

Point Prevalence Studies Relating to Antibiotic Usage in Dr. Doğan Baran Pediatric Hospital

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Abstract

Objective: Inappropriate antimicrobial use remains a common problem worldwide. This inappropriate use of antimicrobials unnecessarily promotes antibiotic resistance. Resistance in bacteria because of inappropriate usage of antimicrobials raises mortality and morbidity in patients. In this study, we aimed to evaluate the ratio of inappropriate usage of antimicrobials in hospitalized patients in our hospital.

Material and Methods: Data of patients were collected on a single day in 2009, 2010, and 2012. Patient's age, gender, presence of fever, microbiological test results, and blood values (WBC, CRP, etc) were evaluated by a pediatrician and microbiologist. Appropriateness of antimicrobials were evaluated by searching parameters, like right agent, right dose, right dosing interval, right duration, and right route of administration.

Results: Inappropriate antimicrobial usage ratios were 64%, 60%, and 74.28% in 2009, 2010, and 2012, respectively. The inappropriate antimicrobial usage ratio of all patients evaluated was 67%. The ratio of appropriate antibiotic usage rate was 21.9% in empirical therapy, whereas it was 100% in specified therapy given for infectious agents. These results show that usage of inappropriate antimicrobial agents is high for inpatients.

Conclusion: The frequency of antimicrobial prescription is high in hospitalized patients in Turkey. Performing educational activities, limiting applications, asking for consultation with an infectious disease specialist, preparing antimicrobial treatment guidelines, making point prevalence studies, and prescribing antimicrobial agents according to microbiological test results would be useful to decrease the inappropriate usage rate of antimicrobial drugs. (*J Pediatr Inf* 2014; 8: 18-22)

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Introduction

Antibiotics are the group of drugs that are used the most in Turkey as well as all over the world. In fact, antibiotics should not be used without an obvious reason. Rational use of antibiotics requires extensive knowledge and expertise.

When it comes to taking a decision for treatment, factors such as patients' age, pregnant state, kidney and liver functions and the site of infection should be considered. In addition to the host functions, when deciding for the antibiotic, features such as antibacterial spectrum of the drug, its interaction with the other drugs, side effects and costs should also be considered. Common and inadequate use of antibiotics

causes some undesirable consequences such as resistant microorganisms, economic burden, toxicity and ecological changes (1, 2). When choosing antibiotics especially for children, the pharmacological features of antibiotics should also be considered. The pharmacological features of the drug (bioavailability, protein binding, and the organ it was eliminated from, effective concentration on the site of infection, half-life, being a dose or concentration-dependent drug, maximal and estimated serum or infection site concentration) are most important especially in infections which are difficult to treat (3).

The aim of this study is to evaluate the inappropriate usage of antibiotics in the hospitalized pediatric patients in the Dr. Dogan Baran Maternal and Children's Hospital.

Material and Methods

A total of 85 children hospitalized in the Infant 1, Infant 2 and Infant 3 services of our hospital and receiving antibiotic treatment in 2009, 2010 and 2012 were included in our study. 25 patients in 2009, 25 in 2010 and 25 in 2012 were investigated. After recording the name, age, weight, gender information of the patients, the clinicians established initially the provisional diagnosis and then the final diagnosis if there was one. It was searched in patients' files to see if there was request for a culture test or its result and the way of the onset of antibiotics (empiric-oriented, prophylactic-oriented) was established. It was recorded down from the nurse's tracking chart whether the patents had fever. Percentages of WBC, neutrophil and lymphocyte, CRP, sedimentation value, stool and complete urine test results were analyzed from the laboratory results of the patients. The patients using antibiotics were evaluated regarding appropriate antibiotic choice, appropriate dose, and appropriate dose range, appropriate duration, based on the criteria of appropriate route of administration by a pediatrician and microbiology consultant. Choice of inappropriate antibiotic was divided into subgroups of redundant use and redundant combination and evaluated this way. Evaluation of the data was based on the Harriet Line Handbook and Nelson Textbook of Pediatrics.

