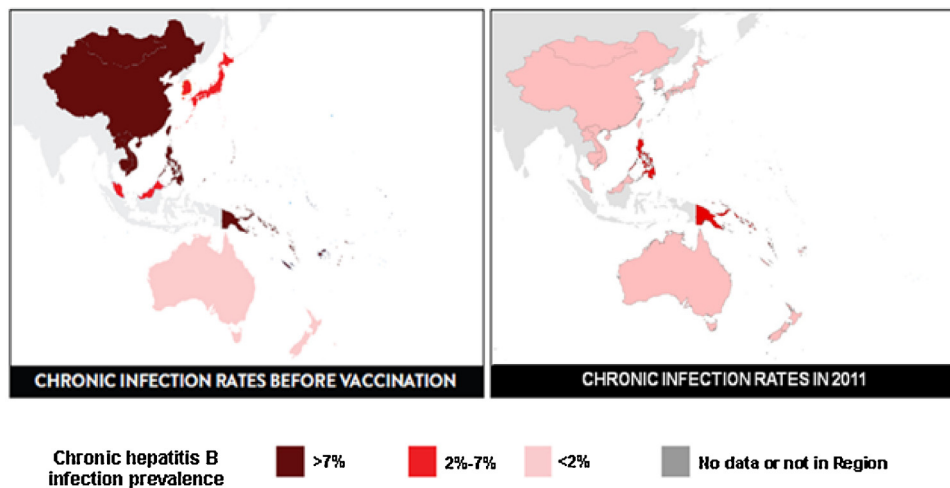


Fig. 2. Chronic hepatitis B infection rates in children before and after hepatitis B vaccine introduction, WHO's Western Pacific Region. Pre-vaccine chronic infection prevalence were previously estimated [4]. Post-vaccine prevalence estimates come from serosurveys [4,13] and when these data were not available, they were estimated using a mathematical model inputting 2007 vaccination coverage data.

free of charge and seeking GAVI support to strengthen activities in low performing counties and provinces [23,24]. The Philippines is an example of a middle income country that was not eligible for GAVI support and although policy called for hepatitis B vaccination earlier, it was not until 2007 when vaccines were fully funded by the national government did vaccination coverage begin to significantly increase. When GAVI began supporting the introduction of hepatitis-B containing combination vaccines, they discontinued the opportunity for GAVI-eligible countries to receive funds for hepatitis B monovalent vaccine which is required for birth dosing since combination vaccines cannot be given at birth. With the uniformly strong commitment toward hepatitis B control in the Region, none of the GAVI-eligible countries discontinued birth dose vaccination. Some countries began financing monovalent vaccine with national funds and others identified other donor support.

4.3. Regional guidance and support

Estimating the threshold coverage levels needed to reduce prevalence to <2% was critical for translating prevalence targets into coverage targets that were more meaningful to immunization programmes. Technical support to countries included training or consultations on birth dose vaccination, conducting birth dose implementation assessments, conducting and analyzing seroprevalence surveys, and assisting with and coordinating the verification process. Important resource and guidance documents created included: (1) a description of immunization strategies for hepatitis B control, (2) field guidelines for introducing the hepatitis B birth dose, (3) guidelines for national serosurveys and country verification, (4) development of generic protocols for seroprevalence surveys, and (5) detailed instructions for initiating the verification process [12,25–27].

4.4. Expert Resource Panel

The Hepatitis B ERP has been invaluable for providing guidance to the Region. The range of their experience includes hepatitis B epidemiology, survey design, laboratory science, national immunization program operations and leadership. They have been available for ad hoc technical advice and for periodic in-person consultations. They review country data and provide recommendations on whether countries may be ready to initiate the verification process and they serve as members of country verification panels.

4.5. Value of seroprevalence surveys beyond verification purposes

Cambodia, Lao PDR and Vietnam had not met threshold vaccination coverage levels in 2007; however, serosurveys found that chronic infection prevalence among 5 year olds in 2012 may be less than 2% (Table 1). These findings were somewhat unexpected however reasons for lower prevalence include that: (1) all countries used point of care tests that are not 100% sensitive and actual prevalence may be slightly higher and (2) all countries had relatively high three-dose coverage and low birth dose coverage suggesting that their immunization programmes may have successfully prevented early childhood chronic infections and the bulk of remaining infections were acquired through perinatal transmission. This supports the case that several countries in the Region will likely need to strengthen prevention of perinatal transmission to reach the <1% prevalence goal.

