

Original Research

Drugs in upper respiratory tract infections in paediatric patients in North Trinidad

Kameel MUNGRUE, Tessa BROWN, Ivory HAYES, Savatri RAMROOP, Portio THURSTON, Lexley PINTO PEREIRA.

Received (first version): 13-Oct-2008

Accepted: 7-Jan-2009

ABSTRACT*

Objective: We explored the prescribing patterns of physicians in North Trinidad in treating upper respiratory tract infections (URTI) in paediatric patients and the appropriateness of drugs prescribed.

Methods: A retrospective observational study was conducted, with a sample size of 523 paediatric patients, diagnosed with an URTI during the period of June 2003 to 22 June 2005. The study was conducted at five Primary Health Care Facilities in North Trinidad.

Results: The three most frequent URTIs diagnosed were non-specific URTI, common cold, and acute tonsillitis in rank order. Four patterns of prescribing were identified, (1) no drug therapy [1.9%]; (2) antibiotic therapy alone [6.1%]; (3) antibiotic and symptomatic therapy [53.0%]; and (4) symptomatic therapy alone [39.0%]. The most frequently prescribed antibiotics were penicillins (amoxicillin [46.3%] and amoxicillin/clavulanate [5.3%]) and a macrolide (erythromycin [6.1%]). The three symptomatic agents most frequently prescribed were paracetamol [40.1%]; diphenhydramine [29.1%]; and normal saline nasal drops [14.2%]. In 112 cases with swab analyses done, of these, 98.2% revealed a growth of commensals only, while 1.8% grew pathogenic micro-organisms. Of the cases showing commensal growth only, 84.6% were treated with an antibiotic, 14.5% were treated with symptomatic agents alone and 0.9% received no drug therapy at all.

Conclusions: A large proportion of paediatric patients diagnosed with an URTI in North Trinidad was prescribed antibiotics although not indicated. The inappropriate use of antibiotics can potentiate the worldwide trend of antimicrobial resistance.

Keywords: Drug Utilization. Anti-Bacterial Agents. Trinidad and Tobago.

MEDICAMENTOS EN INFECCIONES DEL TRACTO RESPIRATORIO ALTO EN PACIENTES PEDIÁTRICOS EN NORTH TRINIDAD

RESUMEN

Objetivo: Exploramos los patrones de prescripción de los médicos en Trinidad Norte para el tratamiento de infecciones del tracto superior respiratorio (URTI) en pacientes pediátricos y la adecuación de los medicamentos prescritos.

Métodos: Se realizó un estudio observacional retrospectivo, con un tamaño de muestra de 523 pacientes pediátricos diagnosticados con una URTI entre junio 2003 y 22 junio de 2005. Este estudio fue realizado en 5 centros de atención primaria en Trinidad Norte.

Resultados: Las 3 URTI más frecuentemente diagnosticadas fueron, por orden, URTI no específicas, resfriado común, y amigdalitis aguda. Se identificaron 4 patrones de prescripción, (1) sin tratamiento farmacológico [1,9%]; (2) tratamiento antibiótico solo [6,1%]; (3) tratamiento antibiótico y sintomático [53,0%]; y (4) tratamiento sintomático solo [39,0%]. Los antibióticos más frecuentemente prescritos fueron penicilinas (amoxicilina [46,3%] y amoxicilina/clavulánico [5,3%]) y macrólido (eritromicina [6,1%]). Los 3 agentes sintomáticos más frecuentemente prescritos fueron paracetamol [40,1%]; difenhidramina [29,1%]; y gotas de suero salino normal [14,2%]. En 112 casos con análisis de torundas, de los que el 98,2% reveló crecimiento de comensales, mientras que en el 1,8% crecieron microorganismos patógenos. De los casos que mostraron crecimiento de comensales sólo, se trataron con antibiótico el 84,6%, con agentes sintomáticos solos el 14,5% y el 0,9% no recibió tratamiento alguno.

Conclusiones: A una gran proporción de pacientes pediátricos diagnosticados con una URTI en Trinidad Norte se le prescribió antibióticos aunque no estaban indicados. El uso inadecuado de antibióticos puede potenciar la tendencia mundial hacia las resistencias antimicrobianas.

