

CD Alert

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ADULT IMMUNIZATION

INTRODUCTION

Vaccination is one of the most cost effective strategies available in public health today. In addition to protecting the vaccinated individual from developing a potentially serious disease, vaccines help protect the community by reducing the spread of infectious diseases. It is highly fitting that one of the most dramatic successes in the history of public health, the eradication of small pox served as a definitive conclusion to the story of smallpox vaccination by Edward Jenner.

More than three decades have passed since India adopted the WHO EPI schedule in January 1978. India has responded with an unhesitating commitment of leadership and resources to expand immunization efforts. The Universal Immunization Programme (UIP) was launched in 1985 to progressively cover the country. The UIP aimed to reduce mortality and morbidity from the six vaccine preventable diseases (measles vaccine was added in 1985). Vitamin A supplementation was included in 1990. Many advances have been made in increasing vaccine coverage amongst infants for the diseases covered under the EPI (tuberculosis, tetanus, diphtheria, pertussis, polio and measles) although the coverage remains variable in different parts of the country.

At present our public health system has reached a stage where basic infrastructure for immunization programme, system for vaccine delivery, cold chain and vaccine production capacity are in place. A potential exists where the immunization programme can expand its immunization activities beyond infancy to accommodate newer vaccines for adolescents and adults, depending on disease burden and cost-effectiveness of the intervention.

REASONS FOR TARGETTING ADULTS

Immunization for infants worldwide has led to important long term effects on the traditional

epidemiological patterns of major infectious diseases. Countries have found that vaccine induced immunity may not have the same long term stability as disease induced immunity, raising the average age of incidence for various vaccine preventable diseases. Many childhood vaccine preventable infections are now found among adults. A massive diphtheria epidemic occurred in the former Soviet Union with more than 1,57,000 cases and 5000 deaths. A majority of cases throughout this epidemic occurred in persons ≥ 15 yrs old, and adults from 40 to 49 yrs old had very high incidence and death rates. Both in resource rich and resource poor countries, outbreaks of measles, mumps and rubella have caused major disruptions on college campuses, in the workplace and in institutions such as hospitals and prisons. An estimated 6% to 11% of young adults are unprotected against rubella.

There is also a sizeable disease burden due to vaccine preventable diseases in adults. This is responsible for large economic losses directly and indirectly. Among adults, with Community-Acquired Pneumonia (CAP) requiring hospital admission, *S pneumoniae* ranks first as a cause and accounts for most of such cases. There are 155.8 million clinical episodes of pneumonia globally, which contribute to approximately 1.9 million deaths, 70% of which occur in Africa and south-east Asia. A study from the Gambia showed that mortality was 16% lower in a PCV immunized group compared to placebo recipients. Similarly, Pneumococcal disease is also estimated to account for 3,000 cases of meningitis, 50,000 cases of bacteraemia, 500,000 cases of pneumonia, and 7 million cases of otitis media each year.

In the United States alone, 36,000 annual deaths are related to influenza and the average number of hospitalizations associated with influenza has been estimated at 226,000.

The number of HBsAg carriers in India has been estimated to be over 40 million. Annually around

205,286 deaths related to chronic hepatitis occur in India. Tetanus causes nearly 309,000 deaths worldwide annually. Surveillance of tetanus in United States between 1998 -2000 showed that the majority of tetanus cases occurred among persons inadequately vaccinated or with unknown vaccination history who sustained an acute injury. Adults aged >60 years were at highest risk for tetanus and tetanus-related death.

The adult age group (more than 18 years) along with adolescents presents an important additional target group for existing immunization programmes.

The WHO scientific advisory group of experts (SAGE) to Global programme for vaccines and immunization (GPV) has indicated the need to expand immunization activities beyond infancy, either as part of routine immunization services, or as part of disease elimination and/ or eradication measures.