In addition, Cambodia's seroprevalence results indicate a significantly higher chronic infection prevalence in the remote compared to urban populations surveyed, information that has important programmatic implications. Other countries in the Region had reported high vaccination coverage but found higher than expected prevalence suggesting possible decreased vaccine effectiveness due to poor vaccine handling (e.g., freezing the vaccine) [28,29]. These examples highlight that serosurveys provide data for programmatic guidance and advocacy for programme strengthening.

4.6. Support facility deliveries

Administering birth dose vaccination is most feasible among facility births and is the first tier approach for preventing perinatal HBV transmission [27,30]. The increases in timely birth dose coverage in Cambodia during 2008–2011 can be partially attributed to Cambodia's national efforts to increase numbers of births that take place in health care facilities [31,32]. Perinatal HBV prevention in China has also benefited from the country's successful efforts and promotion of facility births [24]. Increasing facility births and access to newborn and maternal care is an important strategy for reducing maternal and newborn mortality and is in-line with efforts to meet the UN Millennium Development Goals 4 and 5 calling to improve newborn and maternal health.

Studies have found that health facilities with birth dose policies on-site and standing orders for birth dose vaccination have higher birth dose coverage [33–35]. Additionally, identifying a specific

time band to administer vaccine is important for decreasing the chances of vaccination interfering with other essential newborn activities and of delaying or missing vaccination all together [36]. Assigning responsibility for vaccination in the delivery or post-natal care setting is important to ensure vaccination takes place before discharge [2,17].

4.7. Reach home births

Reaching newborns born at home requires that immunization, maternal and newborn services coordinate efforts [23,37]. Specifically, immunization programmes should facilitate training on vaccine handling, administering and reporting birth dose vaccination, and coordinating vaccine supply to the specialized workforce that tends to home births and post-natal care visits. Although the ultimate goal is to increase facility births, it is important to incorporate birth dose vaccination into other WHO/UNICEF guidelines and initiatives on home visits for newborn care.

Other strategies for reaching home births include using the heat stable hepatitis B vaccine in a controlled-temperature-chain (CTC), formerly referred to as out-of-cold chain. Storing vaccine in CTC increases access to vaccine by storing vaccine in health centers that lack cold chain or in communities to facilitate vaccination by community midwives or health workers [27,38,39]. In addition, the use of Uniject, a compact pre-filled auto-disabled device, has been reported to have high acceptability among midwives and communities for the administration of hepatitis B vaccine as well as other biologicals including tetanus toxoid vaccine, gentamicin, and oxytocin [40–43]. A pilot project took place in Papua New Guinea in 2009 that trained lay community health workers to administer vaccine using Uniject in CTC in several districts; unpublished data indicate feasibility, high acceptability of lay worker vaccination, and increased birth dose vaccination among home births. A similar project is being planned for Lao PDR in 2012 with an emphasis on evaluation of feasibility, impact, and cost to scale-up.

4.8. Timing of birth dose administration

There is ample evidence that a hepatitis B vaccine given at birth and followed by at least 2 other doses prevents perinatally acquired chronic HBV infection [44]. However, the randomized clinical trials designed to measure vaccine effectiveness were not designed to distinguish the maximum window after the birth the vaccine retains its effectiveness. WHO recommends that vaccine should be given as soon as possible after birth and preferably within 24 h [45].

This recommendation can be feasibly implemented in health facilities. However, timely vaccination of home births is challenging because many are delivered without a skilled birth attendant and may not have a post-natal care visit for weeks or at all. For example in Lao PDR, where 87% of births occur at home and most infants in the country are vaccinated by quarterly outreach sessions, the chances of timely birth dose vaccination are rare unless the mother brings her baby to the health center [46]. Given this scenario exists in several countries in the Region to different degrees, regional recommendations are to administer vaccine at the first post-natal opportunity regardless of timing. If a country uses a hepatitis B-containing combination vaccine, the birth dose (monovalent hepatitis B vaccine) should be given up until the combination vaccine is scheduled. The reasons for this are two-fold, (1) birth dose vaccine is effective at preventing perinatal infection even when administered after 24 h [23], and (2) a single dose of vaccine can induce a protective immune response in 16–40% of infants and thereby can also protect against horizontal transmission during the high risk period of early infancy.

4.9. Adverse Events Following Immunization (AEFI) preparedness

Over one quarter of neonatal deaths occur within the first 24 h of life [47]. Due to the coincidental timing of birth dose vaccination and the peak neonatal death window, there will be neonatal deaths that occur that are unrelated to vaccine. Vietnam had reached 63% timely birth dose coverage in 2006; however, coverage steeply declined to <30% in 2007 and 2008 after coincidental adverse events. This decline occurred despite an independent group concluding that there was no causal association between the deaths and vaccine. Experience from Vietnam highlights the importance of responding to AEFI's immediately, developing pre-emptive communication strategies that anticipate AEFIs, educating and coordinating information with the media [11]

4.10. Prevalence among five year-olds – challenges with waiting 5 years to measure impact

The Regional target is to reduce prevalence among children at least five years-old; therefore, programmes must wait five years before they can measure impact of current vaccination activities. The Eastern Mediterranean Region set a target of <1% infection prevalence among children under 1 year of age. Measuring prevalence among 1 year olds is preferable than having to wait 5 years to measure impact among 5 year olds and is more conducive for using data to strengthening programme activities.

