

# Survey of the status of self-paid varicella vaccination among children one to six years of age in Taiwan

Sui-Ling Liao<sup>1,2</sup>, Tsuimi Huang<sup>3,4</sup>, Yhu-Chering Huang<sup>1,5</sup>, Donald Dah-Shyong Jiang<sup>4</sup>

<sup>1</sup>Department of Pediatrics, Chang Gung Children's Hospital and Chang Gung Memorial Hospital, Taoyuan; <sup>2</sup>Department of Pediatrics, Hung Chi Women and Children's Hospital, Taoyuan; <sup>3</sup>Public Health Bureau of Taoyuan County, Taoyuan; <sup>4</sup>Center for Disease Control, Department of Health, Taipei; and <sup>5</sup>School of Medicine, Chang Gung University, Taoyuan, Taiwan

Received: December 30, 2005 Revised: July 6, 2006 Accepted: July 13, 2006

**Background and Purpose:** Prior to 2004, the mass immunization program in Taiwan did not include varicella vaccine; however, parents could have their children vaccinated by the self-payment option.

**Methods:** In April 2002, we distributed 1271 questionnaires to the caregivers of children aged 1 to 6 years in Taoyuan county, Taiwan, to survey the status of vaccination rate against varicella, parental attitudes toward self-paid varicella vaccine, and the demographic characteristics of the family.

**Results:** Based on the answers provided in the questionnaires (99% response rate), we learned that until April 2002, the vaccination rate against varicella was 26%. Most children received this vaccine by the age of 1 to 2 years (64%) mainly at local clinics (66%). Majority of the caregivers (94%) would have immunized their children against varicella if the vaccines were freely provided or partially paid for. Caregivers living in the city, those children whose parents had a relatively high education level, those from families with fewer children, those whose children were inoculated with other self-paid vaccines, and those parents with a higher family income were significantly ( $p < 0.0001$ ) willing to have their children inoculated.

**Conclusions:** In Taiwan, most caregivers were willing to have their children immunized against varicella if the vaccines were freely provided, or even if they were partially paid for. In case of other effective vaccines of high cost and not included in mass immunization, partially paying for the vaccine may be an option, since the parents' willingness was substantially greater when the cost is lowered.

**Key words:** Chickenpox vaccine; Immunization; Patient acceptance of health care; Taiwan

## Introduction

Chickenpox is highly contagious and almost always symptomatic with an infection rate of up to 85% to 90% [1,2]. Before varicella vaccine was introduced in Taiwan, it was estimated that there were about 300,000 to 400,000 cases of chickenpox per year, with about 1000 children requiring hospitalization and 5 to 10 lethal cases [3,4]. Varicella vaccine was developed in Japan in the

1970s [5] and was licensed to Taiwan in 1997. Prior to 2004, varicella vaccine was not included in the mass immunization program of the Department of Health of Taiwan and was available in the market on a self-payment basis (approximately New Taiwan dollars [NT\$] 2000). Hsu et al studied the cost-effectiveness of varicella vaccine and estimated that for every NT\$ spent on vaccination, 2 NT\$ could be subtracted from medical expenses [6].

In this study, we surveyed the status of vaccination rate against varicella, parental beliefs toward varicella vaccine, parental attitudes toward self-paid vaccines such as varicella vaccine, and the characteristic discrepancies between those who have and have not received varicella vaccination before 2004 when the varicella vaccine was not included in the mass vaccination program in Taiwan.

The first two authors contributed equally to this manuscript.

Corresponding author: Yhu-Chering Huang, Division of Infectious Diseases, Department of Pediatrics, Chang Gung Children's Hospital, No. 5, Fu-Hsin Street, Kweishan 333, Taoyuan, Taiwan.  
E-mail: ychuang@adm.cgmh.org.tw

## Methods

The survey was conducted in April 2002 in Taoyuan county, which is situated in northern Taiwan. Questionnaires were distributed among the caregivers of children aged 1 to 6 years (born between August 1996 and July 2001). By April 2002, a total of 165,905 children aged 1 to 6 years were registered in the county. Subjects from 13 executive districts (cities or towns) in the county were randomly selected based on the date of birth as recorded in their birth certificates, using the probability proportionate to size sampling method.

The questionnaires were distributed by the nurses working in the local health offices and included the following items: (1) demographic characteristics of the study population: name, sex, birth date, place of birth, number of siblings, main caregivers of the family, ages, and occupations of the parents as well their level of education, and monthly family income; (2) status of vaccination against varicella: whether the children were infected by chickenpox and their age at infection, whether the children had received self-paid vaccine against varicella, and the place and age at vaccination (vaccination record cards were checked, if available, to minimize recall bias); (3) parental attitudes toward self-paid and state-funded varicella vaccine; (4) whether children had received self-paid vaccines other than varicella (for example, vaccines against *Haemophilus influenzae* type b (Hib), hepatitis A, pneumococcus [polysaccharide], and influenza); and (5) comparison of the characteristics between those who had and had not received the self-paid varicella vaccine.