ADULT IMMUNISATION: BOTTLENECKS

In spite of the heavier burden of diseases, vaccines recommended for adults are not widely used. There are several reasons for this such as:

- There is a limited perception on part of the health care providers and beneficiaries that adult vaccine preventable diseases are significant health problems.
- There are doubts in the minds of some health care providers and public about the efficacy and safety of several of the vaccines used for adults.
- Adult immunization is selective not universal, different vaccines have different target group.
- Healthy adults are harder to reach through public health system and hence vaccination of this age-group becomes difficult.

ADULT IMMUNISATION: CATEGORIES

- Boost protection acquired by immunization earlier in life in the absence of “natural” boosting from exposure to the infectious agent.
- Accelerate control or elimination efforts: Disease control initiatives frequently aim at increasing herd immunity, interrupting transmission and covering the non-immune cohorts.
- Counter specific risks such as travel, high risk behaviour and immuno-compromised state.

STRATEGIES FOR REACHING OUT TO ADULTS

Increase the demand for adult vaccination by improving provider and public awareness

Better public understanding of the seriousness of vaccine preventable diseases and the benefits of vaccination is essential. Studies have shown that literacy status and socioeconomic profile is an important determinant associated with adult immunization. (Guthmann JP, Med Mal Infect 2010) Health educational programmes can help increase public understanding of the need for and benefits of adult immunization.

Ensure that health care system has an adequate capacity and strategies to deliver vaccines to adults

Tetanus toxoid vaccine has been delivered successfully to women of child bearing age for many years as part of routine immunization services. Such an organized approach should also be replicated for other vaccines for adults. However, healthy adults are harder to reach through public health systems and most vaccines recommended for adults are not part of the Government immunization programme. Hence it becomes important that physicians both general as well as specialists should explore opportunities for vaccination while providing clinical care. For those working in the organized sector, employers should review the vaccination status of their employees from time to time.

Ensure adequate financing mechanisms to support the expanded delivery of vaccines to adults

Childhood immunization programme have received financial support from national as well as international agencies like Global Alliance for Vaccine Initiative (GAVI) and UNICEF. The Government of India currently spends over Rs. 200 crores annually on the procurement of the 6 UIP vaccines alone (excluding the Pulse Polio Immunization Programme). Till now public health agencies have been negligibly involved with adult immunization. Steps should be taken to increase indigenous production capacity of vaccines used for adult immunization.

Ensure adequate support for research

An important policy for the Government is the prioritization and coordination of national vaccine development needs. R&D and production in public

funded organizations, and PSUs must be patronized to develop and produce affordable, safe and effective vaccines that are needed for the Indian markets. Prior identification of which vaccines are most suitable for the public health standpoint may be helpful for the researchers in steering their research priorities accordingly.

VACCINES

CHOLERA VACCINE

Acute diarrhoeal diseases continue to be a major source of morbidity and mortality worldwide. 15% of under five mortality worldwide is due to acute diarrhoeal diseases. Cholera is an important cause of acute infectious diarrhoea and therefore vaccines against cholera are an attractive disease prevention strategy. Vaccines for cholera are available as injectable killed whole cell vaccine; and oral cholera vaccine. The injectable killed whole cell vaccine has been found to have a poor efficacy (45%) and the protection lasts for a duration of only 3 months.

Recommendations

Two types of oral cholera vaccines are available: (i) a monovalent vaccine – not licensed for children < 2 years of age) and (ii) bi-valent vaccines). The injectable vaccine prepared from phenol-inactivated strains of *V. cholerae* is still manufactured in a few countries; the use of this vaccine is not recommended mainly because of its limited efficacy and short duration of protection.