Results

The ages of 85 patients included in this study for three years varied between 10 months and 11 years. 66 of the patients (77.6%) were male, 19 (22.4%) female. Provisional diagnosis and final diagnosis are; bronchopneumonia, otitis, enteritis, urinary tract infection, pyelonephritis, tonsillitis, bronchiolitis, tonsillopharyngitis. 4 patients were asked to provide urine culture with the provisional diagnosis of urinary tract infection; and 3 patients were asked throat culture with the provisional diagnosis of tonsillopharyngitis. In 3 of the 4 patients asked to provide urine culture, significant growth was found. In all of the 33 patients asked to provide throat culture, group A beta hemolytic streptococci growth was found. In preliminary examination of 85 patient, it was established that 52 (61.1%) had fever (above 37.2°C) and that antibiotic was used in the entire patient with fever.

In 57 (67%) out of 85 patients, inappropriate antibiotic use was detected. It was also established that in 42 (49.4%) of 85 patients, redundant antibiotic was started; and in 15 (17.6%) patients, redundant doublet antibiotic combination was used (Table 1). Redundant antibiotic use

ratios in 2009, 2010 and 2012 were respectively found as; 64%, 60% and 74.28% (Table 2).

It was established that the antibiotics used were ampicillin (28.6%), ampicillin-sulbactam (21.4%), second generation cephalosporins (10.7%), third generation cephalosporins (14.3%), aminoglycosides (21.4%) and flaggy (3.6%). It was observed that antimicrobial treatment was started empirically in 73 patients (85.8%), and was started based on the agent detected in 12 patients (14.2%). It was established that in empirically started treatments, 78.1% of the treatments were not given with the appropriate indications; in treatments, on the other hand, provided in line with the agent detected, 100% appropriate indications were given.

While penicillin was to be sufficient in the treatment 7 of the 12 patients diagnosed with bacterial tonsillopharyngitis, it was established that third generation cephalosporins were used and broad spectrum antibiotics were used redundantly.

In the point prevalence studies, the ratios of redundant use of antibiotics for the years 2009, 2010 and 2012 were respectively established as 44%, 48% and 54.2%. The use of redundant doublet antibiotic combination, on the other hand, for the years 2009, 2010 and 2012 was respectively established as 20%, 12% and 20.08%. The data regarding dose, dose range, duration and route of administration were given in the relevant table (Table 3). Regarding the parameters, while the inappropriate route of administration was 56% in 2009, it dropped to 4% in 2012 and none was detected in 2012.

Discussion

Antibiotic use is very high in Turkey. The antibiotic use between 2001 and 2006 was investigated and it was found that antibiotic consumption in 2005 increased more

Table 1. Ratio of inappropriate antibiotic use in all hospitals

	Redundant use	Redundant combination	Inappropriate antibiotic use
Number of patients /All patients	42/85	15/85	57/85
Patient ratio (%)	49.4	17.6	67

Table 2. Annual ratio of inappropriate antibiotic use

	2009 (25 pat.)		2010 (25 pat.)		2012 (35 pat.)	
	Number	%	Number	%	Number	%
Inappropriate antibiotic use	16	64	15	60	26	74.28

Table 3. Evaluation of antibiotic use in hospitalized patients

Antibiotic use	2009 (25 pat.) Number	%	2010 (25 pat.) Number	%	2012 (25 pat.) Number	%
Antibiotic is inappropriate (redundant use)	11	44	12	48	19	54.2
Antibiotic is inappropriate (redundant doublet combination)	5	20	3	12	7	20.08
Inappropriate dose	5	20	10	40	11	31.42
Inappropriate dose range	6	24	5	20	8	22.85
Inappropriate duration	15	60	13	52	25	71.42
Inappropriate way of drug administration	14	56	1	4	0	0

than two times than in 2001 (4). IN a study done at Pamukkale University, it was reported that antibiotics were used in 49% of hospitalized patients in 2003, 53% in 2004 and 61% in 2005 (5). In another study carried out at Mustafa Kemal University, it was found that while the antibiotic use was 61.5% in hospitalized patients, inappropriate antibiotic use was 40.5% (6). In a multi-centered study involving 12 pediatric hospitals in Turkey, antibiotic use was found to be 54.6% (7). In another study involving 18 hospitals, it was established that the use of one or more antimicrobial agent in 9471 hospitalized patients was 30.6% (8). Antibiotic use in the Dr. Behçet Uz Pediatric and Surgery Training and Research Hospital was found to be 57.1% (9).