Palabras clave: Utilización de medicamentos. Agentes antibacterianos. Trinidad y Tobago.

* Kameel MUNGRUE. MBBS MPH FRIPH MBA. Faculty of Medical Sciences, University of the West Indies. St Augustine (Trinidad).

Tessa BROWN. BSc. Faculty of Medical Sciences, University of the West Indies. St Augustine (Trinidad).

Ivory HAYES. BSc. Faculty of Medical Sciences, University of the West Indies. St Augustine (Trinidad).

Savatri RAMROOP. BSc. Faculty of Medical Sciences, University of the West Indies. St Augustine (Trinidad).

Portio THURSTON. BSc. Faculty of Medical Sciences, University of the West Indies. St Augustine (Trinidad).

Lexley PINTO PEREIRA. PhD. Faculty of Medical Sciences, University of the West Indies. St Augustine (Trinidad).

INTRODUCTION

An upper respiratory tract infection (URTI) is a non-specific term used to describe acute infections

involving the para-nasal sinuses, middle ear, pharynx, epiglottis and larynx.^{1,2} Upper respiratory tract infections are among the leading cause of acute morbidity and the most frequent cause of health service access worldwide.^{4,5} According to estimates from the United States National Ambulatory Medical Care Survey, acute URTIs were the fifth most common reason for seeking care and accounted for 17 million physician visits in 1991.⁵ In addition 30-50% medical consultations and 20-40% were in children.⁷

Consequently respiratory tract infections are the second most common indication for antibiotic prescriptions in primary care accounting for 10% of all prescriptions annually in ambulatory practice.⁸ Data from the National Centre for Health Statistics in the United States indicate that in recent years, approximately 75% of all outpatient prescriptions for antimicrobial medications have been issued primarily for five conditions: otitis media, sinusitis, bronchitis, pharyngitis or non-specific URTIs.⁹

The majority of URTIs are of viral origin, due to rhinovirus, parainfluenza virus, coronavirus, adenovirus, Coxsackie virus, and influenza virus.¹ However, pharyngitis and the common cold have the greatest probability of being of viral origin.^{10,11} Only 10% of URTIs has been attributable to bacterial aetiology⁹, with the three most common organisms being *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis*.¹² The development of antimicrobial resistance has occurred predominantly among *Streptococcus pneumoniae*, *Haemophilus influenzae*, and *Moraxella catarrhalis* in paediatric patients.¹³

Trinidad and Tobago has a two tier system of health care namely public health care and private health care. The former is free of cost to the client at all levels and for all services. While all pharmaceutical agents are free they are limited in range and the majority are generic brands. This service is managed by the Ministry of Health and funded by the state. Private health care is based upon fee for service, is costly and affordable mainly by high income earners.

Prescribing an antibiotic for URTIs is a common practice in the medical profession.^{8,9,12} Watson et al reported that visits for any upper respiratory tract complaint resulted in an antibiotic being prescribed in 65% of the consultations¹⁴, particularly for pharyngitis where antimicrobial therapy should not be prescribed in the absence of diagnosed group A streptococcal or other bacterial infection.¹⁵

Mohan et al in 2004 reported that the five most frequent URTIs presenting in children in Trinidad are the common cold, pharyngitis, tonsillitis, sinusitis and acute otitis media in rank order.³ Further only 12% of physicians would request laboratory tests before prescribing antimicrobials; 87.5% of physicians considered them unnecessary; 30% felt that a clinical diagnosis was sufficient; and 51.3% said the long waiting periods for results rendered laboratory impractical.³

The frequent and unnecessary use of broad-spectrum antimicrobial together with the use of second-generation macrolides has been demonstrated unequivocally to lead to antimicrobial resistance.¹⁶⁻¹⁸ The majority of antibiotic prescriptions are for respiratory infections and occur in primary care.^{19,20} Children are the principal recipients of a disproportionate quantum of these prescriptions.

This study examined the prescribing patterns for URTIs in paediatric patients 97 attending primary care clinics in north Trinidad, and the appropriateness of prescribed 98 agents. We also determined the proportion of paediatric patients who actually had a 99 bacterial URTI based on culture and sensitivity tests.

