

The world is greying and so is India. Currently pegged at around 8% of our population, the Indian elderly are projected to constitute around 12.17% of our population by 2026<sup>1</sup>.

As our population ages, infectious disease in this segment is becoming a serious public health concern. The increased risk of infections observed with aging may be due to physiologic changes of 'homeostenosis', that accompany "normal" ageing, age-associated diseases and the interventions for them. Immunosenescence contributes to the increased prevalence of infections, cancer and autoimmune disorders in the elderly population with extrinsic and intrinsic causes.

Pneumonia, Influenza, Tetanus & the lately recognized Diphtheria, Pertussis & Herpes Zoster are a group

of Vaccine preventable diseases which otherwise cause considerable morbidity & mortality in older adults. Considering the inadequate medical & health infrastructure; vaccination for above diseases is a good cost effective preventive strategy to achieve positive health.

As one grows old, the immune system undergoes age-associated changes. The decrease in immune response due to age is termed as immunosenescence. It is characterized by decline in elements of immune response with T and B cells, enhanced pro-inflammatory cytokine production by macrophages, and preservation of the same status of CD8 T cells. This makes the elderly more vulnerable to infections and delayed recovery from infections, it also reduces responses to vaccination.

**Table 1: Types of Pneumococcal Vaccine**

Vaccine	Advantages	Disadvantages
PPSV23	<ul style="list-style-type: none"> <li>• Long experience (licensed in 1983)</li> <li>• Not expensive</li> <li>• At present, relatively high serotype coverage for IPD in elderly (60-70 %)</li> <li>• Considerable efficacy proven against IPD (50–70 %) in immunocompetent elderly</li> <li>• Cost-effective proven for elderly people even if it only prevents IPD</li> </ul>	<ul style="list-style-type: none"> <li>• T cell-independent immune response (IgM antibody produced, response declines in 3–5 years and no anamnestic response at revaccination)</li> <li>• Decrease in memory B cell frequency after PPV23</li> <li>• Weak immunogenicity in some individuals</li> <li>• Unclear (null to small) efficacy against nonbacteremic pneumococcal pneumonia. No effect on nasopharyngeal carriage</li> <li>• No efficacy demonstrated in reducing nasopharyngeal carriage</li> <li>• No impact proven in reducing overall pneumococcal disease burden</li> </ul>
PCV13	<ul style="list-style-type: none"> <li>• T cell-dependent immune response (larger duration and boosting effect at revaccination)</li> <li>• High efficacy (80–90 %) against vaccine type IPD proven in children</li> <li>• Significant efficacy against pneumococcal pneumonia (CAPiTA study)</li> <li>• Potential efficacy in reducing nasopharyngeal carriage</li> <li>• Considerable impact in reducing all pneumococcal disease burden shown by prior PCV7</li> </ul>	<ul style="list-style-type: none"> <li>• Short experience (approved in 2011)</li> <li>• Expensive</li> <li>• At present, relatively small serotype coverage for IPD in the elderly (30-40 %)</li> <li>• Future reduction of vaccination impact in adults/elderly (because of probable indirect effects from PCV13 pediatric use)</li> </ul>

## PNEUMOCOCCAL VACCINE

Pneumococcal disease is an infection caused by streptococcus pneumoniae which manifests as pneumococcal pneumonia, otitis media, sinusitis & IPD (meningitis and bacteraemia).

Pneumococcal infections are seen at extremes of age in infants and children, and elderly persons<sup>2</sup>. Persons with co-existing conditions such as diabetes mellitus, CHF, cardiomyopathy, bronchiectasis, bronchial asthma, COPD, hepatitis C infection, cirrhosis of liver, chronic renal failure are vulnerable to pneumococcal infections. The smokers too exhibit an increased risk for development of pneumonia.

Immunocompromised persons such as those with HIV/aids exhibit high risk of pneumococcal disease.

Influenza predisposes patients to pneumococcal pneumonia. Prolonged stay in nursing homes / chronic indoor stay also exposes a person to respiratory infections.. There is increasing incidence of multiple antimicrobial resistances among streptococcus pneumoniae isolates throughout the world. The variation in penicillin resistance in streptococcus pneumoniae across the globe is well known.

There are two types of vaccines namely pneumococcal polysaccharide vaccine (PPSV23) and pneumococcal conjugate vaccine (PCV13). (Table 1)

PPSV 23 is given only once as a single dose to elderly persons. PPSV is a sterile, clear, colourless liquid vaccine. One dose of (0.5 ml) of the vaccine contains 25 micrograms of each capsular polysaccharide antigen dissolved in isotonic saline solution with 0.25% phenol as a preservative. Revaccination may be recommended for persons exhibiting an increased risk for pneumococcal infection

PCV13 is administered in a dose of 0.5 ml intramuscularly. The preferred site is the deltoid muscle of the upper arm.

