ORIGINAL ARTICLE

Review of the Oral Polio Vaccineimmunization Coverage with Regard to Polio Eradication in Zambia: 2000-2009

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ABSTRACT

***Objectives**:* To review the Oral Polio Vaccine (OPV) immunization coverage (routine and supplemental) in Zambia from 2000 to 2009, with the view of identifying opportunities for system strengthening, given that routine immunization is the "bed rock" for polio eradication.

Design: A retrospective descriptive analysis design was conducted on secondary routine and supplemental immunization data for Zambia for the period 2000-2009, consisting of all children aged<5years who had received OPV country wide. Immunization performance was evaluated using the WHO-specified 90% target.

Results: The target of 90% for Routine Immunization (RI)could not be reached in most provinces. Only Central province attained the target throughout the stated period. In 2004 and 2008, all provinces apart from Copperbelt attained the target. The 90%target for supplemental immunization activities were reached during all rounds of National Immunization Days (NIDs) apart from the first two (2) rounds in1996. The two rounds of Mopping –up immunization in 2002 attained the90% target.

Conclusion: Routine immunization for the oral polio vaccine has been an integral part of immunization activities in Zambia. The WHO target for OPV immunization was not attained in most districts and provinces in the period under review. This situation needs to be addressed through partner collaboration to raise herd immunity in case of imported polio viruses. While RI alone cannot eradicate the disease, good routine OPV coverage reduces the incidence of polio and makes eradication feasible. It also prevents the re-establishment of poliovirus if it is re-introduced from other countries, through international travelers and migrant populations from conflict areas

INTRODUCTION

The origin of the global eradication of poliomyelitis is conventionally attributed to Albert Sabin and his colleagues in the frequently quoted and often re-printed 1960 report on the effects of rapid mass trivalent Oral Polio Vaccine (tOPV) immunization of children below five years in Toluca, Mexico[1]. This strategy serves as the foundation of today's global polio eradication initiative. The call for global eradication of polio by the year 2000 was made during the Declaration of Talloires in March 1988 where the issue emerged on top of the list of recommendations. Following this, the World Health Assembly (WHA) during the 41st meeting passed resolution 28 known as WHA 41.28, declaring that "World Health Organization (WHO) takes initiative for global eradication exclusively by OPVimmunization by year 2000, with all member countries, a goal that was later pushed to 2005, 2010, 2012 and then to 2018.Since 1988, Polio cases worldwide have decreased by over 99%, from an estimated 350,000 cases in more than 125 endemic countries, to 1,997 reported cases in 2006 and 650 in 2012. In the African Region, Nigeria presents the biggest challenge to polio eradication and is among the four (4) countries that remain polio endemic globally[2,3]. Others are Pakistan and Afghanistan. The

global polio eradication effort involves both halting the incidence of the disease and the worldwide eradication of the polio virus that causes it.

There are four WHO regions that have been certified polio free; the Americas on 20th August 1994, the Western Pacific on29th October 2000, the European on 21st June 2002 in the Copenhagen Glyptotek and the South-East Asia on 27thMarch 2014. The African (AFR) and Eastern Mediterranean (EMR) regions have not yet been certified polio free, but have made excellent progress towards the target of stopping wild poliovirus circulation[4,5].

The most important step in eradication of polio is interruption of endemic transmission of poliovirus. This can bepursued through a combination of four (4) recommended strategies;

Firstly, a highRI coverage with at least four doses of OPV among children in their first year of life in developing and endemic countries- not just at national, but at regional and district levels as well. RI is referred to as the "bedrock"for polio eradication. While it cannot eradicate the disease alone, good routine OPV coverage reduces the incidence of polio and makes eradication feasible. It is also important in the development of *herd immunity* [6]. For polio to occur in a population there needs to be an infecting organism (poliovirus), a susceptible human population, and a cycle of transmission[7].

If the vast majority of the population is immune to the polio virus through vaccination, its ability to infect another host is reduced; the cycle of transmission is interrupted, and the pathogen cannot reproduce and dies out. This concept, called community or herd immunity, is important to disease eradication, because it means that it is not necessary to inoculate 100% of the population, a goal which is often logistically very difficult to achieve the desired result. Herd immunity can only be achieved when vaccination levels are high[7]. It is estimated that 80-86 percent of individuals in a population must be immune to polio for the susceptible individuals to be protected by herd immunity[7].WHO, through its Expanded Programme on Immunization (EPI), has established a global target of at least 90% immunization coverage by the year 2000 against six diseases: diphtheria, tetanus, whooping cough, tuberculosis, measles, and polio. During 1997, 82% children were fully immunized - a 22% increase over 1988, when the polio eradication initiative was launched[4]. When polio has been eradicated globally, immunization against polio will no longer be needed. In the meantime, regions and areas where eradication has been achieved, such as the Americas or the Western Pacific, must continue to ensure high levels of immunization coverage to prevent the re-establishment of poliovirus if it is re-introduced from other countries through international travelers, migrant populations from conflict areas, or population sub-groups who refuse even routine immunization[4].

