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Contribution of polio eradication initiative to effective new vaccine introduction in Africa, 2010–2015

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ABSTRACT

Background: Significant progress has been made to increase access to vaccines in Africa since the 1974 launch of the Expanded Programme on Immunization (EPI). Successes include the introduction of several new vaccines across the continent and likely eradication of polio. We examined the contribution of polio eradication activities (PEI) on new vaccine introduction in the countries of the African Region.
Methods: We reviewed country specific PEI reports to identify best practices relevant to new vaccine introduction (NVI), and analyzed trends in vaccine coverage during 2010–2015 from immunization estimates provided by WHO/UNICEF.
Results: Of the 47 countries in African Region 35 (74%) have introduced PCV, 27 (57%) have introduced rotavirus, and 14 (30%) have introduced IPV. National introductions for HPV vaccine have been done in 5 countries, while 15 countries have held demonstration and pilot projects. In 2014, the regional coverage for the third dose of PCV (PCV3) and rotavirus vaccines was 50% and 30% respectively. By end of 2015, all countries within the meningitis belt will have introduced MenAfriVac™ vaccine.
Conclusions: PEI activities had a positive effect in strengthening the process of new vaccine introduction in the African Region. The major contribution was in availing immunization funding and providing trained and experienced technical staff to introduce vaccines. More investment is needed to advocate and sustain funding levels to maintain the momentum gained in introducing new vaccines in the region.

1. Introduction

In 1974, the World Health Organization (WHO) launched the Expanded Program on Immunization (EPI) to fight six vaccine-preventable diseases (diphtheria, measles, pertussis, poliomyelitis, tetanus, tuberculosis) through routine infant immunization [1]. Since then several international efforts to increase EPI coverage have been adopted, including the Gavi Alliance and most recently the Global Vaccine Action Plan (GVAP) 2011–2020 which aims to increase universal access to vaccines in all parts of the world by strengthening routine immunization (RI), advancing research and introducing new and improved vaccines to tackle more vaccine-preventable diseases [2]. These initiatives, coupled with regional efforts such as the WHO African Region's (AFR) vaccine action plan 2014–2020 (RVAP) and the Reach Every District (RED) approach have led to significant improvements in the performance of the EPI programme in the 47 member WHO African region (AFR) though country variability exists. Regional coverage with three doses of the diphtheria-tetanus-pertussis which is given by 12 months of age (DTP3) rose from 5% in 1974 to 77% in 2014 [3,4]. Moreover, there has been significant progress in the introduction of new and underutilized vaccines in Africa, especially in the recent past. These vaccines include hepatitis B birth dose (HepB-BD), *Haemophilus* influenza type b (Hib), pneumococcal conjugate (PCV), rotavirus, and those targeting older age–age groups or specific demographic e.g., human papilloma virus (HPV) and meningococcal group A conjugate vaccine (MenAfriVac™).

Optimal vaccine introduction requires a strong planning process that is integrated within RI programmes with well-trained workforce, functional cold chain, logistics and vaccine management system, and system for safe immunization practices and monitoring of adverse events [5]. Studies have found new vaccine introduction (NVI) to be most efficient when the vaccine is

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integrated into existing delivery platforms used by RI programmes for other EPI antigens, or when combined with another childhood vaccine [6]. NVI can have both positive and negative impact on the overall national immunization programme and the country's health system [7]. On one hand NVI provides an opportunity to strengthen immunization and health systems, while on the contrary NVI, especially in countries with weak systems may 'stress' existing programmes and hamper their ability to meet global performance indicators [8]. This strain is compounded by ongoing health initiatives e.g., Global Polio Eradication Initiative (GPEI). Moreover, the Polio Eradication and Endgame Strategic Plan 2013–2018 calls on countries to introduce at least one dose of inactivated poliovirus vaccine (IPV) into their RI programmes [9]. Critics accuse disease-specific health initiatives of burdening weak health systems in countries with limited resources further preventing them from meeting disease-specific targets [8,10].

Significant progress has been made since the 1988 launch of the GPEI and only Afghanistan and Pakistan remain that have not interrupted wild poliovirus (WPV) transmission [11]. The African region is much closer to eradicating polio with the removal of Nigeria from the list of polio-endemic countries [12]. Prior to this, Nigeria and Northern Nigeria in particular had been identified as a reservoir for WPV cases that were reintroduced into 26 previously polio-free countries in AFR resulting in large international outbreaks [13]. These outbreaks led to intensified polio eradication activities in AFR to interrupt WPV transmission in Nigeria and control the polio outbreaks by improving surveillance and conducting several supplemental immunization campaigns (SIAs) [14].

