Acute flaccid paralysis surveillance for polio, South Africa and other African countries, 2016

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Executive summary

Acute flaccid paralysis surveillance is the mainstay of the global polio eradication initiative, which aims to eradicate polio by 2018. All suspected acute flaccid paralysis cases require laboratory investigation of stool samples for poliovirus. For January – December 2016, the South African national acute flaccid paralysis rate was 3 per 100 000 children under 15 years of age. This rate is above the previous target from 2014 of 2/100 000 but not yet at the 2015-2016 heightened target of 4/100 000. Surveillance adequacy amongst various districts was heterogeneous, with 2 silent districts and 5 districts with case detection rates at less than 1/100 000. Surveillance should be strengthened in these areas and vigilance maintained for any imported case.

Introduction

The National Institute for Communicable Diseases (NICD) serves as the national polio reference laboratory for acute flaccid paralysis (AFP) surveillance for South Africa and neighbouring countries including Botswana, Lesotho, Swaziland, Mozambique and Namibia, as well as Angola. In addition, the NICD is a regional reference laboratory for the World Health Organization polio laboratory network within the African region, performing molecular characterisation of suspected polio isolates from other national laboratories including, but not limited to, Central African Republic, Ethiopia, Zimbabwe, Ghana, Kenya, Madagascar, Democratic Republic of Congo, Senegal, Uganda and Zambia.

In 2016, there were historic changes in the global polio eradication initiative. Following the declaration of eradication of wild poliovirus type 2 in September 2015, April 2016 saw a globally coordinated withdrawal of Sabin poliovirus type 2 worldwide, termed the 'switch' from trivalent to bivalent oral polio vaccine. Since the switch, the NICD has upgraded its facilities to incorporate a biosafety level 3 laboratory equipped to deal with poliovirus type 2 material in a high containment environment.

Background to polio epidemiology

The polio eradication initiative dates to May 1988 when the 41st World Health Assembly adopted a resolution to globally eradicate polio. Polio would be the second human disease eradicated, the only other being smallpox, eradicated in 1979. The number of polio-endemic countries has reduced from more than 125 in 1988 to only three currently - Nigeria, Pakistan and Afghanistan - with a greater than 99% reduction in the number of global polio cases. In 2012, global eradication of polio was declared a programmatic emergency for public health, and in May 2014 further declared a Public Health Emergency of International Concern. The new target for global certification of polio eradication has been set for 2018.

Currently, only wild poliovirus type 1 continues to circulate. For wild poliovirus type 3, the last detection event occurred in Nigeria in 2012. For wild poliovirus type 2, the last identification was in India in 1999. For South Africa, the last wild type polio case occurred in 1989.

Surveillance methods

Field surveillance

Surveillance is conducted through national notification of all cases of acute flaccid paralysis from any health facility to the National Department of Health, together with appropriate sample collection. Adequate case investigation requires that two stool samples be sent to NICD for each case, collected within 14 days of onset of paralysis, 24-48 hours apart, and must arrive at the laboratory on ice within 3 days of collection. Field surveillance occurs through active case finding, with targets for the under 15 year age group monitored by the WHO to assess surveillance adequacy. The South African operational AFP target detection rate is 4/100 000 (doubled from the 2015 target of 2/100 000). Case classification of all inadequately investigated AFP cases is performed quarterly by the National Polio Expert Committee (Table 1).

Laboratory methods

Virus isolation is performed by inoculation of faecal material into cell culture, followed by microscopic detection of cytopathic effect caused by enteroviruses. Samples with suspected polioviruses are characterised by PCR, termed 'intratypic differentiation'. Any identified poliovirus is then sequenced to further classify the virus (vaccine, wild-type or vaccine derived poliovirus (VDPV)). Phylogenetic analysis can indicate transmission patterns and transmission links via the number of mutations detected through sequence analysis.

Results

South Africa

Sample results: 1035 faecal samples from 526 South African cases of acute flaccid paralysis were processed. No wild type or VDPV strains were detected. Sabin (vaccine) polioviruses were isolated from seven cases. Detection of Sabin virus from stool is usually a coincidental finding in oral polio vaccine (OPV)-using countries and no case was classified by the National Polio Expert Committee NPEC as vaccine associated paralytic poliomyelitis (VAPP).

