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Clinical benefits of routine varicella vaccination for adults

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Varicella is a highly contagious disease caused by varicella zoster virus. In children, it is generally a mild to moderate illness while it is often more severe in adults, with serious complications as dehydration, pneumonia, bleeding problems, infection or inflammation of the brain, secondary bacterial infections, sepsis, toxic shock syndrome, bone infections, joint infections and deaths. Some groups of adults are at major risk of complications, in particular immunocompromised persons as subjects with impaired humoral immunity and who is receiving systemic steroids, persons who live or work in environments in which transmission of varicella is likely, health-care personnel and pregnant women. After the introduction of Universal Mass Vaccination (UMV), the first mathematical models suggested that vaccination will lead to a shift in the average age at infection from children to adults with an increasing numbers of complicated forms, nevertheless new models predicted that, although an upward shift in the age at infection may occur, the overall morbidity due to varicella is likely to decrease. Current literature seems to suggest that for public health authorities the key action to prevent an increase of varicella incidence among adults is to achieve high vaccination coverage among babies and adolescents in countries who adopted UMV.

Keywords: immunization strategies, risk groups, susceptible adults, Universal Mass Vaccination, varicella

Abbreviations: UMV, Universal Mass Vaccination; VZV, varicella zoster virus; CDC, Center for Disease Control and Prevention

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Introduction

Severe acute varicella and its serious complications are not a part of the past but they are dramatically actual.

Varicella is an acute infectious disease caused by varicella zoster virus (VZV), highly contagious and endemic worldwide.[1] In children, varicella is generally a mild to moderate and self-limited illness while it is often more severe in adults.[2]

Recent epidemiological changes make varicella increasingly common in adults and adolescents who together with immunosuppressed individuals and pregnant women are at a higher risk of severe infection and complications.[2-3] Seroepidemiological studies showed that the rate of seronegative adults ranged from 1 to 7% and seems higher in countries who adopted universal mass vaccination against varicella.[4]

Serious complications among adults include dehydration, pneumonia, bleeding problems, infection or inflammation of the brain, secondary bacterial infections, sepsis, toxic shock syndrome, bone infections, joint infections and deaths.[5-7]

In the scientific literature of the last years there are many case reports of varicella in adults. Pneumonia is the most common complication and cause of death among non immunocompromised adults affected by this illness.[5,8-10]

Varicella or zoster related vasculopathies are caused by productive viral infection in cerebral arteries and clinical manifestations range from transient ischemic attacks to protracted illness involving both small and large arteries (aneurysm, cerebral and subarachnoid hemorrhage, arterial ectasia).[11-15]

Varicella infection causes a wide spectrum of neurologic complications.[16] Infection of the central nervous system such as encephalitis, meningitis, myelitis or angiitis occurs less frequently in adults but is burden with numerous unfavourable outcomes.[17-20] Trigeminal and facial nerves are the most commonly affected nerves in cranial neuropathies and there are only few case reports of patients with lower cranial neuropathy.[21,22] Thrombocytopenia

is another possible complication of adults varicella even if rare.[23]

International recommendations and several piece of literature identified some groups of adults as a major risk of varicella infection and complications.

Immunocompromised persons who get varicella can be sick longer than immunocompetent persons and are at risk of developing visceral dissemination leading to pneumonia, hepatitis, encephalitis and disseminated intravascular coagulopathy.[24-27] Also susceptible persons with impaired humoral immunity[28] and who is receiving systemic steroids for certain conditions, such as asthma, and even if not otherwise immunocompromised are universally recognized as at major risk of varicella infection.[29]

At increased risk for exposure or transmission of varicella are also persons who live or work in environments in which transmission of VZV is likely (e.g., teachers, day-care employees, residents and staff in institutional settings, college students, inmates and staff members of correctional institutions, and military personnel).[30] Outbreaks of varicella get reported quite often in these settings, where the spread of infection may be more rapid and unpredictable.[31-34]

Nosocomial transmission of VZV is well documented,[35-42] and there are specific guidelines for the prevention of nosocomial VZV infection and for infection control in health-care personnel.[43-44]

Ten to 20 percent of pregnant women who get varicella develop pneumonia, with the chance of death as high as 40%; then prenatal assessment of women for evidence of varicella immunity is recommended.[45]

A live attenuated varicella vaccine was available since 1974[46] and in 1996 it was recommended by the American Academy of Pediatrics for American children aged 12 months to 13 years.[47]

In European Union, only 5 countries universally recommend varicella vaccination for children at national level and 2 at regional level, 17 countries recommend nationwide vaccination for susceptible teenagers and/or susceptible risk groups only.[48]

In the first years after the introduction of UMV, some mathematical model suggested that vaccination will lead to a shift in the average age at infection from children to adults where risk of complication is greater. The worry is that enough adults with severe varicella will be infected after vaccination to counterbalance the benefit in reduction in children.[49-51]

In the following years, new models predicted that, although an upward shift in the age at infection may occur, the overall morbidity due to varicella is likely to decrease following mass infant vaccination, even if only when coverage exceeds 70–90%, vaccination is able to reduce varicella transmission sufficiently to decrease both adult and child morbidity.[52]

A seroepidemiological study carried out in Apulia Region (Italy) that adopted UMV for varicella since 2006, seems to confirm this hypothesis. In a region where high vaccination coverage (>90 %) has been achieved in newborns, the results of the survey excluded clusters of susceptible subjects among adults. Also in vaccination era, the average age of infection did not seem to shift among adults and then the study are able to exclude an increase of case of complicated varicella due to the UMV.[4]

Future studies have to investigate the impact of the reduction of the natural booster on the incidence of zoster, that theoretically should increase.

The Center for Disease Control and Prevention (CDC) conveys recommendations about immunization schedule for varicella in adults aged 19 y and older. All adults without evidence of immunity to varicella should receive 2 doses of single-antigen varicella vaccine or a second dose if they have received only 1 dose.[30]

The vaccination strategy is based on giving "appropriate occasion," enrolling and encouraging physicians that take care of patients at high risk (such as gynecologist or oncologist) and occupational health physicians, especially in health trusts. This is consistent with a "personal health" perspective.

In the public health perspective, mathematical models and serosurvey seems to suggest that to prevent an increase of varicella incidence among adults, the key action is to achieve high vaccination coverage among babies and adolescents in countries who adopted UMV. This could become a priority for national and international public health authorities.

Disclosure of Potential Conflicts of Interest

No potential conflicts of interest were disclosed.

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