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Antibacterial therapy in outpatient treatment of respiratory tract infections in children

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Article received: 22.02.2014. **Accepted for publication:** 14.05.2014.

The study was aimed at *analyzing prescriptions of antibacterial drugs for outpatient treatment of respiratory tract infections in children.* ***Patients and methods.*** *The study involved patients with acute respiratory tract infections: 158 children were undergoing outpatient treatment, whereas 30 children were being treated at the polyclinic day hospital. The children aged from 3 months to 15 years. Acute rhinopharyngitis, acute laryngitis, acute bronchitis, tonsillitis and pneumonia were registered in 66.5, 2.6, 18.1, 11.7 and 1.1% of cases. We appraised indications for antibacterial therapy, prescription terms, therapy duration and choice of an antibacterial drug.* ***Results.*** *Antibacterial therapy prescription was found unreasonable in 44.0% of acute rhinopharyngitis cases, 41.1% of acute bronchitis cases and 60.0% of acute laryngitis cases. In the first day of diagnosis establishment, antibiotics were prescribed in 63.8 and 100% of cases at pediatric divisions and day hospitals, respectively. The unreasonable antibiotic prescription rate in infants was 66.7% - significantly higher than in 1-7-year-old children ($p < 0.05$). The most frequently (66.4%) prescribed class of antibacterial drugs at pediatric divisions was penicillins (amoxicillin, amoxicillin clavulanate); at day hospitals, they were prescribed in 23.3% of cases ($p < 0.01$). Use of cephalosporin antibiotics as the initial therapy was significantly higher at day hospitals than at pediatric divisions ($P < 0.01$); the drug was administered parenterally in 90% of cases. Antibiotic prescription courses did not exceed 5 days in most cases (60.1%).* ***Conclusions.*** *We revealed high rate of unreasonable antibiotic use for outpatient treatment of acute rhinopharyngitis, laryngitis and acute bronchitis, especially at day hospitals and in infants.*
Keywords: *acute respiratory tract infections, treatment, antibacterial drugs, outpatient treatment, day hospital, children.*

RELEVANCE

More than 90% of respiratory diseases developed by children are acute infections [1]. Despite practical recommendations on the use of antibacterial drugs for outpatient treatment of children [2], these drugs are often prescribed unreasonably, which is why issue of rational use thereof for treating respiratory tract infections remains relevant. As long as up to 70% of acute respiratory tract infections are of viral nature, they do not require antibacterial therapy. This applies to most upper respiratory tract infections and acute bronchites. Prescription of antibiotics for respiratory viral infections does not reduce term of treatment and amount of complications, whereas unreasonable prescription increases the risk of side effects, disturbs biocoenosis and contributes to development of drug resistance [1].

The study was aimed at analyzing prescriptions of antibacterial drugs for outpatient treatment of respiratory tract infections in children.

PATIENTS AND METHODS

In order to conduct the study, we selected 380 outpatient medical records (form No. 112u) in equal proportion from all pediatric divisions of two pediatric outpatient clinics of the children, who underwent treatment of acute respiratory tract infections in the short period of 2012. We simultaneously analyzed 32 case records of the children treated at the day hospital of pediatric outpatient clinic No. 3. The prevalent diagnoses in these children were acute rhinopharyngitis (59.7%) and acute bronchitis (33.7%). We revealed 158 cases of acute respiratory infections in children aged from 3 months to 15 years, the treatment whereof at a pediatric division involved antibacterial drugs (antibiotic prescription rates at different outpatient clinics – 35.0 and 48.8%, respectively; 41.5% on the average), and 30 cases of antibiotic prescription to children with respiratory tract infections at day hospitals (prescription rate - 93.7%). We analyzed completed cases of the respiratory infection treatment involving use of antibiotics and appraised the following parameters:

- age of patients;
- nosological form and severity of disease;
- indications for antibacterial therapy, prescription terms and therapy duration;
- disease outcome.

The children were distributed by age as follows:

- infants – 15 (7.9%);
- 1-3-year-old children – 52 (25.9%);
- 3-7-year-old children – 71 (37.8%);
- schoolchildren – 50 (26.8%).