METHODS

This was a retrospective observational study of paediatric patients with a physician diagnosis of an URTI during the period June 2003 to June 2005. Five public health facilities were randomly selected for this study, four of which had independent routine swab analysis performed by the National Surveillance Unit. A paediatric patient was a subject 12 years or below and an antibiotic was defined as a substance with bactericidal or bacteriostatic effects. The term is often extended however to include synthetic antibacterial agents, not produced by microbes²⁴, such as sulfonamides and quinolones, which was adopted in this study. The diagnoses of URTIs for the purposes of this study are: the common cold, acute pharyngitis, acute tonsillitis, sinusitis, acute otitis media, viral URTI, influenza and non-specific URTI. Exclusion criteria were (1) age equal or lower 13, (2) subjects immunocompromised, malnourished or infected by laboratory confirmed resistant strains of pathogens and chronic respiratory tract diseases and (3) a subject without a definite diagnosis of URTI. Data were analysed using Minitab version 14.²⁵ Data from throat swabs performed under the National Surveillance Programme conducted at four (4) of the health facilities studied were collected and used for analysis. Swabs were taken from children presenting with complaints of an upper respiratory tract infection and were obtained on the same day as the physician's visit and were independent of physician consultation. These swabs were transported in commercially available transport media to the Microbiology department of the Port of Spain General Hospital where they were initially plated on blood agar containing antibiotic strips to detect sensitivity.

RESULTS

Five hundred and twenty three [523] children met the inclusion criteria and included. 285 [54.5%] boys and 238 [45.5%] girls. The mean ages for males and females were 1.7 [SD=1.98] and 1.8 [SD=2] years respectively, however 96.2% of cases were between 0-7 years. The most common condition diagnosed was non-specific URTI [285, 54.5%] followed by the common cold [171, 32.7%]. Acute

tonsillitis, acute otitis media and acute pharyngitis together accounted for only 8.4% of all children studied and no child had a diagnosis of sinusitis. Looking at the distribution of cases by age non-specific URTI was the most common diagnosis in patients 0-2 years [225/392, 57.4%] and 3-4 years [42/84, 50%]. In children less than 4 years the common cold [21/47, 44.7%] was most frequent. The common cold and non-specific URTI were also the only two diagnoses made in children over 9 years of age. Disease occurrence and gender were not associated except for otitis media in which 11(79%) of the 14 cases occurred in boys. Four patterns of prescribing were observed, (1) no drug therapy [10, 1.9%], (2) antibiotic therapy alone [32, 6.1%], (3) antibiotic therapy and symptomatic therapy [277, 53.0%] and (4) only symptomatic therapy [204, 39.0%]. A total of 309 [59.1%] patients received a single antibiotic; two or more antibiotics used in combination were never prescribed. Of patients diagnosed with the common cold 51.5% received an antibiotic and 58.2% of those diagnosed with a non-specific URTI received an antibiotic. Many patients (82.1%) with other diagnoses (acute tonsillitis, acute otitis media, viral URTI, influenza, and acute pharyngitis) also received an antibiotic. The most frequent antibiotics prescribed were amoxicillin [242, 78.3%], erythromycin [32, 10.4%] and amoxicillin/clavulanate [28, 9.1%]. The remaining 7 patients received different agents such as cefaclor, cefuroxime and co-trimoxazole. Irrespective of the diagnosis amoxicillin was the antibiotic of choice even among the 14 patients diagnosed with viral URTI, 4[28.6%]. In just over a third (204, 39%) of patients symptomatic therapy was recommended, one agent in 95, two in 101 and 3 in 8 patients. Both an antibiotic and symptomatic therapy were prescribed for 277 patients. Reported, 78.2% were treated with antibiotics and symptomatic agents and 6.4% were treated with an antibiotic alone. The five symptomatic agents most frequently prescribed were paracetamol [40, 1%]; diphenhydramine [29, 1%]; normal saline nose drops [14.2%]; chlorpheniramine [7.3%]; and histatussin [3.1%]. There was a significant association between antibiotic prescribing and therapy for relief of symptoms [$p=0.021$] so that antibiotic prescription was likely to be given with a prescription for symptom relief. In 112 of the 523 cases studied throat swabs were analysed for culture and sensitivity. In 110 [98.2%] participants growth of commensals only was reported, and only two subjects had pathogenic organisms; one with *Streptococcus pyogenes* and the other with *Staphylococcus aureus*. In children harbouring commensals, 52.7% were diagnosed with a non-specific URTI, and 34.8% had the common cold. In the one patient in whom *Staphylococcus aureus* was isolated, a diagnosis of the common cold was made, the patient received amoxicillin/clavulanate and the sensitivity report indicated resistance to ampicillin. In the patient with *Streptococcus pyogenes*, the child had non-specific URTI, received amoxicillin, and the sensitivity report indicated resistance to amoxicillin.

