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Original Article

Antibiotics in Respiratory Tract Infections in Hospital Pediatric Emergency Departments☆

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ABSTRACT

Background: Respiratory tract infections are one of the most frequent problems in pediatric clinics and generate an elevated prescription of antibiotics. The aim of this study was to find out the standard of care practice about antibiotic use in these infections in a pediatric emergency department and to evaluate compliance with clinical guidelines.
Methods: A pediatric emergency department database was reviewed from July 2005 to October 2007 under the category "respiratory infection", including variables such as age, antibiotic prescription and compliance with current clinical recommendations.
Results: Out of the 23 114 reviewed reports, 32.7% (7567) were upper respiratory tract infections (URTI) (cold, acute otitis media [AOM], sinusitis and tonsillopharyngitis) or lower respiratory tract infections (LRTI) (laryngitis, bronchitis, bronchiolitis and pneumonia). Children under the age of 2 were the most represented age group.
Amongst URTI, rhinopharyngitis was the most frequent infection, while bronchitis was the most frequent among LRTI. Antibiotic therapy (mainly amoxicillin) was prescribed in 30.8% of URTI (5.7% rhinopharyngitis, 96.5% AOM, and 36.7% tonsillopharyngitis) and in 12.4% of LRTI.
Conclusions: The percentage of respiratory tract infections was similar to previous studies and the antibiotic prescriptions followed current guidelines, except for cases diagnosed with AOM. Prescription compliance and clinical course of the cases should be monitored.
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Antibióticos en las infecciones respiratorias en urgencias pediátricas hospitalarias

Palabras clave:
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Infecciones respiratorias de vías altas
Infecciones respiratorias de vías bajas

RESUMEN

Introducción: Las infecciones respiratorias son un motivo frecuente de consulta en pediatría y originan un gran número de prescripciones de antibióticos. El objetivo de este trabajo es conocer la práctica clínica habitual en relación con el uso de antibióticos en estas patologías en un servicio de urgencias pediátricas hospitalario, así como su adecuación a las guías clínicas.
Métodos: Revisión de la base de datos clínicos de las visitas en el servicio de urgencias pediátricas de un hospital de segundo nivel en el período comprendido entre julio de 2005 y octubre de 2007 y análisis del porcentaje de consultas debidas a infecciones respiratorias, analizando las variables: edad, prescripción de antibióticos durante la visita y adecuación de la misma a las recomendaciones internacionales actuales.
Resultados: De los 23.114 informes estudiados, el 32,7% (7.567) correspondieron a infecciones respiratorias altas (IRVA) (catarro de vías altas, otitis media aguda [OMA], sinusitis y faringoamigdalitis) o bajas

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(IRVB) (laringitis, bronquitis, bronquiolitis y neumonía) como diagnóstico principal. El grupo de edad más representado fueron los menores de 2 años.
Entre las IRVA, la rinofaringitis fue la más frecuente, y entre las IRVB destacó la bronquitis. Se prescribieron antibióticos, principalmente amoxicilina, en el 30,8% de los casos de IRVA (en el 5,7% de las rinofaringitis, el 96,5% de las otitis medias agudas y el 36,7% de las faringoamigdalitis) y en el 12,4% de las IRVB.
Conclusiones: El porcentaje de visitas por cuadros respiratorios infecciosos coincidió con el descrito previamente en estudios similares y la prescripción de antibióticos se ajustó a las recomendaciones actuales, excepto en el caso de la OMA. Es necesario el seguimiento del cumplimiento de la prescripción y de la evolución clínica de los casos.
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Introduction

The rational use of medicines is a fundamental pillar of medical practice that is particularly relevant in the case of antibiotics. Their inappropriate use can affect the quality of care and healthcare expenditure, and can also facilitate onset of side effects and resistances.[1–6]

Since abuse of these drugs is a common problem in routine pediatric clinical practice,[7] their use should be permanently monitored. A high prevalence of antibiotic use has been detected at international level, especially in preschool patients, with a rate of 2.2 prescriptions per person per year, and estimated unjustified use in at least one-third of children with infectious disease.[8,9] Respiratory infections, most of which are viral in origin, are among the most prevalent affecting the pediatric population, and as such constitute a major target for potentially erroneous prescription of antibiotics.[10] In Spain, a study conducted in 11 pediatric emergency departments found between 14% and 80% inappropriate antibiotic use in bronchial infections.[11]

The increase in antibiotic resistance is a major public health problem that has prompted the implementation of programs to improve prescription quality and to educate both healthcare personnel and the general public in their use, together with the introduction of both in-hospital and out-of-hospital treatment protocols or guidelines.[10–13]

The rational use of antibiotics is also one of the parameters assessed to determine the quality of medical care. For example, one of the indicators recommended for evaluation by the Spanish Society of Pediatric Emergencies (SEUP) is "antibiotic treatment in febrile syndrome of viral origin", as a parameter adapted to pediatrics.[14] Thus, incorrect use of antibiotics would indicate poorer quality of care. However, their use in children is not only determined by pediatric prescription; among many other determining factors are the different levels of access to and use of healthcare services by the population, the use of medicines on the parents' own initiative, and the extent to which they expect pediatricians to prescribe antibiotics. These factors are all very strongly associated with social and cultural levels.[15,16]