To achieve and maintain high levels of vaccination coverage, routine vaccinationswere supplemented by annual National Immunization Days (NIDs) from 1996 to 1998 and Sub-NIDs conducted in districts bordering DR Congo and Angola from 1999 to 2001. There after Child Health Weeks have been conducted twice per year. This is the second strategy for polio eradication; two supplementary doses of OPVare given to all childrenless than five years of ageover a large geographical area at the same time during low season for poliovirus transmission regardless of their vaccination status. The aim is to interrupt circulation of poliovirus by rapidly increasing population immunity and for those already immunized boosting both systemic and intestinal immunity, there by instantly depriving the virus of the fertile seed bed on which its survival depends[7].

The third strategy is establishment of a highly effective and sensitive active surveillance system for Wild Polio Viruses (WPV) through reporting and laboratory testing of all cases of Acute Flaccid Paralysis (AFP)[8]among children less than fifteen years of age in order to pinpoint the original source of WPVs. This was adopted globally as a key strategy for monitoring the progress of the polio

eradication initiative[9, 10, 11].The fourth strategy is through targeted "mop-up" vaccination campaigns, conducted when WPV transmission is limited to a specific focal area or among populations at high risk or where the virus is known or suspected to still be circulating in a country with certification-standard AFP surveillance. In Zambia, mop-up immunizations were conducted in 2002 in Western and North-western provinces, following importation of WPVs from Angola into Kalabo district of western province.

Immunization services have been conducted in Zambia since the inception of the EPI programme in 1975, running as a vertical programme in selected facilities and have been implementing the Universal Childhood Immunization (UCI) programme, managed by UCI Secretariat since 1984. High vaccine coverage has been achieved over the years through fixed and outreach posts, resulting in the reduction of reported cases and deaths due to vaccine preventable diseases. However, the WHO recommended 90% target for OPV could not be reached in most provinces during the period under review.If uniformly high immunization coverage is not maintained, pockets of non-immunized children build up, favoring continued spread and outbreaks of poliovirus in the event of an importation from endemic countries. The specific objectives were to review the OPV 3 immunization coverages from the year 2000 to 2009 and to review coverages for OPV 3 supplemental immunizations in the same period.

METHODS

A retrospective descriptive analysis was conducted on secondary immunization data for Zambia for the period 2000-2009, consisting of all children aged<5.Records of routine immunization data, with a focus on number vaccinated with OPV 3 submitted monthly from all districts were reviewed in the WHO immunization data base. Percentages were then worked out on the basis of the number of children vaccinated against the target populations of under one's age group (1% of total population).Immunization performance was evaluated using the WHO-specified target (90%) for routine immunizations. Means were worked out per year to determine the average number of districts that did not attain the target.

RESULTS

Routine immunization services are provided through monthly fixed post and outreach services spread throughout the country. Reported OPV3 coverage has been varying overtime. The 90%target could not be reached in most provinces and districts; only Central province attained the target throughout the stated period. In 2004 and 2008, all provinces apart from Copperbelt attained the target. In 2002 and 2009, 50% of provinces could not attain the OPV 3 coverage target, while Lusaka province attained the target throughout the stated period, apart from the year 2002 and 2009as shown in Table 1. On the average, sixteen out of twenty-five districts did not attain the WHO recommended target.

Table 1: Routine immunization-OPV 3 coverage by province: 2000-2009

Province	YEAR									
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Central	121%	105%	105%	124%	161%	100%	120%	115%	130%	106%
Copperbelt	69%	86%	81%	75%	76%	75%	74%	81%	82%	152%
Eastern	69%	90%	64%	70%	99%	91%	93%	82%	94%	85%
Luapula	90%	98%	76%	88%	105%	90%	84%	70%	105%	91%
Lusaka	101%	108%	74%	97%	98%	96%	100%	90%	102%	81%
Northern	71%	99%	59%	102%	99%	86%	91%	90%	99%	80%
N/Western	99%	105%	100%	89%	96%	84%	96%	70%	91%	76%
Southern	101%	102%	86%	105%	115%	104%	111%	95%	91%	85%
Western	101%	85%	89%	84%	91%	89%	94%	97%	94%	98%
National	**92**	**100**	**81**	**81**	**96**	**100**	**98**	**88**	**97**	**97**

Data source: WHO EPI data base

The 90% target for supplemental immunization activities were reached during all rounds of NIDs,

apart from the first two rounds in1996 as shown in table 2. Table 3 shows that the WHO target was attained during both mop-up rounds in 2002.

