

# Adult Vaccination: Unmet Needs and Public Health Implications

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## ABSTRACT

Immunocompromised (IC) populations are at increased risk of vaccine-preventable diseases (VPDs). In India, the concern of VPDs in IC populations is particularly acute due to the prevalence of crowded living situations, poor sanitation, and variable access to healthcare services. We present a narrative review of IC-related disease and economic burden, risk of VPDs, and vaccination guidelines, based on global and India-specific literature (2000–2022). IC conditions considered were cancer, diabetes mellitus, chronic kidney disease, respiratory disorders, disorders treated with immunosuppressive therapy, and human immunodeficiency virus (HIV). The burden of IC populations in India is comparable to the global population, except for cancer and HIV, which have lower prevalence compared with the global average. Regional and socioeconomic inequalities exist in IC prevalence; VPDs add to the burden of IC conditions, especially in lower-income strata. Adult vaccination programs could improve health and reduce the economic impact of VPDs in IC populations.

**Keywords:** Immunocompromised (IC), vaccine-preventable diseases (VPDs), human immunodeficiency virus (HIV)

## INTRODUCTION

The population is aging, both globally and in India. Older age is associated with a weakened immune system. People with an immunocompromised (IC) status have a higher risk of contracting infections. The combination of these conditions greatly increases the risk from infectious disease. A large percentage of infections, referred to as vaccine-preventable diseases (VPDs), could be avoided by vaccination. However, India-specific guidelines for adult immunization are limited and there is a low awareness of these recommendations among healthcare professionals and patients.

Adult vaccination is a critical but often neglected public health priority globally, with particularly low coverage in India. Immunization helps prevent infectious diseases across all age groups, yet adult vaccination rates remain suboptimal. The consequences include increased morbidity and mortality, higher healthcare costs, and economic losses. Factors such as

vaccine hesitancy, misinformation, accessibility challenges, and lack of awareness contribute to low uptake. While global and Indian initiatives address these gaps, significant policy changes and targeted interventions are required.

## GLOBAL LANDSCAPE OF ADULT VACCINATION

India is projected to be the most populous country in the world very shortly.

The population of adults aged  $\geq 60$  years is growing at a rate three times faster than that of the total Indian population and will account for 19% of the worldwide population by 2050 according to projections.<sup>[1]</sup>

This shifting age structure, alongside rapid urbanization, lifestyle transitions, deteriorating diets, and pollution, has resulted in a growing burden of immunocompromising non-communicable diseases (NCDs).<sup>[2,3]</sup>

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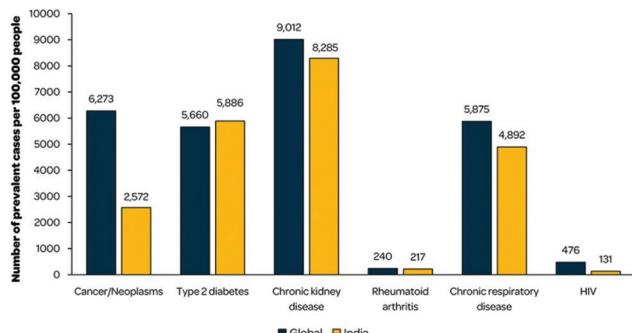
NCDs have become the primary cause of mortality in India, accounting for 60% of total deaths.<sup>[4,5]</sup>

The most prominent NCDs contributing to the overall IC population in India include cancer; disorders treated with immunosuppressive therapy, such as autoimmune diseases and transplant patients; diabetes mellitus, and chronic kidney disease. Communicable diseases, foremost human immunodeficiency virus (HIV), add to the overall size of the IC population in India.

Risk factors for NCDs in India have been evaluated in a systematic review: the authors found a significant increase in overweight and obesity among adults during the observation period between 2005 and 2016. Obesity favors the development of cardiac disease and diabetes; on the other hand, alcohol and tobacco consumptions, risk factors for cancer and chronic liver disease, declined.<sup>[2]</sup>

Similarly, NCDs treated with immunosuppressive therapy increase the risk of infectious disease. Autoimmune disorders, such as rheumatoid disorders, multiple sclerosis, and inflammatory bowel disease, as well as people with asthma and transplant recipients, are in general treated with immunosuppressive therapy.

However, with the increased use of immunosuppressive therapy, the concern for infections in general, and tuberculosis in particular, has sharpened, adding to the burden of rheumatoid disorders.<sup>[6]</sup>



## CURRENT COVERAGE AND TRENDS

Despite efforts to promote adult immunization, vaccine coverage remains inadequate worldwide. A report by GSK and IQVIA revealed that over 100 million adult vaccine doses were missed globally in 2021–2022 compared to pre-pandemic projections. Human papillomavirus vaccine coverage is alarmingly low, with only 27% of girls and 7% of boys receiving the first dose. In the U.S., overall adult vaccination rates remain low, with just 22.8% of adults aged 19 and older receiving recommended vaccines.

Disparities in coverage exist across socioeconomic and ethnic groups. For example, pneumococcal vaccination rates among adults aged 65+ in the U.S. are highest among White adults (69.1%) but significantly lower among black (53.5%), Hispanic (41.7%), and Asian (50.2%) populations. These gaps highlight the need for equitable vaccine access.

## IMPACT OF THE COVID-19 PANDEMIC

The COVID-19 pandemic disrupted routine vaccination services, leading to a significant backlog in immunization efforts. An estimated 2.2 billion people worldwide remained unvaccinated against COVID-19, with the vast majority residing in low-income countries. The pandemic underscored the importance of adult immunization while also exacerbating pre-existing inequalities.