When the prescribing habit of the world market is examined, it is seen that antibiotics are at the top of the drug use list (10). It was found that 36% of the hospitalized patients were prescribed antibiotics in a hospital in Zurich (11). It was concluded in a point prevalence study in Vietnam including 36 hospitals that 5104 (67.4%) of 7571 patients received antibiotic treatment. Inappropriate antibiotic use was established in 1573 of the 5104 patients, which is almost one third of them (12). In a study done in Italy, on the other hand, 511270 antibiotic prescriptions written for 219257 pediatric patients were examined and it was revealed that at least one antibiotic prescription was written for 52.9% of the patients. It was reported that this ratio for children aged 1-2 was 70.4% and for children aged 11 and older 35.8% (13).

Extensive use of antibiotics and as a result the ensuing resistance to antibiotics both in Turkey and in the world has increasingly gone up in the last 25 years and become one of the 10 most important health problems in the world (14-19). Some measures were taken in Turkey with some schemes initiated by the Ministry of Health in Turkey. With this initiation, it was ensured that microbiology experts in hospitals posted limited notices while reporting the antibiogram results, the approval of Experts of Infectious Diseases and Clinical Microbiology for the

use of some group of drugs were required, the functionality of Infection Control Committees increased and antibiotic control teams were set up.

As inappropriate antibiotic use turned out to be high (67%) in our hospital, a meeting with participation of all the physicians was arranged in order to search for such a result. It was eventually established that taking cultures from hospitalized patients was neglected and the physicians became concerned due to time loss as the culture test results came out at least 24 hours later. The ratio of appropriate use antibiotics in treatments aimed at determining the agent in our study was established as 100% and it once again became obvious that culture was crucially important in the diagnosis of infectious diseases.

Furthermore, given the facilities of our hospital, it was stated that the infection occurred because of bacterial or viral causes, most of the necessary tests except culture could be performed in our hospital. Under these circumstances, instead of redundant use of the antibiotic treatment, it was emphasized that it was crucial that families be informed about the treatment and prognosis.

Besides, it was also indicated that the families of out-patient patients did not believe that their children would recover without using antibiotics and they pressurized the doctors about it. Similarly, it was emphasized that a patient not prescribed an antibiotic were inclined to apply immediately to another physician or polyclinic and make sure that an antibiotic was prescribed. Apart from that, since some of the patients from country side failed to come for follow-ups and controls regularly and ignore the hygiene rules, it was reported that some doctors ended up writing prescriptions as they were unsure of the treatment. It was found that in the preliminary examination of 52 (61.1%) of 85 patients, they had fever (above 37.2°C), and an antibiotic was given to all patients with fever; there appeared to be an inclination to prescribe an antibiotic when the patient had fever in the clinic. However, fever is associated with a viral infection that is expected to be healed on its own in children and many other cases.

Using antibiotics with febrile children is true for the bacterial infections especially likely to create risks. Not only will the inappropriate and excessive use of antibiotics not contribute to the recovery of the patients, it will also lead to the development of bacterial resistance against frequently used empirical antibiotics. This resistance has the risk of causing failure in routine antibiotic treatment of likely infections in the patient in question or other patients (20).

In the light of all these data, it was concluded that no excuse could explain the rationale of redundant and inappropriate antibiotic prescription. It was eventually agreed that the Infection Control Committee would continue their practices of monitoring, inspection, reporting and feedback; furthermore, the ratio of antibiogram of the urine and blood cultures taken in our hospital would be annually reported by the microbiology expert and finally that these data would need to be considered in the future empirical treatments.

Conclusion

It is possible to minimize the development to resistance in antibiotics through rational antibiotic use. In order to do this, both public and physicians should be made more aware through various informing activities and courses, antimicrobial use guide book should be prepared in hospitals and antibiotic use should be implemented in accordance with the protocols and guidelines within the framework of evidence-based medicine and consultation request for infectious diseases should be encouraged. Furthermore, setting up national antimicrobial resistance surveillance systems and inspecting the antibiotic use periodically through point prevalence activities in hospitals will also be beneficial.

