INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: https://www.ijpsjournal.com

Review paper

Adult Vaccination: Current Concepts, Practices, and Global Recommendations

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ARTICLE INFO

Published: 23 Jan 2026
Keywords:
Adult vaccination; Vaccine-preventable diseases; Immunization policy; Vaccine hesitancy; Public health
DOI:
10.5281/zenodo.18351094

ABSTRACT

Background: Adult vaccination is an essential but frequently overlooked component of comprehensive immunization strategies. Although childhood immunization has achieved substantial coverage globally, many adults remain susceptible to vaccine-preventable diseases (VPDs), which contribute to considerable morbidity, mortality, and healthcare costs. Objective: To provide a narrative review of current concepts, practices, and global recommendations for adult vaccination, synthesizing immunological rationale, disease burden, guideline harmonization, barriers to uptake, and emerging vaccine technologies. Methods: A targeted literature review was performed using major guideline repositories (WHO, CDC, ECDC, national technical advisory groups) and peer-reviewed literature published between 2018 and 2024, focused on adult immunization practices, vaccine effectiveness, safety, and policy frameworks. Results/Discussion: Adult immunization policies vary widely between countries, reflecting differences in healthcare infrastructure, epidemiology, resource allocation, and policy priorities. Key vaccines recommended for adults include seasonal influenza, COVID-19, pneumococcal conjugate and polysaccharide vaccines, tetanus-diphtheria-pertussis boosters, hepatitis A and B, human papillomavirus (HPV) for catch-up cohorts, and herpes zoster vaccination for older adults. Immunosenescence, comorbidities, and social determinants of health increase adult vulnerability and underscore the need for lifelong immunization strategies. Barriers such as low awareness, vaccine hesitancy, poor access, and cost impede uptake, particularly in low- and middle-income countries. Advances in vaccine platforms—mRNA, recombinant proteins, and novel adjuvants—offer improved immunogenicity and potential for broader adult vaccine portfolios. Conclusion: Strengthening adult vaccination requires harmonized guidelines, integration into primary care and universal health coverage schemes, effective communication to address hesitancy, enhanced surveillance, and equitable access to novel vaccine technologies.

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Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

INTRODUCTION

Vaccination remains one of the most impactful public health interventions, significantly reducing the burden of infectious diseases worldwide. While childhood immunization programs have been the major focus of national and international efforts for decades, adult vaccination has often been deprioritized. Demographic shifts toward older populations, rising prevalence of chronic non-communicable diseases, increased global travel, and the threat of emerging pathogens have emphasized the need for comprehensive, lifespan immunization strategies. The coronavirus disease 2019 (COVID-19) pandemic highlighted the consequences of insufficient adult immunity and reinforced the importance of robust adult vaccination policies and infrastructure. This review synthesizes contemporary evidence, global recommendations, and implementation relevant to adult-vaccination

BURDEN OF VACCINE-PREVENTABLE DISEASES IN ADULTS

Adults contribute substantially to the global burden of vaccine-preventable diseases (VPDs). Seasonal influenza remains a leading cause of respiratory morbidity and mortality, resulting in thousands of deaths annually and substantial healthcare utilization and economic losses. Pneumococcal disease, including invasive pneumococcal disease and pneumococcal pneumonia, disproportionately affects older adults and those with comorbid conditions, leading to significant hospitalization rates and mortality. Herpes zoster incidence increases markedly after age 50, often resulting in prolonged pain and reduced quality of life. Viral hepatitis, notably hepatitis B, contributes to chronic liver disease and hepatocellular carcinoma in adult populations globally. The COVID-19 pandemic further demonstrated the catastrophic potential of novel respiratory pathogens in adults, particularly among older adults and those with underlying conditions. Taken together, these VPDs impose a heavy clinical and economic burden, motivating expansion of adult immunization efforts.