## DISCUSSION

IC conditions combined with an increased risk of VPDs impose a high burden on patients and their families, as well as the healthcare sector. The burden of IC is not distributed uniformly in India. Some geographic regions and socioeconomic strata have significantly higher prevalence rates compared with others. For example, cancer and HIV prevalence were highest in North and Northeast regions. In addition, low-income households bear a proportionally higher economic burden due to IC conditions compared with the middle- and high-income classes. Most of the disease burden due to IC conditions occurs when people are in their peak working and earning years, thus affecting productivity and economic development.<sup>[7]</sup>

Preventative measures, such as immunization programs, could reduce the burden of illness in IC adults, thereby minimizing the impact on working hours and the economy.

Mass immunization programs are effective strategies to lower the disease and economic burden of VPDs both at the individual level and from a health-economic perspective. Despite undoubted benefits of adult immunization, vaccination coverage remains suboptimal even in high-income countries. Barriers to vaccination include limited healthcare encounters, lack of specific recommendations, and limited awareness of health benefits conferred by vaccination. An additional challenge in vaccinating people with IC conditions concerns the varying levels of altered immunocompetence. Individuals with a severe IC status may have an inadequate immunogenic response to vaccines; the level of altered immunocompetence should be determined before vaccination by the physician, rendering vaccination strategies even more complex.<sup>[8]</sup>

It has been reported that socioeconomic status is strongly correlated with vaccination status; in the richest areas of India, the vaccination coverage is indeed two times higher compared with the poorest areas.<sup>[9,10]</sup> India's universal immunization program covers eleven vaccines, but these are mainly for children and pregnant women.<sup>[11]</sup> Therefore, IC adults in India have to pay for their vaccinations themselves, which places a huge additional financial burden on the Indian population for whom the cost of IC treatment is already high; This acts as a significant barrier to the acceptance of vaccines.<sup>[12]</sup>

A lack of education about the role of vaccination and concerns about vaccine efficacy and potential side effects are additional factors contributing to the poor rates of adult vaccination.<sup>[13,14]</sup> In India, one survey reported that 68% of adults were not aware of the vaccines recommended for them, and 38% of adults perceived immunization as being for children only.<sup>[15,16]</sup>

Cultural and religious factors also pose a barrier to vaccination among IC adults in India. Western biomedicine and indigenous medicine coexist and adherence to either of these is distributed along a wide spectrum. Within some communities, there is little acceptance of Western medicine, including vaccinations.<sup>[17]</sup> However, if vaccine education is delivered in a culturally responsive and sensitive way, there is still the possibility to reach people in these communities.

## LOW COVERAGE AND BARRIERS

India faces significant challenges in adult vaccination, with negligible coverage for key vaccines. A study of adults aged 45+ found extremely low immunization rates for influenza (1.5%), pneumococcal disease (0.6%), typhoid (1.9%), and hepatitis B (1.9%). Even among older adults (60+), the highest coverage was for diphtheria and tetanus (2.75%), reflecting a lack of established adult immunization practices.

## BARRIERS TO ADULT VACCINATION IN INDIA INCLUDE

- Lack of national guidelines: The absence of clear immunization recommendations results in inconsistent healthcare practices
- Public perception and awareness: Vaccination is widely viewed as a childhood necessity, with little emphasis on adult immunization
- Limited accessibility: Healthcare infrastructure is primarily designed for pediatric vaccines, leading to a shortage of adult vaccination centers
- Financial constraints: Many vaccines are not covered under public health schemes, making them unaffordable for lower-income populations.

## IMPACT ON INDIA

India accounts for a high proportion of global cases of diseases like diphtheria, tetanus, and Japanese encephalitis. The lack of adult vaccination exacerbates this burden, leading to preventable hospitalizations and deaths. Older adults and those with chronic conditions are at heightened risk, yet their vaccine coverage remains critically low.

## CONCLUSION

IC populations in India pose an increasing challenge for the healthcare and social welfare system. Vaccines are one of the most cost-effective health interventions available and the implementation of successful adult immunization programs is imperative, particularly for the most vulnerable adult populations. A rapidly growing older population, inequalities in healthcare access, and the absence of a public immunization program targeting the adult population complicate the task of providing nationwide immunization against VPDs. Following the COVID-19 pandemic, India has an unprecedented opportunity to leverage the infrastructure put in place for the COVID-19 vaccination campaign to provide nationwide immunization coverage against other VPDs.

Several countries have adopted lifelong vaccination policies, recognizing the need to maintain immunity throughout adulthood. Key strategies include:

- Digital health records: Systems that track vaccination status and send reminders improve adherence
- Expanded access: Making vaccines available at pharmacies and primary care clinics increases convenience
- Healthcare provider engagement: Physicians' recommendations significantly influence vaccination uptake
- Public awareness campaigns: Addressing misinformation through targeted education improves vaccine confidence.

India's Universal Immunization Programme primarily targets children and pregnant women, with limited provisions for adult vaccines. However, some steps have been taken to improve coverage:

- Digital platforms: The U-WIN portal, initially developed for COVID-19 vaccinations, has the potential to expand into adult immunization tracking
- Medical society guidelines: Organizations like the Indian Medical Association and the Association of Physicians of India have issued recommendations for adult vaccines, though implementation remains limited
- Vaccination clinics: Centers like AIIMS Jodhpur have established dedicated adult vaccination facilities, but these remain few and far between.

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