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

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References

1. Şardan Çetinkaya Y. Antibiyotik Kontrol Komitesinin İşlevi ve Kontrollü Antibiyotik Kullanımı. *Ankem Derg* 2004; 18: 56-8.
2. Memikoğlu KO. Antibiyotik Tedavisinin Temel İlkeleri. *Türk Urol Sem* 2010; 1: 211-5.
3. Hacimustafaoğlu M. Antibiyotiklerin Farmakolojik Özelliklerinin Akılcı Antibiyotik Kullanımındaki Önemi. *Güncel Pediatri* 2004; 2: 15-20.
4. Karabay O. Türkiye’de Antibiyotik Kullanımı ve Direnç Nereye Gidiyor? *Ankem Derg* 2009; 23: 116-20.
5. Saçar S, Toprak Kavas S, Asan A, Hırçın Cenger D, Turgut H. Pamukkale Üniversitesi Tıp Fakültesi hastanesinde Antibiyotik Kullanımına İlişkin Nokta Prevelans Çalışması. *Ankem Derg* 2006; 20: 217-21.
6. Evirgen O, Onlen Y, Ertan O. The intensity of antibiotic usage in the university hospital and the investigation of an inappropriate use of antibiotics. *Bratislava Medical Journal* 2011; 112: 595-8.
7. Ceyhan M, Yıldırım I, Ecevit C, et al. Inappropriate antimicrobial use in Turkish pediatric hospitals: a multicenter point prevalence survey. *International Journal of Infectious Diseases* 2010; 14: 55-61. [\[CrossRef\]](#)
8. Usluer G, Ozgunes I, Leblebicioğlu H. A multicenter point-prevalence study: antimicrobial prescription frequencies in hospitalized patients in Turkey. *Ann Clin Microbiol Antimicrob* 2005; 4: 16. [\[CrossRef\]](#)
9. Devrim İ, Gülfidan G, Oruç Y, et al. Dr. Behçet Uz Çocuk Hastanesinde Antibiyotik Kullanımına İlişkin Nokta Prevelans Çalışması: 2008 ile 2012 verilerinin karşılaştırılması. *J Pediatr Inf* 2012; 6: 46-9. [\[CrossRef\]](#)
10. Eroğlu L, Çalangu S, Tuna R, Ülger İşiç I. Antibiyotikleri Akılcı Kullanıyor muyuz? *Ankem Derg* 2003; 17: 352-60.
11. Potocki M, Goette J, Szucs TD, Nadal D. Prospective survey of antibiotic utilization in pediatric hospitalized patients to identify targets for improvement of prescription. *Infection* 2003; 31: 398-403.
12. Thu TA, Rahman M, Coffin S, Harun-Or-Rashid M, Sakamoto J, Hung NV. Antibiotic use in Vietnamese hospitals: a multicenter point-prevalence study. *Am J Infect Control* 2012; 40: 840-4. [\[CrossRef\]](#)
13. Resi D, Milandri M, Moro ML. Antibiotic prescriptions in children. *J Antimicrob Chemother* 2003; 52: 282-6. [\[CrossRef\]](#)
14. Çakır N. Antibiyotik Kullanımı ve Direnç Sorunu. *Türkiye Klinikleri* 2003; 2: 67-78.
15. Guven GS, Uzun O. Principles of good use of antibiotics in hospitals. *The Journal of Hospital Infection* 2003; 53: 91-6. [\[CrossRef\]](#)
16. Erdeljić V, Francetić I, Macolic Sarinić V, et al. Evaluation of Justification for antibiotic use at the Internal Medicine Clinic of the Clinical Hospital in Zagreb. *Acta Med Croatica* 2004; 58: 293-9.
17. Cusini A, Rampini SK, Bansal V, et al. Different patterns of inappropriate antimicrobial use in surgical and medical units at

- a tertiary care hospital in Switzerland: a prevalence survey. Plos One 2010; 5: e14011. [\[CrossRef\]](#)
18. Del Fiol Fde S, Lopes LC, Barberato-Filho S, Motta Cde C. Evaluation of the prescription and use of antibiotics in Brazilian children. Braz J Infect Dis 2013; 17: 332-7. [\[CrossRef\]](#)
 19. Gagliotti C, Morsillo F, Resi D, Milandri M, Moro ML. A three-year population-based study of antibiotic treatments for children. Acta Paediatr 2005; 94: 1502-4. [\[CrossRef\]](#)
 20. Hacimustafaoğlu M. Ateşli Çocukta Antibiyotik: Ne Zaman? Güncel Pediatri 2006; 3: 88-91.