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Original Article

Epidemiologic features of Kawasaki disease in acute stages in Taiwan, 1997−2010: Effect of different case definitions in claims data analysis

Ming-Chih Lin [a,b,c], Mei-Shu Lai [c], Sheng-Ling Jan [a,b], Yun-Ching Fu [a,b,*]

[a] *Department of Pediatrics and Institute of Clinical Medicine, National Yang-Ming University, Taipei, Taiwan, ROC*
[b] *Department of Pediatrics, Taichung Veterans General Hospital, Taichung, Taiwan, ROC*
[c] *Graduate Institute of Epidemiology and Preventive Medicine, National Taiwan University, Taipei, Taiwan, ROC*

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Abstract

Background: Kawasaki disease is the leading cause of pediatric acquired cardiac disease in many industrialized countries. The aim of this study was to estimate the incidence of Kawasaki disease in acute stages in Taiwan, by linking the diagnosis code to medication and comparing the differences in epidemiological features with those of previous reports that used the diagnosis code alone.

Methods: We searched the National Health Insurance Research Database from 1997 to 2010. For the International Classification of Diseases, Ninth Revision (ICD-9) set, all inpatients with a main diagnosis of Kawasaki disease (ICD-9, 446.1) were retrieved. For the ICD-9 + intravenous immunoglobulin (IVIG) set, Kawasaki disease in acute stages was defined as the disease stages requiring IVIG. The epidemiologic features were calculated and compared by both methods.

Results: The incidence rates for children under 5 years ranged from 21.5 to 68.5 per 100,000 person-years (average 49.1) for the ICD-9 + IVIG set and from 48.5 to 82.8 per 100,000 person-years (average 74.9) for the ICD-9 set. Significant discrepancy in peak season estimation occurred in summer. The 5-year recurrence rate was 1.1% for the ICD-9 + IVIG set and 4.5% for the ICD-9 set. The coronary complication rates were around 7.24% (ICD-9 + IVIG) and 6.48% (ICD-9).

Conclusion: Discrepancies occurred when different case definitions were used in claims data analysis. Previous reports might have overestimated the incidence, recurrence rate, and complication rate in older children. The new method might slightly underestimate them. The true incidence might lie in between.

Keywords: claims data; epidemiology; Kawasaki disease; seasonal variations

1. Introduction

Kawasaki disease is an acute, self-limited, systemic vasculitis.[1] It is now the leading cause of acquired cardiac disease in children in many industrialized countries.[2−10] It may induce coronary artery abnormalities ranging from transient ectasia and small aneurysms to giant aneurysms.[11−13] Prompt diagnosis and timely administration of intravenous immunoglobulin (IVIG) are crucial to prevent coronary complications.[1,14−18] Thus, estimating the incidence of Kawasaki disease in acute stages is important for understanding the disease burden and public health policy making.

Incidences of Kawasaki disease in different countries were reported previously.[3−10,13,19−21] Most of the data were derived from either claims data analysis or hospital surveys. Few countries have a Kawasaki disease registry.[4] The incidence of Kawasaki disease in Taiwan has also been reported previously.

Conflicts of interest: The authors declare that there are no conflicts of interest related to the subject matter or materials discussed in this article.

* Corresponding author. Dr. Yun-Ching Fu, Department of Pediatrics, Taichung Veterans General Hospital, 1650, Section 4, Taiwan Boulevard, Taichung 407, Taiwan, ROC.

E-mail address: ivanfu@vghtc.gov.tw (Y.-C. Fu).

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Both hospital surveys and claims data from the National Health Insurance (NHI) have been used.[6,19,20] However, there are some discrepancies in the data derived from these two resources (Table 1).[6,19,20] The hospital survey is regarded as noncomprehensive and subject to double counting when patients are transferred between hospitals. As the NHI has been available in Taiwan since 1996 and covers more than 98% of the population,[22,23] epidemiologic data retrieved from its database are regarded as more reliable and comprehensive. However, previous reports using claims data from the NHI focused on admission with a main diagnosis code of Kawasaki disease. Whether the reason for admission was the acute stages of this disease or not was not well defined.[6,19] This might somewhat overestimate the disease incidence.

