

Vaccines for the Elderly – a Small Step for Improved Quality of Life

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Abstract

The population of elderly is increasing worldwide due to improved health care and availability of newer treatment and better diagnostics. The increase in elderly population is more in developing countries than industrialized nations. On the other hand, measures taken to improve the quality of life of elderly are not in proportion with this rising demographic trend in developing countries including India. Worldwide, pneumonia and influenza are associated with high morbidity and mortality in elderly. In India, for every 1000 elderly, 16 and 77 persons suffer from chronic lung conditions and asthma. This not only increases hospitalization but also increases the financial burden upon the aged and their caretakers causing out of pocket expenditure on treatment. Two pneumococcal vaccines, i.e., 13 valent conjugate and 23 valent polysaccharides are available commercially. The majority of the elderly population reside in rural areas where treatment facility and quality care is not available. The older population if provided with pneumococcal and influenza vaccine, then morbidity, mortality and cost of health care and consequent out of pocket expenditure will reduce. The studies from India regarding the cost effectiveness of vaccines among elderly are scarce but studies in other developed nations are available which show a dramatic reduction in morbidity, hospitalization and mortality among vaccinated elderly persons. The inclusion of these vaccines in National Immunization Schedule for adults over 60 years of age is the need of the hour.

Key words: Elderly, Pneumonia, Influenza, Pneumococcal vaccine, Flu vaccine.

(Journal of The Indian Academy of Geriatrics, 2015; 11:174-179)

Introduction

The increase in elderly population is a worldwide phenomenon. It is due to increased life expectancy and decreased fertility resulting from improvement in healthcare: the advent of antibiotics, vaccines, newer treatments, diagnostics and improved standards of living. The proportion of elderly population, i.e., aged 60 years and above, is

expected to increase from 11% in 2006 to 22% by 2050. Every second two persons celebrate their 60th birthday in the world.¹ Percentage of persons above 80 years has also increased over years. The proportion of elderly is 7.5% in India and it is projected to increase to 12.4% by 2026.²

The rate of growth in elderly population is more in low and middle-income countries compared to the developed nations. It is estimated that by 2050 more than two third of the elderly population of the world will reside in developing countries. The elderly are the disadvantaged section in low and middle-income countries compared to the developed nations due to poverty, illiteracy, low status and lack of quality health care.¹

The health problems faced by the elderly are unique compared to other age groups. The

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prevalence and severity of infectious diseases are higher in the aging population due to the decrease in immune function.³ Not only infectious diseases but also the prevalence of the non-communicable diseases is greater in the elderly. They need specialized long-term care through trained personnel. Unfortunately, the current health systems, particularly in developing countries are poorly designed to meet chronic care needs of the graying mass. Worldwide, Pneumonia and Influenza are included in top 10 causes of death in the elderly. Cough and cold are the third most commonly reported morbidity among elderly. In India, for every 1000 elderly persons, around 16 and 77 individuals suffer from chronic lung conditions and asthma, respectively. Financial reason is the major issue for not seeking appropriate health care among rural elderly.⁴ In this context currently available pneumococcal and flu vaccines can be administered to older persons and episodes of illness, hospitalization, as well as financial burden on family members can be reduced to a great extent.

Vaccines recommended for the elderly

The elderly persons are more prone to infection due to decreased immune response. In this article following vaccines will be emphasized for the elderly population.

1. Pneumococcal vaccine
2. Influenza vaccine

A. Pneumonia and recommendations for vaccination

Pneumonia, an infection of lungs affects millions of people worldwide. Common signs include cough, fever, and difficulty in breathing. Adults above 65 years and children below five years are particularly at risk.

Pneumonia is caused by viruses, bacteria, and fungi. Common causes of viral pneumonia are influenza & Respiratory Syncytial Virus and among bacterial pneumonia, most common cause is *Streptococcus pneumoniae*.⁵

Disease burden

Data regarding morbidity & mortality due to Pneumonia are rare in India but studies in the US reports Pneumococcal pneumonia and invasive bacterial disease (IBD) like meningitis and blood stream infections, kill 18,000 adults above 65 years annually. In the US, pneumococcal disease kills one in every four to five adults infected by it.⁶

The figure in India and other developing countries could be many times more.⁷ World Health Organization (WHO) estimated that the mortality associated with Lower Respiratory Tract Infection (LRTI) is twice higher in adults above 65 years (256 per 1,00,000 persons) compared to children less than 14 years (108 per 1,00,000 persons) in India.⁶ The IBIS study (Invasive Bacterial Infection Surveillance) conducted in India by INCLIN during 1993 to 1997 revealed that one fourth of patients diagnosed with Invasive Pneumococcal Disease (IPD) were adults above 50 years of age.⁸ The diagnosis of IPD is based on blood culture and demonstration of antigen. These kinds of diagnostic tests are not available at District Hospitals and below and many of the IPD cases go underreported.

