

Varicella vaccination programs do not seem to shift the age of disease to older age groups

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Abstract: The paper of Baxter *et al.*, recently published in *Pediatrics* show through five cross-sectional studies, a high impact of vaccination in the decline of varicella incidence and hospitalizations in all age groups in the United States between 1995 and 2009. As a consequence of herd immunity, varicella incidence has also diminished in those non vaccinated, which indicates no shift in the burden of varicella to older age groups.

Keywords: Varicella; varicella vaccination; epidemiology; chickenpox; vaccine impact

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The article recently published in *Pediatrics* by Baxter *et al.* shows the results of the impact of varicella vaccination on the epidemiology of the disease in the United States from 1995 to 2009 (1). The aim of the study was to assess the impact of vaccination on the incidence and severity of varicella both in children and adult population by performing five cross-sectional studies in 1994 (prevaccine), 1999, 2003, 2006 and 2009, in Kaiser Permanente of Northern California.

The main factor for the success of a vaccination program is given by the attainment of high vaccination coverage to allow the control of the disease, which is intended to prevent. Varicella vaccination was initially introduced in the childhood immunization schedule of the United States with an only dose of vaccine. As a consequence, a marked reduction on the incidence was reported (2-4). In 2007 the Advisory Committee on Immunization Practices (ACIP) recommended a second dose of varicella vaccine in order to further decrease varicella disease and its complications, as there had been observed an increase of cases of breakthrough disease, as well as varicella outbreaks in well-vaccinated communities. The ACIP recommendations also included to vaccinate age groups in which the disease could be more severe (5). In the last years several countries have included varicella vaccination in the immunizations

schedule. In others, one of the main obstacles to introduce it, has been the possibility of a shift in the age of infection to older age groups, where more severe disease might be more common, due to a decreased exposure to circulating varicella-zoster virus (VZV) (6). Although this might particularly be possible with vaccination coverage below 80% (7), high vaccine coverage and a two-dose program might be very effective in stopping varicella transmission in the population (8). The authors show a high vaccination coverage that increased rapidly from 51% to 98.8% in children aged 5-9 years in the period from 2000 to 2009, from 11% to 94.7% in children aged 10-14 and from 3% to 53.6% in 15-19 age group. The study also remarks that catch-up vaccination has been effective at reaching susceptible children and adolescents. The proportion of varicella-unprotected children and adolescents decreased from 18% in 1995 to 5.8% in 2009.

With respect to the incidence, the study of Baxter *et al.* shows that it has decreased 96% in children aged 5-9 years in the period 1995-2008, and 90-95% for all ages considered in the study. Previous studies in the USA reported similar results (9,10). The 2009 survey reflected the two-dose vaccination and revealed that the age-specific incidence rates of varicella were at an all-time low, consistent with an added benefit from the second dose. In other countries where

varicella vaccination programs have been implemented, the results are quite similar to those reported by Baxter *et al.* In Italy, eight regions starting from 2003, have progressively introduced universal varicella vaccination, in their immunizations schedule, and the preliminary results showed a general reduction of incidence and hospitalization rates (11). In Germany, varicella vaccination started in 2004. Between 2005 and 2009, a global reduction of 55% of cases of varicella has been reported (12). In Navarra, Spain, a 2-dose vaccination program started in 2007 and there has been achieved a global decrease of 97.3% on the incidence of varicella (13). In Saudi Arab, where varicella vaccination is compulsory since 2008, the number of cases decreased by 75% (14). The widespread use of the varicella vaccine in Taiwan from 2004 has resulted in a 75-80% decrease in the incidence of chickenpox in children (15). Post-vaccination data from Uruguay reveal no change in age epidemiology (16).

The authors also describe a reduction in hospitalization rates, around 90% in the period 1994-2009, (from 2.13 per 100,000 inhabitants in 1994 to 0.25 in 2009), for all age groups, including adults. Similar results have been reported in Australia, where hospitalizations with a principal diagnosis of varicella in children 1-4 years of age declined from 34.1 per 100,000 in the pre vaccine era (95% CI: 31.3-37.1) to 9.4 per 100,000 (95% CI: 8.5-10.3) four and a half years after the program commenced (17). Results from Canada suggest that decreased circulation of varicella appears to significantly contribute to declines in varicella-related hospitalizations for infants <1, as well as adults aged 20-39 (18). In Bavaria, Germany, the incidence of hospitalizations decreased from 7.6 per 100,000 children <17 years of age in 2005 to 4.3 in 2009, and from 21.0 to 4.7 in children <5 years of age (19). Results from Navarra, Spain show that the hospitalization rates decreased 89% in the whole population (13). In Uruguay, the proportion of hospitalizations due to varicella among children was reduced by 81% (16).

Although a higher proportion of cases now occur among older children, adolescents, and adults who may have escaped varicella disease or vaccination, it does not mean that a shift to older age groups has been produced, as the majority of the studies have shown that the incidence in non-vaccinated also decreases, due perhaps to herd immunity acquired by the high coverage obtained in the vaccination programs (1,12,13,16,20). Baxter *et al.* show that in the 2009 survey, the age-specific incidence rates of varicella were lower than those in previous surveys.

Compared with 2006, a substantial decrease in all age groups in 2009 was observed.

In conclusion, the paper by Baxter *et al.* has shown a high impact of vaccination in the decline of varicella incidence and hospitalizations in all age groups, both vaccinated thorough herd immunity, and those non-vaccinated. The results of the surveys did not indicate a shift in the burden of varicella to older age groups.

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Footnote

Conflicts of Interest: The author has no conflicts of interest to declare.

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