

Pneumonia Etiological Agents in Vietnamese Children

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Background: Acute respiratory infections (ARI) remain a main cause of morbidity and mortality in children. The World Health Organization (WHO) estimates about 156 million new pneumonias each year in children aged less than 5 years, of which 151 million episodes occurs in developing countries. Acute respiratory infections are caused by a broad range of viruses and bacterial pathogens. We utilize our ongoing population based pediatric acute respiratory infection surveillance established at Khanh Hoa General Hospital (KHGH) in Nha Trang, Vietnam in 2007 to investigate to role of viruses and bacterial on pediatric pneumonia in Vietnam.

Method: All children from our target population hospitalized at KHGH which is the only hospital in the region were enrolled to the study. Clinical-epidemiological information, nasopharyngeal samples were collected, routine blood testing and chest Xray were taken to all enrolled cases. Multiplex PCR assays were performed to determine the common respiratory viruses and bacteria. Periodical cross section viral and bacterial carriage surveys were perform to the healthy children in the community.

Results: We found that respiratory viruses were associated with 65 to 70% of hospitalized ARI cases, and Rhino, RSV and influenza A viruses were major viral pathogens. Multiple viral infection were detected in 12 to 15% of the cases, and RSV and HMPV infections independently increased the risk of pneumonia.

Streptococcal pneumoniae (SP) is the major bacterial pathogen for pneumonia and commonly colonize in the nasopharynx of children. We investigate the association of pneumococcal bacteria load and viruses in healthy, children with radiologically confirmed pneumonia (RCP), lower respiratory tract infection (LRTI) and healthy children. We found that SP load was higher in children with RCP compared with healthy controls or other LRTIs. SP load was 15-fold higher in pneumonia children with viral co-infection compared with those without ($1.4 \times 10^7/\text{ml}$ versus $9.1 \times 10^5/\text{ml}$; $P = 0.0001$). SP load was over 200-fold higher in serotypeable SP compared with non-typeable SP ($2.5 \times 10^6/\text{ml}$ versus $1 \times 10^4/\text{ml}$; $P < .0001$).

Vietnam introduced Hib vaccine into the national immunization program in 2010 so we investigated the role of Hib vaccine on hospitalized pneumonia cases on Vietnam. We found a substantial decline (17-29%) of RCP following Hib vaccination by statistical model. Reduction in healthy carriage was also observed. Our ongoing ARI surveillance has allowed us to determine the minimal clinical impact of 2009 pandemic influenza and high impact RSV ON-1 emergence in central Vietnam.

Conclusion: RSV, rhino, and influenza viruses and SP play important role among hospitalized ARI cases in Vietnam. Population based ARI surveillance study plays a crucial role to monitor newly emerging viruses.