WHO recommends that Cholera control should be a priority in areas where the disease is endemic. Given the availability of 2 oral cholera vaccines and data on their efficacy, field effectiveness, feasibility and acceptance in cholera-affected populations, immunization with these vaccines should be used in conjunction with other prevention and control strategies in areas where the disease is endemic and should be considered in areas at risk for outbreaks. Although all age groups are vulnerable to cholera, where resources are limited immunization should be targeted to the high-risk age groups (children, pregnant women, and the elderly)

DIPHTHERIA, PERTUSSIS & TETANUS

Recommendations

Primary vaccination:

For unvaccinated individuals 7 years of age and older, WHO recommends that Td combination vaccine can

be administered, 2 doses, 1-2 months apart and a third dose after 6-12 months can be used with subsequent boosters at least 1 year apart for a total of 5 appropriately spaced doses to obtain same long term protection. Pertussis whole cell vaccine is not recommended for adolescents or adults.

Booster dose:

A booster dose of tetanus and diphtheria toxoid-containing vaccine should be administered to adults who have completed a primary series and if the last vaccination was received >10 years previously. Tdap, Td or TT vaccine may be used, as indicated.

Tetanus vaccination in pregnancy:

Since 1983 in India, the nationwide Expanded Program on Immunization policy has been implemented to provide 2 doses of tetanus toxoid (TT2) to all pregnant women during each pregnancy (1 dose is provided if <3 years have passed since the previous pregnancy, and this is designated as TT-B). The policy aims at preventing neonatal and maternal tetanus.

HEPATITIS A

The virus has a worldwide distribution and causes about 15 million cases of clinical hepatitis each year. Different studies in India have shown HAV seroprevalence to be between 38% to 92% in different age groups.

Recommendations

WHO considers that in countries where hepatitis A is highly endemic, exposure to HAV is almost universal before the age of 10 years. In such countries clinical hepatitis A is usually a minor public health problem, and large-scale immunization efforts against this disease may not be undertaken. Hence, universal immunization for hepatitis A is not recommended as yet. More epidemiological data is required to ascertain the benefits of the vaccine.

Currently, four inactivated vaccines against HAV are internationally available. All four vaccines are safe and effective, with long-lasting protection. None of the vaccines are licensed for children less than one year of age.

The (HAV) vaccines are given parenterally, as a two-dose series, 6-18 months apart. The dose of vaccine, vaccination schedule, ages for which the vaccine is licensed, and whether there is a paediatric and adult formulation varies from manufacturer to manufacturer.

In developed countries with low endemicity of hepatitis A and with high rates of disease in specific high-risk populations, vaccination of those populations against hepatitis A may be recommended. The high-risk groups include injection-drug users, homosexual men, persons travelling to high-risk areas, and certain ethnic or religious groups. However, it should be noted that vaccination programmes targeting specific high-risk groups may have little impact on the overall national incidence of disease.

HEPATITIS B

Hepatitis B causes a spectrum of liver diseases, including acute self limiting hepatitis, acute fulminant hepatitis and chronic HBV infection. Burden of HBV infection across India varies across regions. A systematic review of literature concluded the prevalence of Hepatitis A in India to be between 1-2%. A recent met-analysis showed the prevalence of Hepatitis A among tribal population to be 15.9% (95%CI-11.4-20.4) and amongst non tribal population 2.4% (95%CI- 2.2-2.7%).

Recommendations

Hepatitis B vaccination is indicated for all unvaccinated adults at risk for HBV infection and all adults seeking protection from HBV infection including post-exposure prophylaxis.

WHO recommends inclusion of hepatitis B vaccine in the routine immunization schedule. Three doses (for high-risk groups if not previously immunized) is also recommended.

Additional target groups for vaccination include people with risk factors for acquiring HBV infection, such as those who frequently require blood or blood products, dialysis patients, recipients of solid organ transplantations, people interned in prisons, injecting drug users, household and sexual contacts of people with chronic HBV infection, people with multiple sexual partners, as well as health-care workers and others who may be exposed to blood and blood products through their work.

In countries with intermediate to low endemicity where a relatively large part of the disease burden results from acute HBV-related disease and is attributable to infection acquired by older children, adolescents and adults, catch-up strategies targeted at adolescents as a supplement to routine infant vaccination are also recommended.

