2010 Report for Brunei Darussalam: Certification of the Eradication of Poliomyelitis

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'As an international community, we have few opportunities to do something that is unquestionably good for every country and every child, in perpetuity.'

Dr Margaret Chan
Director-General
World Health Organisation

INTRODUCTION

Acute flaccid paralysis (AFP) is any illness characterised by acute weakness of the limbs, classically poliomyelitis but may also include acute inflammatory polyneuropathy (Guillain-Barré Syndrome and its variants), inflammatory myelopathy (e.g. transverse myelitis), neuromuscular junction disorder and myopathy.

Poliomyelitis mainly affects children below the age of five years. Figure 1 depicts the clinical manifestations of poliomyelitis. The polio virus is a ribonucleic acid (RNA) virus that usually enters the body via the faeco-oral route. It then enters the lymphatic system prior to invading the blood. Subsequent nervous system invasion occurs either via the blood-brain barrier or by axonal transport. Most patients are asymptomatic with only a mild gastroenteritis or pharyngitis. However in 0.5%, it causes irreversible lower limb paralysis by invading the anterior horn cells causing asymmetric, flaccid weakness with marked muscle wasting. Of those paralysed, five to 10% will die due to respiratory muscle weakness. Very rarely, encephalitis ensues causing confusional state, coma, autonomic dysfunction and usually resulting in death.

Post-polio syndrome may occur many years, even decades later (Figure 2). This is characterised by deterioration in existing limb weakness from previous polio infection with electrophysiological evidence of acute dener-

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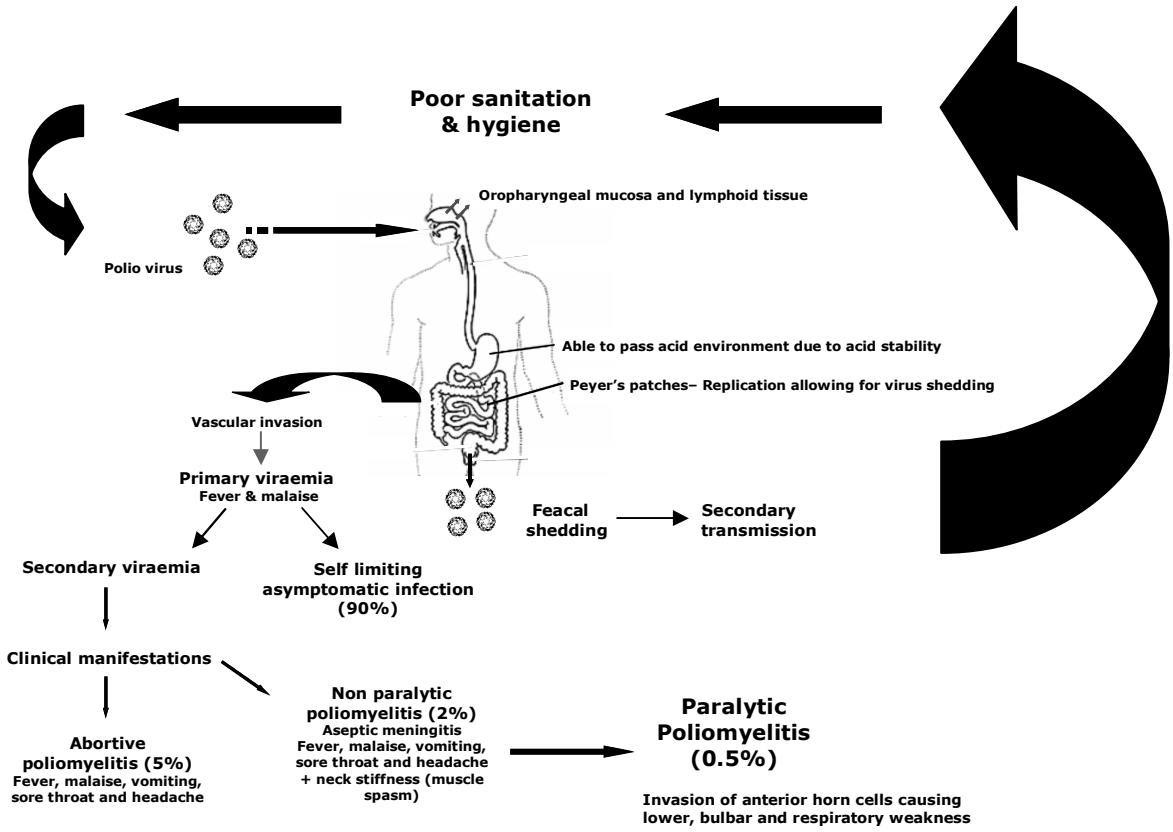

