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Editorial

Adult Vaccination in Indian Settings – An Update

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INTRODUCTION

Vaccination has historically played a transformative role in public health, particularly in childhood immunization. However, adult immunization remains a neglected domain in India. Unlike paediatric vaccination, adult immunization lacks a cohesive national framework, leading to missed opportunities for disease prevention in later life. The consequences are evident in the persistent burden of vaccine-preventable diseases (VPDs) among adults, particularly those with comorbid conditions, healthcare workers (HCWs), and the elderly. The need for structured adult vaccination policies and practices in India has never been more urgent, especially in the wake of emerging infectious threats, India's demographic shift towards an aging population (from 0.9% in 1978 to ~1.5% in 2024) and the increasing burden of non-communicable diseases (NCDs).[1,2]

Recent experiences during the COVID-19 pandemic have further underscored the vulnerability of adults to infectious diseases and the importance of immunization across the lifespan. The 2024 review emphasized this gap and advocated for the integration of adult vaccination into routine care, surveillance, and policy implementation.[3]

WHY VACCINATE ADULTS?

The rationale for adult vaccination rests on several biological, epidemiological, and public health considerations:

1. Waning immunity from childhood vaccines renders adults susceptible to diseases such as pertussis, diphtheria, and measles.
2. Occupational exposure, especially among HCWs, increases the risk of disease transmission to vulnerable populations.
3. Adults with chronic comorbidities such as diabetes, (COPD), cardiovascular disease, chronic kidney disease (CKD), or chronic liver disease (CLD) are at higher risk of severe illness from VPDs.
4. With evolution, new strains, emerging infections, and vaccine technology advancements are there.
5. Outbreak control and herd protection are strengthened through adult immunization. Pandemic preparedness relies heavily on vaccinating vulnerable adult populations.
6. Travel to endemic areas is another reason.

Moreover, adults are at risk of both endemic and emerging infections, such as seasonal influenza and COVID-19, which carry disproportionately higher morbidity and mortality among older individuals and those with comorbidities. Vaccinating adults also contributes to herd immunity, indirectly protecting infants, immunocompromised individuals, and others who cannot be vaccinated.[4,5]

Thus, the benefits of adult immunization span individual protection, outbreak control, and population-level health security.

BURDEN OF VACCINE-PREVENTABLE DISEASES IN ADULTS

India bears a significant burden of VPDs among its adult population. India sees 30,000–50,000

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influenza-related deaths annually, especially in older adults and people with pre-existing illnesses. Despite recommendations, adult vaccine coverage remains <2% among those aged ≥45 years.[6,7] The poor uptake is compounded by genetic mismatch between circulating and vaccine strains in some regions, lowering vaccine effectiveness.[8]

Pneumonia, sepsis, and meningitis are significant causes of morbidity in adults, especially diabetics and the elderly. Studies from Vellore and Delhi revealed that 30% of circulating strains were not covered by existing vaccines.[9,10] A sequential PCV13 followed by PPSV23 schedule is recommended for all adults over 65 and those 19–64 years with risk factors. Despite the availability of effective PCV13 and PPSV23 vaccines, adult vaccination coverage remains low. Indian studies support the cost-effectiveness of this vaccination regimen, especially among diabetics, smokers, and individuals with CLD or CKD.[11]

The seroprevalence of Hepatitis B remains high in India, with the potential to progress to cirrhosis and hepatocellular carcinoma. Studies indicate that vaccine coverage among HCWs is only 55–64%.[12] The three-dose regimen (at 0, 1, and 6 months) is crucial for HCWs, dialysis patients, and individuals with liver disease. Post-vaccination serologic testing is recommended to confirm the development of protective immunity.[13]

Human papillomavirus (HPV) accounts for 88–98% of cervical cancer cases. Yet, only 2% of urban and 1.7% of rural women have ever undergone screening. HPV vaccination has been shown to be both immunogenic and cost-effective. National societies such as the Federation of Obstetric and Gynaecological Societies of India and the Indian Academy of Pediatrics have endorsed its early administration and catch-up programs for eligible adult females.[14,15]

Herpes zoster, caused by reactivation of the varicella-zoster virus, can lead to chronic neuralgia and hospitalization in older adults. Zoster vaccination is recommended for all individuals above 50 years of age and for all immunocompromised persons. Although only moderately cost-effective, it remains essential in high-burden cohorts.[16]

BARRIERS TO ADULT VACCINATION

Vaccine hesitancy is shaped by several factors:

- Low public awareness and perceived lack of necessity.
- Mistrust regarding vaccine safety and side effects.
- High out-of-pocket costs for non-UIP (fullform?) vaccines.
- Limited national guidance and absence of integrated adult immunization policy.