Data were collected and analyzed using the Epi Info™ 2002 (Centers for Disease Control and Prevention, Atlanta, GA, USA) software. Variables were analyzed for their relative means and standard deviation, and compared for significance using the chi-squared test.

## Results

Of the 1271 questionnaires, 1258 usable questionnaires were returned, giving an effective response rate of 99%. Vaccination record cards were available for 94.8% of the study subjects.

### Vaccination status of varicella

Survey results revealed that 17% of the children had contracted chickenpox by 2 to 3 years of age (31%). Among the infected children, 6.6% had received vaccination against varicella before infection.

The vaccination rate against varicella was found to be 26%, and among the 331 already vaccinated children, 63% of them received this vaccine by 1 to 2 years of age and 22.7% by 2 to 3 years of age. Very few children received vaccination after the age of 5 to 6 years. As many as 30.3% of the caregivers were willing to have their children vaccinated, while 43.4% of the caregivers had not yet or probably would not get their children vaccinated with this vaccine.

“To prevent chickenpox and its related complications” (47%) was the main reason cited by the caregivers of most children who had received vaccination (multiple choices). Other reasons included “doctors’ advice” (27%), “preventing parents from losing work days due to their children contracting chickenpox” (15%), and “learning from propagandas regarding varicella vaccine and experiences of relatives or friends” (14%).

Among children who had not been vaccinated against varicella, 41% of their caregivers were willing to have their children vaccinated. The common reasons for the delay (multiple choices) were “did not know about the vaccine” (27%), “too busy to take their children for vaccination” (24%), and “received the scheduled vaccines first” (18%). While in case of those caregivers who would not have their children vaccinated against varicella (multiple choices), 35.3% of the children had already contracted chickenpox, 24% considered natural infection as the best form of active immunization, 24% considered the vaccine too expensive, 13% had insufficient information about the vaccine, and only 9.5% questioned the effectiveness.

### Parental attitudes toward varicella vaccine

The parental attitudes toward varicella vaccine as well as the comparison of the attitudes between those who had and had not vaccinated their children are shown in Table 1. If there was a younger sibling other than the study subject, 75% of the caregivers agreed to let their children receive the self-paid vaccine against varicella, while 25% did not. However, 93.6% of the parents would get their children vaccinated if the vaccine was freely provided; 90.9% of the parents agreed if the vaccine was partially paid for; and 26% would get their children vaccinated even if the vaccination expense was more than NT\$500 to NT\$599.

In all, 393 children (31.2%) had received other self-paid vaccines — Hib vaccine, 18%; influenza vaccine, 13%; diphtheria-acellular pertussis-tetanus vaccine, 12%; Infanrix® (diphtheria and tetanus toxoids and acellular pertussis vaccine adsorbed [GlaxoSmithKline

**Table 1.** Parental attitudes toward varicella vaccine and comparison between parents whose children were and were not vaccinated against varicella

Variable	Total (n = 1258) No. (%)	Vaccinated (n = 331) No. (%)	Not vaccinated (n = 927) No. (%)	p
	Willingness to get younger children inoculated	943 (75)	321 (97)	
Willingness to get children inoculated if vaccine is freely provided	1177 (93.6)	327 (98.8)	850 (91.7)	<0.0001
Willingness to get children inoculated if vaccine is partially paid for	1143 (90.9)	325 (98.2)	818 (88.2)	<0.0001
Have inoculated children with self-paid vaccines other than varicella vaccine	393 (31.2)	201 (60.7)	192 (20.7)	<0.0001

Biologicals, Rixensart, Belgium], Hib, and poliomyelitis), 2.5%; and pneumococcus (polysaccharide) vaccine, 0.9%.

### Demographic characteristic

The demographic characteristics of the children who were vaccinated and those not vaccinated with the varicella vaccine are shown in Table 2. Variables such as the sex of the children and age of the caregivers did not have any influence on the decision as to whether children were vaccinated. The number of children within the family, monthly family income, caregivers' education level, receipt of other self-paid vaccine, and urbanization had a significant impact on the decision for immunization against varicella ( $p < 0.0001$ ). These factors were found to be statistically significant when analyzed by the multiple logistic regression method.

### Discussion

In this study, we found that 16.9% of the children below 6 years of age had been infected by the varicella-zoster virus. The incidence rate of chickenpox decreased from 10% of 163 children aged 1 to 2 years before 1995, to 54% of 81 children aged 5 to 6 years, with a mean of 29% of 483 children aged 1 to 6 years, as reported in a seroepidemiological study in Taipei city [4] during

the pre-varicella vaccine period. A previous study [7] on complications associated with varicella requiring hospitalization before and after the introduction of varicella vaccine also showed a marked reduction by 51% in the number of cases in the post-vaccine period (before mass immunization). We believe that this decrease might be related to the effectiveness of varicella vaccine.

In this study, we found that 13 of 331 children (4%) previously immunized with varicella vaccine still contracted chickenpox, but only a milder form of the disease. The incidence of breakthrough cases of modified chickenpox was compatible with those from a series of studies in the United States [8-10].

