

# Influenza vaccination in severely multiply handicapped persons/children

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## Abstract

**Background:** Many reports about the preventative effects of inactivated influenza vaccine have been published, targeting persons with underlying medical conditions. However, the effectiveness for severely multiply handicapped persons/children (SMHPs) is not yet well established.

**Methods:** The study group consisted of 79 SMHPs (36 males and 43 females, aged 18–66 years), with long-term hospitalization in Niigata National Hospital. We compared serum antibody responses before and after two-doses vaccination.

**Results:** Before vaccination for the 2004–2005 season, SMHPs showed continuously high HAI titer in A/New Caledonia/20/99(H1N1)-strain from March to October in 2004. The seroprotection rates were increased after the first dose, but no remarkable change was seen after the second dose in all three strains. Subjects less than 30 years old ( $\leq 29$  group) had a high antibody titers against all three strains compared with subjects aged  $>40$  years old. On the other hand, in the seroconversion rates, there were no significant differences in age, gender, and severity of symptoms.

**Conclusions:** According to our study, SMHPs are low responders except  $\leq 29$  group and the influenza vaccine effectiveness is more affected by their age than severity of symptoms. We suggest a recommendation for influenza vaccination especially in SMHPs; inactivated influenza virus vaccine (one dose) should be performed during the previous fall. In addition, further studies are needed about chemoprophylaxis, which can prevent influenza outbreaks in SMHPs.

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**Keywords:** Influenza vaccine; Severely multiply handicapped persons/children; Antibody titer; Seroprotection rate; Chemoprophylaxis

## 1. Introduction

The benefits of inactivated influenza virus vaccine such as the significant preventative effects on influenza, the decrease of excess death rate, and its safety are documented [1–3]. Nevertheless, influenza illness and complication cannot be completely prevented. Epidemics of influenza virus infection occur worldwide every year. Influenza viruses can cause considerable numbers of deaths due to serious complications

[4]. Recently, influenza virus encephalopathies were reported as mortal complication [5,6]. Centers for Disease Control and Prevention (CDC) recommends vaccination with inactivated influenza vaccine especially for patients who have chronic diseases, because they may quickly deteriorate into a condition [7].

High-risk persons, included severely multiply handicapped persons/children (SMHPs) may obtain limited effectiveness of vaccination compared with healthy adults. Many reports about the effectiveness of influenza vaccination have been published, targeting elderly persons and persons with underlying medical conditions (e.g. chronic heart disease,

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chronic lung disease, diabetes, HIV infection) [3,8–10]. All of these reports conclude that high-risk persons can substantially benefit from influenza vaccination, and should receive it. SMHPs have also been recognized as debilitated and compromised [11–13]. Their severe multiple handicaps consisted mainly of cerebral palsy, epilepsy, and intellectual disorder. SMHPs are identified by their body functions and structure, activity and participation in International Classification of Functioning, Disability and Health [14], in addition to their diseases. To our knowledge, however, no reports have been published concerning the effects of influenza vaccination assessed in a large number of SMHPs. We examined the effect of inactivated influenza vaccine from many different aspects in SMHPs. In this study, we propose that influenza vaccination should be performed in SMHPs.

**2. Methods**

*2.1. Subjects and study design*

The study group consisted of 79 SMHPs (36 males and 43 females) under long-term hospitalization in Niigata National Hospital (Table 1). Their ages ranged from 18 to 66 years (mean 41.1 ± 11.2). Their severe multiple handicaps also consisted mainly of cerebral palsy, epilepsy, and intellectual disorder. Patients of Mucopolysaccharidosis, sequelae of encephalitis, Cornelia de Lange syndrome were also included. Oshima’s classification (Fig. 1) is very useful and convenient to classify SMHPs according to severity of symptoms. Oshima’s classifications 1–4 are true SMHPs in a narrow sense. Sixty-one cases (77%) were Oshima’s classification 1–4 in this study. Oshima’s classifications 5–25 are broadly SMHPs. The control group consisted of 49 healthy adults (9 males and 40 females, mean age 27.0 ± 5.3). All of them and/or their family members completed a form of informed consent to be included in this study. In addition, our hospital’s Ethic Committee authorized this study.

We supposed that SMHPs be low responders, so they need two-dose vaccination for getting high antibody titers. All subjects were vaccinated with two doses of inactivated influenza

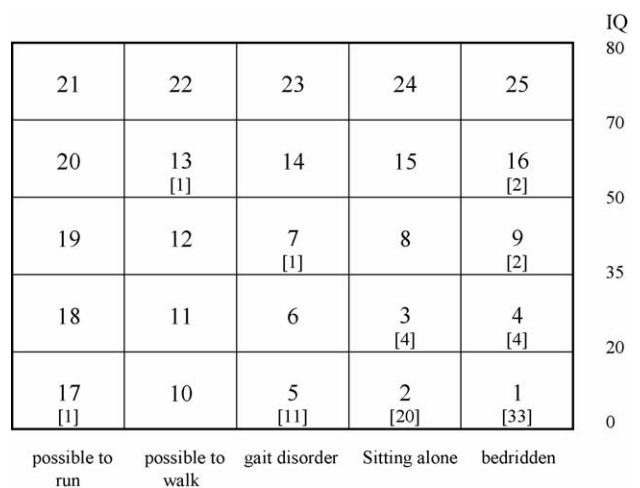


Fig. 1. Oshima’s classification. The number of subjects is in parentheses [ ].

vaccine in the 2004–2005 season. They were injected with the first dose in October 2004 and the second dose with 4–6 weeks later in November to December 2004. All subjects had been vaccinated with one or two doses annually from the 2000–2001 season. The control group members were vaccinated with one dose of inactivated influenza vaccine in the 2004–2005 season. Forty-two of them were vaccinated with one dose of inactivated influenza vaccine, the other seven were not vaccinated in the 2003–2004 season. We compared serum antibody responses before and after two doses of vaccination against influenza, according to interval of vaccine, age, gender, and severity of symptoms.

*2.2. Vaccination*

All of the subjects were administered with two doses of inactivated influenza vaccine (Denka Seiken Co., Ltd., Tokyo, Japan). The strains were A/New Caledonia/20/99-(H1N1), A/Wyoming/3/2003(H3N2), and B/Shanghai/361/2002, which were recommended for the 2004–2005 season by the World Health Organization. The vaccine contained at least 15 µg of hemagglutinin antigen in each 0.5 ml dose. According to the standard procedure in Japan,

Table 1  
Characteristics of the subjects and age groups

	Control	All subjects	Age-group			
			≤29 group	30–39 group	40–49 group	≥50 group
No. of subjects	49	79	21	15	23	20
Age						
Range (mean)	20–39 (27.0)	18–66 (41.1)	18–29	30–39	40–49	50–66
Male/Female	9/40	36/43	11/10	5/10	11/12	9/11
Oshima’s classification						
1–4/5–25	–	61/18	19/2	14/1	16/7	12/8
Body weight (kg)						
Range (mean)	–	16.1–54.6 (33.8)	16.1–48.9 (32.6)	17.1–42.9 (31.0)	22.7–54.6 (36.1)	22.1–46.2 (34.2)

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