During the COVID-19 pandemic, vaccine acceptance rose sharply, with 93% of Indian adults receiving at least one dose within a year, showing that public willingness can be mobilized when infrastructure and communication are aligned.

RECOMMENDATIONS FOR HEALTHCARE WORKERS (TABLE 1)

HCWs face elevated occupational risks due to potential exposure to infectious agents and contact with vulnerable populations. A structured vaccination schedule is essential to ensure personal protection and prevent nosocomial outbreaks.[17,18]

- **Hepatitis B**: A three-dose schedule (0, 1, 6 months) remains standard for all HCWs, particularly those with exposure to blood borne pathogens. Titer testing post-vaccination is advised for dialysis patients, those with liver disease, and personnel in high-risk departments. Record-keeping and periodic audits enhance coverage.
- **Influenza**: Annual vaccination reduces absenteeism and hospital-acquired infections. Indian surveillance data shows consistent seasonal peaks. Cost-effectiveness is well established in high-risk healthcare settings.
- **MMR**: Due to sporadic measles outbreaks and waning immunity in adults, two doses of MMR (0 and 4 weeks apart) are advised for HCWs lacking documentation of prior immunity. Outbreak monitoring and immunity audits help ensure preparedness.
- **Varicella**: Two-dose vaccination is recommended for seronegative HCWs, especially in immunocompromised patient units (e.g., oncology, transplant). Live vaccines remain contraindicated in pregnant or immunosuppressed staff.
- **Tdap/Td**: One-time Tdap dose followed by Td boosters every 10 years is advised for all HCWs. It is particularly critical during pregnancy (27–36 weeks) and for those working in maternal and neonatal care.
- **COVID-19**: Universal immunization of HCWs with boosters per national policy is mandated. CoWIN tracking and monitoring breakthrough infections help guide response strategies.

- **Herpes Zoster**: Optional but recommended for HCWs ≥50 years and those immunocompromised. It reduces incidence of post-herpetic neuralgia and hospitalization, with institutional policies guiding its inclusion based on risk assessment.

Table 1. Mandatory Vaccination For HCWs

VACCINE	DOSE/ ROUTE	SCHEDULE	REMARKS
Hepatitis B	1 ml; Deep i.m.	0,1,6 months	• All adults (19-59) + >65 at risk (CLD;CKD; HIV; IV drug abuse, etc.) • CKD- double dose at 0,1,2,6 months
Tdap/Td	0.5 ml i.m.	1 dose then Td/Tdap 10 yearly	• All adults • 1 dose Tdap during each pregnancy
MMR	0.5 ml s.c.	1 dose 2 doses- 0, 4 wks	Indicated in: • If no evidence of prior immunity to MMR in form of lack of childhood vaccination, not suffering from these diseases, or inadequate antibody responses • HIV with CD4 >200 #C/I in pregnancy, and immunocompromised states
Varicella	0.5 ml S.C.	1 dose 2 doses- 0,4-8 weeks	Indicated in if no evidence of prior immunity to Varicella in form of lack of childhood vaccination, not suffering from these diseases, or inadequate antibody responses #C/I in pregnancy, and immunocompromised states
COVID-19	0.5 ml I.M.	2 doses, 0, 4 weeks	Age >18 yrs
Influenza	0.5 ml I.M.	1 dose, annually	Age> 18 yrs; #LAIV C/I in Age>65, Pregnancy, and Immunocompromised
Herpes Zoster	0.5 ml I.M.	2 doses, 2-6 months apart	• All >50 yrs age • All HIV pts

Abbreviations: HCW-Health care worker, CLD- Chronic liver disease, CKD-chronic kidney disease, LAIV- live attenuated influenza vaccine, C/I-contraindication

Despite clear guidelines, uptake among HCWs remains below optimal levels. Addressing barriers such as cost, lack of mandates, and inadequate awareness through policy enforcement and on-site vaccine availability is crucial.