People with risk factors for acquiring HBV infection and travelers who have not completed their hepatitis

B vaccination series should be offered the vaccine before leaving for endemic areas.

HUMAN PAPILLOMA VIRUS

HPV infection is one of the most common sexually transmitted infections. HPV is associated with >95% cervical cancers which is the second most common cancer among women worldwide and the commonest in India.

Two vaccines are currently available. Quadrivalent (HPV types 6,11,16 and 18) licensed for use in females as young as 9 years of age to prevent cervical precancers and cancers. In addition, the quadrivalent vaccine is licensed for prevention of vulvar and vaginal pre-cancers and cancers as well as of anogenital warts in females. In some countries, the vaccine is also licensed for the prevention of anogenital warts in males. Bi-valent (HPV types 16 and 18) has been licensed for use in females as young as 10 years of age to prevent cervical pre-cancers and cancers. HPV vaccines are designed for prophylactic use only; they do not clear existing HPV infection or treat HPV-related disease. The mechanisms by which these vaccines induce protection have not been fully defined but seem to involve both cellular immunity and neutralizing immunoglobulin G antibodies.

The vaccine has to be delivered prior to exposure to the HPV virus. Therefore, the immunization must precede the sexual debut. Evidence suggests the age for initiation for vaccination to be 10 - 12 years. Screening for cervical cancer and primary prevention should be continued in spite of HPV vaccination.

Recommendation

- Since both vaccines are intended for females before the onset of sexual activity, i.e. before first exposure to HPV infection, a three-dose schedule is recommended. The quadrivalent is given at baseline and after 2 and 6 months. A minimum interval of 4 weeks between the first and second dose, and a minimum interval between the second and third does of 12 weeks is recommended by the manufacturer. The bivalent vaccine is given at baseline and after 1 and 6 months. If flexibility in the schedule is necessary the manufacturer recommends that the second dose is administered between 1 and 2.5 months after the first dose.
- For both vaccines, alternative schedules are being explored. Restarting the 3-dose series is not necessary if interrupted, but remaining doses

should be administered as close to the schedule intervals as possible.

- Currently, the manufacturers do not recommend any booster dose following completion of the primary series.
- Catch-up vaccination can be advised up to the age of 26 years for Gardasil® vaccine (quadrivalent vaccine) and 45 years for Cervarix® vaccine (bivalent vaccine)
- HPV vaccination of males for prevention of cervical cancer is not recommended at this time. Vaccination strategies that achieve high coverage (>70%) in the primary target population of young adolescent girls are expected to be more cost-effective in reducing cervical cancer than including vaccination of males.

INFLUENZA

Influenza caused by Influenza A and Influenza B are the most common illness experienced by otherwise healthy adults and children and causes significant morbidity. Ramamurthy N et al have reported a monthly incidence of respiratory infections to be 23% in urban areas and 17.7% in rural areas in Chennai among the paediatric age group. Although the rates of infection are highest among children, risks for complications, hospitalizations and deaths from influenza are higher among persons aged over 65 years, young children and persons of any age who have co-morbid medical conditions that place them at increased risk for complications from influenza.

Recommendations

In the absence of epidemiological surveillance regarding the influenza serotypes in our country, presently the use of influenza vaccine in India is not recommended.

However, in response to the current influenza (H1N1) pandemic, the WHO strategic advisory group of experts (SAGE) have recommended the use of H1N1 influenza vaccine for health-care workers as a first priority to protect the essential health infrastructure. SAGE recommends that vaccination is also particularly important for people who are at increased risk of severe outcomes if they catch pandemic influenza, including pregnant women and people with underlying medical conditions. As vaccines available throughout is initially not sufficient, a step-wise approach to vaccinate particular groups is to be considered.

