Point-Prevalence Study Related to Antimicrobial Usage in a Children's Diseases and Surgery Training and Research Hospital: Comparison with 2008 and 2012 Data

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Abstract

Objective: We aimed to determine the patterns of antimicrobial drug usage and appropriateness of antibiotic indications ratios in patients hospitalized in a children's diseases and surgery training and research hospital.
Material and Methods: This retrospective and observational study included 130 patients who were under antimicrobial therapy in pediatric and surgical wards at Dr. Behçet Uz Children's Diseases and Surgery Training and Research Hospital on July 1, 2015. A standard form was prepared, and the demographic features such as age, gender, specifications of ward, diagnosis of infection, antimicrobial drug indications for antimicrobial selection, microbiological results, appropriateness of the dosage and dosing intervals of the antimicrobial drugs, and presence of pediatric infectious disease consultations were recorded in this form and evaluated by two pediatric infectious disease specialists simultaneously. The results were compared with the data of the previous point-prevalance studies conducted at the same hospital in 2008 and 2012.
Results: In this study, 130 (49.6%) of 262 patients had been under antimicrobial therapy. The inappropriate antimicrobial usage rate was 19.6% in pediatric wards, while it was 57.1% in surgical wards; the rate was significantly higher in surgical wards ($p<0.001$). The ratio of inappropriate antibiotic therapy was 23.2% in empirical therapy, whereas it was 76.5% in prophylaxis ($p<0.001$). In patients who had been consulted by pediatric infectious disease specialists, the provision of appropriate treatment was significantly higher ($p<0.001$).
Conclusion: Rational antimicrobial use is the most important strategy for decreasing the development of antimicrobial resistance and lowering the cost of health care. In particular, increasing the rates of consultations with an infectious disease specialist will be a factor for decreasing the inappropriate usage of antimicrobials. *(J Pediatr Inf 2016; 10: 44-8)*

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Introduction

Rational antibiotic use is the treatment in which the right antibiotic is used in the right indication, through the most appropriate route, at the most appropriate dose, at the most appropriate intervals for the appropriate length of time and in which the patient compliance is ensured (1, 2). Inappropriate use of antibiotics, on the other hand, is important, in addition to lack of success in the treatment, due to the increase in the cost of treatment, the problem of resistance development and increase in the frequency of side effects. In accordance with the budget implementation guidelines (BIG), since 2003, of the parenteral antibiotics, vancomycin, teicoplanin, imipenem, meropenem, piperacillin/tazobactam, cefepime came to be used; on the other hand, antibiotics such as ceftriaxone, cefotaxime, ceftizoxime, cefoperazone/sulbactam, ciprofloxacin, levofloxacin came to be used within the first 72 hours with the approval of a consultant and after 72 hours, with the approval of infectious diseases specialist (IDS) (3). Even though this particular practice decreases the onset of inappropriate antimicrobial by the IDS and the rate of inappropriate antimicrobial use, there is still the issue of high level of antimicrobial use in Turkey as it is the case all over the world (4, 5).

The present point prevalence study was carried out to evaluate the use of antimicrobial use and the compatibility of indication in patients hospitalized at the Dr. Behçet Uz Pediatric Diseases and Surgery Training and Research Hospital. We aimed to compare the findings obtained of the present study with those of our previous studies in 2008 and 2011.

Material and Methods

The present point prevalence study was comprised of 130 patients aged 0-18 who received antimicrobial treatment on July 1, 2015 at the Dr. Behçet Uz Pediatric Diseases and Surgery Training and Research Hospital. The study was a retrospective observational one and was carried out in line with the Helsinki Declaration. Age of the patients, their gender, the service they were hospitalized in, diagnosis of the infection, the antimicrobial drug(s) prescribed and the reasons of prescription (empirical, based on defined and prophylactic factors), microbiologic test results, whether the treatment is appropriate, antimicrobial dose range, and the appropriateness of the dose were all recorded on the standard data form and the two children were evaluated by the IDS. Whether the antimicrobials started based on empirical, prophylactic and factors were appropriate, the dose and the dose range were determined according to the Sanford Antimicrobial Treatment Guidelines (6).

Statistical analysis

For the evaluation of the data obtained, the “Statistical Package for the Social Sciences for Windows Release 18.0 Software (SPSS Inc.; Chicago, IL, USA)” statistical package program was used. The Chi-square method was used for the comparison of non-parametric data. For the statistical difference, the p value lower than 0.05 was accepted as statistically significant.