Even in the absence of comorbidities, healthy adults remain susceptible to vaccine-preventable infections due to waning childhood immunity, occupational exposure, and shifting epidemiological patterns. Core vaccines recommended for all adults include Tdap/Td, influenza, and COVID-19, which help reduce respiratory illness burden and curb community transmission.[19,20] Successful strategies to improve adult immunization coverage rates will result in reductions in morbidity, mortality, and healthcare costs.[21]

Incorporating vaccination into preventive health check-ups, occupational assessments, and wellness programs can improve coverage and foster a culture of lifelong immunity.

TARGETED VACCINATION FOR HIGH-RISK ADULTS

Adult immunization should be tailored to underlying conditions that increase the risk of severe outcomes from infections. In India, the dual burden of non-communicable diseases and persistent infectious threats makes such targeted strategies both clinically essential and cost-effective (Table-2 and Table-3).

Table 2. Recommended Vaccination for different age groups.

All adults in age group should get the vaccine	Some adults in age group should get the vaccine	Adults should talk to their health care provider to decide if this vaccine is right for them

Vaccine	19-26 Years	27-49 years	50-64 years	≥ 65 year
COVID-19	At least 1 dose of the current Covid-19 vaccine			65+: At least 2 doses
Influenza/ Flu	Every Year			

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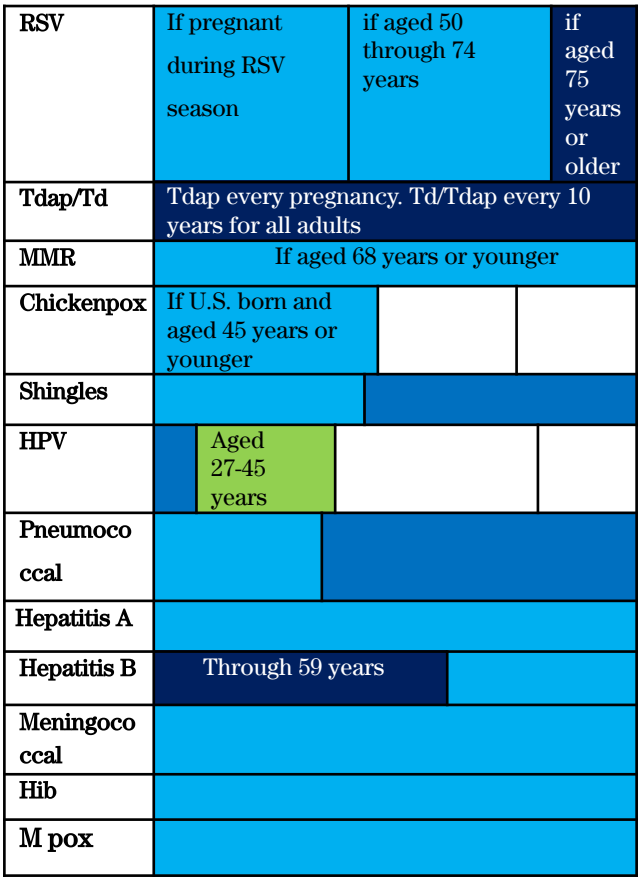

RSV- Respiratory syncytial virus, MMR, HPV-Human papilloma virus, Hib, M pox- Monkey pox

1. Chronic Liver and Kidney Disease (CLD/CKD)

These individuals are vulnerable to complications from hepatitis B, pneumococcal infections, and influenza. The recommended vaccines are included in table 3. Tracking tools include dialysis unit audits and liver clinic registries.

2. Chronic Heart and Lung Disease

Patients with cardiovascular disease, COPD, or asthma face heightened risk from respiratory pathogens. They should receive as in table 3. Immunization status can be reviewed during NCD clinic visits and through monitoring of respiratory admissions.