Freeman and Freed [11] reported that several factors influenced the parents' decision on whether their children should receive vaccination against varicella. These included the physicians' recommendations, the relatives' experiences of vaccination, and doubts on whether the new vaccine had safely passed experimental trials. It was found that their knowledge about the vaccine came mainly from the media and family physicians. In this study, the parental recognition that vaccination can prevent chickenpox and associated complications played an important role in their children's vaccination status. Among the children who were not vaccinated against varicella, 27.6% of their parents had

**Table 2.** Comparison of demographic characteristics between children who had and had not received varicella vaccine

Characteristic	Vaccinated (n = 331) No. (%)	Not vaccinated (n = 927) No. (%)	p
	Male	167 (50.5)	
No. of children >1	237 (71.6)	736 (79.3)	0.004
Parents as main caregivers	156 (47.1)	480 (51.8)	0.17
Parents as decision-maker for immunization	313 (94.6)	841 (90.7)	0.039
Parents education level beyond junior high school	161 (48.6)	240 (25.9)	<0.0001
Parents age <30 years	113 (34.1)	331 (35.7)	0.656
Monthly income <NT\$60,000	178/326 (54.6)	638/922 (69.2)	<0.0001
Living in city	216 (65.2)	461 (49.7)	<0.0001

Abbreviation: NT\$ = New Taiwan dollars

not learned about the vaccine, and 24.2% of the parents believed that getting the infection naturally might be better than active immunization.

In Taiwan, scheduled vaccinations are given mainly in local public health offices, while self-paid vaccines are mainly provided at hospitals and clinics. Most children (66%) who had received varicella vaccine in this study were vaccinated at local clinics. However, a significant number of parents were unaware about where their children could receive vaccination against varicella; thus, further reducing their willingness for active immunization. A total of 25% of the caregivers would not have their children immunized against varicella mainly because of the high expense of the vaccine. However, 94% of the parents were willing to have their children vaccinated if the vaccine was freely provided, and 91% of the parents would still be willing if the vaccine was partially paid for.

In the present study, there were a few differences in demographic characteristics between the children who had and had not been vaccinated with varicella vaccine. Caregivers residing in the city, those who had a relatively high education level, those belonging to families with fewer children, those who had had their children vaccinated with other self-paid vaccines, and those with a higher family income were significantly more willing to have their children vaccinated. These features clearly indicate that socioeconomic factors play an important role in the decision to opt for self-paid varicella vaccine in Taiwan.

Immunization against varicella has been included in mass vaccination for infants aged 12 months in Taiwan since 2004. However, in case of other effective vaccines of high cost such as conjugated pneumococcus vaccine that are not provided free to patients in Taiwan, we suggest that partial public funding of the vaccine be considered, since parental acceptance also shows a substantial increase when the cost is lowered.

## References

1. Wharton M. The epidemiology of varicella-zoster virus infections. *Infect Dis Clin North Am.* 1996;10:571-81.
2. Finger R, Hughes JP, Meade BJ, Pelletier AR, Palmer CT. Age-specific incidence of chickenpox. *Public Health Rep.* 1994; 109:750-5.
3. Liu SC, Wang JD, Lee CY, Chou MC. Seasonal variation of chickenpox, mumps, and rubella in Taiwanese children estimated by pediatric clinics. *J Microbiol Immunol Infect.* 1998;31:217-24.
4. Lin YJ, Huang LM, Lee CY, Chih TW, Lee PL, Chang LY, et al. A seroepidemiological study of varicella-zoster virus in Taipei city. *Zhonghua Min Guo Xiao Er Ke Yi Xue Hui Za Zhi.* 1996;37:11-5.
5. White CJ. Varicella-zoster virus vaccine. *Clin Infect Dis.* 1997; 24:753-61.
6. Hsu HC, Lin RS, Tung TH, Chen TH. Cost-benefit analysis of routine childhood vaccination against chickenpox in Taiwan: decision from different perspectives. *Vaccine.* 2003; 21:3982-7.
7. Chuang YY, Huang YC, Chang LY, Chiu CH, Lin TY. Complications of varicella requiring hospitalisation before and after the introduction of varicella vaccine in a children's hospital in Taiwan. *Eur J Pediatr.* 2003;162:112-3.
8. White CJ, Kuter BJ, Ngai A, Hildebrand CS, Isganitis KL, Patterson CM, et al. Modified cases of chickenpox after varicella vaccination: correlation of protection with antibody response. *Pediatr Infect Dis J.* 1992;11:19-23.
9. Kuter BJ, Weibel RE, Guess HA, Matthews H, Morton DH, Neff BJ, et al. Oka/Merck varicella vaccine in healthy children: final report of a 2-year efficacy study and 7-year follow-up studies. *Vaccine.* 1991;9:643-7.
10. Watson BA, Piercy SA, Plotkin SA, Starr SE. Modified chickenpox in children immunized with the Oka/Merck varicella vaccine. *Pediatrics.* 1993;91:17-22.
11. Freeman VA, Freed GL. Parental knowledge, attitudes, and demand regarding a vaccine to prevent varicella. *Am J Prev Med.* 1999;17:153-5.