Results

130 (49.6%) of the 262 patients hospitalized at the Dr. Behçet Uz Pediatric Diseases and Surgery Training and Research Hospital were under microbial treatment. 28/41 (68.2%) of the patients in the surgery and 102/221 (46.1%) of the patients in the pediatrics service received antimicrobial treatment. It was found that the most frequently used antibiotics were respectively; cephalosporins (29.1% including the 1.generation 4.6%; 2. generation 4.6%; 3.generation 19.1%; 4. Generation 0.8%), ampicillin-sulbactam (25.3%), aminoglycosides (23.8% including gentamycin 14.6%; amikacin 9.2%), ampisillin (%18.4), glycopeptides 13.8% including vancomycin 10%; teicoplanin 3.8%), carbapenems 13% including (meropenem 10%; and ertapenem 3%), macrolides (7.6%), piperacillin-tazobactam (6.9%), ornidazole (2.3%), metronidazole (1.5%), and clindamycin (1.5%). It was also found that for the antifungal treatment, the following drugs were used; fluconazole (8.4%), kaspofungin (1,5%), amphotericin B (0.8%), and voriconazole (0.8%). For the antiviral treatment, the following drugs were used; acyclovir (2.3%), and ganciclovir (0.8%) (Figure 1).

It was seen that the antimicrobial treatment was started empirically in 95 patients (73.1%); in 18 patients (13.8%) for prophylactic purposes and based on microbiologic agents in 17 patients (13.1%).

Given the antimicrobial compatibility, it was found that the rate of antibiotic use with inappropriate indication throughout the hospital was 27.7% (36/130); the rate of treatment with inappropriate dose range 3.8% (5/130) and the rate of treatment with inappropriate antimicrobial dose 3.8% (5/130). It was found that while the use of antimicrobial use with inappropriate indication in the pediatric services was 19.6%, the rate in the surgery services was 57.1%; this difference was statistically significant ($p<0.001$). It was also found that all the 5 treatments with inappropriate dose and dose range were implemented in the pediatric services.

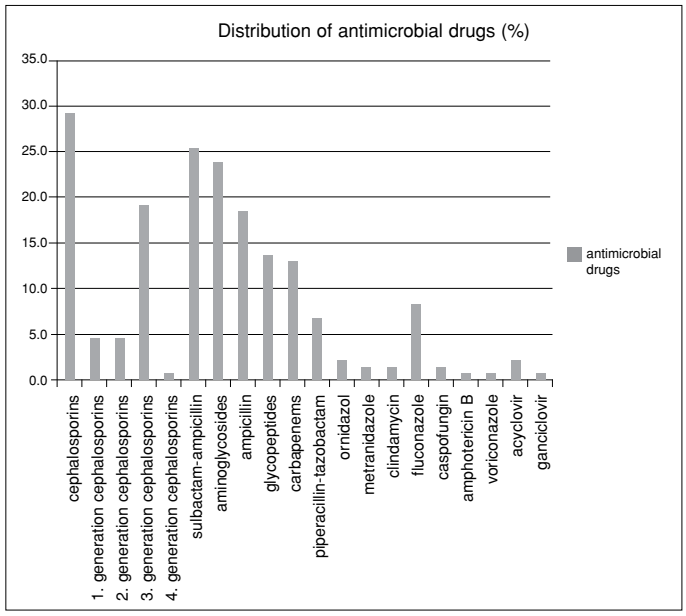

Figure 1. Distribution of antimicrobial drugs used in patients hospitalized on July 1, 2015 (%)

Antimicrobial use with inappropriate indication was 48.5% in sulbactam-ampicillin; 11.1% in piperacillin-tazobactam; in amikacin 50%; and in ceftriaxone 12.5%; in ampicillin 29.2%; in meropenem 30.8%; in vancomycin 15.4%; in teicoplanin 40%; in macrolides 44.4%; and in fluconazole 36.4%; no antiviral use without indication was detected.

The rate (77.7%) of inappropriate antimicrobial treatments for prophylactic purposes was statistically more significant in comparison to the rate (23.1%) of inappropriate antimicrobial treatments for empirical purposes (p<0.001). It was found that the rate of inappropriate antimicrobial treatments for prophylactic purposes was 80% in the pediatric services; and 75% in the surgery services (p>0.05). The rate of inappropriate antimicrobial treatments for empirical purposes was 15.5% in the pediatric services, it was found that this rate was 55.5% in the surgery services; this difference was statistically significant (p<0.001).

