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Introduction

- Streptococcus pneumoniae* (SPN) is the most common cause of bacterial pneumonia.
- In December 2020, the Malaysian government included the 10-valent pneumococcal conjugate vaccine (PCV10) in the National Immunisation Programme (NIP).

Methods

- Observational prospective case-control study recruited children under 5 years old from three teaching hospitals located in Peninsular Malaysia.
- Nasopharyngeal (NP) swabs were collected and subjected to testing for SPN using both culture and multiplex conventional PCR.
- Urine samples were tested for pneumococcal urinary antigen using BINAXNow® assay.

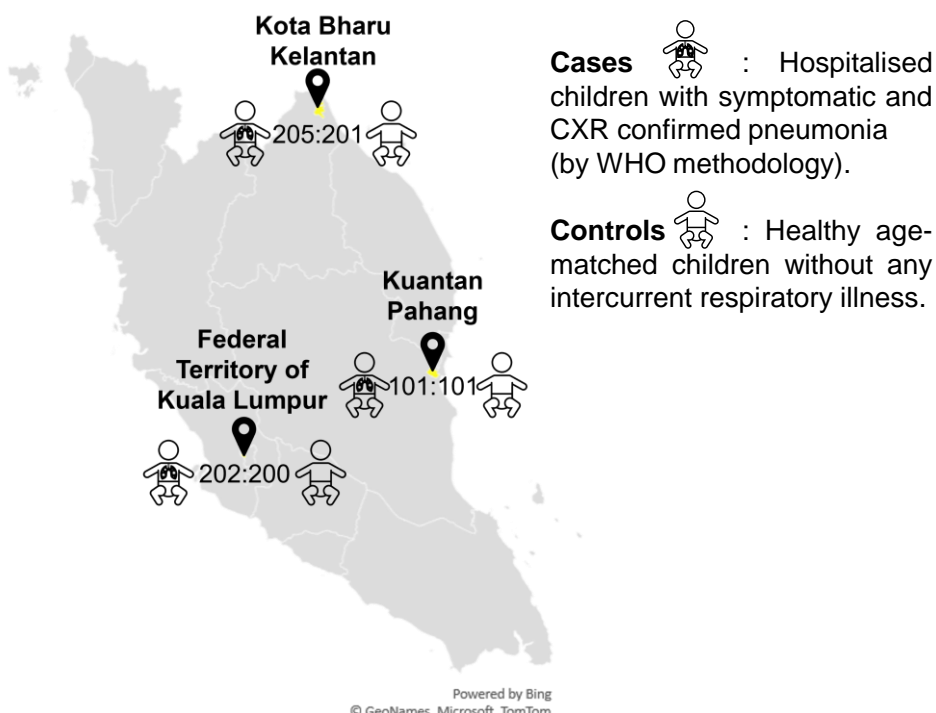


Figure 1: Recruitment sites in Kuala Lumpur, Pahang, and Kelantan with the number of subjects (Case:Control).

Results

- In total, 1,010 children were recruited (October 2021-August 2023).
- Optochin-sensitive SPN isolates were found in 15.4% of sample culture.
- Multiplex PCR (n=920) detected SPN in 14.6% of samples.
- The most prevalent pneumococcal serotypes/serogroups were 35F/47, 13, 6A/6B, 19F, 15B/15C, and non-typeable, collectively 64.7% of all strains.
- Vaccine-type (VT) serotypes accounted for 38.7% while non-vaccine type (NVT) serotypes and non-typeable (NT) strains accounted for 42.2% and 19.1% of PCR-positive SPN.
- Carriage of serogroups 6A/6B (p=0.001), 3 (p=0.043), 13 (p=0.015), 35F/47 (p<0.001), and NT (p=0.007) were significantly different between cases and controls.

Table 1: Demographic and clinical characteristics of cases and controls.

Characteristics	Cases (n= 508), n(%)	Controls (n= 502), n(%)	p-value*
Age, mean (months) ± SD	20.55 ± 15.4	20.90 ± 16.26	0.725
Age group (months)			0.864
0-12	200 (39.4)	197 (39.2)	
13-24	130 (25.6)	127 (25.3)	
24-36	85 (16.7)	77 (15.3)	
37-48	60 (11.8)	60 (12.0)	
49-60	33 (6.5)	41 (8.2)	
Underlying medical conditions**			<0.001
Yes	94 (18.5)	36 (7.2)	
No	414 (81.5)	466 (92.8)	
Day care or nursery school attendance			0.822
Yes	212 (41.7)	206 (41.0)	
No	296 (58.3)	296 (59.0)	
Residential area			0.055
Urban	347 (68.3)	365 (72.7)	
Rural	47 (9.3)	54 (10.8)	
Others	114 (22.4)	83 (16.5)	
Household size, mean ± SD	5.60 ± 2.116	5.24 ± 2.092	0.006
Siblings (<5 age of years)			<0.001
Yes	288 (56.7)	222 (44.2)	
No	220 (43.3)	280 (55.8)	
Exposure to tobacco at home			0.002
Yes	203 (40.0)	154 (30.7)	
No	304 (60.0)	348 (69.3)	
Educational level of parents			0.106
No/primary/unknown	12 (2.4)	16 (3.2)	
Secondary/vocational/diploma	277 (54.5)	241 (48.0)	
College degree or higher	219 (43.1)	245 (48.8)	
Vaccination up-to-date (UTD) status			0.159
Yes	506 (99.6)	502 (100)	
No or unknown	2 (0.4)	0	
PCV 1st dose			0.068
Yes	285 (56.1)	310 (61.8)	
No	223 (43.9)	192 (38.2)	
PCV 2nd dose			0.313
Yes	249 (49)	262 (52.2)	
No	259 (51)	240 (47.8)	
PCV 3rd dose			0.173
Yes	111 (21.9)	128 (25.5)	
No	397 (78.1)	374 (74.5)	

*significant findings appear in bold.
**immunodeficiency conditions, kidney disease, cardiac disease, sickle-cell disease, thalassemia, chronic liver disease, malnutrition, and any other chronic illness.

