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[Intervention Review]

Pneumococcal conjugate vaccines for preventing vaccine-type invasive pneumococcal disease and pneumonia with consolidation on x-ray in children under two years of age

Marilla G Lucero[1], Vernoni E Dulalia[2], Rhea Angela N Parreño[3], Dolores Lim-Quianzon[4], Hanna Nohynek[5], Helena Makela[5], Gail Williams[6]

[1]Department of Medicine, Research Institute for Tropical Medicine, Muntinlupa City, Philippines. [2]Room 3 Department of Epidemiology and Biostatistics , Research Institute for Tropical Medicine , Muntinlupa City, Philippines. [3]Western Michigan University, Kalamazoo , MI, USA. [4]Room 3 Department of Epidemiology and Biostatistics, Research Institute for Tropical Medicine, Muntinlupa City, Philippines. [5]Department of Vaccines, Unit of Clinical Trials, National Public Health Institute, Helsinki, Finland. [6]Australian Centre for International and Tropical Health and Nutrition, School of Population Health, Queensland University, Herston, Australia

Contact address: Marilla G Lucero, Department of Medicine, Research Institute for Tropical Medicine, Filinvest Corporate City, Alabang, Muntinlupa City, 1781, Philippines. marilla.lucero@gmail.com, noniritm@info.com.ph.

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ABSTRACT

Background

Pneumonia, most commonly caused by *Streptococcus pneumoniae* (Pnc), is a major cause of morbidity and mortality among young children especially in developing countries. Recently, the prevalence of antibiotic-resistant Pnc has increased worldwide such that the effectiveness of preventive strategies, like the new pneumococcal conjugate vaccines (PCV) on rates of invasive pneumococcal disease (IPD) and pneumonia, needs to be evaluated.

Objectives

To determine the efficacy of PCV in reducing the incidence of IPD due to vaccine serotypes (VT) and x-ray confirmed pneumonia with consolidation of unspecified etiology in children who received PCV before 12 months of age.

Search methods

We searched the following databases: the Cochrane Central Register of Controlled Trials (CENTRAL) (*The Cochrane Library,* 2004, issue 1) which contains the Acute Respiratory Infections Groups specialized register, MEDLINE (1990 to March 2004) and EMBASE (1990 to December 2003). Reference list of articles, and books of abstracts of relevant symposia, were hand searched. Researchers in the field were also contacted.

Selection criteria

Randomised controlled trials (RCTs) comparing PCV with placebo, or another vaccine, among children below two years with IPD and clinical/radiographic pneumonia as outcomes.

Data collection and analysis

Two review authors independently identified eligible studies, assessed trial quality, and extracted data. Differences were resolved by discussion. The inverse variance method was used to pool effect sizes.

Main results

We identified four trials assessing the efficacy of PCV in reducing the incidence of IPD, two on x-ray confirmed pneumonia as outcome, and one on clinical pneumonia, with or without x-ray confirmation. Results from pooling HIV-1 negative children from the South African study with the other studies were as follows: the pooled vaccine efficacy (VE) for vaccine-type IPD was 88% (95% confidence interval (CI) 73% to 94%; fixed-effect and random-effects models), the effect measure was statistically significant (P <0.00001) and there was no heterogeneity (P = 0.77I^2 0%); the pooled VE for all-serotype IPD was 66% (95% CI 46% to 79%; fixed-effect model), the effect measure was statistically significant (P <0.00001) and there was no statistical heterogeneity (P = 0.09, I^2 51%); the pooled VE for x-ray confirmed pneumonia was 22% (95% CI 11% to 31%; both fixed-effect and random-effects models) and there was no statistical heterogeneity (P = 0.80, I^2 0%). Analyses that included all the children in the South African study (HIV-1 negative and HIV-1 positive children) and pooled with data from the other studies gave very similar results.

Authors' conclusions

PCV is effective in reducing the incidence of IPD from all serotypes but exerts a greater effect in reducing VT IPD. Although PCV is also effective in reducing the incidence of x-ray confirmed pneumonia, there are still uncertainties about the definition of this outcome. Additional randomised controlled trials are currently in progress.

PLAIN LANGUAGE SUMMARY

Pneumococcal conjugate vaccines (PCV) can prevent blood infection due to pneumococcus (Pnc) bacteria and lung infection among children less than two years of age

The pneumococcus is one of the major causes of invasive disease (overwhelming blood infection) and pneumonia (lung infection) among young children. Pneumococci resistant to antibiotics are now being found in great numbers worldwide. This may reduce the effectiveness of recommended antibiotic treatment. Preventive measures like vaccination are needed. This review found two trials from the US, one from South Africa, and one from Finland that involved 83,553 children less than two years of age. In these studies, PCV was able to prevent invasive disease due to pneumococci and x-ray confirmed pneumonia of unspecified etiology among children less than two years old.