The WHO is also currently assessing a trivalent vaccine effective against the H1N1 pandemic virus, the seasonal H3N2 virus, and influenza B viruses, and a bivalent seasonal vaccine, effective against H3N2 and influenza B viruses, which might need to be supplemented with a separate monovalent H1N1 pandemic vaccine. SAGE concluded that both options should remain available for vaccine formulations in the southern hemisphere, subject to national needs.

In terms of protective efficacy, the live influenza vaccines appear to be comparable with the TIVs (trivalent, inactivated influenza vaccines.) However, CAIV-T (cold-adapted influenza vaccine) is licensed only for healthy people aged 5-49 years, given reports of an increase in reactive airway disease in vaccinees <5 years of age and insufficiently documented protective efficacy in older people.

JAPANESE ENCEPHALITIS

Japanese encephalitis (JE) is a form of viral encephalitis spread by arthropod borne virus belonging to the family Flaviviridae and genus Flavivirus. It is spread by the bite of infected culicine mosquito. In India, the disease is endemic in southern India and cases occur sporadically throughout the year, while in north India the cases occur in the form of epidemics during the summer and monsoon months. It is predominantly a disease of children living in rural areas although people residing in semi urban areas may also be affected. The control measures for JE are two pronged, namely vector control and prophylactic vaccination.

The vaccines used for immunization against Japanese encephalitis (JE) are (i) mouse brain-derived inactivated vaccine that uses the Nakayama strain (e.g., BIKEN/JE-VAX®) and (ii) PHK cell-cultured, live-attenuated vaccine (e.g., SA 14-14-2 vaccine). With effect from 2007, the production of the mouse brain-derived inactivated vaccine has been stopped at the Central Research Institute (CRI), Kasauli and this vaccine is not available for use in India. The SA 14-14-2 live attenuated vaccine is currently in use in China, India, Korea, Sri Lanka and Nepal. It is administered subcutaneously as a single 0.5 ml dose and a booster dose may be given at one year.

Recommendations

The JE vaccine is primarily useful in the paediatric age group in JE endemic areas as JE is mainly a disease of children. Currently, the JE vaccine is not recommended for routine use in adults

MENINGOCOCCAL MENINGITIS

Meningococcal disease is an acute bacterial disease caused by Gram negative capsular diplococcal bacteria, the meningococcus (*Neisseria meningitidis*). At present 13 serogroups of meningococcus are known viz. A, B, C, E, H, I, K, L, M, X, Y, Z, W 135. Meningococcal disease occurs worldwide as endemic infections. Strains of serogroup B and C cause majority of infections developed countries, where as strains of serogroup A and to a lesser extent serogroup C dominate in the developing world. In India the disease is endemic in some states like Delhi and sporadic cases are reported from other states such as Haryana, UP, Rajasthan, Gujarat, West Bengal and Orissa. Meningococcal disease is potentially preventable through vaccination and chemoprophylaxis in special circumstances.

Two types of vaccines are in use for meningococcal meningitis (i) the polysaccharide vaccines and (ii) conjugate vaccines. A third type based on outer membrane protein [OMP] has not been found to be very effective and is not widely used. Internationally marketed meningococcal polysaccharide vaccines are either bivalent (groups A and C) or tetravalent (groups A, C, Y and W135).

Recommendations

Routine vaccination of all adults is not recommended in view of low efficacy of meningococcal vaccines in children below 2 years and the short-lived protection provided by the currently available polysaccharide vaccines.

Vaccination of adults with meningococcal vaccine should be done if they meet any of the following indications and any person seeking protection from hepatitis A virus (HAV) infection.

- Medical: Adults with anatomic or functional asplenia, or persistent complement component deficiencies.
- Other: First-year college students living in dormitories; microbiologists routinely exposed to isolates of *Neisseria meningitidis*; military recruits; and persons who travel to or live in countries in which meningococcal disease is hyperendemic or epidemic (e.g., the "meningitis belt" of sub-Saharan Africa during the dry season [December through June]),

particularly if their contact with local populations will be prolonged. Vaccination is required by the government of Saudi Arabia for all travellers to Mecca during the annual Hajj.