## INFLUENZA VACCINE

Influenza<sup>3</sup> or flu, is an acute, contagious viral respiratory illness, mostly ignored. Infection occurs in the upper respiratory tract; nose, throat, and at times descends to lungs.

Epidemiological survey suggests the presence of influenza virus during all the 12 months of the year with two peak season; one, in and around rainy season and another during the winter months when there is sudden fall in the atmospheric temperature.

There are two types of vaccines: killed and live attenuated vaccine.

The “trivalent inactivated influenza vaccine (tiv) and the live attenuated influenza vaccine (laiv)”, are good and are recommended for use by the advisory committee on immune practice (ACIP) for prevention of influenza.

The seasonal influenza vaccine (laiv) is a trivalent vaccine containing two influenzas a strains: one H1N1 type, one

H3N2 strain and one influenza type b strain (each 15mg) decided by who on the epidemiologic and antigenic analysis of the currently circulating strains.

Annual vaccination against influenza is recommended for any adult who wants to reduce the risk of becoming ill with influenza.

Vaccination is also recommended in :

- persons aged >50 years.
- women who will be pregnant during the influenza season.
- persons who have chronic pulmonary infection (including asthma); cardiovascular (except hypertension), renal, hepatic, hematological or metabolic disorders (including diabetes mellitus).
- persons who have immune suppression
- persons who have any condition (e.g., cognitive dysfunction, spinal cord injuries, seizure disorders, or other neuromuscular disorders) that can compromise respiratory function or the handling of respiratory secretions or that can increase the risk for aspiration.
- residents of nursing homes and other chronic-care facilities.
- health-care personnel.
- house hold contacts and caregivers of children aged <5 years and adults aged >50 years, with particular emphasis on vaccinating contacts of children aged <6 months; and
- house hold contacts and caregivers of persons with medical conditions that put them at high risk of catching influenza or developing severe complications.

Tiv is given only once as a single dose to elderly persons.

Revaccination: influenza vaccine is recommended to be administered annually.

## TETANUS VACCINE

Tetanus is an acute, often fatal, disease caused by an exotoxin produced by the bacterium clostridium tetani. It is characterized by generalized rigidity and convulsive spasms of skeletal muscles. The muscle stiffness usually involves the jaw (lockjaw) and neck and then becomes generalized.

In India, however, tetanus is an important endemic infection<sup>24</sup>.

Vaccine<sup>4</sup> available for active immunisation against tetanus is tetanus toxoid, an inactivated tetanus toxin. Tetanus toxoid was first produced in 1924, and tetanus toxoid immunizations were used extensively in the armed services during world war ii.

### Vaccine types

Tetanus toxoid consists of a formaldehyde-treated toxin.

150 The toxoid is standardized for potency in animal tests according to FDA regulations.

Types of toxoid available—

- adsorbed (aluminium salt precipitated) toxoid.
- fluid toxoid.

Although rates of seroconversion are almost about equal, the adsorbed toxoid is preferred because the antitoxin response reaches higher titres and is longer lasting than that following the fluid toxoid.

Tetanus toxoid is available as

- a single-antigen preparation
- tet-vac (Serum International), sii tetanus toxoid (Serum Institute of India Ltd.), tetanus toxoid (Haffkine institute), tetanus toxoid (Bioe).
- suspension of tetanus toxoid adsorbed on aluminium phosphate and suspended in isotonic sodium chloride solution
- combined with diphtheria toxoid as paediatric diphtheria-tetanus toxoid (dt) or adult tetanus-diphtheria (td)
- with both diphtheria toxoid and acellular pertussis vaccine as dtap or tdap
- as combined dtap-hepb-ipv and dtap-ipv/hib

### TDAP VACCINE - DIPHtherIA

Diphtheria<sup>5</sup> is a localised infection of mucus membranes of the throat caused by a bacteria called corynebacterium diphtheriae. The infection is potentially fatal and the lethal effect occurs through its toxin. Any person who has not been immunized against diphtheria when exposed to a person infected with diphtheria becomes susceptible to diphtheria.

Diphtheria is a vaccine preventable disease. Diphtheria vaccine protects against the disease. A vaccine is recommended as part of routine immunisation in infants in their first year of life and is administered as a combined vaccine with tetanus toxoid and pertussis vaccines (dpt).

