

# Preliminary Evaluation Of Use Pattern Of Pneumococcal Vaccine In A Developing Country: A Study Of 24 Cases In A Tertiary Care Hospital In Nepal

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## Abstract

**Background:** Respiratory diseases are a common problem in Nepal. Pneumococcal infections are a common cause of respiratory infection in Nepal and worldwide. The data regarding the use of pneumococcal vaccine is lacking in Nepal.

**Objectives:** The present study was conducted to collect the demographic details of the patients receiving pneumococcal vaccine, to identify the basis for vaccination of the patients and to study the use pattern of the vaccine in the hospital.

**Methods:** The patient files of all the patients who were prescribed with pneumococcal vaccine during the period from 1st January 2006 to 31st December 2006 were obtained from the medical records department and the necessary details were collected as per the study objectives.

**Results:** Altogether 24 patients received the vaccination. The mean  $\pm$  SD age of the patients was  $60.54 \pm 20.06$  years. Seventeen (47.22%) of the patients were suffering from COPD. It was found that 10 (41.67%) patients had diseases since the last 5 years. Three patients were on oral corticosteroids (prednisolone) at the time of administration of the vaccine.

**Conclusion:** The study identified the pattern of use of the pneumococcal vaccine in a Nepalese hospital. Though the number of patients receiving the vaccine was low, there is a potential scope for improving the vaccination program. Studies covering a larger population are needed to extrapolate our findings.

## INTRODUCTION

Respiratory diseases are a common problem worldwide.<sup>1</sup> As per the recent national census sample survey of Nepal, asthma and bronchitis combined constitute the number one cause of mortality.<sup>2</sup> Patients suffering from asthma and bronchitis are more prone to infections due to H. influenza, S. pneumoniae and M. catarrhalis.<sup>3</sup> Data from the United States (US) suggest that, among adults with community-acquired pneumonia (CAP) requiring hospital admission, S. pneumoniae is the number one causative organism. Pneumococcal disease is estimated to account for 3,000 cases of meningitis, 50,000 cases of bacteremia, 500,000 cases of pneumonia, and 7 million cases of otitis media each year.<sup>4</sup> More people die from pneumococcal infections, with an estimated mortality of 40,000 annually in the United States (US), than from any other vaccine preventable disease

and approximately one-half of the cases are potentially preventable with pneumococcal vaccine.<sup>5</sup>

A study from a tertiary care teaching hospital in Nepal conducted four years back identified S. pneumoniae as the predominant isolate accounting for 12.7% of the total gram positive isolates causing lower respiratory infections.<sup>6</sup> Pneumonia, febrile bacteraemia and meningitis are the most common manifestations of invasive pneumococcal disease, whereas bacterial spread within the respiratory tract may result in middle-ear infection, sinusitis or recurrent bronchitis.<sup>7</sup> A potential means of preventing the occurrence of this infection is by providing vaccination to the predisposed population. Evidence suggests that a considerable amount of pneumococcal infections can be prevented if the high risk population is vaccinated

adequately.<sup>7</sup> The cost effectiveness of this vaccine is also well established.<sup>8,9</sup>

Manipal Teaching Hospital (MTH) is a tertiary care teaching hospital located in the Western region of Nepal. In this hospital, a good number of patients with COPD get treated on an outpatient as well as inpatient basis. In the year 2006, a comprehensive pneumococcal vaccination program was initiated for the susceptible patients under the care of a chest physician for those who could afford vaccination. Data regarding the use pattern of pneumococcal vaccine are lacking in Nepal. Hence we conducted the present study with the following objectives.

**Objectives:** The objectives of the study are as follows.

1. To collect the demographic details of the patients receiving pneumococcal vaccine
2. To identify the basis for vaccination in the patients and
3. To study the use pattern of the vaccine in the hospital.

**Methodology:** The study methodology is discussed below.

**Study type:** A retrospective case series analysis was carried out.

**Study site:** Manipal Teaching Hospital (MTH), the tertiary care referral hospital of the Manipal College of Medical Sciences, Pokhara, Nepal.

**Inclusion and exclusion criteria:** All the patients prescribed pneumococcal vaccine during the time period from 1st January 2006 to 31<sup>st</sup> December 2006 were enrolled in the study. The patients for who adequate documentation is not available are excluded from the study.

**Methods of data collection:** The name and hospital number of the patients who purchased the vaccine from the Hospital Pharmacy were located by the researchers with the help of the Pharmacy staff. Based on their name and the hospital number, the patient files were collected from the Medical Records Department (MRD). The necessary details for the study were obtained from the patient files.