Reference

CDC Streptococcus Laboratory. NCIRD/DBD/RDB-Centers for Disease Control and Prevention. 2010. Streptococcus pneumoniae carriage study protocol - nasopharyngeal (NP) swab processing.

Table 2: Laboratory results of UAT BINAXNow®, Optochin sensitive SPN isolates from culture and PCR serotyping targeting cpsA.

Characteristics	Cases	Controls	p-value
BINAXNow® positivity status (n=1003)			
Positive	59 (11.7)	44 (8.8)	0.126
Negative	444 (88.3)	456 (91.2)	
Optochin sensitive SPN isolates (n=1010)			
Positive	77 (15.2)	79 (15.7)	0.799
Negative	431 (84.8)	423 (84.3)	
cpsA multiplex PCR positivity (n=920)			
Positive	96 (22.0)	38 (7.9)	<0.001
Negative	340 (78.0)	446 (92.1)	

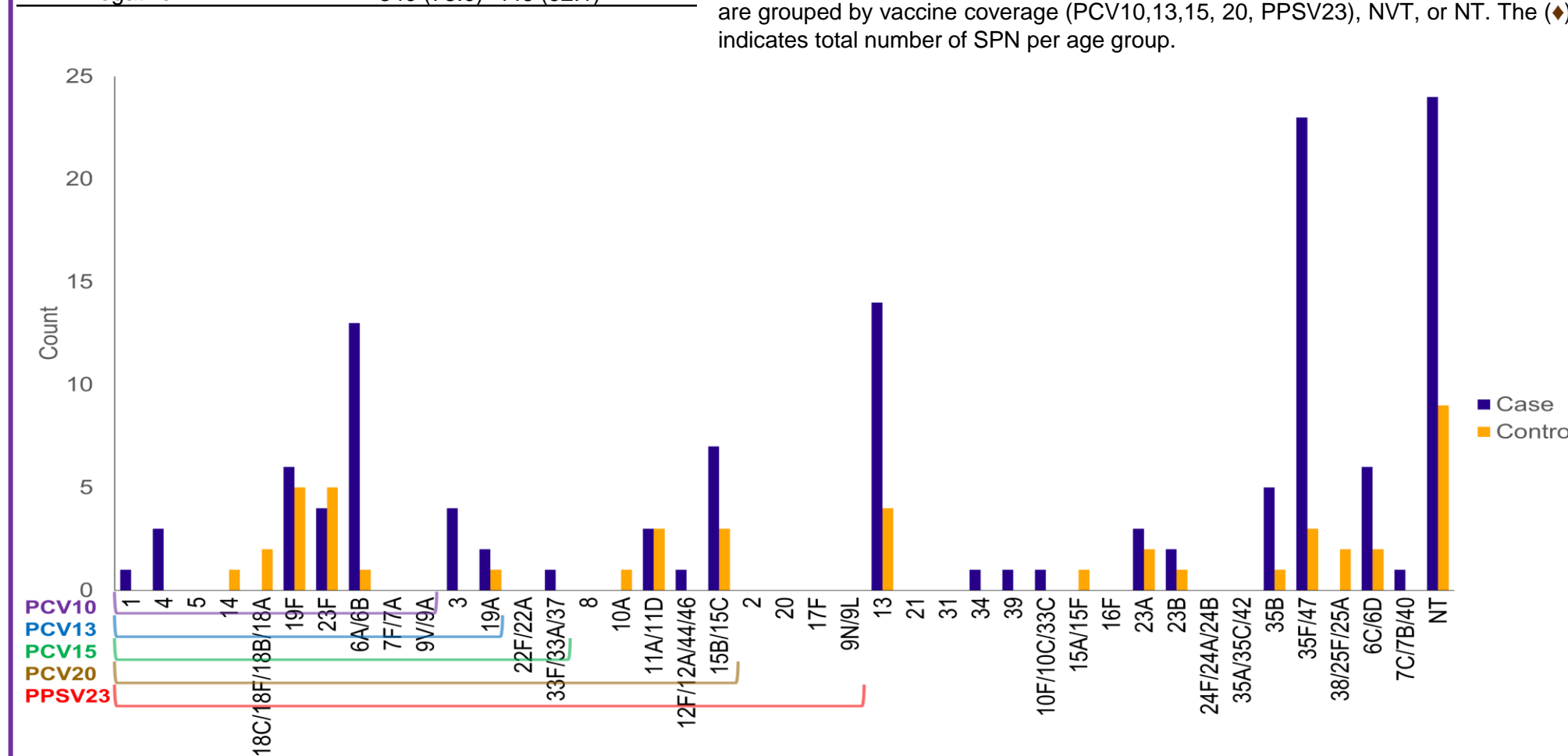


Figure 3: Distribution of SPN serotypes in children <5 years old by Case and Control subject type.

Conclusions

- SPN carriage tested by PCR was higher cases than controls, with higher carriage of SPN in children 0-12 months old.
- Underlying medical condition(s), household size, having siblings <5 years old and exposure to tobacco at home were observed to be significant risk factors for symptomatic pneumonia.
- This study contributes to pneumococcal carriage surveillance, serotype distribution, and aids estimation of the impact of PCV10 implementation in Malaysia.

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