Risk factors

The risk of acquiring Pneumococcal pneumonia and IPD is highest in elderly and under five children. Certain other factors which enhance infection are environmental (overcrowding, indoor air pollution, smoking); presence of pulmonary or systemic diseases (asthma, COPD, Diabetes Mellitus, chronic kidney disease, nephrotic syndrome, post-splenectomy, sickle cell disease, haemoglobinopathies, chronic heart failure, cardiomyopathies, cirrhosis of liver; immunodeficiency conditions such as HIV infection, malignancies, transplant recipients, chemotherapy etc.⁹

Serotypes of Pneumococcus

More than 90 serotypes of Pneumococcus responsible for disease have been isolated, but few of them cause invasive disease. IBIS study revealed serotype 1 is mostly responsible for invasive disease followed by 3, 4, 5, 6, 7, 8, 12, 15 & 19.¹⁰ The Polysaccharide component of Pneumococcal capsule is serotype specific. Antibodies generated against these capsular polysaccharides are protective.

Pneumococcal Vaccines

There are two types of vaccines available for prevention of pneumococcal pneumonia:

1. Pneumococcal polysaccharide vaccine (PPV 23), 23 valent
2. Pneumococcal Conjugate Vaccine (PCV 13), 13 valent

PPV 23 contains 25 micrograms of purified capsular polysaccharide of 23 different serotypes of *S. pneumoniae*. The immune response is very poor in children less than two years. The antibody levels

decline gradually over 2-10 years; thus revaccination might be required.

PCV 13 is conjugated with non-toxic diphtheria protein. It is currently prescribed for immunizing children above six weeks. The other advantage is the existence of immunological memory. The higher cost and fewer serotypes coverage are the drawbacks of PCV 13.⁵

Table 1. Comparison between Pneumococcal vaccines

Characteristics	PPV 23	PCV 13
Dose & route	A single dose of 0.5 ml intramuscular or subcutaneously	A single dose of 0.5 ml intramuscularly
Storage	2-8°C	
Revaccination	Required in immuno-suppressed persons	Not required
Safety	Safe and well tolerated	
Side Effects	Commonly pain, erythema, mild fever, myalgia. Rarely serious reactions such as anaphylaxis, serum sickness, etc. Both localized and systemic symptoms are seen more in PPV 23 than PCV 13.	

Efficacy and cost-effectiveness of Pneumococcal vaccine

One study demonstrated that PCV 13 is efficacious in reducing the incidence of vaccine-type Community Acquired Pneumonia and vaccine type IPD in a population of 65 years and above with or without co-morbidities. In follow-up studies, it has been seen that the protection offered by the vaccine is maintained even beyond four years.¹²

A study conducted in CMC, Vellore reported that the serotype coverage of PPV 23 was observed to be 83% in IPD isolates for adults over 60 years. The serotype coverage of PCV 13 was found to be 77% of IPD isolates in the same age category. Even 13 valent PCV covered all multidrug resistant serotypes.¹³ Another multicentric study conducted by ASIP (Alliance for Surveillance of Invasive Pneu-

mococci) in India found that 70% of isolates found in patients are covered in all available vaccines.¹⁴

Justification of Pneumococcal vaccination in elderly

The morbidity and mortality associated with LRTI and invasive pneumococcal disease are higher in the elderly population. Secondly, the list of Antibiotic resistant strains is ever increasing. The aged persons also suffer from life-threatening complications more in comparison to healthy adults below 50 years. Moberly et al. found that 23 valent polysaccharide vaccine substantially reduces invasive pneumococcal disease.¹⁵ Many developed countries have included the 13 valent PCV vaccine in the childhood immunization program. Reports show the immunization in children had consistently reduced the incidence of pneumococcal disease among adults due to the creation of herd immunity. In India, where less than 1% children receive the pneumococcal vaccine, the issue of adults being protected through herd immunity is quite unrealistic. Thus, the introduction of pneumococcal vaccine in the elderly age group will be a cost-effective public health approach.