IMMUNOLOGICAL RATIONALE FOR ADULT VACCINATION

The immunological landscape changes across the lifespan. Immunosenescence—characterized by reduced naïve lymphocyte output, diminished B-cell repertoire diversity, impaired T-cell function, and altered innate immune responses—leads to increased susceptibility to infections and reduced vaccine responsiveness in older adults. Chronic low-grade inflammation, often referred to as inflammaging, further modulates immune responsiveness and contributes to age-related diseases. Booster vaccination in adulthood serves multiple functions: restoring waning immunity from childhood vaccines, introducing protection against pathogens for which individuals were previously unvaccinated, and optimizing immune responses in the context of evolving vaccine technologies such as adjuvanted and mRNA platforms designed to enhance immunogenicity in adults.

CURRENT ADULT VACCINATION PRACTICES WORLDWIDE

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There is substantial heterogeneity in adult vaccination practices across countries. High-income countries (HICs) commonly maintain comprehensive adult immunization schedules, with routine recommendations for influenza, pneumococcal, herpes zoster, tetanus-diphtheria-pertussis (Tdap) boosters, hepatitis B where indicated, and targeted programs for HPV and COVID-19. Many HICs also implement seasonal vaccination campaigns and workplace vaccination programs. In low- and middle-income countries (LMICs), adult immunization services are generally less developed, often focusing on specific groups such as pregnant women (tetanus, pertussis), healthcare workers, and special risk populations, with fewer routine recommendations for broader adult cohorts. Structural challenges in LMICs—limited cold-chain capacity for additional vaccine types, financial constraints, and competing health priorities—contribute to lower adult vaccine coverage.

Table 1: Major Adult Vaccines, Dosage, and Global Recommendations

Vaccine	Recommended Age/Group	Dosage Schedule	Typical Global Recommendation
Influenza	All adults; annually especially ≥60 yrs. and risk groups	Annual single dose	WHO/CDC/ECDC recommend annual influenza vaccination
COVID-19	All adults; boosters per risk and age	Primary series + booster(s) as recommended	WHO/CDC/ECDC recommend vaccination for adults
Pneumococcal	Adults ≥50–65 yrs. and high-risk groups	PCV (once) ± PPSV23 per local guidance	Recommended for older adults and risk groups
Tdap (tetanus, diphtheria, pertussis)	All adults	One Tdap then Td booster every 10 yrs.	Booster every 10 years; Tdap once in adulthood
Hepatitis B	Non-immune adults at risk	3-dose series (0,1,6 months) or accelerated schedules	Recommended for at-risk adults; catch-up where needed
HPV	Catch-up up to 26 yrs. (shared decision 27–45)	2–3 doses by schedule	Catch-up vaccination recommended; expanding adult use
Zoster (RZV)	Adults ≥50 yrs.	Two doses, 2–6 months apart	Recommended for older adults (RZV preferred)

GLOBAL RECOMMENDATIONS (WHO, CDC, ECDC, INDIA, UK, ETC.)

Global advisory bodies and national agencies provide varying, yet overlapping, recommendations for adult vaccination. The World Health Organization (WHO) emphasizes the Immunization Agenda 2030 (IA2030) vision of vaccination across the life course, advocating for adult vaccination in the context of universal health coverage and disease-specific strategies. National bodies such as the Centers for Disease Control and Prevention (CDC) in the United States provide detailed adult immunization schedules that include annual influenza vaccination, age- and risk-based pneumococcal vaccination, Tdap boosters, zoster vaccination for older adults, and COVID-19 boosters. The European Centre for Disease

Prevention and Control (ECDC) offers evidence synthesis and an interactive vaccine scheduler to support EU/EEA countries. In India, national guidance increasingly recognizes adult vaccination needs, with recommendations for influenza in high-risk adults, pneumococcal vaccination for older adults and risk groups, and catch-up immunization in specific contexts. The Joint Committee on Vaccination and Immunisation (JCVI) in the United Kingdom issues age- and risk-based recommendations, including maternal pertussis vaccination and zoster vaccination for older adults.

STRATEGIES TO IMPROVE ADULT OUTREACH

- **Improve the demand for adult immunization by raising public and provider knowledge**

The benefits of vaccination and the significance of vaccine-preventable diseases should be better understood by the public. According to the study socioeconomic background and literacy level are the major contributor of adult vaccination.