Despite the relevance of this topic, trends in the use of hospital pediatric emergency departments, the impact of visits for respiratory infections, and the quality of antibiotic prescription during these visits are largely unknown. These data must be obtained to be able to optimize the use of resources, and to monitor health care processes.[10]

The working hypothesis is that clinical practice guidelines on the use of antibiotics in pediatric respiratory infections are adequately followed in emergency departments. The objectives of this study were to determine the percentage of consultations for respiratory infections, the most common diagnoses, level of compliance with international recommendations on antibiotic prescription in our hospital pediatric emergency department, whether or not antibiotic therapy is correctly prescribed, and if so, the choice of antibiotic, and the existence of other factors that could be related to the type of visit and use of antibiotics.

Methods

All discharge reports issued from the pediatric emergency section of a secondary university general hospital between July 2005 and October 2007 were retrospectively reviewed. Informed consent was obtained from the parents or legal guardians in all cases, and the study protocol was approved by the local ethics committee. The following variables were evaluated: diagnoses (primary and secondary) according to the International Classification of Diseases (ICD-9), age, sex, and prescription of antibiotic at that visit (whether prescribed or not, and if so, the type of antibiotic selected). The data obtained were tabulated and a descriptive study was performed. The percentage of visits for infections out of all visits in the study period was analyzed, including visits for 2 respiratory disease sub-groups: upper respiratory tract infections (URTIs) and lower respiratory tract infections (LRTIs). The first sub-group included the common cold, acute otitis media (AOM), sinusitis and tonsillopharyngitis, and the second included laryngitis, bronchitis, bronchiolitis and pneumonia. The age variable associated with the type of visit was then analyzed. To perform the comparative analysis, the population using the hospital and the number visits during the study period based on all reports issued (both infectious and non-infectious cause) were analyzed.

Finally, the use of antibiotics in these patients and their appropriateness according to the diagnosis was studied. The guidelines established in the protocols used in the department, which coincide with the recommendations of international guidelines, were considered correct. The prescription (or absence of prescription) as well as the appropriateness of the choice of specific antibiotic prescribed was analyzed.

A descriptive statistical analysis of the sociodemographic data obtained was carried out. The chi-squared test was used to compare the quantitative data of absolute frequencies and percentages. The differences associated with P values <.05 were considered statistically significant. All statistical analyses were performed using statistical package SPSS (version 14.0, SPSS Inc, Chicago, IL, United States).

Results

A total of 23 114 (13 337 boys and 9777 girls; 42.3%) reports with a mean age of 2.5 years were analyzed; 15 094 (65%) corresponded to infection.

Among the reports with a diagnosis of infection, the group with highest attendance was infants under 2 (44.1%), in most cases for colds.

URTIs constituted 47% of the visits due to infection; cold was the most frequent diagnosis (59.1%). AOM and tonsillopharyngitis together accounted for the remaining 40.9%. There were no cases of sinusitis. Antibiotics were used in 5.7% of the cases of colds. Amoxicillin was most commonly used, followed by amoxicillin-clavulanic acid. The use of antibiotics was proportionally greater among 5 and 6-year-old (33.2% of the patients who visited for a cold received antibiotics).

Tonsillopharyngitis accounted for 19.8% of the visits for URTIs and for 9.3% of the reports of infectious cause. The highest visitation rate due to this cause was infants under 2, and there was a slight increase in cases among 6 and 8-year-old. In total, 36.7% of the cases were treated with antibiotics, mostly amoxicillin. Antibiotics were prescribed more often in patients over 3-years-old, peaking in the 11 to 12-year-old age group.

AOM accounted for 21.1% of the visits due to URTI, mostly involving children aged 3–6 years. Diagnosis in infants under 2-years old was rare. Antibiotics were prescribed in 95.6% of cases. Amoxicillin was most widely used (72%), followed by amoxicillin-clavulanic acid (23%), cephalosporins (4%) and azithromycin (1%).

AOM was diagnosed concurrently in 1411 cases in which the primary diagnosis was infection not suitable for antibiotic treatment, but this secondary diagnosis ultimately justified the use of these drugs.

LRTI reports accounted for 13.6% of the total number of infections; among these, acute bronchitis was the most common diagnosis (49.9%). Most visits were concentrated in the under 4 age group. The use of antibiotics in bronchitis rose to 11.3%, with amoxicillin prescribed most often. Bronchiolitis accounted for 16.8% of all LRTIs; 3.2% were treated with antibiotics, with amoxicillin again being the most commonly used. Laryngitis accounted for 23.50% of all LRTI, 2.5% of which were treated with antibiotics. Pneumonia only accounted for 14.6% of total cases; most were considered of viral etiology and did not receive antibiotic treatment. Most of the remaining cases (42.3%) were treated with beta-lactam antibiotics. In school-age patients, azithromycin was the most widely used antibiotic, consistent with the higher incidence of so-called atypical pneumonias (caused by *Mycoplasma pneumoniae* and *Chlamydia*, among others). In total, macrolides were prescribed in 33% of the pneumonias treated with antibiotics (41 cases with azithromycin and one case with clarithromycin).