Table 2: **National Immunization Days coverages by year**

Year	NID round	Date / month	H/H imm. used (yes/no)	No. of < 5 yr olds targeted	No. of <5yrs reached with OPV	Reported coverage (%)
1996	NID	19,20 July	No	2,216,385	1,910,655	86
1996	NID	23,24 August	No	2,216,385	1,871,264	84
1997	NID	18,19 July	No	2,071,696	2,045,364	99
1997	NID	22,23 August	No	2,071,696	1,869,227	90
1998	NID	10,11 July	No	1,957,631	2,051,964	104
1998	NID	7,8 August	No	1,957,631	2,155,783	110
1999	SNID	23,24 July	No	1,072,114	968,620	90
1999	SNID	20,21 August	No	1,072,114	971,189	90
2000	SNID	21-24 July	No	883,180	928,148	99
2000	SNID	25-26 August	No	883,180	917,690	98
2001	SNID	10,11 August	No	989,288	1,033,318	104
2001	SNID	14,15 Sep	No	989,288	953,272	96
2002	SNID	24-28 July	Yes	917,527	1,215,533	132
2002	SNID	28 Aug to 2 Sep	Yes	1,215,533	1,250,363	103

Data source: WHO EPI data base.
HH: House to House strategy

Table 3:Mop-up immunization coverage: 2002

Year	Date / month	H/H imm. used (yes/no)	No. of < 5 yr olds targeted	No. of < 5yr olds immunized	Reported coverage (%)
2002	11-15 March	Yes	311,971	364,694	117
2002	15-19 April	Yes	364,694	429,899	118

Data source: WHO EPI data base.

DISCUSSIONS

The study revealed that most districts and provinces could not attain the 90% target for OPV 3 immunization. Factors affecting the coverage could be attributed to inadequate implementation and monitoring of a financial sustainability plan for immunizations at alllevels, insufficient political and social commitment to RI, inadequate health system and community partnership in tracking eligible children, regular vaccine stock outs and lack of active efforts, e.g. training, supervision of health workers to improve interpersonal communication at vaccination sessions. Other factors could be; immunization services not being tailored to community needs, not using service, performance and outcome data to improve services, inability to monitor drop-out rate and ensuring its 10% at all levels.The findings of this study coincide with the global OPV3 coverage which indicated that most WHO regions could not attain the 90%target in the period under review.

Global routine vaccination coverage for infants with 3 doses of OPV was estimated at 78% in 2005, the most recent year with fully reported data, and was similar to the 3-dose OPV coverage reported in 2004 (81%). Estimated routine coverage varied among WHO regions in 2005: 63% in the South-East Asian, 69% in the African, 84% in the Eastern Mediterranean, 87% in the Western Pacific, and >90% in the European and Americas. In the four polio-endemic countries, 3-dose OPV coverage was estimated at 77% in Pakistan, 76% in Afghanistan, 58% in India, and 39% in Nigeria; however, lower coverage has been reported in areas with ongoing polio transmission (e.g., northern Nigeria and the northern Indian states of Uttar Pradesh and Bihar)[4].

High routine immunization coverage is a critical factor in reducing the risk of outbreaks following importation of WPV. All identified countries with persistent high risk of importation ought to review or develop plans for strengthening Immunization coverage [6].The drivers of RI performance improvement need to be identified, explored and

strengthened at every level to enhance population immunity through strong immunization partner coordination, advocacy and continued political and social commitment. An assessment should also be done to document reasons for sub-optimal routine immunization performance in districts with the highest number of un-immunized children or those that could not attain the 90% target and findings used to inform routine immunization improvement plans.

There should also be a strong health system / community partnership and a regular review of program and health worker performance including training, depending on the identified gaps. Involvement of cooperating partners in form of funding, technical advice, capacity building and provision of equipment and commodities is another factor that could enhance the OPV 3 coverage, including regular supply and monitoring of vaccine utilization and adequate cold chain. This could result in building community confidence in immunization services and enhance community acceptance and demand for services. The 90% target for Supplemental Immunization Activities (SIAs) for OPV was reached during all rounds, apart from the first two (2) rounds in1996.The success could be attributed to political commitment for the programme in the country, hard work of the volunteers and supervisors and effective social mobilization.

The support from the various NGOs, good organization and coordination, availability of logistics could be other contributory factors. To the contrary, a global outlook of SIAs showed that there were low coverages for OPV in countries that conducted SIAs using mOPV1(monovalent OPV) in 2005 and 2006 with coverages of 22% and 46% respectively, reflecting programmatic shift in campaign strategy. The SIAs were conducted in endemic countries, where WPVs were re-introduced through importations in 2006 and in countries with no WPV confirmed cases in 2006 as a precaution against polio virus importation[12]. The OPV 3 coverage was not consistently above the recommended target, this needs to be addressed to avoid continued spread and outbreaks of poliovirus in the event of an importation from endemic countries.

ACKNOWLEDGEMENTS

Dr. Charles Michelo and Dr. Celestine Nzala, Dr. Peter Mwaba and all Provincial and District Medical Officers, Dr. Olusegun Babaniyi and Bishop Donald Chirambo.

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