Surveillance adequacy: The 2016 national non-polio AFP detection rate in children less than 15 years of age was 3/100 000. In comparison, the national non-polio AFP rate for 2015 was 3.2/100 000 and for 2014 was 2.5/100 000, according to annual polio update reports. Of South Africa's nine provinces, only Mpumalanga met the new surveillance target with a rate of 7.1/100 000. Of 52 districts, 13 districts obtained the target detection rate, with two silent districts. This data reflects that most districts are not reaching the new target. For the full list, see Table 1.

Laboratory surveillance indicators showed that 99% of samples reported within fourteen days of receipt (target of 80%). The non-polio enterovirus isolation rate was 14% (target 10%) showing adequate laboratory systems for enterovirus detection. More than 45% of samples were received beyond 3 days of collection, showing difficulties with logistics concerning sample transport to the laboratory.

Table 1. Classification system used by the National Polio Expert Committee, South Africa.

Status	Classification	Code	Reason
Final	Confirmed (Wild type)	A1	Wild type poliovirus found in stool sample of case or one of the contacts.
	Confirmed (Vaccine-associated)	B1	Vaccine-type poliovirus found in stool sample of case, which has residual paralysis at 60-day follow-up; and is confirmed clinically.
	Compatible	C1	AFP case lost to follow-up at 60 days.
		C2	Death related to the illness within 60 days.
		C3	Residual paralysis for which other no medical reason is evident.
	Discarded	D1	No residual paralysis and no wild polio found in stool samples.
		D2	Confirmed alternative diagnosis
		D3	Non-polio enterovirus isolated.
		D4	No virological investigation, and a clinical picture incompatible with polio.
		D5	Two adequate negative stool specimens with 14 days of onset of paralysis
	Denotified	E1	Not an AFP case
Pending	Inadequate Information	F1	PEC is unable to make a decision due to the lack of information. The investigating team is given 30 days from the committee meeting to find further details. The final decision is taken at the next PEC meeting.
	60-day follow-up not yet done	F2	Final decision is referred to the next PEC meeting for final decision.

Table 2. Field surveillance adequacy for acute flaccid paralysis by district, South Africa, January – December 2016 (case-based data, courtesy National Department of Health).

Districts	Population non-polio AFP under 15 years of age	Non-polio AFP cases (under 15 years)	Non-polio AFP detection rate (under 15 years)	AFP cases with two adequate stools 24-48 hours apart within 14 days	Stools adequate rate (%)
A Nzo DM	301 726	6	2	5	83
Amathole DM	269 612	10	3.7	9	90
Buffalo City MM	229 061	5	2.2	4	80
C Hani DM	283 478	4	1.4	4	100
Joe Gqabi DM	120 678	1	0.8	1	100
N Mandela Bay MM	336 721	7	2.1	7	100
O Tambo DM	498 847	12	2.4	9	75
Sarah Baartman DM	130 338	4	3.1	3	75
Fezile Dabi DM	136 576	4	2.9	4	100
Lejweleputswa DM	136 603	4	2.9	3	75
Mangaung MM	234 916	3	1.3	3	100
T Mofutsanyane DM	195 614	8	4.1	7	88
Xhariep DM	31 173	1	3.2	0	0
Ekurhuleni MM	730 979	23	3.1	17	74
Johannesburg MM	1 151 935	37	3.2	29	78
Sedibeng DM	212 617	10	4.7	9	90
Tshwane MM	750 173	15	2	11	73
West Rand DM	191 354	9	4.7	8	89
Amajuba DM	174 586	7	4	7	100
eThekwini MM	963 624	13	1.3	11	85
iLembe DM	178 497	9	5	9	100
Harry Gwala DM	196 118	8	4.1	5	63
Ugu DM	264 219	8	3	6	75
uMgungundlovu DM	321 593	19	5.9	15	79
Umkhanyakude DM	243 945	2	0.8	1	50
Umzinyathi DM	186 532	5	2.7	2	40
Uthukela DM	240 302	8	3.3	8	100
King Cetshwayo DM	354 331	9	2.5	7	78
Zululand DM	301 261	6	2	6	100
Capricorn DM	421 539	9	2.1	6	67
Gr Sekhukhune DM	332 426	14	4.2	14	100
Mopani DM	347 674	14	4	13	93

