



ORIGINAL ARTICLE

# Estimation of the Incidence of Kawasaki Disease in Taiwan. A Comparison of Two Data Sources: Nationwide Hospital Survey and National Health Insurance Claims



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## Key Words

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National Health  
Insurance claims;  
Taiwan

**Background:** Kawasaki disease (KD), first described by Dr. Tomisaku Kawasaki in 1967, was found for the first time in Taiwan in 1976. It continued to occur in increased numbers. For the study of incidence rates and epidemiological features of KD, we conducted five nationwide hospital surveys (NHS) in 1987, 1992, 1994, 2001 and 2008, respectively. We estimated also the annual incidence rates of KD during 1996–2007, based on the National Health Insurance (NHI) database, which had been implemented since 1995, covering 98% of the population in Taiwan.

**Methods:** The annual incidence rates of KD during the twelve years, from 1996 to 2007, estimated by the NHS and the NHI claims were compared, analyzed and discussed.

**Results:** During 1996–2007, a total of 9,938 cases of KD were reported by the Departments of Pediatrics of all hospitals surveyed, and a total of 11,849 cases of KD were claimed in the NHI database. The annual number of cases and incidence rates of KD based on NHI claims constantly surpassed those by the NHS. The ratio of the two incidence rates varied from 1.10 to 1.33. They were well correlated ( $r = 0.902$ ,  $p < 0.001$ ) with a linear equation,  $NHI = 16.07 + 0.93 \times NHS$ . The changes in annual incidence rate by the NHI were mean 1.149,  $p = 0.07$ , 95% CI  $-0.082 - 2.382$ , and those by the NHS were mean 1.562,  $p < 0.001$ , CI 0.656 – 2.468.

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**Conclusion:** The annual incidence rates of KD can be estimated by the NHI claims and by the classic NHS. The values estimated by the NHI claims constantly outnumbered those by the NHS. Some pitfalls involved in the NHI claims are discussed.

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## 1. Introduction

Taiwan is an island country with a population of 23 million and an area of 35,680 Km<sup>2</sup>. Kawasaki disease (KD), first described by Dr. Tomisaku Kawasaki in 1967,<sup>1</sup> was first encountered in Taiwan in 1976.<sup>2,3</sup> For the study of the incidence and epidemiological features of KD in Taiwan, we carried out five nationwide questionnaire hospital surveys (NHS), as designed by Japan Kawasaki Disease Research Committee,<sup>4</sup> in 1987, 1992, 1994, 2001 and 2008, respectively.<sup>2,5–10</sup> Utilizing the Taiwan National Health Insurance (NHI) database, which had been implemented since 1995, covering 98% of the population in Taiwan, we also estimated the annual incidence rates of KD during the period from 1996 to 2007.<sup>11–13</sup> The number of cases and incidence rates of KD estimated from the NHS and those from the NHI database during the 12 years, from 1996 to 2007, are compared, analyzed and discussed in this communication.

## 2. Methods

A questionnaire survey form, designed for a retrospective study of KD patients was sent with a personal request letter to the chairs of pediatric departments of all hospitals with 100 or more beds, as listed by the Taiwan Pediatric Association, together with a copy of the diagnostic guidelines for KD and coronary artery lesions, proposed by the Japan Kawasaki Disease Committee,<sup>14,15</sup> the Council of Cardiovascular Disease in the Young, American Heart Association,<sup>16</sup> and our Study Group.<sup>17</sup>

There were 40 hospitals in 1996 and 94 in 2007. All the hospitals responded to our request, and submitted their duly filled forms to us for the analysis. From the database of the Taiwan NHI, which had been implemented since 1995, covering 98% of the population in Taiwan, we collected the number of KD cases, based on the reimbursement claims made by all physicians for KD patients less than 20 years of age, who were hospitalized with a major diagnosis and/or second diagnosis of KD (ICD-9-CM code 446.1), and coronary artery aneurysm (ICD-9-CM code 414.11). The number of KD-associated hospitalizations each year was thus obtained, and was divided by the total number of children below 5 years of age each year in Taiwan from 1996–2007 (Taiwan census data). The annual incidence rate of KD was then calculated as the number of KD-associated hospitalizations per 100,000 children less than 5 years of age.

### 2.1. Statistical analysis

Analysis of data was carried out using statistical package SPSS (version 20.0) for Windows. Significance was set at

$p < 0.05$ . Linear regression was used for analysis of the correlation and changes in annual incidence rates.

## 3. Results

During the 12 years from 1996 to 2007, a total of 9938 KD cases were diagnosed and reported to us by the chairs of the pediatric departments of the surveyed hospitals, and physicians claimed NHI reimbursement for a total of 11,849 KD cases. The annual incidence rates of KD each year estimated from both the NHI and the NHS are listed in Table 1. The number of KD from the NHI claims constantly surpassed that of the NHS in a ratio of 1.10 to 1.33. The two sets of numbers were closely correlated with a coefficient,  $r = 0.902$ ,  $p < 0.001$  ( $\text{NHI} = 16.07 + 0.93 \times \text{NHS}$ ) (Figure 1). The mean changes in annual incidence rate by NHI was 1.149, 95% CI  $-0.082 - 2.382$  ( $p = 0.07$ ), and by NHS was 1.562, 95% CI  $0.656 - 2.468$  ( $p < 0.01$ ) (Figure 2).

## 4. Discussion

KD is a febrile illness of unknown etiology, mainly affecting children younger than 5 years of age. In Taiwan, since the first case of KD was diagnosed in 1976, the disease has continued to occur in increasing numbers. The increase in

**Table 1** Annual incidence rates of Kawasaki disease estimated from National Health Insurance claims and nationwide questionnaire hospital surveys in Taiwan, 1996–2007.

Year	National Health Insurance claims		Nationwide questionnaire hospital surveys		A/B ratio
	No. of cases	Incidence* (A)	No. of cases	Incidence* (B)	
1996	999	59.0	750	47.5	1.24
1997	847	52.0	677	42.4	1.23
1998	1149	72.0	846	54.9	1.31
1999	1047	68.0	801	53.3	1.28
2000	1103	69.0	804	54.1	1.28
2001	1160	76.0	1018	62.0	1.23
2002	1000	71.0	860	53.5	1.33
2003	872	59.9	760	48.6	1.23
2004	916	66.9	838	57.2	1.17
2005	969	74.8	897	63.6	1.18
2006	931	77.1	871	66.2	1.16
2007	856	70.0	816	63.6	1.10
Total	11,849	—	9938	—	—

\* Per 100,000 children less than 5 years of age.

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