In the 110 participants in whom commensal growth was reported, 78.2% were treated with antibiotics and symptomatic agents and 6.4% were 168 treated with an antibiotic alone.

DISCUSSION

The three most frequent URTI's diagnosed in children were non-specific URTI, common cold and acute tonsillitis. The diagnosis of non-specific URTI's may reflect difficulty by physicians in our setting to precisely identify the diagnosis and aetiology. The recognition by physicians that bacterial URTI's are infrequent is in part due to the lack of local evidence that emphasises this feature of URTI's which in turn facilitates the misconceptions regarding antibiotics and URTI's. There were no gender differences in the occurrence of URTI except for acute otitis media in which there were more boys [78.5%] than girls [21.5%]. We find this difficult to explain as did Pukandor et al who reported similar findings.²⁶

Four patterns of prescribing prevail in community health care in Trinidad: (1) no drug therapy [1.9%] (2) antibiotic therapy alone [6.1%] (3) antibiotic and symptomatic therapy [53.0%] and (4) only symptomatic therapy [39.0%].

A large percentage [59.1%] of patients was prescribed antibiotics for URTIs contrary to evidence based practice.^{1,13} The factors contributing to this prevailing pattern of prescribing in our setting is a complex process involving both patient and physician factors. Public misconceptions on the effectiveness of, and indications for, antibiotics exist. Patients presenting with an acute febrile illness often believe that infection is the problem and antibiotics is the answer. Thus patient expectations significantly influence prescribing even if the physician judges that antibiotics are not indicated. Lack of continuing medical education among primary care physicians not presently a legal requirement for continuing to practice may also contribute, as more primary care physicians are more likely to initially see these patients than paediatricians.²⁷

Amoxicillin was the most frequently prescribed antibiotic a finding similarly reported by Britt et al.²⁸ However, in our setting, the choice of this antibiotic may be influenced by the ease of availability at public health pharmacies where antimicrobials are often available without prescription.²⁹

In addition, 51% of patients with the common cold received an antibiotic contrary to evidence based guidelines. Even with a mucopurulent rhinitis (thick, opaque, or discoloured nasal discharge) which frequently accompanies the common cold antimicrobial treatment is not indicated unless it persists without improvement for 10 to 14 days.³⁰ More than 50% of patients with a non-specific URTI received an antibiotic which is not recommended as it does not enhance illness resolution or alter the rates of complications.⁷

A large percentage (82.1%) of patients with other URTIs (acute tonsillitis, acute otitis media, viral

URTI, influenza, and acute pharyngitis) also received an antibiotic. Almost all patients (23/24) with a diagnosis of acute tonsillitis were prescribed antibiotics. Thus is not unusual as physicians are more concerned with the prevention of rheumatic fever especially as laboratory support is inadequate and treatment of Group A streptococcal infection with antimicrobial therapy should be initiated within 9 days of onset to be effective in the prevention acute rheumatic fever.^{31,32}

All patients diagnosed with acute otitis media were treated with antibiotics. While antimicrobials are indicated for treatment of acute otitis media, diagnosis requires documented middle ear effusion and symptoms and signs of acute local or systemic illness.³³ The pressures of large volume clinics and the difficulty to follow up patients may strongly influence physicians to use antimicrobials. Eight of the 14 patients diagnosed with acute otitis media received amoxicillin. Any decision to treat children with acute otitis media with an antibacterial agent, requires that amoxicillin be prescribed because of its safety, low cost, acceptable taste, and narrow microbiologic spectrum.^{34,35} Treating influenza without established secondary bacterial infection with antibiotics has not proven beneficial^{36,37} yet eight of the nine patients diagnosed with influenza received antibiotics. Only 2 [1.8%] of the 112

children who had swab analyses showed growth of bacterial pathogens supporting the evidence that most URIs are of viral origin.