Diphtheria vaccine contains a toxoid (a modified vaccine of the diphtheria toxin) and it is not given as a single injection. It is given in the form of dpt vaccine from six weeks of infancy at monthly intervals three times. dpt vaccine is recommended at the age of 18-24 months to booster its effects. Another booster dose of diphtheria vaccine is recommended at the age of 15-17 years.

The adolescent/adult dpt vaccine is recommended on a single occasion to those who have previously completed a course of the vaccine.

Adults and adolescents receive diphtheria toxoid combined with tetanus toxoid, and pertussis acellular vaccine as a booster. Such vaccine contains a small amount of diphtheria and tetanus toxoid which are modified to make them harmless and small amounts of purified components of pertussis acellular vaccine and aluminium

salt (tdap). After the vaccine has been given, it generally takes about 2 weeks to build immunity in the body<sup>28</sup>. The adult/adolescent tdap vaccine is recommended as a one-time vaccine to those who have previously completed a schedule of the immunization.

### TDAP VACCINE - PERTUSSIS

Pertussis<sup>5</sup> or whooping cough or '100 days' cough is a highly contagious infection of the respiratory tract caused by the bacterium, bordetella pertussis.

Infection with pertussis induces temporary natural immunity. Immunization against pertussis does not confer life-long immunity. While adults rarely die if they contact pertussis after the effects of their childhood vaccine get worn off, they may transmit the disease to people at much higher risk of death. The duration of protection by the vaccine is between 5 to 10 years.

New vaccines for use in adolescents and adults, containing small amount of tetanus and diphtheria toxoids with acellular pertussis vaccine have been made available (tdap).

In developed countries, the vaccine that is given to infants aged 6 weeks through 6 years is diphtheria toxoid, acellular pertussis vaccine and tetanus toxoid (dapt). Dt refers to tetanus and diphtheria toxoids without component of pertussis vaccine. Td refers to tetanus toxoid with small amount of diphtheria toxoid. Tdap refers to vaccine given as a one-time vaccine and it contains small amounts of diphtheria toxoid and acellular pertussis vaccine. These vaccines are given as injections in the anterolateral thigh in infants and in the deltoid region for older children and adults. Immunisation against diphtheria and pertussis is necessary to protect adolescents and adults.

Efficacy of the vaccine against clinical disease exceeds 90%.

### HERPES ZOSTER

Herpes zoster<sup>6</sup> is a burden to the public health. Pain and suffering from herpes zoster is greatest for elderly people who are often least able to access medical care or tolerate the medications used to manage the symptoms.

Treatment for herpes zoster is not always effective or available. People should start anti-viral treatment within 72 hours of onset of rash in order to get the benefit. However, many patients do not get diagnosed right away and miss this window of opportunity. Treatment is only partially effective at relieving and shortening the duration of symptoms.

Shingles is a painful skin rash, often with blisters. It is also called herpes zoster or just zoster. A shingles rash usually appears on one side of the face or body and lasts from 2 to 4 weeks. Its symptoms are severe pain, fever, headache, chills, and stomach upset. For about one person in five, severe pain can continue even after the rash clears up. This is called post-herpetic neuralgia.

Shingles is not contagious, and it cannot be passed from one person to another. However, a person who has never

had chickenpox or received chickenpox vaccine could get chickenpox from someone with shingles. Shingles is far more common in people aged 50 and more than in younger people. It is also more common in people whose immune system is weakened from diseases such as cancer, or drugs such as steroids or chemotherapy.

- a single dose of shingles vaccine is indicated for adults 60 years of age and older.

zostavax, the vaccine to prevent herpes zoster consists of attenuated (oka-strain) varicella virus at a concentration at least 14 times that found in varivax®

- the vaccine is available as 0.65 ml dose containing a minimum of 19,400 plaque-forming units (ffu) of oka/merck strain of *varicella zoster* virus.
- zostavax cannot be used in children and cannot be used in place of varicella vaccine.
- varivax cannot be used in place of zostavax.
- the shingles vaccine is specifically designed to protect people against shingles and will not protect people against other forms of herpes, such as genital herpes.

- the shingles vaccine is not recommended to treat active shingles or post-herpetic neuralgia (pain after the rash is gone) once it develops.

In 2011, FDA expanded the age indication for zostavax® to include adults 50 through 59 years old for preventing herpes zoster. For them the risk of getting shingles and having prolonged pain after shingles is much lower than for people 60 years and older.

## REFERENCES

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