Abstract

Background:

Streptococcus pneumoniae can asymptomatically colonize the nasopharynx and cause a various range of illnesses. Pneumococcal conjugate vaccines (PCVs) are at present used in different countries. The aim of the study is to determine the effect of different vaccination policies PCV7/13 to that PCV10 on the carriage rates and comparing the impact of different vaccination policies in East Jerusalem and West Bank region.

Methods:

Five cross-sectional surveillances *of S. pneumoniae* were carried out in East Jerusalem and Palestinian authority (PA), where two Palestinian populations with different vaccination policies were screened, with an annual average of 348 and 616 children., respectively, were performed during 2009-2016. Nasopharyngeal swabs and data were collected from children less than 5 years old visiting primary care physicians who visited any of three private pediatric clinics in Bethlehem, Nablus, and Ramallah in PA. In East-Jerusalem (EJ), PCV7 was implemented in 2009 and replaced by PCV13 in late 2010, while in Palestine (PA), PCV10 was implemented in 2011.

Swabs were streaked and incubated overnight at 35°C in 5% CO_2 enriched air to detect the presence of *S. pneumoniae*. Presumed colonies of *S. pneumoniae* were identified by morphological characteristics, such as α hemolysis and optochin susceptibility. *S. pneumoniae* serogroup was determined by the latex agglutination test and *S. pneumoniae* serotype was determined and confirmed using PCR and gel-electrophoresis.

Results:

A total of 4686 children were screened in EJ (n=1615) and PA (n=3070), the overall rate of *S. pneumoniae* carriage did not change significantly during the 5 first years of the study, in either population. The pediatric subjects from EJ were determined to carry *S. pneumoniae* during the 5 years study, 2009, 2010, 2011, 2014, and 2016 as 28.9%, 29.3%, 26.9%, 30.7% and 16.9%, respectively. In addition 35.9%, 33.6%, 28.8%, 28.6% and 32.9% of the pediatric subjects from PA were shown to carry *S. pneumoniae in 2009-2016*, respectively. By year 2016, *S. pneumoni-*

ae carriage was reduced significantly in EJ from ~29% on average to ~17%, following seven years application of PCV7/13. In PA, where follow-up included only 5 years after PCV10 application, *S. pneumoniae* carriage remained ~30%. Interestingly, VT7 strains gradually decreased following PCV implementation. Following vaccine implementation, during the study period, there was a significant decrease in carriage of *S .pneumoniae* in the EJ between 2009 and 2016 (*P*=0.001). No significant variation was seen in the overall carriage of *S. pneumoniae* between 2009 to 2016 in PA (*P*=0.065). PCV10 was introduced to PA late in 2011, but *S. pneumoniae* carriage was approximately (160/566) 28% in2011, prior to vaccine introduction, and (216/656), 32.9% in 2016, five years following vaccine implementation.

In PA region, PA VT13-10 strains declined from 18.87% in 2011 to 9.78% in 2014, but re-emerged to 18.06% in 2016.

In both EJ and PA, a significant increase of non-VT isolates was observed between 2009 and 2016 following vaccine implementation (*P*<0.0001 in both regions). Between 2009 and 2016, in EJ and PA, there was a decrease in PNSSP prevalence following vaccine implementation (p=0.2251 and p=0.1864, respectively).

S. pneumoniae carriage among the parents was relatively rare, with 3.3% of parents detected as nasopharyngeal carriers in both regions throughout the five study years.

Conclusions: Following PCV implementation, a decrease in the prevalence of VT strains was observed in EJ, and PA.

Keywords: Streptococcus pneumoniae, pneumococcal conjugate vaccine, vaccine-type strain, non-vaccine type strains, 7-valent PCV (PCV7),