Districts	Population non-polio AFP under 15 years of age	Non-polio AFP cases (under 15 years)	Non-polio AFP detection Rate (under 15 years)	AFP cases with two adequate stools 24-48 hours apart within 14 days	Stools adequate rate (%)
Vhembe DM	444 113	4	0.9	2	50
Waterberg DM	240 023	2	0.8	2	100
Ehlanzeni DM	620 876	49	7.9	48	98
G Sibande DM	300 467	16	5.3	16	100
Nkangala DM	364 056	25	6.9	23	92
Bojanala Platinum DM	502 223	6	1.2	5	83
Dr K Kaunda DM	199 551	4	2	3	75
Ngaka Modiri Molema DM	221 145	6	2.7	6	100
Ruth Segomotsi Mompati DM	158 450	9	5.7	7	78
Frances Baard DM	111 725	3	2.7	3	100
J T Gaetsewe DM	77 548	5	6.4	5	100
Namakwa DM	29 157	0	0	0	0
Pixley ka Seme DM	55 773	2	3.6	1	50
ZF Mgcawu DM	69 041	2	2.9	2	100
Cape Town MM	1 026 629	22	2.1	14	64
Cape Winelands DM	219 535	5	2.3	5	100
Central Karoo DM	18 761	0	0	0	0
Eden DM	149 587	5	3.3	4	80
Overberg DM	70 384	2	2.8	2	100
West Coast DM	106 238	1	0.9	1	100
South Africa	**15454330**	**462**	**3.0**	**394**	**85**

Colours shown per 'traffic light system' – green represents detection rate above 4/100 000; yellow represents 2-4/100 000; red represents <2/100 000; blue represents silent districts. Stool adequacy defined as two stools sent on ice, within 14 days of onset of paralysis, 24-48 hours apart. There were 2 silent districts and 5 districts with rates less than 1/100 000. DM = district municipality, MM = metropolitan municipality

African region

In 2016, 129 samples were referred to NICD. Not all samples were derived from AFP cases – some were from contacts of cases. Prior to the switch in April 2016, two samples from Madagascar were identified as VDPV type 1; six samples from Guinea as VDPV type 2 and two samples from the Democratic Republic of Congo as VDPV type 2. The Madagascar samples were related to the 2015 VDPV type 1 outbreak in the country. Appropriate responses were conducted in the relevant areas by the World Health Organization. Following the switch there were two Sabin polio type 2 viruses detected, one from Cameroon and the other from Guinea. There was one VDPV type 2 confirmed from Mozambique, prompting a vaccination campaign using monovalent OPV2 vaccine. Further information is available from the website of the Global Polio Eradication initiative, updated weekly at http://www.polioeradication.org/

Environmental surveillance activities for the African region
Environmental samples were received from four sites in Angola for enterovirus isolation. Non-polio enteroviruses were commonly isolated, with a non-polio enterovirus isolation rate of 90%, indicating robust laboratory systems for enterovirus detection. Sabin poliovirus type 3 was isolated from three samples, indicating that appropriate sites are being sampled.

In addition, isolates detected through environmental sampling from Madagascar, Burkina Faso, Cameroon and Senegal were referred to the NICD for sequencing. Two environmental isolates were confirmed as VDPV type 2, one from Niger and one from Senegal, both dating prior to the switch.

Discussion and conclusions

Heightened surveillance and rapid responses are required to any poliovirus event as global eradication nears. As global incidence decreases, the significance of an imported case in any country escalates. Continuous in-service training and communication is required to support surveillance staff nationally and to address surveillance gaps. Acute flaccid surveillance can serve as a model of a functioning surveillance system and lessons learnt can be applied to other notifiable medical conditions.

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