- **Assure sufficient funding sources to facilitate the increased distribution of vaccination to adults**

National and international organization such as UNICEF and global alliance for vaccine initiative (GAVI) have given funds for childhood vaccination programs

- **Provide necessary financial support for research**

Setting priorities and coordinating national vaccine development needs is a key government policy. To develop and manufacture the reasonably priced, secure, and efficient vaccines required for the Indian markets, R&D and production must be supported by PSUs and public-funded institutions.

VACCINE HESITANCY IN ADULTS

- **Lack of awareness about adult vaccines**

Studies indicate that lack of knowledge about adult immunization, specific vaccines and national vaccination guidelines contribute significantly to hesitancy

❖ **Lack of trust and misinformation**

Lack of trust in healthcare systems, government agencies and pharmaceutical industries are key factors contributing to hesitancy. False information spread through social media can increase the confusion about vaccines.

- **Fear of adverse effects**

many adults hesitate to take vaccines because they are afraid of the side effects such as fever, pain, or long-term health problems

- **Psychological and behavioral factors**

Research using health behavior models found that negative attitude towards vaccines were associated with higher hesitancy

BARRIERS TO ADULT VACCINATION AND PROPOSED SOLUTIONS

Adult vaccination is influenced by multiple interrelated barriers that operate at individual, health-system, and societal levels. One of the most significant obstacles is the widespread lack of awareness among adults regarding the need for vaccines beyond childhood, often driven by low perceived susceptibility to vaccine-preventable diseases and limited knowledge of recommended adult immunization schedules. Vaccine hesitancy, stemming from concerns about safety, mistrust of

pharmaceutical companies, misinformation spread through social media, and cultural or religious beliefs, further impedes vaccine uptake. Cost and affordability remain critical barriers, particularly in low- and middle-income countries where adult vaccines are not routinely covered under national immunization programs, leading to substantial out-of-pocket expenditure. Limited access to vaccination services—due to inadequate infrastructure, restricted clinic hours, workforce shortages, and weak cold-chain systems—also hampers coverage. Policy-level issues, including inconsistent national recommendations, absence of adult immunization registries, and fragmented healthcare delivery, exacerbate poor uptake. Addressing these challenges requires coordinated strategies such as strengthening public health communication to counter misinformation, improving provider–patient dialogues, and integrating vaccination reminders into routine clinical care. Expanding insurance coverage, subsidizing high-priority adult vaccines, and incorporating adult immunization into universal health coverage frameworks can improve affordability. Enhancing access through workplace vaccination programs, community outreach camps, mobile clinics, and pharmacist-led vaccination services can bridge logistical gaps. Furthermore, establishing national adult immunization schedules, digital registries, and robust surveillance systems can help harmonize policies, track coverage, and support evidence-based decision-making. Together, these interventions can significantly improve adult vaccination uptake and reduce the burden of vaccine-preventable diseases.

SAFETY, EFFICACY, AND REAL-WORLD EFFECTIVENESS

Adult vaccines have demonstrated favorable safety profiles and meaningful effectiveness in both clinical trial and real-world settings. Influenza vaccines, while variable in effectiveness across seasons, reduce the risk of severe illness and hospitalization, particularly among older adults and those with comorbidities. COVID-19 mRNA vaccines exhibited high efficacy against symptomatic disease and strong protection against severe outcomes in initial trials, with continued benefit against hospitalization and death in observational studies despite waning neutralizing antibody levels. Recombinant adjuvanted zoster vaccine (RZV) showed high efficacy against herpes zoster in randomized trials and sustained protection in longer-term follow-up. Pneumococcal conjugate vaccines have reduced invasive pneumococcal disease and demonstrate herd protection effects in populations with high uptake. Safety surveillance systems, including passive and active monitoring platforms, continue to ensure post-marketing vaccine safety and prompt risk mitigation when necessary.