The main limitation of the study was the use of nurses at the health facility to take the throat swabs although the technique was explained to them we had no way of validating the procedures. Future studies to evaluate the resistance patterns of organisms commonly implicated in URIs in Trinidad and Tobago are recommended.

CONCLUSIONS

In conclusion we provide evidence justifying the need to modify the current approach to the management of URTI in the paediatric setting in Trinidad. Mainly as a result of the large proportion of paediatric patients diagnosed with an URTI who were treated with an antibiotic. Although this study was conducted in a small developing country, there are global implications as inappropriate use of antibiotics can potentiate the worldwide trend of antimicrobial resistance.

CONFLICT OF INTEREST

None declared.

References

1. Mossad SB. Upper respiratory tract infections. Cleveland Clinic. Department of Infectious Disease. Available at: www.clevelandclinicmeded.com/medicalpubs/diseasemanagement/infectiousdisease/urti/urti1.htm (accessed December 6, 2008).
2. Walker R, Edwards C. *Clinical Pharmacy and Therapeutics* 3rd ed. New York: Churchill Livingstone; 2003.
3. Mohan S, Dharamraj K, Dindial R, Mathur D, Parmasad V, Ramdhanie J, Matthew J, Pinto Pereira LM. Physician behaviour for antimicrobial prescribing for pediatric upper respiratory tract infections: a survey in general practice in Trinidad, West Indies. *Ann Clin Microbiol Antimicrob*. 2004;3:11.
4. Hueston WJ, Mainous AG, Ornstein S, Pan Q, Jenkins R. Antibiotics for upper respiratory tract infections. Follow up utilization and antibiotic use. *Arch Fam Med*. 1999;8(5):426-430.
5. Schappert SM. National ambulatory medical care survey, 1991 summary. Hyattsville, Md: National Centre for Health Statistics. *Vital health statistics* 13, 1994; (116).
6. Benson V, Marano MA. Current estimates from the National Health Interview Survey, 1992.. *Vital Health Stat* 10. 1994;(189):1-269.
7. Ressel G; Centers for Disease Control and Prevention, American College of Physicians, American Society of Internal Medicine, American Academy of Family Physicians, Infectious Diseases Society of America. Principles of Appropriate Antibiotic Use: Part II. Nonspecific Upper Respiratory Tract Infections. *Am Fam Physician*. 2001;64(3):510.
8. Mc Caig LF, Hughes JM. Trends in antimicrobial drug prescribing among office-based physicians in the United States. *JAMA*. 1995;273(3):214-219.
9. Fahey T, Stocks N, Thomas T. Systematic review of the treatment of upper respiratory tract infection. *Arch Dis Child*. 1998;79(3):225-230.
10. The Merck manual of diagnosis and therapy. Section 7 -ear, nose, and throat disorders and chapter 87- pharyngitis. Available at URL: <http://www.merck.com> (accessed June 6, 2005).
11. Clark M, Kurnar P, Ballinger A, Patchett S. *Saunders' pocket essentials of Clinical medicine* 3rd ed. London: Elsevier; 2004.
12. Dowell SF, Marcy SM, Phillips WR, Gerber MA, Schwartz B. Principles of Judicious Use of Antimicrobial Agents for Pediatric Upper Respiratory Tract Infections. *Pediatrics* 1998;101 (1):163-165.
13. Jacobs MR, Dagan R. Antimicrobial resistance among pediatric respiratory tract infections: Clinical challenges. *Semin Pediatr Infect Dis*. 2004;15(1):5-20.
14. Watson RL, Dowell SF, Jayaraman M, Keyserling H, Kolczak M., Schwartz B. Antimicrobial use for pediatric upper respiratory infections: Reported practice, actual practice, and parent beliefs. *Pediatrics*. 1999;104(6):1251-7.
15. Schwartz B, Marcy SM, Phillips WR, Gerber MA, Dowell SF. Pharyngitis- Principles of judicious use of antimicrobial agents. *Pediatrics*. 1998;101(1):171-174.
16. Kollef MH, Leeper K. Prevention of infections due to antibiotic-Resistant bacteria. Available at URL: <http://www.medscape.com/viewprogram/4044pnt> (accessed June 2, 2005).