**Data analysis:** The data was analysed using Microsoft excel spread sheet. The SPSS (Statistical Package for Social Sciences) version 9.0 was used to carry out the descriptive

statistics.

## RESULTS

Altogether 26 patients were prescribed pneumococcal vaccine during the study period. Among these patients, the details regarding 2 of them were not available and hence the remaining 24 were only included.

**Patient demography:** The mean SD age of the patients was 60.54 20.06 years. The details regarding the patient demography are mentioned below in Table 1.

Table 1. Demography distribution

**Diagnosis of the patients:** The details regarding diagnoses of the patients are mentioned below in Table 2.

Table 2. Diagnosis of the patients \* (n=36)

**Duration of disease:** The details regarding the duration of the disease were studied. It was found that 10 (41.67%) patients had disease since the last 5 years, 5 (20.83%) from 6-10 years, 2 (8.33%) from 11-15 years. The duration of the disease state for 7(29.17) of the patients was not known.

**Indications for pneumococcal vaccine:** The details regarding the indications for vaccination for the patients are listed in Table 3.

Table 3. Indications for pneumococcal vaccine

**Smoking status:** The smoking status of the patients was studied and it was found that 6 (25%) were non-smokers, 15 (62.5) past smokers and 3 (12.5) were current smokers.

**Number of admissions prior to vaccination:** The total number of hospital admissions prior to the administration of vaccine is listed in Table 4.

Table 4. Number of hospital admissions (Prior)

**Rationality of use of pneumococcal vaccines:** The rationality of use of the pneumococcal vaccine was studied and it was found that, it was used rationally in 23 cases and was irrational in 1 case.

**Concurrent medications:** Among the total 24 patients, except one, the remaining had a total of 94 concurrent medications. The various concurrent medications used in the patients are listed in Table 5.

Table 5. Concurrent medications (n=94)

## DISCUSSION

Pneumococcal infections are a common problem worldwide<sup>7,10</sup> and also in Nepal<sup>6</sup> accounting for significant morbidity and mortality. The present study identified the utilization pattern of pneumococcal vaccine in a tertiary care teaching hospital in Nepal. The vaccination program was initiated in the hospital under the care of a Chest physician in the year 2006. The preparation used was pneumococcal 23 valent vaccine. The pneumococcal vaccine with 23 pneumococcal capsular polysaccharide types became available in 1983. The 23 capsular pneumococcal vaccine contains purified capsular polysaccharides of pneumococcal types 1, 2, 3, 4, 5, 8, 9, 12, 14, 17, 19, 20, 22, 23, 26, 34, 43, 51, 54, 56, 57, 68, 70 (American nomenclature).<sup>11</sup> There is also another preparation of the vaccine with 7 strains (pneumococcal 7 valent) which is mainly used in children. This preparation is however not available in our hospital and hence is not been prescribed.

Previous studies have identified that prior pneumococcal vaccination may improve survival, reduce respiratory failure or the severity of the infection, and decrease length of stay among hospitalized patients with community-acquired pneumonia.<sup>12,13</sup> Pneumococcal polyvalent vaccine is indicated for patients 2 years of age and older with a high risk of serious pneumococcal infection. This includes patients who had undergone a splenectomy, patients with sickle-cell anemia, cochlear implant recipients, and children with nephrotic syndrome and chronic renal failure, as well as in adults with chronic illness, especially cardiovascular disease and chronic pulmonary disease, who have an increased morbidity with respiratory infections. It is also indicated in adults with chronic illnesses associated with an increase of pneumococcal disease or its complications (splenic dysfunction or anatomic asplenia, Hodgkin's disease, multiple myeloma, cirrhosis, alcoholism, renal failure, CSF fluid leaks and immunosuppressive illness). It is also indicated in older adults (65 years and older), who are otherwise healthy.<sup>11,14</sup> The vaccine is administered intramuscularly as a 0.5 ml dose and may be administered concurrently with other vaccines but at a separate site. Revaccination may be advised after 5 years or more after the first dose.

Our study identified that males receiving the vaccine were more in number. It might be due to the fact that more number of men suffers from respiratory problems. Age of the patients is one of the major determinants for the use of

this vaccine. In our study the number of elderly patients receiving the vaccine was high. In a retrospective cohort study the pneumococcal vaccine was effective in preventing pneumococcal bacteremic disease in elderly patients.<sup>15</sup> In another case-control study, pneumococcal vaccine was 70% effective in preventing pneumococcal infection in the immunocompetent elderly.<sup>16</sup> This is similar to the efficacy of the vaccine in the general immunocompetent population. These data suggest that pneumococcal vaccine can significantly reduce the risk of serious pneumococcal infection in immunocompetent elderly patients. In our study three patients less than 40 years of age also received the vaccination. This is because they had other indications necessitating the need for the vaccine.