PHARMACOLOGICAL AND PUBLIC HEALTH PERSPECTIVES

From a pharmacological standpoint, advances in vaccine formulation—such as adjuvanted recombinant proteins, conjugate approaches, and nucleic acid platforms—have improved immunogenicity and expanded the range of vaccine targets in adults. Adjuvants enhance immune responses in populations with weaker baseline immunity, while conjugate vaccines reduce carriage and transmission of bacterial pathogens. Public health perspectives emphasize the population-level benefits of adult vaccination: reduced healthcare utilization, prevention of outbreaks in institutional settings, protection of vulnerable groups through herd immunity, and mitigation of antimicrobial resistance by lowering bacterial infection rates. Economic evaluations frequently demonstrate favorable cost-benefit

ratios for adult vaccination programs when direct and indirect costs are considered.

DISCUSSION

Strengthening adult vaccination requires recognition of its role within comprehensive immunization strategies and public health systems. Harmonization of recommendations across authorities can help reduce confusion among clinicians and the public, while flexible implementation strategies must account for local epidemiology and resource constraints. Integration of adult vaccines into primary health care, employer-based programs, and travel clinics, supported by reimbursement mechanisms, will improve access. Addressing vaccine hesitancy remains essential; interventions should focus on building trust, countering

misinformation with clear evidence-based messages, and engaging community stakeholders. Surveillance systems and real-world effectiveness studies are needed to monitor long-term impact and inform policy updates. Investment in vaccine research and equitable access to novel platforms will ensure that benefits reach diverse populations globally.

CONCLUSION

Adult vaccination is a critical component of public health that can significantly reduce morbidity, mortality, and healthcare costs. Despite scientific advances and clear evidence of benefit, adult vaccine coverage remains suboptimal in many regions due to multiple barriers. Coordinated efforts—comprising policy harmonization, incorporation into primary care and universal health coverage, public education, healthcare provider engagement, and equitable access to novel vaccine technologies—are required to achieve meaningful improvements in adult immunization worldwide.

REFERENCES

1. World Health Organization. Immunization Agenda 2030: A Global Strategy to Leave No One Behind. Geneva: WHO; 2021.
2. Centers for Disease Control and Prevention. Recommended Adult Immunization Schedule, United States, 2024. CDC; 2024.
3. European Centre for Disease Prevention and Control. Vaccine Scheduler and guidance. ECDC; 2023.
4. National Technical Advisory Group on Immunization (NTAGI). Adult Immunization Guidance, India. Ministry of Health; 2024.
5. Polack FP, Thomas SJ, Kitchin N, et al. Safety and efficacy of the BNT162b2 mRNA Covid-19 vaccine. N Engl J Med. 2020; 383:2603–2615.
6. Baden LR, El Sahly HM, Essink B, et al. Efficacy and safety of the mRNA-1273 SARS-CoV-2 vaccine. N Engl J Med. 2021; 384:403–416.
7. Cunningham AL, Lal H, Kovac M, et al. Efficacy of the herpes zoster subunit vaccine in adults 70 years of age and older. N Engl J Med. 2016; 375:1019–1032.
8. Boutry C, et al. Adjuvanted recombinant zoster vaccine confers long-term protection. Clin Infect Dis. 2022;74(8):1459–1467.
9. Litvinova VR, et al. mRNA vaccine production and delivery: advances and challenges. Vaccines (Basel). 2023; 11:1–20.
10. Kobayashi M, et al. Expanded recommendations for pneumococcal vaccination in adults. MMWR. 2024/2025.
11. GBD 2019 Collaborators. Global burden of disease study – respiratory infections and influenza. Lancet. 2020.

