

The Effect of 23-valent Pneumococcal Polysaccharide Vaccine on Pharyngeal Colonization in Healthy Children under 5 Years of Age.

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Summary:

Background: Streptococcal pneumonia is one of the most common pathogens that cause otolaryngological diseases (otitis media, sinusitis, tonsillitis) and other invasive diseases such as pneumonia, so that decreasing the pharyngeal carriage of pneumococci will eventually decrease the occurrence of these common diseases and hence decrease the morbidity and mortality associated with these diseases.

Objectives: Are to evaluate the pharyngeal carrier rate of pneumococci in healthy children and to demonstrate the effect of 23-valent pneumococcal polysaccharide vaccine on pneumococcal pharyngeal carriage.

Patients and methods: This prospective study was carried on 100 healthy children under 5 years of age. They were divided into two groups, the control group consisting of 65 children, throat swabs were taken for them, and the vaccinated group consisting of 35 children which received 23-valent pneumococcal polysaccharide vaccine and throat swabs were taken 1 and 6 months after vaccination.

Results: The pharyngeal carriage of pneumococci in the control group was 60% while in the vaccinated group was 8.6%.

Conclusion: 23-valent pneumococcal polysaccharide vaccine is significantly effective in decreasing the pharyngeal carriage of pneumococci.

Keywords: Pneumococci, 23-valent pneumococci polysaccharide vaccine.

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Introduction:

The pneumococci are gram positive diplococci, often arranged in chains and possessing a capsule of polysaccharide that permits typing with specific antisera.⁽¹⁾

Pneumococci are normal inhabitants of the upper respiratory tract of humans and can cause otitis media, sinusitis and other infectious processes.⁽¹⁾ Many factors both non-immunological and immunological, act together to defend the host against pneumococcal infection.^(2, 3) In most cases of pneumococcal infections, one or more non-immunological or immunological deficiencies in the mechanisms of host defense can be implicated.⁽⁴⁾

Pneumococcal infections almost always occur in people who are asymptomatic pharyngeal carriers of the organism.⁽⁴⁾ Studies conducted in 1970s showed carrier rates 38-60% in preschool children.⁽⁵⁾ Pneumococcal vaccine should be administered as a single 0.5 ml dose intramuscularly or subcutaneously.⁽⁶⁾ When 23-valent pneumococcal polysaccharide vaccine given with influenza vaccine, but at a separate site, there is no decrease in the individual antibody responses to the two vaccines.⁽⁷⁾ Malaria prophylaxis with choroquine does not affect the antibody responses to pneumococcal vaccination.⁽⁸⁾

Local side effects include erythema, induration, and pain.⁽⁴⁾ These reactions last 1 to 3 days and are well tolerated.^(6, 9) Local and febrile reactions following vaccination are more likely to occur in people with higher concentration of antibodies to pneumococcal polysaccharides.⁽¹⁰⁾ Primary pneumococcal vaccination of healthy children is well tolerated, and no marked local reactions have been reported following revaccination in infants.⁽¹¹⁾ ELISA has been developed for measuring antibodies to pneumococcal polysaccharides.^(13, 14)

Patients and methods:

This prospective study was carried out to Alkadhiya Teaching Hospital for the period from October 2001 to October 2002. The target sample consists of 100 healthy children under 5 years of age, the children were divided into two groups. A control group consisting of 35 healthy children. Throat swabs were taken for the control group. 23-valent pneumococcal polysaccharide vaccine were administered as a single 0.5 ml dose subcutaneously in the right deltoid region, and throat swabs were taken one and six months after vaccination. Microbiological study of the throat swabs were done, figure (1) shows the study plan.

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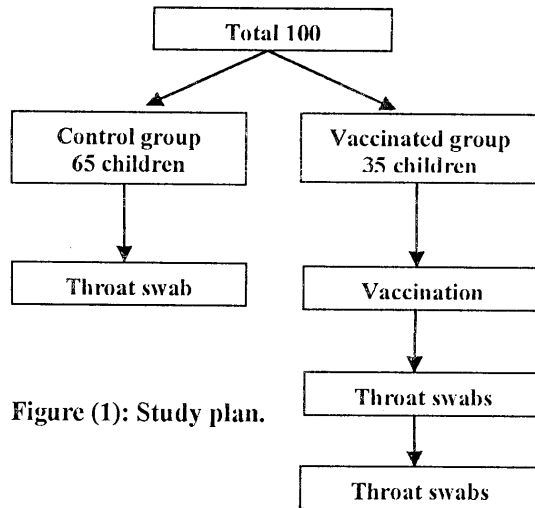


Figure (1): Study plan.

Results:

All children included in this study were under the age of 5 years and most of them around 3 years of age (table (1) and figure (2)).