17. Hellinger WC. Confronting the problem of increasing antibiotic resistance. *South Med J.* 2000;93(9):842-8.
18. Stille CJ, Andrade SE, Huang SS, Nordin J, Raebel MA, Go AS, Chan KA, Finkelstein JA. Increased use of second generation macrolide antibiotics for children in nine health plans in the United States. *Pediatrics* 2004;114(5):1206-1211.
19. Ipp M. Reduced antibiotic use in a paediatric practice: Practical office strategies based on current evidence. Available at URL: <http://www.utoronto.ca/kids/aboveruse.htm> (accessed on June 6, 2005).
20. Nash DR, Harman J, Wald ER, Kelleher KJ. Antibiotic prescribing by primary care physicians for children with upper respiratory tract infections. *Arch Pediatr Adolesc Med.* 2002;156(11):1114-1119.
21. Goossens H, Ferech M, Vander Stichele R, Elseviers M; ESAC Project Group. Outpatient antibiotic use in Europe and association with resistance: a cross-national database study. *Lancet.* 2005;365(9459):579-587.
22. Hardman JG, Limbard LE, Molinoff PB, Ruddon RW, Goodman Gilman A. *The pharmacological basis of therapeutics.* 9th Ed. New York: McGraw Hill; 1996.
23. *Dorland's illustrated medical dictionary*, 29th ed. London: Saunders; 2000.
24. *Mosby's medical nursing and allied health dictionary.* 6th ed. St.Louis: Mosby; 2002.
25. Minitab Release 14. State College; Pennsylvania: Minitab Inc, 2004.
26. Pukander J, Karma P, Sipila M. Occurrence and recurrence of acute otitis media among children. *Acta Otolaryngol.* 1982;94(5-6):479-486.
27. Schwartz RH, Freij BJ, Ziai M, Sheridan MJ. Antimicrobial prescribing for acute purulent rhinitis in children: a survey of paediatricians and family practitioners. *Pediatr Infect Dis J.* 1997;16(2):185-190.
28. Parimi N, Pinto Pereira LM, Prabakar P. The general public's perception and use of antimicrobials in Trinidad and Tobago. *Rev Panam Salud Publica.* 2002;12(1):11-18.
29. Britt H, Sayer GP, Miller GC et al. BEACH Bettering the Evaluation and Care of Health. A Study of General Practice Activity. Six-month Interim Report. AIHW cat. No. GEP 1. Canberra: Australian Institute of Health and Welfare (General Practice Series no. 1).
30. Rosenstein N, Phillips WR, Gerber MA, Marcy MS, Schwartz B, Dowell SF. The Common Cold -Principles of Judicious Use of Antimicrobial agents. *Pediatrics* 1998;101(1):181-184.
31. Rammelkamp CH Jr. Rheumatic heart disease -a challenge. *Circulation.* 1958;17(5):842-851.
32. Putto A. Febrile exudative tonsillitis: viral or streptococcal? *Pediatrics.* 1987;80(1):6-12.
33. Schwartz B, Marcy M, Phillips WR, Gerber MA, Dowell SF. Otitis Media -Principles of Judicious Use of Antimicrobial Agents. *Pediatrics* 1998;101(1):165-171.
34. American Academy of Family Physicians (AAFP) and American Academy of Pediatrics (AAP). Diagnosis and Management of Acute Otitis Media Available at URL: <http://www.aafp.org/x26481.xml>. (accessed April 12, 2006).
35. Piglansky L, Leibovitz E, Raiz S, Greenberg D, Press J, Leiberman A, Dagan R. Bacteriologic and clinical efficacy of high dose amoxicillin for therapy of acute otitis media in children. *Pediatr Infect Dis J.* 2003;22(5):405-413.
36. Chidiac C, Maulin L. [Using antibiotics in case of influenza]. *Med Mal Infect.* 2006;36(4):181-189.
37. Townsend EH Jr, Radebaugh JF.. Prevention of Complications of Respiratory Illness in Paediatric Practice: A Double-Blinded Study. *N Engl J Med.* 1962;266:683-689.