

# Adolescent immunizations

## Abstract

Vaccines are among most victorious and cost-effective public health strategy for averting deadly communicable disease. So far, most of the accessible immunization programs reached children younger than 5 years which have effectively reduced worldwide infant and child death. Adolescent immunization has been comparatively ignored, yielding a quarter of world's inhabitants under-immunized and consequently susceptible to numerous preventable infectious diseases. Four infectious diseases for which routine adolescent vaccination is currently recommended are pertussis, meningococcal disease, human papillomavirus and influenza. Prominent inconsistency in adolescent vaccination coverage by age, vaccine type, and medical care-related factors present a structure for developing future outreach activities to raise adolescent vaccine use. Missed opportunities for adolescent vaccinations against these infections are common and the missed opportunities should be properly utilized to increase adolescent immunization coverage. Although there has been an improvement in recent years, coverage rates of adolescent immunization in the world stay suboptimal, mainly for the human papillomavirus vaccine. Further studies should also be performed to better comprehend and deal with the barriers to adolescent immunization, in order that all adolescents might be protected for severe vaccine-preventable diseases. Hard work to boost immunization coverage rate in adolescents should be carried on, especially as new vaccines and missed opportunities are becoming accessible for utilization in this adolescent age group.

**Keywords:** adolescent, vaccines, human papillomavirus, dtap, vaccination, tdap, immunization, hpv

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**Abbreviations:** HPV: Human Papillomavirus; MCV4: Meningococcal Vaccine; Tdap; Tetanus, Diphtheria and Acellular Pertussis; DTaP: Diphtheria-Tetanus-Acellular Pertussis; STD: Sexually Transmitted Disease; NIS-teen: National Immunization Survey-Teen

## Introduction

Vaccines are among most victorious and gainful public health strategies for averting deadly communicable disease. Thus far, most of the accessible immunization programs reached children younger than 5 years which have effectively reduced worldwide infant and child death. Consequently; thousands of adults and hundreds of children still die every year in the earth from vaccine-preventable serious infectious diseases regardless of efficient vaccines against many bacterial and viral illnesses. Adolescent immunization has been comparatively ignored, yielding a quarter of world's inhabitants under-immunized and consequently susceptible to numerous preventable infectious diseases.<sup>1</sup>

Vaccination is a significant and successful approach for preventing morbidity and mortality of infections in adolescents as well. Adolescent immunization has drawn significantly more attention since the beginning of the human papillomavirus (HPV) vaccination in 2006. Although vaccines decrease the burden of disease, many adolescents still stay under-immunized, particularly for HPV and influenza infections.<sup>2,3</sup> In recent years, a great deal of programs have been commenced to boost the utilization of different vaccines in adolescents; however, the vaccination coverage among the adolescent group overall maintains very low, especially in low- and middle-income nations.<sup>4</sup>

## Recommended adolescent vaccinations against four infections

In the last decade, the approach to adolescent vaccinations has

altered considerably. Timely and complete adolescent vaccination remains an obscure public health goal. Four infectious diseases for which routine adolescent vaccination is currently recommended are pertussis, meningococcal disease, human papillomavirus and influenza. Thus, at 11 or 12 years of age, routine administration of 4 different vaccines- tetanus, diphtheria, and acellular pertussis (Tdap) booster, the first of two doses of quadrivalent conjugate meningococcal vaccine (MCV4), the first of three-dose series of HPV vaccine, and an annual influenza vaccine- should be now suggested and followed up by health professionals.<sup>3</sup>

## Adolescent form of tetanus, diphtheria and acellular pertussis (Tdap) vaccination

The world has observed a significant rise in described pertussis cases over the last decade.<sup>5</sup> The efficacy of diphtheria-tetanus-acellular pertussis (DTaP) vaccine diminishes significantly after the fifth dose at 4 to 6 years of age; there is a mounting need for Tdap vaccination and protection against pertussis in adolescents.<sup>6</sup> Consequently, since 2005, children 11 years and older adolescents have been routinely advised to uptake a one dose of Tdap vaccine in USA.<sup>7</sup> However, routine Tdap vaccinations have shown not to be able to prevent pertussis outbreaks. During the first year, Tdap provided moderate protection against pertussis and then declined quickly in order that slight protection continues 2-3 years after vaccine received. For instance: even with high Tdap vaccine coverage among adolescents, the state of California observed great pertussis outbreaks in 2010 and 2014.<sup>6</sup>

## Meningococcal conjugate (MCV) vaccination

Meningococcal conjugate vaccine was advised in October 2010 in USA for routine use in adolescents (preferably aged 11 or 12 years, with a booster at 16 years) to thwart invasive meningococcal disease caused by Neisseria meningitidis sero groups A, C, Y, and W-135.<sup>8,9</sup>

## Human papillomavirus (HPV) vaccination

HPV is the most frequent sexually transmitted infection, with a determined 79 million persons aged 15–59 years in the USA currently infected with HPV, and approximately 14 million new cases diagnosed in each year.<sup>10</sup> Even though most HPV infections are asymptomatic, temporary, and do not cause disorder, persistent HPV infections can initiate anal, cervical, oropharyngeal, penile, vulvar and vaginal cancer. In the USA, roughly 27,000 HPV-attributable cancers are thought to happen every year. HPV immunization is an efficient primary prevention policy that can reduce lots of the HPV infections leading to cancer, and is routinely advised for each adolescent aged 11–12 years.<sup>10</sup> The Advisory Committee on Immunization Practices (ACIP) first time suggested the quadrivalent HPV vaccine for the routine vaccination schedule for 11- to 12-year-old boys in October 2011. Similarly, the 2016 immunization schedule published by the Swiss Federal Office of Public Health includes new clauses such as reimbursement of the additional HPV vaccination in young (11–26 years) males.<sup>11</sup>