Table (1): Age distribution.

| Age (year) | No. | Percent % |
|------------------|-----|-----------|
| Less than 1 year | 5 | 5 % |
| -2 | 22 | 22 % |
| -3 | 40 | 40 % |
| -4 | 26 | 26 % |
| -5 | 7 | 7 % |
| Total | 100 | 100 % |

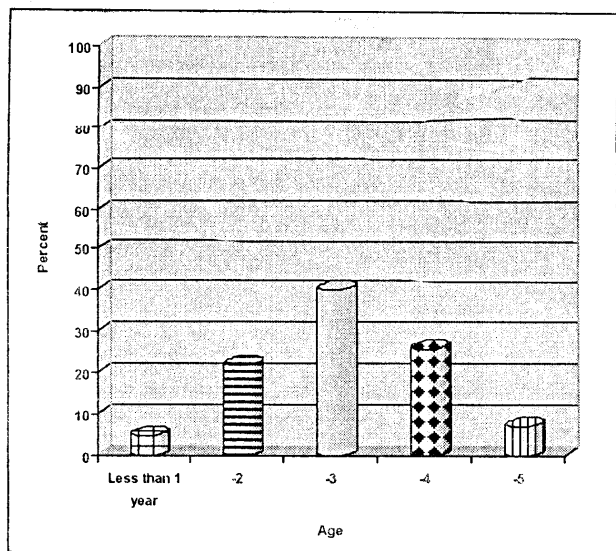


Figure (2): Age distribution.

Fifty three (53%) children were males, and 47 (47%) children were females, male to female ratio was 1.13: 1, Figure (3).

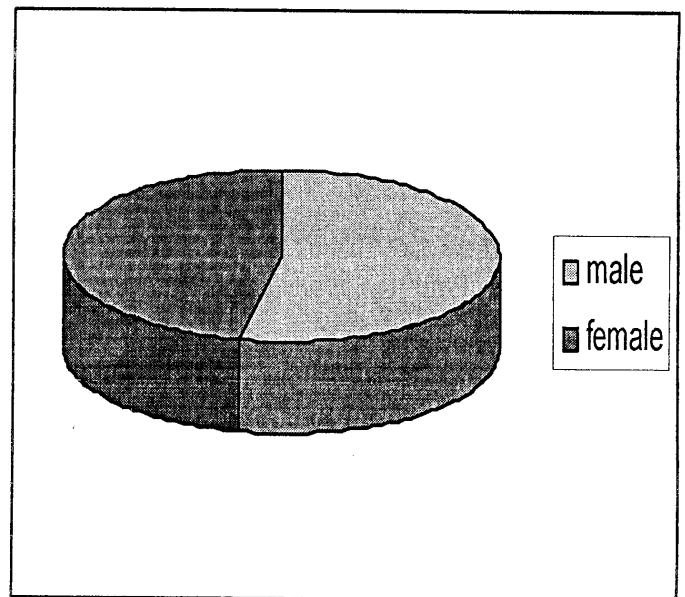


Figure (3): Sex distribution.

The pneumococcal pharyngeal carriage was 60% in the control group and 8.6% in the vaccinated group (tables 2 and 3).

Table (2): Results of throat swabs in group I.

| | Type of micro-organisms | No. | Percent % |
|---|-------------------------|-----|-----------|
| 1 | <i>Pneumococci</i> | 39 | 60 |
| 2 | <i>Staph. aureus</i> | 33 | 50.8 |
| 3 | <i>H. influenzae</i> | 29 | 44.6 |
| 4 | Others | 8 | 12.3 |

Table (3): Results of throat swabs in group II.

| | Type of micro-organisms | 1 month after vaccination | | 6 months after vaccination | |
|---|-------------------------|---------------------------|-----------|----------------------------|-----------|
| | | No. | Percent % | No. | Percent % |
| 1 | <i>Pneumococci</i> | 3 | 8.6 | 3 | 8.6 |
| 2 | <i>Staph. aureus</i> | 17 | 48.6 | 15 | 42.9 |
| 3 | <i>H. influenzae</i> | 18 | 51.4 | 16 | 45.7 |
| 4 | Others | 4 | 11.4 | 3 | 8.6 |

The pneumococcal pharyngeal carriage is significantly lower in the vaccinated group than the control group (P value < 0.001).

Discussion:

The sample that we have chosen for the study is under the age of 5 years, because as were mentioned in the literatures that pneumococcus is the major cause of morbidity and mortality in young children (under 5 years) throughout the world.⁽¹⁵⁾



Our study showed that pharyngeal carriage with pneumococci was 60% of healthy non vaccinated children. Lakshman R et al, ⁽¹⁶⁾ noted in his study of 188 healthy children under the age of 2 years that 41% were pharyngeal carrier of pneumococci. LO, - W-T et al ⁽¹⁷⁾ noted in their study of 478 healthy children that the carrier rate was higher in children aged between 2 and 5 years. Studies conducted in 1970s showed carrier rate of 38-60% in preschool children. ⁽⁵⁾

In our study the pharyngeal carriage in the vaccinated children was significantly lower than in control group (P value < 0.001); O'Brien et al ⁽¹⁸⁾ showed that the vaccine can reduce pharyngeal colonization by pneumococci.

This study showed that 23-valent pneumococcal polysaccharide vaccine significantly decrease pharyngeal pneumococcal carrier and this will eventually decrease the occurrence of invasive and non invasive pneumococcal diseases. Asensi F et al ⁽¹⁹⁾ showed that the vaccine significantly decrease the mortality and morbidity associated with pneumococcal infections in young children. Hedlund J et al ⁽²⁰⁾ confirmed that the vaccine is effective in decreasing the hospital admissions and hospital mortality associated with pneumococcal infections.

Conclusion:

This prospective study showed that a significant percent (60%) of healthy children under 5 years of age are pharyngeal carrier of pneumococci and 23-valent pneumococcal polysaccharide vaccine is a significantly effective in decreasing the pharyngeal carriage of pneumococci.

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