As IVIG therapy is covered by the NHI when an acute episode of Kawasaki disease is diagnosed, including incomplete Kawasaki disease, most patients in Taiwan receive IVIG in the initial stage of illness. Therefore, Kawasaki disease in acute stages could possibly be defined by analyzing the use of IVIG. The aim of this study was to estimate the incidence of Kawasaki disease in acute stages in Taiwan, by linking the diagnosis code to medication and comparing the differences in the epidemiological features with those of previous reports that used the diagnosis code alone.

2. Methods

This was a retrospective cohort study. Although the NHI of Taiwan was initiated in 1995, the database for that year was incomplete. We, therefore, searched the National Health Insurance Research Database (NHIRD) of Taiwan to collect patients' medical records from 1997 to 2010. Files of inpatient expenditure by admission (DD1997–DD2010 files) and details of inpatient orders (DO1997–DO2010 files) were the main resources for data analysis.

For the International Classification of Diseases, Ninth Revision (ICD-9) set, medical records of all inpatients whose first or second diagnosis was Kawasaki disease (ICD-9, 446.1) were retrieved. On the other hand, for the ICD-9 + IVIG set, in addition to the first or second diagnosis fulfilling the criteria for Kawasaki disease (ICD-9, 446.1), we further cross-linked the details of inpatient orders to see if patients were treated with IVIG. Patients were regarded as having received IVIG therapy if their inpatient orders included medication whose anatomical therapeutic classification code was J06BA02. Coronary aneurysm was identified by any discharge diagnosis, including ICD-9 414.11. Recurrence was defined as readmission of patients with a main diagnosis of Kawasaki disease in the ICD-9 set, and readmission of patients with a main diagnosis of Kawasaki disease and receipt of immunoglobulin in the ICD-9 + IVIG set. If two admissions were within 30 days, they were regarded as being in the same acute stage. If two admissions of the same patient were separated by more than 30 days, they were regarded as two episodes of Kawasaki disease in acute stages.

Table 1
Comparison of incidence, recurrence, and coronary artery complication rates among previous series and this study.

	Incidence rate [a]	Recurrence rate (%)	Coronary artery complication rate (%)
Lue et al[20]	55	—	25.8
Chang et al[19]	66	1.3	7.3
Huang et al[6]	69	1.5	7.2
This study	49	1.1	7.2

[a] Incidence rate unit: 100,000 children aged under 5 years per year.

Patients' sex, age, and date of admission were retrieved. The annual incidence, monthly distribution of patients, sex distribution, recurrence rate, and complication rate were calculated. The population statistics were obtained from the website of the Ministry of the Interior, Taiwan.

According to the NHIRD, data that could be used to identify patients or care providers, including medical institutions and physicians, are scrambled before being sent to the National Health Research Institutes for database construction and are further scrambled before being released to individual researchers (http://w3.nhri.org.tw/nhird//en/Data_Protection.html). A written agreement declaring there would be no attempt to obtain information that could potentially violate the privacy of patients or care providers was signed before the beginning of data retrieval. This analysis was conducted for research purposes only. There is no potential conflict of interest. The computer-processed personal data protection law and related regulations of the Bureau of NHI and the National Health Research Institutes of Taiwan were strictly followed. The protocol was reviewed and approved by the National Health Research Institutes prior to data release. The study protocol has also been approved by the institutional review board of Taichung Veterans General Hospital.

SAS 9.1 for Windows (SAS Institute, Inc., Cary, NC, USA) was used for data retrieval and data analysis. Chi-square tests were applied for categorical data comparisons. The Poisson regression model was used for comparing incidences. A p value of <0.05 was considered statistically significant.

3. Results

3.1. Annual incidences per 100,000 children aged under 5 years and sex distributions

The demographic data are summarized in Table 2. The annual incidence rates per 100,000 children <5 years old are shown in Table 3. When we calculated the number of patients with the ICD-9 code alone, the incidences ranged from 48.5 to 82.8 per 100,000 children <5 years of age. The average incidence from 1997 to 2010 was 74.9 per 100,000 children under 5 years of age. When we calculated the number of patients treated with IVIG, the incidences ranged from 21.5 to 68.5 per 100,000 children. The average incidence from 1997 to 2010 was 49.1 per 100,000 children under 5 years of age. There were significant discrepancies between these two sets of data. The difference was more significant in 2003, when a severe acute respiratory syndrome (SARS) outbreak occurred in Taiwan. The incidences declined significantly during the