In older children and adolescents group C disease may be prevented by a single dose of (group C conjugate meningococcal) vaccine. Where disease in children above two years of age is the main concern, or where resources are limited, several years of protection may be achieved by single injection of the combined groups A and C polysaccharide vaccine.

PNEUMOCOCCUS

Lower respiratory infections including community acquired pneumonia (CAP) are an important cause of morbidity and mortality worldwide. A vast majority of the lower respiratory infections are caused by viral infections. However, most cases of CAP are of bacterial origin. Among the bacterial pathogens causing CAP, *S. Pneumoniae* is the single most common organism worldwide. A study conducted by International Clinical Epidemiology Network (INCLEN) on pneumococcal infection during 1993-97 in India showed pneumococcal pneumonia, bacteremia and meningitis were associated with case fatality rates of 19%, 21% and 34% respectively. Moreover nearly one third (33%) of patients with proven IPD were younger than 5 years and about 23% were older than 50 years.

Currently, a 7-valent polysaccharide–protein conjugate vaccine (PCV-7) and an unconjugated polysaccharide vaccine covering 23 serotypes are marketed internationally. A three dose regimen before one year of age along with a booster after one year is recommended for the 7-valent polysaccharide–protein conjugate vaccine. 23-valent vaccine is primarily designed for use in older children and adults who are at high risk for pneumococcal disease. It is not licensed for use in children aged <2 years.

Recommendations

More than 15 meta-analyses with conflicting results have been published so far the efficacy of PPV in adults. Available evidence is insufficient to recommend routine use of PPV in adults. Although PPV is efficacious in preventing invasive pneumococcal disease among adults, routine PPV administration to adults is not likely to be cost-effective in India. Pneumococcal vaccination is

recommended in patients undergoing splenectomy (preferably at least 2 weeks prior to splenectomy)

Currently the WHO states that in resource-limited settings where there are many competing health priorities, the evidence does not support routine immunization of the elderly and high-risk populations with PPV.

RABIES

Rabies is an acute viral disease which causes encephalomyelitis in virtually all warm blooded mammals including man. Rabies virus is transmitted to other animals and to humans through close contact with their saliva (i.e. bites, scratches, licks on broken skin and mucus membrane). Rabies occurs in all continents with the exception of Antarctica. Estimates suggest that in India, around 20,000 human deaths occur due to rabies annually which accounts for about 1/3rd of total global mortality (APCRI 2004). It is estimated that 17.4 million animal bites occur per year; of these many do not seek post exposure prophylaxis.

As rabies has a long incubation period, it is possible to institute prophylactic post exposure vaccination.

Recommendations

Currently, cell culture rabies vaccines are used for rabies prophylaxis, which may be administered by intramuscular or intradermal route. For post exposure prophylaxis, five doses of the vaccine are administered on days 0, 3, 7, 14, and 28 in the deltoid muscle or in the anterolateral part of the thigh. They are not to be injected in the gluteal region. For intradermal inoculation of cell culture vaccines, Updated Thai Red Cross Regimen is approved for use in India. In this, 0.1 ml of vaccine, irrespective of reconstituted volume, is administered at 2 sites intradermally in the deltoid region on days 0, 3, 7 and 28. Intradermal inoculation of cell culture vaccines not only makes post exposure prophylaxis economical but also enables wider coverage in available quantity of vaccines.

Pre-exposure prophylaxis is recommended in high risk groups such as veterinary personnel, medical doctors, dog catchers, postmen, wild life wardens etc. Vaccine is given intramuscularly (1ml/0.5ml) or intra-dermally (0.1ml, irrespective of reconstituted volume) on days 0, 7, 21 or 28.