According to medical documents, upper or lower respiratory tract inflammatory process symptoms were observed in all the children. Condition of these children was considered satisfactory or moderate and neither child was recommended hospitalization to a day-and-night inpatient hospital at this stage of prescription of initial antibacterial therapy. The following clinical diagnoses were registered: acute pharyngitis or rhinopharyngitis – 125 (66.5%) children; acute laryngitis – 5 (2.6%) children; acute bronchitis – 34 (18.1%) children; tonsillitis or pharyngotonsillitis – 22 (11.7%) children. Pneumonia was established and radiologically confirmed in 2 (1.1%) children. Diagnosis was established by a pediatrician on the basis of clinical examination data in most cases (91.4%); only 16 (8.3%) of the children were examined by an otolaryngologist due to complicated course of acute respiratory infection. The course of acute rhinopharyngitis was complicated by purulent sinusitis, adenoiditis or acute otitis media manifestations in 45 out of 125 (36.0%) children; that could indicate overlay of a bacterial infection. The course of acute bronchitis was accompanied by bronchial obstruction manifestations in four children. Along with antibacterial therapy, the children underwent anti-inflammatory, mucolytic and symptomatic therapy. We used a non-parametric test - Fisher's angular transformation (E.V. Gubler, 1978) – for appraising significance of statistical parameters.

RESULTS

The first stage of analysis consisted in antibiotic prescription reasonability. We revealed the most widespread mistake of outpatient practice – prescription of antibacterial drugs for acute respiratory viral infections, although antibiotics are not indicated in the event of non-complicated disease course and absence of data on overlay of bacterial infection [1-5]. According to the current recommendations on antibiotic use for outpatient treatment of children [2, 4-7], indications for antibiotic prescription are bacterial focus or suspicion thereof. Theoretically, most doctors realize inexpediency of antibacterial therapy at this pathology; however, knowledge of methodological recommendations does not determine practical adherence of pediatricians to rational management of children with acute respiratory infections. We considered a distinct

bacterial focus (pneumonia, descending laryngotracheitis, tonsillitis with established streptococcal etiology) or suspicion thereof reasonable antibacterial therapy prescription [1-3].

At pediatric divisions, antibiotics were prescribed in the first day of diagnosis establishment in 63.8% of the cases, in the 2^{nd}-3^{rd} day – in 22.8% of the cases, ≥ 3days of observation – in 13.3% of the cases. Children were usually admitted to the day hospital in the 5^{th}-7^{th} day of disease or later; antibacterial therapy was prescribed to all children at admission. It ought to be mentioned that antibiotics were prescribed on time in the event of pneumonia diagnosis, i.e. in the first ambulation day. Acute tonsillitis diagnosis was established in 22 children over 6 years of age on the basis of clinical symptoms only (high fever, severe sore throat, tonsillar hyperemia with purulent accretions, hypertrophy and painfulness of submandibular and mesiobuccal lymph nodes, absence of catarrhal symptoms). Antibacterial drug were prescribed empirically in 100% of the cases (without prior bacteriological examination). Streptococcal express test was infeasible. Bacteriological analysis of tonsillar mucus revealed beta-hemolytic group A streptococcus in 24.5% of the children. Having completed the main antibacterial therapy course, 10 children with acute tonsillitis diagnosis (45.5%) received a singular benzathine benzylpenicillin injection, although risk factors of streptococcal infection recurrence development were not appraised (tb. 1).

In a range of cases doctoral notes in the outpatient medical records and case records kept at day hospitals did not provide absolute confidence in determining antibacterial therapy prescription reasonability. According to our analysis, reasonable antibiotic prescription conditions at bronchitis were primarily lingering course of disease (11 patients), continuous pyretic fever (5 patients), adverse background (2 patients) or recurrent course of respiratory infection (2 patients). Apart from complicated course of acute rhinopharyngitis (otitis, sinusitis, adenoiditis), which requires antibacterial therapy prescription, we distinguished a group of small children, wherein disease onset was accompanied by lingering or recurrent fever (this fact aroused suspicion of bacterial process), whereas nasopharyngeal affection symptoms (catarrhal syndrome) appeared later. Lack of complete outpatient examination of children forced district doctors to adhere to the standard diagnosis – acute rhinopharyngitis.

We believe that it is feasible to considerably decrease prescription of antibacterial drugs to children with acute respiratory infections by registering indications for antibiotic prescription in outpatient medical records. Antibiotic prescription is often associated with a child's small age or pressing parental request. We revealed that parents of 10.1% of the patients treated their children with antibiotics prior to doctoral examination and without securing doctoral approval.

The unreasonable antibiotic prescription rate in infants was significantly higher than in 1-7-year-old children ($p < 0.05$; tb. 2). Antibacterial therapy inexpediency in schoolchildren was often associated with parental prescription of drugs without securing doctoral approval.

Outpatient choice of one or another antibiotic is usually empirical and must consider age, form and severity of disease (and, therefore, of the alleged causative agent). In most cases, antibiotics were prescribed to children as monotherapy.