Among boys, 5% were determined as utilizing the HPV vaccine, with no discrepancies in use by race/ethnicity or sexual orientation. On the contrary, 30% of the girls were determined as utilizing the HPV vaccine, with colored women having lower chances of beginning and finishing the vaccine series corresponding to white women. In the USA, HPV immunization coverage stays behind in men and demonstrates differences among girls. Rising HPV vaccine use and finishing all three doses among colored girls and all boys cause substantial long-term public health profits.<sup>12</sup> While most health care professionals advise this vaccine for each adolescent boy and girl, education of physician including pediatrician, obstetrician and assistants of health care professionals are required to develop accomplishment of the routine vaccination programs in primary / preventive care sites.<sup>13</sup>

## Adolescent vaccine coverage

Prominent inconsistency in adolescent vaccination coverage by age, vaccine type, and medical care-related factors present a structure for developing future outreach activities to raise adolescent vaccination practice. For example: as of 2010 in Michigan, statewide coverage rates for Tdap and MCV4 vaccines were found to be 46.0% and 46.5%, respectively while only 15% of females had finished the HPV vaccine series. Only one in four female adolescents was up to date for all three (Tdap, MCV4 and HPV) of these routinely recommended vaccines.<sup>14</sup>

## Missed opportunities

Missed opportunities for adolescent vaccinations against these infections are common and the missed opportunities should be properly utilized to increase adolescent immunization coverage.

**Preventive care utilization:** Adolescents having at least one preventive care visit were considerably less likely to have missed opportunities for MCV, Tdap, or HPV1. Nonpreventive visits were found to be related with more missed opportunities for MCV (OR:19), Tdap (OR:26), and HPV1 (OR:12) than preventive visits.<sup>15</sup>

**Age and sex:** In a research, by Wong et al showed that adolescent females were more likely to have a missed opportunity for HPV than Tdap ( $p < 0.001$ ) or MCV ( $p = 0.03$ ) vaccinations.<sup>15</sup>

**Adolescent confidence in immunization:** Adolescents have a lesser understanding of vaccine safety and benefits than adults and have higher concerns about potential vaccine reactions. Adolescent views

and attitudes towards immunization may cause missed opportunities. Improving adolescent awareness and knowledge of the benefits and risks of vaccination through school-based educational programs may improve confidence in and uptake of vaccines for adolescents and increase vaccine confidence in the next generation of parents.<sup>16</sup>

**Parental health beliefs on immunization:** In a study, Gargano et al.<sup>17</sup> found that parental health beliefs had important effects on adolescent immunization and on parental intention to vaccinate.<sup>17</sup>

**Role of health care professionals/ physician's recommendation:** The majority of interventional research has focused on parents and young adults, with little targeting on health care professionals. Nonetheless, given the importance of physician advice in adolescent immunization, it looks clear that the time has come to develop physicians' and other health care professionals' involvement and to more effectively implement strong and routine counseling for all adolescent vaccines.<sup>17,18</sup>

**Sexually transmitted disease (STD) clinics:** HPV vaccine initiation and completion were low among adolescent STD clinic patients; coverage was lower compared with other recommended vaccines. STD clinics may be good venues for delivering HPV vaccine, thereby enhancing efforts to improve HPV vaccination.<sup>19</sup>

**Concomitant (same-day) vaccination:** Concomitant delivery of two or more vaccines to adolescents is effective, safe, and efficient. Increasing concomitant vaccination could improve coverage for recommended adolescent vaccines, but little is known about who receives vaccines concomitantly. Missed opportunities for concomitant adolescent vaccination persist, particularly for HPV vaccine. Future interventions targeting groups with low rates of concomitant vaccination could improve population-level coverage with recommended vaccines.<sup>20,21</sup>

**Vaccination survey:** Vaccine use can be simply followed up in the physician office setting utilizing electronic medical records, even though national data for teens (adolescents) have been tracked via the National Immunization Survey–Teen (NIS–teen) since 2005 in USA. For instance; in 2013, NIS–teen showed that Tdap and MCV4 utilization were strong, but HPV vaccination coverage stayed behind significantly.<sup>22</sup>

## Summary

As a summary; preventive care utilization should be encouraged for adolescents. During adolescent visits to STD and preventive (primary) care clinics, adolescent immunization is remembered and performed. Advantages of concomitant (same-day) vaccine administration should be kept in mind. Also, adolescent and parental confidence in immunization ought to be raised to higher levels than existing nowadays. Immunization medical records are kept in track through vaccination surveys.<sup>23</sup>

## Conclusion

While there has been an improvement in recent years; coverage rates of adolescent vaccination in the world stay suboptimal, mainly for the HPV vaccination. Further studies should also be performed to better comprehend and deal with the barriers to adolescent immunization, in order that all adolescents might be protected for severe vaccine-preventable diseases. Hard work to boost immunization coverage among adolescents should be carried on, especially as new vaccines and missed opportunities are becoming accessible for vaccine utilization in this adolescent age group.

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## Conflicts of Interest

None.

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