RUBELLA

There are a number of rubella vaccines available, either as single antigen vaccines or combined with either measles vaccine (MR), mumps vaccine or measles and mumps vaccine (MMR). Most of the currently-licensed vaccines are based on the live, attenuated RA 27/3 strain of rubella virus, propagated in human diploid cells.

Rubella is a mild childhood disease. However infection during pregnancy may cause fetal death or congenital rubella syndrome (CRS). The primary purpose of rubella vaccination is to prevent the occurrence of congenital rubella infection including congenital rubella syndrome (CRS), which is an important cause of deafness, blindness and mental retardation. Women of child bearing age should consider vaccination with rubella if not immunized during childhood. Rubella vaccination should be avoided in pregnancy because of the theoretical, but never demonstrated, teratogenic risk.

Recommendation

For adult immunization, two doses of the vaccine are recommended for health care workers; in the setting of outbreaks; recent exposure to these infections; women who could become pregnant; and college students.

WHO recommends two approaches for rubella vaccination. (a) prevention of CRS only, through immunization of adolescent girls and/or women of childbearing age; or (b) elimination of rubella as well as CRS through universal vaccination of infants, surveillance and assuring immunity in women of childbearing age. The WHO also emphasizes the need for a childhood vaccination programmes achieving and maintaining high levels of coverage to avoid the risk of increasing the number of susceptible among adults, including women of childbearing age, and the possibility of increased numbers of cases of CRS. On the other hand a policy of rubella vaccination of adults is essentially free of risks of altering rubella transmission dynamics.

VARICELLA

The currently marketed varicella vaccines are based on the so-called Oka strain of VZV, which has been modified through sequential propagation in different cell culture. Following a single dose of the above-mentioned vaccines, seroconversion is seen in about 95% of healthy children. From a logistic as well as

an epidemiological point of view, the optimal age for varicella vaccination is 12-24 months.

Recommendations

Varicella vaccine may be used either at an individual level to protect susceptible adolescents and adults. But will not have a significant impact on the epidemiology of the disease on a population basis. Varicella in persons who have received the vaccine ("break-through varicella") is substantially less severe than the disease in unvaccinated individuals.

At the present time WHO does not recommend the inclusion of varicella vaccination into the routine immunization programmes of developing countries. However, (Varicella) vaccine may be offered in any country to individual adolescents and adults without a history of varicella, in particular to those at increased risk of contracting or spreading the infection. This use in adolescents and adults entails no risk of an epidemiological shift, as childhood exposure to VZV remains unaffected.

TREATMENT

Figure 1 Recommended adult immunization schedule, by vaccine and age group

Vaccine	19-26 yrs	27-49 yrs	50-59 yrs	60-64 yrs	>=65 yrs
Tetanus, diphtheria, pertusis	✓ (Tdap should replace one time dose of Td)				✓ (Td booster every 10 yrs)
Human Papillomavirus	✓✓ (3 doses females)	x	x	x	x
Varicella	✓✓ (2 doses)				
Zoster	x	x	x	✓✓ (1 dose)	
Measles, mumps, rubella	✓✓ (1 or 2 doses)	✓ (1 dose)			
Influenza	✓	✓✓ (1 dose annually)			
Pneumococcal	✓ (1 or 2 doses)				✓✓ (1 dose)
Hepatitis A	✓ (2 doses)				
Hepatitis B	✓ (3 doses)				
Meningococcal	✓ (1 or more doses)				

(Source: Adapted from CDC MMWR, January 2010)

- ✓ For all persons in the category who meet the age requirement and who lack evidence of immunity
- ✓ Recommended if some other risk factor is present (eg based on medical, occupational or other indication)
- x Not recommended

...about CD Alert

CDAlert is a monthly newsletter of the National Centre for Disease Control (NCDC) (formerly known as NICD), Directorate General of Health Services, to disseminate information on various aspects of communicable diseases to medical fraternity and health administrators. The newsletter may be reproduced, in part or whole, for educational purposes.

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