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Pneumococcal carriage and serotypes distribution in patients with acute otitis media in Switzerland, 2004-2014

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Introduction

- The seven-valent (PCV7) and 13-valent pneumococcal conjugate vaccine (PCV13) were introduced in Switzerland in 2006 and 2011, respectively.
- This study describes the effects of the vaccines on the pneumococcal nasopharyngeal carriage and serotype distribution in study participants with acute otitis media between 2004 and 2014.

Methods

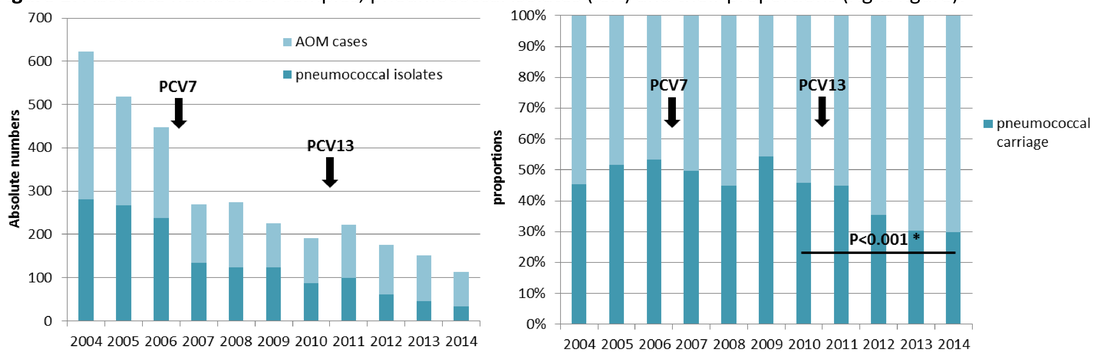
- Nasopharyngeal swabs from participants with acute otitis media collected by sentinel general practitioners and paediatricians in Switzerland from 2004-2014. Around 150 – 250 practitioners and paediatricians from all over Switzerland have participated within the Swiss Sentinella Network .
- The NZPn (National Reference Laboratory for *Streptococcus pneumoniae*) cultured all *S. pneumoniae* isolates and determined the serotypes (Quellung reaction) .
- Patient information (age, gender, vaccination statement) was available for 92% participants.
- Pneumococcal carriage rates and serotype proportions were compared with the Chi-square test for trend.
- Univariate and multivariate logistic regression analyses were performed to identify the association of pneumococcal carriage with age (0-1 year, 2-5 years, 6-15 years, 16-64 years, ≥65 years), time period (2004-2006, 2007-2010, 2011-2014) and vaccination status.
- Odds ratios (OR) with 95% confidence intervals (95%CI) were adjusted for time, age group, gender, day care attendance and vaccination.

Results

1. Pneumococcal carriage:

- In total, 3'213 nasopharyngeal swabs were recorded, 1'498 (46.6%) pneumococcal isolates were received and 52 different serotypes were determined from patients with acute otitis media in Switzerland from 2004-2014.
- *S. pneumoniae* carriage decreased significantly after PCV13 introduction from 45.8% to 29.8% in 2010-2014 (Figure 1).

Figure 1: Absolute numbers of samples, pneumococcal isolates (left) and their proportions (right figure).



* Proportions were compared with the Chi-square test for trend. AOM cases; Nasopharyngeal samples from patients with acute otitis media

2. Risk factors for pneumococcal carriage:

- *S. pneumoniae* colonization was significantly reduced at the period following PCV13 introduction (2011-2014; Table).
- Young children (0-5 years) were more often colonized than more aged children (6-15 years) or adults (16-64 years and ≥65 years).
- Day care attendance was associated with an increased pneumococcal carriage .

Table: Univariate and multivariate logistic regression analyses for risk factors associated with pneumococcal carriage .

Demographic characteristics		N (%)[a]	Pneumococcal carriage			
			OR	95% CI	aOR	95% CI
Total swabs		3213				
Time						
	2004-2006	1588 (49.4)	REF [b]		REF [b]	
	2007-2010	961 (29.9)	0.96	(0.82 – 1.13)	1.06	(0.86 - 1.31)
	2011-2014	664 (20.7)	**0.58**	**(0.48 – 0.70)**	**0.64**	**(0.45 - 0.90)**
Age (years)						
	0-1	1037 (32.3)	REF [b]		REF [b]	
	2-5	830 (25.8)	0.97	(0.81 – 1.17)	0.99	(0.80 - 1.21)
	6-15	778 (24.2)	**0.54**	**(0.45 – 0.66)**	**0.57**	**(0.45 - 0.71)**
	16-64	505 (15.7)	**0.18**	**(0.14 – 0.22)**	**0.20**	**(0.14 - 0.28)**
	≥65	52 (1.6)	**0.12**	**(0.05 – 0.24)**	**0.22**	**(0.09 - 0.48)**
Gender						
	Male	1716 (53.4)	1.10	(0.96 – 1.27)	1.03	(0.87 - 1.21)
Day care attendance						
	No	2141 (66.6)	REF [b]		REF [b]	
	Yes	**844 (26.3)**	**1.69**	**(1.47 – 1.98)**	**1.24**	**(1.03 - 1.50)**
Vaccination type						
PCV7	Yes	648 (20.2)	REF [b]		REF [b]	
	No	2209 (68.8)	**0.66**	**(0.55 – 0.78)**	1.11	(0.86 - 1.42)
PCV13	Yes	167 (5.2)	REF [b]		REF [b]	
	No	2804 (87.3)	0.92	(0.68 – 1.26)	0.76	(0.44 - 1.30)

[a] Number of swabs for each variable
[b] REF, reference group for regression analysis
Statistical significant results are indicated in bold. aOR; adjusted Odds ratio

3. Serotypes distributions:

- PCV7 serotypes proportions decreased significantly after the PCV7/PCV13 introductions (Figure 2).
- PCV13 serotypes proportions declined significantly after 2010.
- As for the proportions of non-PCV13 serotypes, they increased significantly after vaccine introduction.
- Looking exclusively at PCV13 serotypes not included in PCV7, they also declined since 2010.
- The exception is serotype 3 which remained stable.

Figure 2: Serotypes distributions in pre-vaccine, PCV7 and PCV13 eras.

*Proportions were compared with the Chi-square test for trend.
PCV7,PCV13 : Serotypes included in PCV7 or PCV13 respectively.
ST; serotype

Conclusions

- Pneumococcal carriage declined significantly in Switzerland since 2010, after the introduction of PCV13
- PCV13 serotypes generally decreased with the exception of serotype 3.

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