Fig. 1: Transmission and manifestations of polio infections.

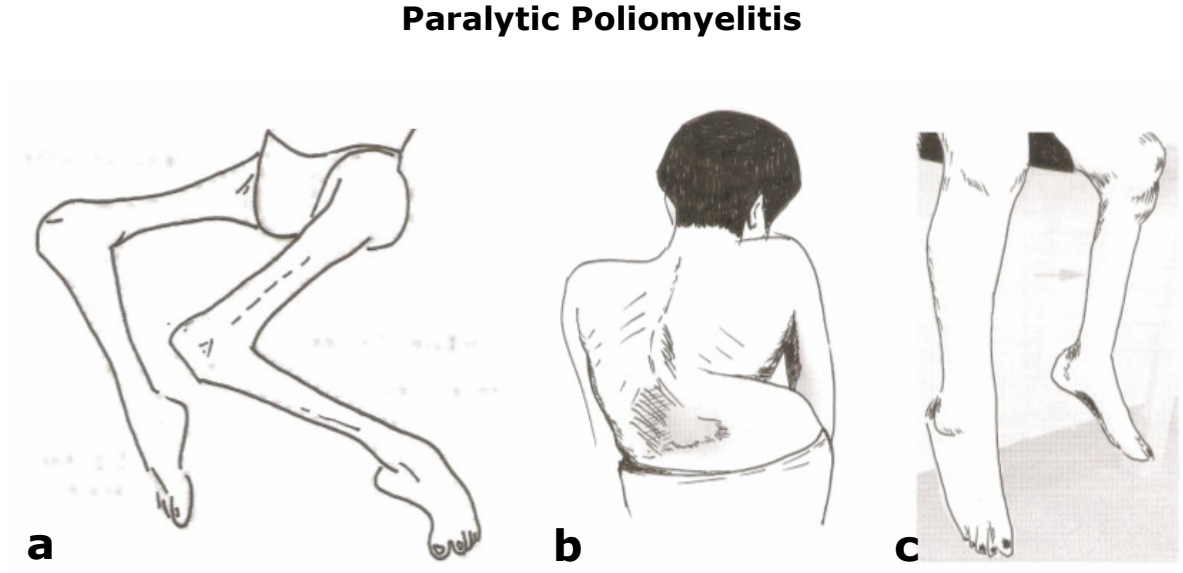

Fig. 2: Examples of clinical manifestations of paralytic poliomyelitis: a) typical polio contractures (adapted from Paediatric Poliomyelitis, Estrada B. Medscape reference available from http://emedicine.medscape.com/article/967950-overview), b) scoliosis (adapted from SCIENCEphotoLIBRARY available from http://www.sciencephoto.com/images/imagePopUpDetails.html?pop=1&id=772400457&pviewid=&country=67&search=&matchtype=FUZZY) and c) unilateral lower limb involvement showing typical small under-developed limb (adapted from Neuromuscular Motor syndrome Available from http://neuromuscular.wustl.edu/motor.html).