Out of aminopenicillins constituting 2/3 of all antibiotic prescriptions, in 50.9% of the cases doctors at pediatric divisions (especially otolaryngologists [83.3% of the cases]) chose combinations of aminopenicillins with clavulanic acid in the event of complicated course of acute rhinopharyngitis (purulent sinusitis, otitis, adenoiditis). Correlation of choice of inhibitor-protected penicillins and recurrent course of respiratory infection or prior antibiotic prescription was revealed only in 27.8% of all the prescriptions made by district doctors. In other cases reasonability of such a choice was not feasible to determine, especially for treatment of acute tonsillitis. Macrolides were primarily (97.9%) represented by azithromycin due to the feasibility of conducting shorter therapy courses as indication of burdened allergic anamnesis was observed in 8 (17.0%) children only. Cephalosporins were prescribed in 4 (2.5%) cases only; however, they were prescribed parenterally in three children (cefazolin, ceftriaxone). This form of antibiotic administration is currently considered unreasonable for outpatient practice (tb. 3).

Use of aminopenicillins at day hospitals was significantly lower ($p < 0.01$) than at pediatric divisions due to higher prescription rates of macrolides and cephalosporin antibiotics. At the same time, preference of cephalosporins was usually associated with parenteral mode of administration (90% of the cases) as the initial therapy in children with acute bronchitis diagnosis. Cephalosporins of both the first (cefazolin) and the third (cefotaxime, ceftriaxone) generations were used. Along with that, 6 children underwent two or more antibiotic courses despite the lack of clear indications. Macrolides and inhibitor-protected aminopenicillins were used as the second antibiotic.

We did not observe prescription of such antibiotics as aminoglycosides, tetracyclines, lincosamides and co-trimoxazole, as well as the 2nd generation cephalosporins.

We ought to mention the following antibiotic dosage regimen defect – nonobservance of drug dosage frequency in 15 (7.9%) children, primarily regarding amoxicillin clavulanate (BID instead of TID); that resulted in daily antibiotic dose decrease. On the other hand, course antibiotic dose increase was associated with 5- or 7-day-long azithromycin prescription to 7 children without correcting the daily dose from the 2nd day of treatment.

Antibacterial therapy was 3-day-long in 28.2% of the cases; such duration was observed in the event of azithromycin prescription; this correlates with the recommended drug's course dose. Such antibiotics as penicillins and cephalosporins were prescribed in courses of not more than 5 days in most (60.1%) cases. Antibiotic therapy of up to 7 days was observed in 34 (25.2%) children, of up to 10 days – in 18 (14.0%) children. 10-day-long aminopenicillin treatment course was not observed in most cases of treating children with acute tonsillites as well. In that case, actual treatment extended only until clinical recovery; that does not ensure streptococcal eradication. Along with that, doctors determined antibiotic therapy duration for children at the moment of antibiotic prescription without notice of antibacterial effect in all cases; notice of antibiotic withdrawal was absent in 25.9% of the cases.

According to this analysis, no adverse reactions of children's bodies to antibiotics were registered.

CONCLUSIONS

1. The most frequent (66.5%) cause of outpatient antibiotic prescription to children is acute rhinopharyngitis, which may or may not be complicated by bacterial infection.
2. The rate of unreasonable antibiotic use in outpatient practice is 38.3%; it is especially high in the event of treatment of acute rhinopharyngitis, laryngitis and acute bronchitis. Antibiotics are unreasonably prescribed to infants in 66.7% of cases.
3. The main antibacterial drug prescribed by pediatricians to children in outpatient practice are amoxicillin, amoxicillin clavulanate and azithromycin.
4. Preference of cephalosporin antibiotics over aminopenicillins at day hospitals is associated with parenteral mode of administration.

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Table 1. Rate of unreasonable antibiotic prescription in outpatient practice depending on the nosological form of disease

Diagnosis	**Children (total)**	**Children treated with antibiotics (total)**	**Unreasonable antibiotic prescription**	
			Total	%
Pharyngitis, rhinopharyngitis (non-complicated)	201	80	55	68.7
Complicated rhinopharyngitis (otitis, sinusitis, adenoiditis)	45	45	-	-
Laryngitis	5	5	3	60
Bronchitis	137	34	14	41.2
Pneumonia	2	2	-	-
Tonsillitis, pharyngotonsillitis	22	22	-	-
Total	412	188	72	38.3

Table 2. Rate of unreasonable antibiotic use in outpatient practice depending on age of the children

Age of the children (years)	**Children (total)**	**Unreasonable antibiotic use**	
	Total	Total	%
Infants	15	10	66.7
1-3	52	19	36.5
3-7	71	20	28.2
7-15	50	23	46.0
Total	188	72	38.3

Table 3. Outpatient choice of an antibacterial drug for treating respiratory tract infections in children

Drug	**Pediatric divisions**		**Day hospitals**		**Significance**
	Total	%	Total	%	p
Penicillins	106	67.1	8	23.3	< 0.01
Macrolides	48	30.4	12	43.3	-
Cephalosporins	4	2.5	10	33.3	< 0.01
Total	158	100	30	100	-