The high level of polio eradication activities (PEI) in AFR have raised discussions as to whether the GPEI has contributed to improved roll out of new vaccines in the region [10]. Evidence on this topic in AFR is mainly anecdotal and limited studies exist. This paper reviews NVI in the African Region during 2010–2015 and the contribution if any provided by PEI. Particular consideration is given to countries that had significant PEI activities in the same time-period because of their risk of WPV transmission.

2. Methods

We searched online databases and peer review journals relevant to vaccination and immunization to identify articles and reports with information on NVI and PEI activities in AFR during 2010–2015. WHO and United Nations Children's Fund (UNICEF) estimates of national infant immunization coverage were retrieved from the WHO-EPI information system which consists of data reported to the WHO AFR office by each Member State annually [15]. The trend in coverage of new vaccines was analyzed from the period following introduction to the most recent year for which full routine coverage data are available.

Information on PEI activities in AFR during 2010–2015 was retrieved from GPEI databases and relevant peer review papers. Best practices from PEI that correlated with NVI during the same time period were identified from a review of country-specific documents that described lessons learnt from PEI implementation as part of polio legacy planning and endgame strategy in AFR. We reviewed documents from six countries (Angola, Chad, Cote D'Ivoire, Ethiopia, the Democratic Republic of Congo (DRC), Tanzania, and Togo) and identified two relevant best practices.

PEI supported infrastructure and human resources were critical in rolling out new vaccines in the selected countries and AFR as a whole. The financial support provided by the PEI initiative enabled technical staff to be recruited increasing the immunization workforce in the region. Polio-funded staffs were primarily located at the country or district level and held key positions within EPI and administration. They often served as EPI mangers and were responsible for supporting all national immunization activities, including NVI. Polio support was key in Angola and helped alleviate a countrywide scarcity of health workforce.

PEI procured several assets and infrastructure to enable countries conduct and monitor numerous rounds of polio SIAs. Managers in Ethiopia, Cote D'Ivoire, Congo and Togo utilized these assets to also monitor NVI in addition to the support provided by the Gavi Alliance. Moreover, trainings for health workers on polio surveillance and prevention were utilized as platforms to reinforce the information on new vaccines. Managers also incorporated messages on new vaccines in polio-information education and communication (IEC) materials and training manuals.

PEI conducted extensive research and developed innovative strategies to identify and reach children in hard-to-reach areas with oral polio vaccine (OPV). Most of these remote areas had a high number of unvaccinated children and women of childbearing ages. Identifying these remote settlements and villages provided information to immunization managers who included them for planning for new vaccines. The numerous polio SIAs conducted in AFR provided EPI managers with invaluable experience in conducting vaccination campaigns, which was previously lacking in the region. PEI-led initiatives to improve district-level planning and microplans helped guide and inform NVI. Lessons learnt from planning for polio campaigns were incorporated in the microplanning section of the New Vaccine Checklist developed by WHO to assist countries in making informed decisions about adding new vaccines and guided the planning of smooth vaccine introduction [5]. This polio support to improving campaigns was especially relevant to MenAfriVac™ that was rolled out through mass vaccination campaigns in countries of the African meningitis belt, including Chad, Cote d'Ivoire, DRC, and Ethiopia.

In Chad, MenAfriVac™ was rolled out through several multiphase campaigns conducted countrywide. Health staff used a model that is similar to that used during polio SIAs to access hard-to-reach villages and provided the vaccine in a combination of fixed, mobile, and outreach strategies.

In Togo, PEI funds initiated and continue to support district level microplanning for new vaccines before their integration into routine immunization.

3. Results

Several countries introduced new vaccines during 2010–2015. By November 2015, 35 (74%) of the 47 countries in AFR had introduced PCV into their national immunization programmes and four more plan to introduce (Fig. 1). For rotavirus vaccine, 27 (57%) of countries in the region had introduced the vaccine and two more are planned for this year. Since the 2013 Human Papillomavirus Virus (HPV) demonstration project in Kenya, more countries in the region have rolled out the vaccine. National introductions for HPV vaccine have been done in five countries: Botswana, Lesotho, Rwanda, Seychelles and South Africa, while 15 countries are carrying out demonstration and pilot projects (Fig. 1). Uganda has been approved for nationwide introduction in 2015. To date, 14 (30%) countries in the AFR region have introduced IPV (Fig. 1) although several have finalized plans to introduce the vaccine and are limited by the global shortage in vaccine supply. Table 1 provides a summary of the number and type of new vaccines that have been introduced in African countries during 2010–2015. In 2014, the regional coverage for the third dose of PCV (PCV3) and rotavirus vaccines, both of which are in the EPI schedule was 50% and 30% respectively.

By end of 2015, all countries within the meningitis belt will have introduced MenAfriVac™ through vaccines (Fig. 2). High quality mass vaccination campaigns were carried out in Ethiopia and Nigeria. These countries were concurrently reporting WPV cases