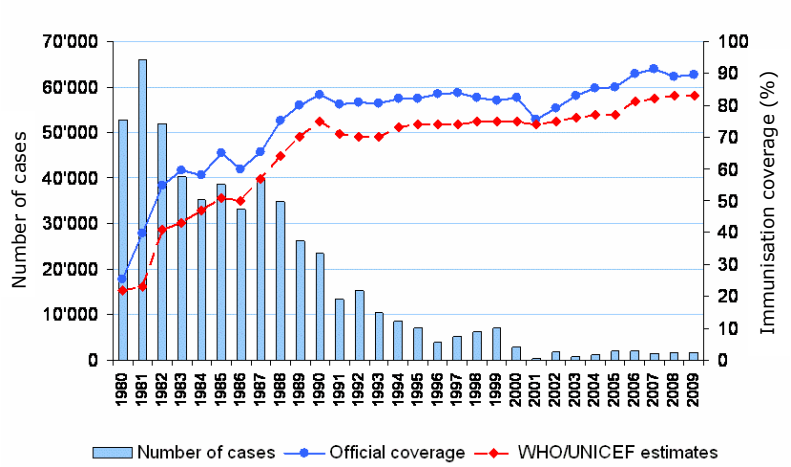

Fig. 3: Poliomyelitis global annual reported cases and the Pol2 coverage between 1980-2009 (Immunisation surveillance, assessment and monitoring: poliomyelitis, World Health Organisation). [3]

vation on the background of chronic denervation. It is not infectious in nature but the exact mechanism is unknown.

Poliomyelitis was endemic during the pre-immunisation era in Brunei Darussalam and was gazetted as a notifiable disease in 1953. Retrospective review of notifications between 1953 and 1996 showed a total of 79 cases reported in the country. The number reported dramatically declined following the introduction of oral polio vaccine in 1962. All the cases reported were based on clinical diagnosis with no virological isolation. The last indigenous case was reported in 1978 from the Tutong District.

In 1988, despite the availability of an effective, cheap oral vaccine, poliomyelitis remained a significant worldwide public health threat with over 350,000 children worldwide paralysed by polio annually. [1] The Global Polio Eradication initiative was launched in that year and by 1999 polio cases had been reduced by 99%. Reported infections rates have dropped dramatically, world

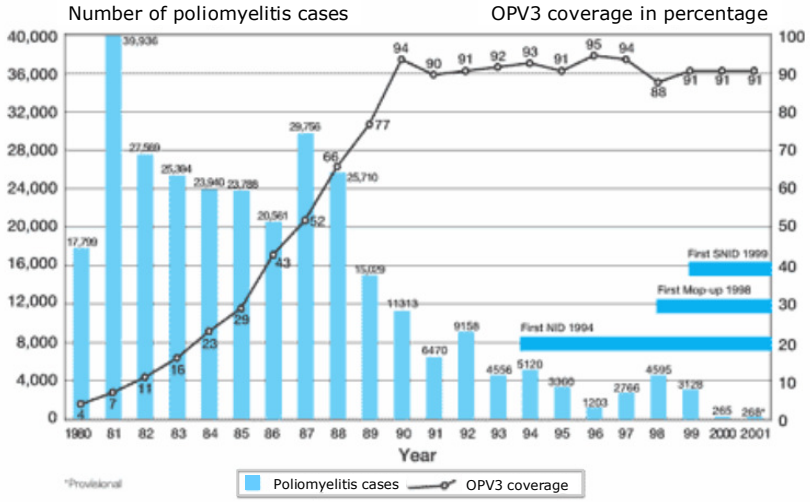

Fig. 4: Reported poliomyelitis cases and the Pol2 coverage from 1980-2001 in the Southeast Asia Region (Health Situation in the South-East Asia Region, 1998-2000, Priority in communicable diseases Figure 35). [4]

wide and the Southeast Asia region (Figures 3 and 4). Surveillance, detection and reporting of AFP in children under the age of 15 years is required for annual country reporting to the Regional Certification Commission for Certification of the Eradication of Poliomyelitis under the auspices of the World Health Organisation (WHO).

Brunei Darussalam has participated in this activity since 1996 through collective work that ensures that all aspects of the post-eradication activities are sustained and conducted accordingly including surveillance, immunisation and laboratory containment activities. The WHO Western-Pacific Region, to which Brunei Darussalam belongs, was certified polio-free in October 2000.