12. Schmid P, Rauber D, Betsch C. Determinants of vaccine hesitancy: a systematic review. PLoS One. 2018;13(1):e0204726.
13. Lu PJ, O'Halloran A, Williams WW. Adult vaccination coverage in the United States. Am J Prev Med. 2023; 64:1–10.
14. World Health Organization. WHO recommendations for routine immunization. 2022.
15. ECDC. Influenza and pneumococcal vaccine effectiveness reports. 2023.
16. Public Health England. JCVI guidance on adult vaccination. 2023.
17. Das MK, et al. Adult vaccination practices in India: challenges and opportunities. J Assoc Physicians India. 2021; 69:45–51.
18. Bonanni P, et al. Strategies to improve adult vaccination: lessons learned. Vaccine. 2020; 38:1–7.
19. Thompson MG, et al. Influenza vaccine effectiveness in adults: observational evidence. Clin Infect Dis. 2022;75:e427–e435.
20. WHO. Global report on vaccine safety and surveillance. 2021.
21. Andre FE, Booy R, Bock HL. Vaccination: the cornerstone of public health. Bull World Health Organ. 2020;98(4):235–244.
22. Loubet P, et al. Vaccine hesitancy in adults in Europe. Vaccine. 2020;38(12):1–6.
23. Chang AY, et al. Economic evaluations of adult immunization programs. Vaccine. 2021;39(3):345–355.
24. Izurieta HS, et al. Comparative effectiveness of influenza vaccines in adults. Vaccine. 2021;39(8):1108–1116.
25. WHO SAGE. Prioritization of COVID-19 vaccination and life-course immunization frameworks. 2021.
26. Ramabhadran M, Sajjanar BS, Pandit R, et al. The current state of adult immunization in India: optimizing policy implementation. Clin Infect Dis. 2023;76(1):178–186.
27. Vaid A, Shankar A, Gupta S, et al. Unmet medical need for vaccination in adults: a narrative review. Hum Vaccin Immunother. 2023;19(2):2224186.
28. Maltezou HC, Theodoridou K, Poland GA. Adult vaccinations today: innovations and challenges for the coming years. Vaccines (Basel). 2024;12(3):455.
29. Pattyn J, Breckpot K, Reynders M, et al. Overview of vaccines for adults authorized, recommended, and implemented within the EU. NPJ Vaccines. 2025; 10:42.
30. Noh JY, Song JY, Cheong HJ, et al. Influenza vaccination in older adults: current status and strategies to improve uptake. Infect Chemother. 2022;54(3):396–409.
31. McNeil SA, Andrew MK. Immunosenescence and adult vaccination strategies: bridging evidence into policy. Curr Opin Immunol. 2023; 84:102324.
32. Klein NP, Fireman B, Goddard K, et al. Safety surveillance of vaccines in adults: evidence from real-world data. Vaccine. 2022;40(23):3211–3220.
33. Williams WW, Lu PJ, O'Halloran A, et al. Adult vaccination coverage in the United States—updated estimates from the National Health Interview Survey. Am J Prev Med. 2023;65(4):502–515.
34. Bonanni P, Ferro A, Guerra R, et al. Lifelong vaccination as a key component of healthy ageing. Vaccine. 2020;38(52):7604–7610.
35. WHO Strategic Advisory Group of Experts (SAGE). Life-course vaccination principles and framework. World Health Organization; 2022.
36. Schaffner W, MacIntyre CR. Seasonal influenza vaccination: updated global epidemiology and recommendations for

adults. Lancet Infect Dis. 2021;21(9):e301–e312.
37. de Gomensoro E, Del Giudice G, Doherty TM. Challenges and opportunities for adult immunization: a global perspective. Hum Vaccin Immunother. 2020;16(4):837–845.
38. Walker TY, Elam-Evans LD, Yankey D, et al. HPV vaccine effectiveness and catch-up strategies in adult populations. MMWR. 2021;70(49):1701–1706.
39. Vila-Coro G, López-Rodríguez MJ, García A, et al. Improving herpes zoster vaccination in older adults: real-world data from Europe. J Infect Public Health. 2023;16(2):183–191.
40. Chang AY, Johnson EK, Opuni M, et al. Economic evaluations of adult immunization programs: cost-effectiveness and global implications. Vaccine. 2021;39(3):345–355.
41. National Centre for Disease Control. CD Alert. Monthly Newsletter of National
42. Centre for Disease Control, Directorate General of Health Services, Government of
43. India. Adult vaccination strategies. Feb–Mar 2011;14(2).

HOW TO CITE: Muhasina Salam*, Rajeev P Thomas, Adult Vaccination: Current Concepts, Practices, and Global Recommendations, Int. J. of Pharm. Sci., 2026, Vol 4, Issue 1, 2605-2612. https://doi.org/10.5281/zenodo.18351094