It was found that the rate of indication compatibility for the treatment of agents detected through microbiological techniques, on the other hand, was 100%.

When the pediatric IDS consultation rates and indication compatibility of the patients were examined, it was found 43% of the patients were asked for infection consultation; antimicrobial use with inappropriate indication was present in 5 (8.9%) of these patients and in 31 (41.9%) of the 74 patients without consultation; the rate of compatibility in patients with infection consultation was statistically high (p<0.001).

Discussion

Appropriate antimicrobial treatment is important in terms of survival, prevention of complications and chronic stages and diminishing the severity and course of the disease. For the rational antibiotic use, following the diagnosis, the appropriate antibiotics should be given through the most appropriate route, at the most appropriate dose, at the most appropriate intervals for the appropriate length of time (1). For rational antibiotic use, the presence of a microbiologically proven bacterial infection should definitely be questioned. Using antibiotics without the necessary consultation in terms of diagnosis and without the infection, the wrong choice of the antibiotic, insufficient or excessive dose of the antibiotics, inappropriate dose intervals prove that the antibiotics have been used inappropriately (2).

It was found that while the rate of antimicrobial use in our present study was 49.6%, it proved to be lower than the rates in our previous studies we carried out at our hospital in 2008 (63.2%) and 2012 (57.1%) (7, 8). We are of the opinion that the gradually decreasing rate might stem from the fact that the physicians became more informed of the rational use of antimicrobials through the trainings provided at our hospital and the patients were evaluated in line with a multi-disciplinary approach by being in touch with the IDS before the onset of antimicrobials.

Inappropriate use of antibiotics in our country was detected as 9-35% in the internal services and 39-74.2% in the surgery services (9-11). In the present study, it was found that while this rate was 19.6% in the pediatric services, it was 57.1% in the surgery services. Similar rates were obtained in our previous study as well (8). It was found that the most important reason for the inappropriate use of antimicrobials was the unnecessary and long-term prophylaxis habits of the surgery clinics. The study concluded that necessary recommendations would be made to the surgery services and frequent trainings would be provided.

When many previous studies were examined according to their purpose of antimicrobial use, it was found that the inappropriate antimicrobial use for treatment purposes was 9.1-34% and the inappropriate antimicrobial use for prophylaxis purposes was 44-85% (9-11). It was found that the rate of inappropriate antimicrobial use for prophylaxis purposes in our study (76.5%), was similar to the one found by Yılmaz (79%) et al.

It was found that the rate of inappropriate antimicrobial use in microbiologically proven infections was zero percent as it was the case in our previous studies. This

particular finding comes from the fact that especially the clinicians and microbiology experts at our hospital liaised very closely with one another and the isolation rate of the agent especially in blood circulation infections was high. One of the most important findings in our study is that the use inappropriate antimicrobial use in patients who were consulted to the pediatric diseases services was statistically significantly low ($p<0.001$). It has commonly been known in recent years that demanding consultation from the IDSs has contributed to the development of especially the antibiotics control policies (13, 14). Therefore, there is a need for future studies in which clinicians should increase consultations with the pediatric infectious diseases.

In a previous study done in Turkey involving adults, the fact that it was reported that 9.8% of the antimicrobials started without consultation were discontinued and the treatment of 57.4% was modified demonstrates the importance of infection consultation (15). Similar inappropriate rates before consultation were also reported in other parts of the world as well (16-18). These rates are quite high and emphasize the need for infectious disease consultations. Rational antibiotic use has proved to be effective in improving the health services in pediatric hospitals and in preventing the possible resistance (19, 20).

In conclusion, multidisciplinary approach is needed in order to establish the use of rational antibiotic use in hospitals and the infection control committees should prepare antibiotic use guidelines for surgical prophylaxis in line with the appropriate conditions of their own hospitals. The point prevalence studies to be carried out periodically will not only provide information about the hospital in general, but also be beneficial in term of pointing out the possible problems.

Ethics Committee Approval: Authors declared that the research was conducted according to the principles of the World Medical Association Declaration of Helsinki “Ethical Principles for Medical Research Involving Human Subjects”, (amended in October 2013).

Informed Consent: Written informed consent was not received due to the retrospective nature of this study.

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