AFP Surveillance

AFP is gazetted in the list of notifiable diseases under the Infectious Disease Order 2003. The AFP Surveillance Framework (established in 1997) is shown in Table 1 whereby officers from the Disease Control Division will actively pursue reports from the sites shown. Current reporting has been modified slightly to incorporate measles surveillance. Since the intensification of the AFP surveillance system in 1997, the level of reporting, specifically the monthly reporting from hospital paediatricians and returns of zero report from the six hospitals in Brunei Darussalam has been optimal (100%). This optimum level of reporting is further verified by the absence of 'unreported AFP cases' picked up from the Six-monthly and Annual Retrospective Record Reviews in the same six hospitals and from other monitoring sites.

The performance of AFP Surveillance for those aged less than 15 years is summarised in Table 2. Based on this performance up till 2009, the average non-polio AFP incidence was 1.92 per 100,000 population below the age of 15 years. The incidence in 2006 at 4.74 was the highest recorded since the commencement of AFP surveillance in 1997.

Analysis of AFP Cases

During the period from 1997 to September 2010, a total of 28 cases of AFP were reported to the Disease Control Division as summarized in Table 3. Twenty-four cases i.e. 86% were reported within 14 days of onset of paralysis, whilst the remaining four cases were reported 17, 19, 22 and 24 days after onset of paralysis. However, all were investigated within 48 hours of being notified. The time lag between onset of paralysis and notification for the 24 cases ranged between 1 to 11 days with the average lag period being 2.13 days.

Table 1: AFP Surveillance Framework.

Frequency	**Reporting Site**
Daily	Dangerously Ill Patients' List (RIPAS Hospital)
Monthly	Reports from Hospital Paediatricians (6 hospitals)
Monthly	Return of Zero Reporting (6 hospitals, 14 health centres and 8 military clinics)
Six monthly	Record Search (14 Health Centres & 8 military clinics)
Annually	Retrospective Record Review (6 hospitals)
Five Yearly	Retrospective Record Review (6 hospitals)

Table 2: Performance of AFP Surveillance from 1997 to 2010 (September).

Year	Population Aged <15 yrs	Expected no. of AFP cases	Total AFP cases (aged <15 yrs)	Total 'non-polio' AFP cases	Non-polio AFP rates*
1997	91,500	At least 1	1	1	1.09
1998	91,600	At least 1	1	1	1.09
1999	96,000	At least 1	1	1	1.04
2000	98,600	At least 1	3	3	3.04
2001	100,912	At least 1	0	0	0
2002	108,000	At least 1	1	1	0.92
2003	113,700	At least 1	2	2	1.75
2004	116,200	At least 1	1	1	0.86
2005	103,600	At least 1	2	2	1.93
2006	105,300	At least 1	5	5	4.74
2007	105,100	At least 1	4	4	3.80
2008	106,200	At least 1	4	4	3.76
2009	106,100	At least 1	1	1	0.94
2010 **	106,100	At least 1	2	2	1.88

* Per 100,000 population aged less than 15 years ** Figures until September 2010
Population estimates obtained from JPKE (The Economic and Planning Unit, Ministry of Finance)

All patients reported were Bruneians apart from two boys who were Nepalese. All had a full three dose course of OPV apart from one Nepalese patient whose immunisation history could not be confirmed as he had previously lived in Hong Kong. Sixty days follow-up was achieved in 93% (26 out of 28 cases). At this point, 16 children had fully recovered; ten children still had residual paralysis, whilst two children had died.

Adequacy of Stool Specimen Collection

For all 28 cases (100%) two stool specimens were collected (summarised in Table 4). In 22 cases collections were within 14 days of onset of paralysis. For the remaining six cases, specimens were only available on the $15^{th}/16^{th}$ day, 18^{th} day $18^{th}/19^{th}$ days, $19^{th}/20^{th}$, after a month and after almost one and a half month respectively.

Laboratory facilities for viral isolation are still unavailable in Brunei Darussalam. There is a standing arrangement for analysis of stool specimens from all AFP cases with the

Table 3: Summary of diagnoses in AFP cases from 1997 to 2009.