The most common diagnosis of the patient receiving the vaccine was COPD, followed by COPD with cor pulmonale and splenectomy. In general, COPD patients are at a higher risk of developing pneumococcal infections.<sup>3</sup> Hence the vaccination for these patients is mandatory. COPD is a common problem in Nepal. One of the major reasons for a high incidence of COPD could be the regular smoking habit by many of the people in Nepal. Our study also acknowledged that 18 (75%) patients were either present or past smokers suggesting a high smoking pattern. Initiating a vaccine program can be a potential intervention in this area. Splenectomy is another compelling indication for pneumococcal vaccine.

While prescribing pneumococcal vaccine, the knowledge regarding concurrent medications is essential. As a general rule, live-attenuated viral or bacterial vaccines should not be administered to patients who are immunosuppressed as a result of large amounts of corticosteroids (more than 10 mg of prednisone or equivalent for more than two weeks). However, an inadequate response to inactivated vaccines may also occur with immunosuppression due to large doses of steroids. Low- to moderate-dose short-term systemic corticosteroid therapy (less than 14 days), topical steroid therapy, long-term alternate-day treatment with low to moderate doses of short-acting systemic steroids, and intra-articular, bursal, or tendon injections of corticosteroids should not be considered contraindications to vaccine administration.<sup>17</sup> Hence it is ideal to give the vaccination to the patients on steroid therapy after stopping the steroid therapy. The exact interval between discontinuing immunosuppressive and regaining the ability to respond to individual vaccines is not known. Estimates vary from three

months to one year.<sup>18</sup> In our study 4 of them were on oral prednisolone at the time of administration of the vaccine.

Safety is an important concern while prescribing a vaccine to a patient. The common side effects include injection site reaction, fever, hemolytic anemia, thrombocytopenia, anaphylactoid reaction, angioedema, transfusion reaction due to serum protein reaction etc.<sup>19</sup> However in our study no such side effects are documented.

Cost is an important constraint while prescribing pneumococcal vaccine. A study from the Netherlands assessed the cost effectiveness (net cost per life year gained) of pneumococcal vaccination of elderly individuals aged 65 years and over. The study concluded that Pneumococcal vaccination is associated with net cost per life year gained of EUR10, 100 (at baseline assumptions). These costs are higher than those for influenza vaccination (EUR5500).<sup>8</sup> Another study from Spain studied the cost-effectiveness of pneumococcal vaccination of 5 of more years aged population. The study concluded that Pneumococcal vaccination is a cost-effective in individuals aged more than 64 years and has a favorable ratio in those aged 45-64 years.<sup>9</sup> The cost of pneumococcal vaccine in our hospital is Nepalese rupees 1679.68 (25 USD approximately). Though, the cost effectiveness is evident, the patients should be explained regarding the cost-benefit ratio and can be convinced if there are compelling indications. One of the options to overcome the cost factor is to provide this vaccination through the government supply. Such an option could still prove to be beneficial since pneumococcal infections is a common problem in Nepal.

In our study it was found that 9 (37.5%) patients had at least one hospital admission in the past. This justifies the need for vaccination in these patients. However, there are contradicting data regarding the vaccination and rehospitalization due to pneumonia. One study from the US reported that the recipients of the pneumococcal vaccine were associated with a slightly increased risk of hospitalization for pneumonia.<sup>15</sup>

Since pneumococcal vaccine is found to be useful in terms of health as well as economic outcomes, there is a need for promoting the use of such vaccination in Nepal. MTH being a tertiary care hospital from the Western region of Nepal which treats a substantial number of patient with pneumococcal infections, it is prudent to strengthen such a vaccination program in the hospital.

Creating awareness regarding the importance of the vaccination is an important factor for rational use of this medicine. A study from America examined whether adding a simple telephone follow-up to an existing mailed physician performance feedback under the Medicare program would increase the impact on billed pneumococcal immunizations. The study concluded that telephone follow-up is an effective and straightforward method to enhance the impact of practice specific feedback to promote improvements in Medicare PPV immunization.<sup>20</sup>

## **LIMITATION**

Our study had a few limitations. The number of patients studied was low. The therapeutic outcomes were not evaluated as the study was a prospective one. The economic outcomes were also not evaluated.

## **CONCLUSION**

The study was successful in identifying the use pattern of pneumococcal vaccine in a tertiary care hospital in Nepal. Vaccines were commonly used in men than women. Elderly patients and patients with COPD were commonly prescribed the vaccine. Prospective studies covering large number of patients over a longer time period can offer useful information regarding the use pattern and significance of pneumococcal vaccine in Nepal.

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