Recommendations

1. US FDA has licensed the use of PCV 13 for prevention of Pneumonia and IPD in adults aged 50 years and above in 2011.
2. European Medicine Agency has approved PCV 13 to be used in adults above 18 years.
3. Association of Physicians of India also endorses the use of pneumococcal vaccines in adults.
4. Advisory Committee on Immunization Practices recommends routine use of PCV 13 & PPV 23 in series to all persons aged 65 years and above.^{16,17}

Table 2. CDC recommendation of vaccination in persons aged \geq 65 years¹⁶⁻¹⁹

Centre for Disease Control and Prevention (CDC) recommendation (2014)	
Not previously vaccinated	A dose of PCV 13 to be given followed by a dose of PPV 23, 6-12 months after
Previously vaccinated with only PPV 23	A dose of PCV 13 (if not taken earlier) one year after vaccination with PPV 23
PPV 23 received at age < 65 years	PCV 13 at age \geq 65 years and PPV 23 after 6-12 months

B. Influenza and vaccine recommendations

Influenza, a respiratory illness in humans, is caused by A & B Influenza virus. However, worldwide most of the infections are caused by Influenza A virus. It can cause mild to severe illness. However risks of complications, hospitalization and case fatality, is higher among persons aged 65 years and more.²⁰

Disease burden

Data on morbidity and mortality related to Influenza are mostly available from industrialized countries. In USA, 20,000 - 40,000 deaths and over 2,00,000 hospitalizations occur annually due to Influenza. A study conducted in USA estimated that mortality due to complications of Influenza is highest in elderly persons aged 65 years and above. The average number of deaths was 98.3 per 1,00,000 persons aged 65 and above and is followed by 7.5 in persons 50-64 years and 0.4 - 0.6 among persons between 0-49 years. Various studies have revealed that vaccination reduces clinical illness by 70-90% in healthy adults less than 65 years.²¹

Types of Influenza vaccine

Two types of Influenza vaccines, i.e., killed or inactivated and live attenuated vaccines are available commercially. But for vaccination in elderly persons, only inactivated vaccines are recommended. The live vaccine is recommended for healthy persons between 2 – 50 years.

The inactivated vaccine contains two strains of Influenza A virus (H3N2 and H1N1) and one Influenza B virus. The strains used for preparation of vaccine are antigenically equivalent to the currently circulating strains.^{22,23}

Administration of Trivalent Inactivated Influenza Vaccine (TIV)²³

Dose – a single dose of 0.5 ml given intramuscularly.

Storage – between 2-8°C and not to be frozen.

Revaccination – every year

Adverse events following immunization (AEFI) –

1. Usually minor systemic side effects such as fever and malaise are seen.

2. Localized pain and tenderness are usual features.

3. Allergic reactions (hives, angio-oedema, anaphylaxis) are rare.

4. Guillain Barre Syndrome (GBS) is a rare side effect of vaccination.

Precautions – vaccination is usually avoided if a person suffers from moderate to acute illness, persons with egg allergy and GBS within six weeks after previous influenza vaccination.

Contraindications – history of severe allergic reaction / anaphylaxis after the previous dose of vaccine

Efficacy of Influenza vaccine

A study conducted between 1998–2000 reported a significant reduction in hospitalizations for cardiac disease, cerebrovascular disease, pneumonia and influenza in vaccinated elderly persons aged 65 years and above.²⁴ Randomized controlled trials provide evidence on decreased mortality in vaccinated elderly persons aged 65 years and above.^{25,26} The decrease in mortality is more in elderly patients with COPD.

Recommendation

Advisory committee on immunization practices (ACIP) recommends Influenza vaccine for persons aged 50 years and above annually.²²

Conclusion

The aged people not only suffer from frequent episodes of illness but the disease severity is also higher due to the age-related decline in immunity. The diseases result in a lot of expenditure and consequently decreased quality of life among elderly. It is estimated that vaccines can prevent more than half of deaths due to pneumonia and influenza. In developed countries, the vaccine coverage among elderly is higher. Various studies all over the world have proved that vaccination of adults with the pneumococcal vaccine is a cost effective approach for prevention of pneumonia & IPD. Similarly, influenza vaccination has decreased the rate of hospitalization. If the immunization for elderly is included in the National Immunization Program, it will benefit the elderly population and decrease complications, chronic long term care and its associated cost. However, further research is required to prove the efficacy and cost-effectiveness of pneumococcal and influenza vaccines among elderly in India.

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