Diagnosis	Number
Guillain-Barré Syndrome	8
Acute demyelinating encephalomyelitis (ADEM)	5
Myositis	3
Limb weakness post Hand Foot and Mouth Disease (Coxsackie)	2
Transverse myelitis	2
Haemophilus influenza B meningitis	1
Neuropathy associated with pneumonia	1
Neurocysticerosis	1
Acute spastic monoparesis post Epstein Barr virus (EBV)	1
Medulloblastoma	1
Acute lymphocytic leukaemia with transverse myelitis	1
Unspecified neuropathy	1
Musculoskeletal pain	1

Victoria Infectious Disease Reference Laboratory, Fairfield Hospital, Victoria, Australia, a WHO-accredited poliovirus reference laboratory. Stool specimens from all AFP cases notified are first sent to the Central State Laboratory, RIPAS Hospital with proper documentation. Specimens are then dispatched by air courier service to Australia. All results are sent by fax to the Head of the Microbiology Laboratory, Central State Laboratory who will then promptly inform the Chairperson of the National Certification Committee.

No poliovirus was identified in any of the stool samples. Other viruses were identified in the stool samples of six of the children and these were: non-polio enterovirus EV71 in three, non-polio enterovirus unspecified, Coxsackie virus B1 and echovirus in one respectively.

Routine Expanded Programme on Immunisation (EPI)

The National Programme on Immunisation was established in Brunei Darussalam in 1957. The programme which included three doses of oral polio vaccine (OPV3) has undergone several reviews and modification as per the latest WHO recommendations. Generally, the EPI Programme has high levels of community acceptance in Brunei Darussalam. Coupled with the high population accessibility to health care services, the EPI coverage has been maintained at optimal level since 1992. A temporary disruption of vaccine supply at the end of 2004 led to the slight lowering of coverage for that year but was recovered with catch-up OPV3 immunisation carried out within the first two months of 2005. In 2000, an immunisation coverage survey was carried out using cluster of 30 sampling technique in each district. The results revealed that coverage level was consistently high as shown in Table 5.

A repeat immunisation coverage survey was also undertaken in May 2007 covering a total of 840 children aged 24 months drawn using a similar method as in 2000. Results of the survey showed coverage of 100% for OPV3. The denominator used for the calculation of percentage of coverage is the total live births in Brunei Darussalam (in 2009 totalling 6625 live-births) which is highly accurate as almost all deliveries are in hospitals. The figure is further supported by the low infant mortality rate (7.4 per 1000 live-births for the year 2009) and minimal population movement both in the context of migration and emigration of population. In view of the sustained high routine immunisation coverage nationally and sub-nationally, supplementary immunisation activities have not been deemed necessary thus far.

As a routine, any incidence of adverse reaction following immunisation including paralysis is to be notified to the programme manager of the EPI. To date, no cases of paralysis following immunisation have been reported in the country.

Preparedness for Detection of and Response to Importation of Wild Poliovirus

The potential threat of importation of wild poliomyelitis is of major concern to Brunei Darussalam especially given recent outbreaks of poliovirus in previously poliomyelitis-free countries such as Tajikistan, re-established poliomyelitis in countries recently free of the disease like Chad and Angola and endemic

Table 4: Table showing adequacy of stool specimen collection.

	AFP cases with adequate ** stool sample		Laboratory results
	(n)	%	
Year			
1997	0	0	No polio virus isolated/ No other virus isolated
1998	1	100	No polio virus isolated/ No other virus isolated
1999	1	100	No polio virus isolated/ No other virus isolated
2000	3	0	No polio virus isolated
			1 patient with non-polio Enterovirus-71
2001	-	-	No polio virus isolated/ No other virus isolated
2002	1	100	No polio virus isolated
			1 patient with non-polio enterovirus isolated
2003	2	100	No polio virus isolated/ No other virus isolated
2004	1	100	No polio virus isolated/ No other virus isolated
2005	1	50 ##	No poliovirus isolated
			1 patient with echovirus 25 identified by sequencing and confirmed by anti-sera neutralisation
2006	4	80 ###	No polio virus isolated
			2 patients with non polio enterovirus (EV 71 isolated)
2007	2	50 ¶	No polio virus isolated
			1 patient with Enterovirus Coxsackievirus B1
2008	3	75 ¶¶	No polio virus isolated/ No other virus isolated
2009	1	100	No polio virus isolated/ No other virus isolated
2010	2	100	No polio virus isolated/ No other virus isolated

