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Review Update on Pneumococcal Conjugate Vaccine: A New Hope for Reduction of Pneumococcal Disease in Bangladesh

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Abstract

Pneumococcal diseases are the common and widely distributed disease in the world. It causes various mortality and morbidity every year, mainly in the developing countries. Pneumococcal conjugate vaccine (PCV) is the new vaccine against all invasive pneumococcal diseases. PCV10 and PCV13 are the available preparation in worldwide. It is safe, highly antigenic and minimal side effects. In Bangladesh, PCV is included in EPI schedule from April, 2015. The current preparation is Synforix PCV10, which is given intramuscularly with pentavalent vaccine in EPI schedule. In conclusion, the assessment of PCV impact in Bangladesh requires national and regional level surveillance and introduction of PCV in EPI will reduce the mortality and morbidity of pneumococcal disease. [*Bangladesh J Infect Dis 2015;2(1):19-22*]

Keywords: Pneumococcal disease; PCV10; PCV13; world health organization; EPI

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Introduction

Pneumonia is the leading global cause of childhood death, outside of the neonatal period, and contributes to 19% of the 10 million childhood deaths occurring annually[1]. Pneumococcal disease is the name given to a group of diseases caused by a bacterium called *Streptococcus pneumoniae*, (also known as pneumococcus). Pneumococcal infection and disease can affect a variety of organ systems resulting in a number of disease syndromes. Diseases caused by pneumococcus include severe diseases such as pneumonia, meningitis and bacteraemia and milder diseases such as middle ear infection (otitis media), sinusitis and bronchitis[2]. Pneumococcus is classified into a number of serotypes, based on the composition of its outer capsule. There are about 93 known serotypes whose

prevalence varies by geographic region of the world, as well as by age. These different serotypes have varying potential to cause disease with relatively few serotypes associated with severe disease in children[3].Therefore, in this review paper, the current preparation, dose schedule of PCV, contraindication and side effects are briefly explained. Various reports regarding vaccine approval by UNICEF and WHO, date of approval and assessment of PCV impact in Bangladesh also discussed.

Pneumococcal conjugate vaccine (PCV)

Pneumococcal conjugate vaccine consists of sugars (polysaccharides) from the capsule of the bacterium *Streptococcus pneumoniae* that are conjugated to a carrier protein. Unlike the pneumococcal polysaccharide vaccine, the pneumococcal conjugate vaccine protects children younger than 2 years of age. It protects against severe forms of pneumococcal disease, such as pneumonia, meningitis, otitis media and bacteraemia[4]. The first pneumococcal conjugate vaccine, a 7-valent product (PCV7) was approved in 2000 in USA (Prevnar; Pfizer [Philadelphia, PA, USA]) but no longer in use because certain non-vaccine Streptococcus pneumonia serotypes still cause significant morbidity and mortality[5]. Two conjugate vaccines are available since 2009, one is 10-valent (PCV10), the other is 13-valent (PCV13) manufactured by (Synflorix; GlaxoSmithKline [Rixensart, Belgium]) .They are effective against 1, 3, 5, 6A, 7F, and 19A serotype[6].

Vaccine schedule of PCV

For PCV administration to infants World Health Organization (WHO) recommends three (3) primary doses (the 3p+0 schedule) or as an alternative 2 primary doses plus a booster (the 2p + 1 schedule). In choosing between the 3p+0 and 2p+1 schedule, countries should consider locally relevant factors including the age distribution of pneumococcal disease, the likely vaccine coverage, and the timeliness of the vaccine doses. If the 3p+0 schedule is used, vaccination can be initiated as early as 6 weeks of age with an interval between doses of 4 - 8 weeks, for example at 6, 10, and 14 weeks or at 2, 4 and 6 months, along with Pentavalent (DTP-HepB-Hib) by intramuscularly . Prematurely born infants (i.e.<37 weeks gestation) should receive PCV at the recommended chronologic age concurrent with other routine vaccinations[7].

Contraindication of PCV

There is a known hypersensitivity to a prior dose. Infants with a moderate or severe illness (temperature ≥39°C) should not be vaccinated until their condition improves[8].

Side effects of PCV

There are some local reactions reported during the administration of PCV like redness, pain and swelling as well as fever[8].

Co-administration with other vaccines or child health intervention

PCV can be co-administered with other EPI vaccines, i.e. during the same visit, but with a separate syringe and in a separate injection site[7].

Safety and immunogenicity of PCV13 and PCV10 over PCV7

PCV13 (Prevnar 13) and PCV10 (Prevnar 10) consists of capsular polysaccharides from the 13 and 10 most common types that cause pneumococcal disease respectively, covalently linked to a nontoxic protein that is nearly identical to diphtheria toxin. These covalent linking to a protein renders the polysaccharide antigenic in infants and toddlers[9]. Because of their excellent immunogenicity in infants and toddlers, PCV10 and PCV13 have been recommended for infants and children in its place since 2009. PCV13 began to be recommended for use in selected high-risk adults since 2012 and for all adults ≥65 years of age since 2014[10].

History of PCV introduction in Bangladesh

In developing countries, Pneumococcal infections cause pneumonia, meningitis and febrile bacteraemia. Nearly half-a-million annual deaths occur in children under 5 years of age by pneumococcal infections[11]. The overall incidence of invasive pneumococcal disease among children less than five 5 years of age was 447 episodes per 100,000 child years, which is comparable to incidence rates found among children coming to hospitals in rural settings[12]. WHO recommends that PCV be included in childhood immunization programme worldwide, and recommends that countries with high childhood mortality (under-5 mortality of greater than 50 for every 1,000 live births) make its introduction a high priority[13]. The 73 countries are eligible to access PCV via the

Advance Market Commitment (AMC) facility in 2007. Of these, 67 countries have access to financial support through Global Alliance for Vaccine and Immunization (GAVI) to accelerate the uptake of PCV into their national immunization programmes. Of the 73 eligible countries, GAVI has approved 46 for introduction of PCV in their national immunization programme in 2009. Bangladesh is one of the countries among these eligible countries from 2013[14] and PCV is included in national immunization programme from April, 2015 in Bangladesh.

Available preparation of PCV in Bangladesh

Available preparation of PCV in Bangladesh is Synflorix PCV10, two dose preparation and its given to the children by Expanded Programme on Immunization (EPI)[7].

Impact of PCV on Bangladesh

PCV has been introduced in Bangladesh from April 2015. Assessment the impact of PCV on Bangladesh requires national/regional data and epidemiological surveillance. But in Bangladesh, lack of funding and newer diagnostic tools, the proper assessment is still interrupted. However, with some external and national funding, some local surveillance sites have established.

From June, 2015 a project has been started to evaluate the impact of PCV in Bangladesh. This study takes place in Sylhet, Bangladesh, at a field site known as Projahnmo that has been conducting community-based research since 2001. The site is a partnership between Johns Hopkins University, the Bangladeshi Ministry of Health, and a number of Bangladeshi non-governmental organizations including ICDDRB, the Child Health Research Fund. This study will establish surveillance of invasive pneumococcal disease pre- and post-vaccine introduction to evaluate the effectiveness of PCV10 using an incident case-control study design[15].

Conclusion

In conclusion, pneumococcal invasive disease is a global burden as well as developing countries. PCV is very safe with high antigenicity with minimal side effects and it is well tolerated by infant. Proper surveillance in Bangladesh can evaluate the impact of PCV and reduce the childhood mortality and morbidity. If UNICEF/WHO and GAVI will continue their close collaboration with current suppliers to improve the balance in supply and demand to the large and developing countries, mortality and mortality caused by pneumococcus should reduced to a greater extent.

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