With respect to the number of return visits for infection in general, considering this to be a further visit by the patient for the same reason within one week, this occurred in 1422 patients (9.4% of all visits for infection).

Discussion

Infections accounted for 65.3% of all discharge reports. Most were URTIs (47%) and the common cold was the most commonly diagnosed illness. These figures are similar to those reported in the literature, according to which more than 50% of the visits to pediatric emergency departments are for nasopharyngitis symptoms (common cold).[7,17] Respiratory disease continues to be the most common reason for prescribing antibiotics in children.[18] Infants under 2 years were the age group with the most visits and were most frequently discharged with the diagnosis of a cold, a finding that is also in line with the literature.[7,19–21]

One children's hospital in our area detected inappropriate prescribing in 22.3% of the visits for three common respiratory diseases (AOM, tonsillopharyngitis and community-acquired pneumonia).[19] This study was limited by the small sample size, the biodemographic characteristics derived from its location on the outskirts of a city, and its status as a tertiary referral hospital.

In the pediatric emergency department of another tertiary referral hospital, the prescription rate after two educational talks delivered to physicians on the rational use of antibiotics was analyzed[20]; there was no significant reduction (13% and 12.7% before and after the intervention), although correct dosing improved.

In our sample, antibiotics were predominantly used in cases of AOM, following strict diagnostic criteria,[22–24] and this diagnosis was hardly made at all in infants under 2 years of age. Cases corresponding to non-serious, uncomplicated infections that did not require antibiotic treatment were acute catarrhal otitis media, and were included in the common cold group. Antibiotic prescription was very high in schoolchildren, which is in line with the literature.[19,25,26] The prescription of amoxicillin for AOM and the lesser use of macrolides and cephalosporins were in line with published international recommendations.[10,22,23]

Antibiotics were used in pneumonia in less than 50% of the cases, which is in line with general recommendations and is probably based on the use of diagnostic tools used in the emergency department (laboratory and radiology). Beta-lactamic antibiotics were prescribed in more than 70% of the cases, also in line with current guidelines.[10] The use of macrolides in schoolchildren is related to diagnosis of pneumonitis due to *Mycoplasma pneumonia*, which also appears to be consistent with recommendations.[27]

In the case of tonsillopharyngitis, antibiotics were not prescribed in infants under 2 years old, an age group in which bacterial etiology is very rare.[28]

In infections with diagnoses of common cold, bronchitis and bronchiolitis, there was a low rate of antibiotic prescription (5.7%, 11.3% and 3.2%, respectively) compared with the literature,[27] although the tendency should be towards not using them at all. Most of these infections were associated with AOM as a second diagnosis which required antibiotic treatment, justifying their prescription.

Non-use of antibiotics in cases of the common cold is considered an indicator of high quality of care. The percentage found in our study was low (5.4%), lower than that described in other published series, in which it reached up to 50% of cases.[7]

The special characteristics of a population can influence both the types of infections seen and the way in which healthcare resources are used, as has been described in our setting and in other multi-ethnic populations.[29–34] Furthermore, other factors such as self-medication and compliance are essential for analysis of the real situation of antibiotic use, and are related with the social and cultural level of patients' families.[15] In Spain, 20% of the parents state that they always use antibiotics for influenza or the common cold, and only one-third are aware of their specific anti-bacterial action. Moreover, they tend to have a poor opinion of the medical care received when antibiotics are not prescribed at the first visit but are given at a subsequent visit.[35]

The large sample size is the greatest strength of our study. Limitations are the absence of specific coding on the etiology and topographic diagnosis of respiratory infections, as well as the lack of data on dosage, route of administration and duration of treatment. As these are patients who only visit the emergency department occasionally, it was not possible to perform follow-up that would have allowed therapeutic compliance to be evaluated. Nevertheless, 9.4% of repeat visits to the emergency department were due to infectious conditions in general. This suggests that these patients require follow-up in the primary care setting to ensure therapeutic compliance where needed, as well as the medical checkups necessary in patients considered to require only symptomatic treatment at their initial assessment.

Conclusions

In summary, this study offers a good profile of the number of patients visiting for infections in a hospital pediatric emergency department, and provides data for monitoring quality indicators.

The common cold is still the main reason for visiting our pediatric emergency department, and URTIs as a whole account for 40% of all visits, representing overuse of the hospital emergency department for cases of minor complaints that could be seen in primary care. In general, there is good compliance with published recommendations in the use of antibiotics, both in terms of appropriateness of prescription, and the antibiotic selected empirically

(although the prescription of antibiotics in cases of AOM needs to be adjusted according to the child's age). Prescription compliance and clinical course should be monitored to complete the study on the use of antibiotics. The existence of clinical protocols for antibiotic use in hospital pediatric emergency departments and the implementation of mechanisms and care quality indicators are essential to improve antibiotic prescription and related healthcare costs.

Conflict of Interest

The authors declare that they have no conflict of interests.

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