** Two stool samples collected at least 24 hours apart, 0-14 days after onset of paralysis and arriving in the laboratory with ice present with sufficient quality for complete analysis and accompanied by proper documentation.
# Two stool samples were collected on the 15th and 16th day after onset of paralysis.
Stool samples for 1 case only collected one month after onset of paralysis.
Stool sample of Case 5 only collected one and half month after onset of paralysis
¶ Stool sample of Case 1 only collected 18 days after onset of paralysis and Case 3 inadequate stools was collected for complete analysis.
¶¶ Stool sample of Case 1 only collected on the18th and 19th days after onset of paralysis

poliomyelitis in India, Nigeria, Pakistan and Afghanistan. There is significant population movement directly and indirectly to and from affected countries for reasons of employment, business, tourism, education, in transit and others such as pilgrimage to Saudi Arabia (Haj and Umrah). A risk assessment exercise identified several features listed in Table 6.

In response to the threat, a contingency plan has been drawn up and was reported to the 8th Regional Certification Commission. Particular attention is given to risk assessment and additional steps to address the issues identified. Measures include close scrutiny of OPV3 immunisation status of all children under five accompanying their families for pilgrimage to Saudi Arabia.

Table 5: Immunisation Coverage (%) by 12 months of age.

	Percentage by administrative method										% by survey
Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2000
	100	100	99	99	92.2	99.5	100	95.2	100	99	100

Table 6: Key features identified on risk assessment in the event of wild poliovirus outbreak in Brunei Darussalam.

- Sustained undetected circulation of wild poliovirus is unlikely within Brunei Darussalam's small population
- Sensitive, well-established AFP surveillance system in Brunei Darussalam
- Low number of susceptible individuals due to high OPV3 coverage therefore low transmission rate likely
- Imported wild poliovirus will be considered as a public health emergency and would prompt execution of the contingency plan
- Commitment to maintain the high OPV3 immunisation is assured as it is available free of charge to all children.
- Emergency fund (Outbreak Fund) is available for procuring additional polio vaccine immediately if required

Conclusion

The Government of Brunei Darussalam remains highly committed to the global polio eradication initiative, as reflected by the continuing availability of resources to support post-eradication activities. The continuous and timely reporting of the AFP cases together with the complete coverage of the AFP Surveillance Framework reflects the sustained awareness, vigilance and cooperation amongst the clinicians on the need to report any suspected cases of AFP.

The success of the vaccination programme in eliminating active polio in Brunei is a major achievement. However continued surveillance needs to be maintained in the event of re-emergence of the disease, particularly re-infection from abroad. It is therefore vital that all healthcare professionals cooperate in this endeavour including vigilance by clinicians and ongoing public health measures. To conclude, we must continue to be vigilant as unvaccinated children remain at risk of paralysis from polio as long as infections still exist in the world.

Acknowledgements

Dr Rahmah MD SAID (Director General of Health Services) is the current Chair of the National Certification Committee of Brunei Darussalam for the Certification of Poliomyelitis Eradication and Dr Dayangku Siti Nur'Ashikin PENGIRAN TENGAH is a committee member. The full report was submitted in October 2010 to the 16th Meeting of the Regional Certification Commission for the Certification of the Eradication of Poliomyelitis in the Western Pacific Region. We gratefully thank past and present members of the National Certification Committee for the Certification of Poliomyelitis Eradication in Brunei Darussalam as well as officers of the Disease Control Division and Maternal and Child Health Division, Department of Health Services as well as the Paediatric Departments of RIPAS Hospital and SSB Hospital, Ministry of Health, Brunei Darussalam.

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