3. Hemoglobinopathies (e.g., Thalassemia, Sickle Cell Disease)

Frequent transfusions and splenic dysfunction increase susceptibility to encapsulated organisms. Recommended vaccines include as in table 3. Pre-splenectomy vaccination and centralized documentation via hematology registries are critical.

4. People Living with HIV (PLHIV)

Vaccine selection depends on CD4 count and clinical status (Table 3). ART centers should maintain immunization records and collaborate with public health systems for surveillance.

5. Pregnancy

Vaccination during pregnancy safeguards both maternal and neonatal health. Recommended vaccines are included in table 3. Live vaccines (MMR, varicella, HPV, LAIV) are contraindicated. Antenatal care records and family health surveys can support monitoring and coverage assessment.

Table 3. Recommendations for the General Adult Population and Special Risk Group

A major challenge in India is the absence of adult immunization guidelines within the national immunization schedule. Consequently, vaccinations in adults are often administered on an ad hoc basis rather than through structured protocols. Integrating adult vaccines into primary healthcare and raising public awareness through targeted campaigns could substantially improve coverage and reduce VPD burden.

CLD/CKD	**Heart/ Lung disease**	**Hemoglobino-pathies**	**HIV**	**Pregnancy**
1. Hepatitis B 2. Tdap/Td 3. MMR 4. Varicella 5. COVID-19 6. Influenza 7.Pneumococcal 8. Hepatitis A (for CLD)	1. Tdap/Td 2. COVID-19 3. MMR 4. Influenza 5. Varicella 6.Pneumococcal	1. Tdap/Td 2. MMR 3. Varicella 4. COVID-19 5. Influenza 6.Pneumococcal 7. Hib 8.Meningococcal	1. Hepatitis B 2. Tdap/Td 3.MMR(C/I CD4<200) 4. Varicella(C/I CD4<200) 5. COVID-19 6. Influenza 7.Pneumococcal 8. Hepatitis A 9.Herpes Zoster 10.Meningococcal	*Recommended-* 1. Hepatitis B 2. Tdap(27-36 weeks) 3. COVID-19 4. Influenza *Contraindicated* 1.MMR 2. Varicella 3. LAIV 4. HPV

Vaccine	Dose/ Route	Schedule	Targeted Population	Remarks
HPV Cervarix/ Gardasil	IM.	2/3 dose series	Up to age 26 year- all adults; Age 27-45 years- based on shared clinical decision	
Pneumococcal	PCV- IM. PPSV-23 SC/IM.	PCV13 dose 1dose PPSV-23 1year later	All adults >65 years All at risk in age group 19-64 years (CLD; CKD; HIV; IV. drug abuse etc.)	In high risk groups(Splenectomy or CSF leak) 8 weeks interval, PPSV23 booster at 5 yrs in high-risk individuals
Hepatitis A	1 ml IM.	2 doses 6-12 m apart	At risk (CLD; HIV; IV drug abuse etc.)	
Hib	0.5 ml IM.	1 dose 3 dose series 4 weeks apart	Anatomical/functional Asplenia Hematopoietic stem cell transplant	If elective splenectomy, 1 dose at least 14 days before splenectomy
Meningococcal		2 doses 8 weeks apart		

Abbreviations: LAIV- live attenuated influenza vaccine, C/I-contraindication, MMR-measles mumps and rubella, PCV-pneumococcal conjugate vaccine, PPSV- Pneumococcal Polysaccharide vaccine, Tdap-Tetanus, diphtheria, acellular pertussis, Hib-H. influenza

CONCLUSIONS

Adult immunization must be recognized as a core component of preventive healthcare in India. Low vaccine uptake among healthcare workers and the general population continues to drive avoidable illness and death from VPDs. Urgent steps include establishing national guidelines, subsidizing key vaccines, implementing digital immunization records, and enhancing coordination between public and private sectors. With an aging population and increasing chronic disease burden, scaling up adult vaccination is not optional, it is a public health necessity.

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Authors declare no conflict of interests.

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DECLARATION FOR THE USE OF GENERATIVE ARTIFICIAL INTELLIGENCE (AI) IN SCIENTIFIC WRITING

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