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ORIGINAL ARTICLE

Recent trends in antibiotic prescriptions for acute respiratory tract infections in pediatric ambulatory care in Taiwan, 2000–2009: A nationwide population-based study



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Background: Antibiotic resistance is a global problem, and the inappropriate overuse of antibiotics is the major cause. Among children seeking medical help, acute respiratory tract infections (ARTIs) are the most common tentative diagnosis made by physicians and the leading condition for which antibiotics are prescribed. This study aimed to examine the trends of prescribing antibiotics in pediatric ambulatory care in Taiwan over a 10-year period.

Methods: Children younger than 18 years old and being diagnosed as having ARTIs [International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes 460, 465, and 466] during ambulatory visits from 2000 to 2009 were retrieved from the systematic random sampling datasets of the National Health Insurance Research Database (NHIRD) in Taiwan. The annual and monthly case numbers were recorded and the children's demographic characteristics, including sex, age, seasonality, location, level of medical institution,

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physician specialty, and their ambulatory prescriptions of antibiotics were collected and analyzed.

Results: Among 565,065 enrolled ambulatory children, 39,324 were prescribed antibiotics. The average antibiotics prescription rate was 7.0% during the 10-year period. There were marked descending trends in case numbers and antibiotic dispensing rates from 2000 to 2009. Female patients, elder ages (≥ 6 years old), summer and autumn, middle and southern areas of Taiwan, medical centers and regional hospitals, and physicians of pediatric specialty were associated with significantly lower antibiotic dispensing rates than other conditions ($p < 0.05$).
Conclusion: The 10-year antibiotics prescription rate in ambulatory children with ARTIs was 7.0% and it decreased gradually from 2000 to 2009 in Taiwan. Through understanding the annual trends in antibiotic prescriptions, it may be possible to design interventions to improve the judicious use of antibiotics in children.

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Introduction

Antibiotic-resistant infections are a worldwide problem, and incur not only considerable cost on health care systems, but also increased morbidity and mortality. The inappropriate use of antibiotics is the most important factor leading to antibiotic resistance. It is generally recognized that broad-spectrum antibiotics are overprescribed in clinical practice, including for conditions for which antibiotic therapy is not indicated, such as viral respiratory tract infections (RTIs). *Streptococcus pneumoniae* remains the most common bacterial cause of community-acquired RTIs. In recent years, antimicrobial resistance in *S. pneumoniae* has spread globally at an increasing rate.^{1–3} Antibiotic nonsusceptibility among those resistant strains is a critical issue in Taiwan due to the overuse of antibiotics, and previous exposure to antibiotics has been reported to be the only risk factor.⁴

Acute RTIs (ARTIs) are often referred to as the common cold and related complications including sinusitis and otitis media. Most of these infections are believed to be viral, which will resolve without the use of antibiotics. Therefore, a high proportion of antibiotic prescriptions for patients with ARTIs are unnecessary or inappropriate. Prudent antibiotic prescribing practices are essential not only to save medical costs, but also to reduce the risk of the development of antibiotic-resistant bacteria in the community. In this study, we aimed to describe the 10-year diagnostic patterns of ARTIs and evaluate recent trends in antibiotic use rates among ambulatory children in Taiwan from 2000 to 2009.

Methods

Data sources

The National Health Insurance of Taiwan was started in 1995, and currently provides coverage for > 99% of the people living in Taiwan. The National Health Insurance Research Database (NHIRD) of Taiwan provides double encrypted data to avoid any chance of identifying individual information for

researchers in performing a population-based nationwide study.^{5–8}

Our study was based on the data subset of systematic sampling data claims from the NHIRD of Taiwan. The datasets contain random samples of 0.2% of the ambulatory care expenditure by visits extracted by a systematic sampling method on a monthly basis.⁷ This study was approved by the Institutional Review Board of Taipei Veterans General Hospital (VGHIRB), Taipei, Taiwan (Number 2012-06-006A).

Study population

The ambulatory claims data of the NHIRD were searched to identify pediatric patients younger than 18 years of age. Any children with a primary diagnosis of ARTI from 2000 to 2009 according to the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) code 460 [acute nasopharyngitis (common cold)], code 465 (acute upper respiratory infections of multiple or unspecified sites), and code 466 (acute bronchitis and bronchiolitis) were retrieved and evaluated for antibiotic prescriptions. Patients with concomitant diagnoses for which antibiotic therapy may have been justified were excluded. The ICD-9-CM codes of excluded diagnoses are listed in Table 1.^{9–11}

Data analysis

Demographic data including sex, age, seasonality, and geographical location of the enrolled children were collected for analysis. We divided the enrolled children into four age groups: 0–2 years old, 3–5 years old, 6–11 years old, and 12–17 years old. Seasonality was divided into spring (March, April, and May), summer (June, July, and August), autumn (September, October, and November), and winter (December, January, and February). The geographic regions of practice were separated into north, central, south, and east of Taiwan and the certification levels of medical institutions were divided into two parts: medical centers and regional hospitals; and district hospitals and clinics. Physician specialty was also analyzed to clarify the prescribing behavior between different physicians.

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