4.11. Partners

Partners have been critical for achieving the success in hepatitis B control; these include, Asian Liver Center, Burnet Institute, GAVI, the Governments of Luxembourg, Japan, Australia, New Zealand, PATH, UNICEF, US Centers for Disease Control and Prevention, and Zeshan Foundation. Support for vaccine introduction has played a strong role in this Region. In the late 1980s the governments of Australia, New Zealand and WHO and UNICEF supported 13 countries to introduce hepatitis B vaccine through the Control of Hepatitis B Infection in Pacific Islands Countries Project. In 2000, GAVI played a pivotal role in supporting vaccine introduction in the GAVI-eligible countries.

5. Challenges and next steps

5.1. Support countries with low vaccination coverage

Despite the successes, important work remains toward reaching the <1% prevalence goal; several countries have substantial challenges in reaching high timely birth dose and 3-dose coverage. For these countries, support largely focuses on maximizing birth dose coverage among newborns born in facilities by conducting assessments and responding to barriers. A WHO consultation held in June 2012 convened immunization and maternal and newborn care programme managers from each of the five priority countries. The focus of the consultation was to discuss barriers, share experiences, and identify needs and actions for strengthening birth dose vaccination. Coordinating with maternal and newborn care sectors will be essential for reaching home births for birth dose vaccination. The benefits for addressing these challenges will extend beyond hepatitis B control if they lead to greater access to newborn care and childhood vaccines.

5.2. Set the target year for the <1% goal

With the important progress that has been made toward the milestone, the Region's Technical Advisory Group (TAG) has

recommended that the target year for the <1% goal should be established. WHO will work with Member States, ERP, and the TAG to establish recommendations and consensus for the target year. The aim is to propose a target year in 2013 WHO Regional Committee Meeting. More flexible and sophisticated mathematical modeling to determine threshold vaccination coverage levels needed to reach the <1% prevalence goal should be developed.

5.3. Sustain and monitor gains

Currently the verification guidelines recommend that vaccination coverage be used to monitor programmes after verification. The ERP will review this recommendation to determine if periodic smaller scale serosurveys or establishing or strengthening surveillance are reasonable and feasible actions for continuing to monitor programme impact.

5.4. Beyond childhood vaccination

Infant hepatitis B vaccination is a priority; however, the Region recommends conducting catch-up vaccination activities if resources allow [26]. Catch-up vaccination targets cohorts who were born before routine hepatitis B vaccination was introduced. The target age cohorts will depend on country resources and priorities; reaching school-aged children is often logistically advantageous. Several countries in the Region have conducted catch-up campaigns including American Samoa, Australia, China, French Polynesia, Macao (China), Niue, Palau, the Republic of Korea, Singapore, Tokelau, Vanuatu, and Wallis and Futuna.

Immunization of high risk populations is also a recommended hepatitis B control strategy in the Region. Several countries are planning or have recently conducted immunization activities to vaccinate the current workforce of health care workers – including Mongolia, Papua New Guinea and Lao PDR. A regional guidance document has been developed to encourage countries to establish mechanisms to routinely vaccinate the incoming health care worker work force and offer vaccination opportunities to the current workforce [48].

5.5. Beyond hepatitis B control

In accordance with the 2010 World Health Assembly resolution for a comprehensive approach for the prevention and control of viral hepatitis, WHO aims to increase its capacity to address the significant numbers of people infected with HBV and hepatitis C virus in the Region. At the WHO global level, a viral hepatitis team has been assembled and a global framework has been drafted for the prevention and control of all viral hepatitides [49]. Translating this work to the Regional level will be important for strengthening support to countries especially in terms of providing guidance for screening and treatment options for chronic hepatitis B and hepatitis C infections.

5.6. Raise awareness

Raising awareness and resources for hepatitis B has been challenging. Reasons include that HBV infection is largely silent in infants and children and disease outcomes are delayed and may not be associated with HBV infection. Additionally, the benefits of childhood hepatitis B vaccination have a delayed impact on mortality and are not immediately appreciated. However, the Region and country successes in dramatically reducing chronic HBV infection prevalence in children serves as an important example of the role of setting goals and feasibility of reducing chronic HBV infection rates through vaccination.

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