Journal of Pediatric Infectious Diseases 9 (2014) 1–4
DOI 10.3233/JPI-140428
IOS Press

First point prevalence survey of neonatal and pediatric antibiotic prescribing in a secondary care hospital in Macedonia

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Received 24 August 2014
Revised 8 October 2014
Accepted 14 October 2014

Abstract. Antibiotic resistance program was developed by Macedonian Ministry of Health in order to improve and expand surveillance of antibiotic use and resistance. As a part of Antibiotic Resistance and Prescribing in European Children or ARPEC study, a point prevalence survey was conducted at General Hospital "Borka Taleski" in Prilep. To present the data from the first point prevalence survey of neonatal and pediatric antibiotic prescribing in secondary care hospital in Macedonia, describe the current antimicrobial prescribing practices at this institution and gather baseline data for future interventions to improve the antimicrobial use. A point prevalence survey was conducted within the pediatric and neonatal departments. Twenty three patients were surveyed: 12 in the pediatric department and 11 in the neonatal unit. 92% of pediatric patients were treated with antibiotics compared with an average of 36% in pediatric departments in other European countries ($p < 0.05$). 18% of hospitalized neonates were treated with antibiotic compared with 8% in other European neonatal departments ($p < 0.05$). Assessment of current antibiotic use in general hospitals is very important for further work on antibiotic prescribing.

Keywords: Point prevalence survey, antibiotic resistance, general hospital

1. Introduction

The European Society for Pediatric Infectious Diseases supported an initiative to improve the evidence base for antibiotic prescribing in European children by developing a prospective surveillance system to monitor rates of antibiotic prescribing and resistance in children in Europe. The initiative, called Antibiotic Resistance and Prescribing in European Children or ARPEC study, has been co-funded by the European Commission through the Executive Agency for Health and Consumers. ARPEC study provides age-specific data for antibiotic prescribing in hospital settings [1].

Macedonia is one of many countries that takes actions to control the use of antibiotics. An antibiotic resistance program was developed by the Ministry of Health in order to improve and expand surveillance of antibiotic use and resistance, establish good practice and prudent use of antibiotics in human and veterinary medicine, increase awareness of healthcare professionals and the population and support the national and international collaboration with different stakeholders (research, non-governmental organisations, government and the media). Although a significant progress has been made, still the use of antibiotics needs to be rationalized [2,3].

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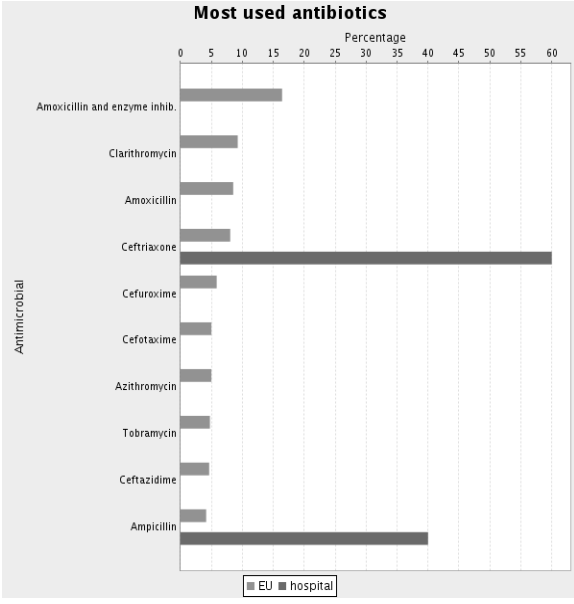

Fig. 1. Antibiotic usage was 100% empirical based. (Colours are visible in the online version of the article; http://dx.doi.org/10.3233/JPI-140428)

The aims of this study are to present the data from the first point prevalence survey (PPS) of neonatal and pediatric antibiotic prescribing in secondary care in Macedonia, to describe the current antimicrobial use at these institutions and gather baseline data for future interventions to improve the antimicrobial use.

2. Material and method

Pediatric health care in Macedonia is provided at three levels. Tertiary paediatrics is offered at the University Children's Hospital, University Clinic for Gynecology and Obstetrics and at the University Clinic for Pediatric Surgery in Skopje. Neonatal and pediatric intensive care is provided only at the university facilities. There are fourteen general hospitals in the country, in all cities with more than 20,000 inhabitants. They are responsible for secondary care. The concept of primary care in Macedonia was introduced six years ago. Family doctors who are pediatricians or general practitioners providing primary care.

We conducted a PPS within the pediatric and neonatal departments of Borka Taleski General Hospital in Prilep. The General Hospital in Prilep provides secondary level of health care to about 200,000 people with approximately 1,100 births per year. The pediatric department has 24 beds. Patients in need of intensive care therapy are transported to university clinics. Pediatric surgery is limited to a few urgent abdominal interventions in post neonatal children. The neonatal department takes care for newborns above 34 weeks gestation. Preterm neonates in need of respiratory support, urgent surgical treatment or under 34 weeks gestation are transported in or ex-utero to a tertiary center.

A PPS was carried out by a medical doctor. All patients from the pediatric and neonatal departments admitted at 8:00 am on the day of the survey who were receiving an antimicrobial treatment were included. Anonymized data were collected in November on the day of PPS. It was a two-step process. First, data were collected on paper forms, and then entered, verified and validated using the ARPEC program.

Permission for conducting the survey was received from the Ministry of Health, the hospital manager and the head of pediatric and neonatal departments. Separate ethical approval was not required.

3. Results

Twenty three patients were surveyed: 12 patients in the pediatric department and 11 in the neonatal unit. Of the 33 patients, 13 were prescribed systemic antibiotics mostly for community acquired infection. The PPS included four main indications for antibiotic prescribing: community acquired infection, hospital acquired infection, surgical prophylaxis and medical prophylaxis.

3.1. Data from the pediatric department

The total number of beds in the pediatric department is 24. On the survey day, 12 beds (50%) were occupied. 92% of hospitalized patients were treated with antibiotics compared with an average of 36% in pediatric departments in other European countries ($p < 0.05$). Table 1 is a comparison between Prilep hospital and the rest of the European centers.

3.2. Data from the neonatal department

Total number of beds in the neonatal department is 24.55% of them were occupied on the day of PPS. 18% of hospitalized patients were treated with antibi-

Table 1
Comparison of antibiotic use in Prilep, Macedonia and Europe

		Department type	
		GPM	GNMW
Macedonia	Bed occupancy (%)	50%	55%
	AM treated patients (%)	92%	18%
Europe	Bed occupancy (%)	73%	65%
	AM treated patients (%)	36%	8%

GPM: general pediatric medicine; GNMW: general neonatal and maternity ward.

otic compared with 8% in other European neonatal departments ($p < 0.05$). 50% of newborns were treated with penicillins and 50% with aminoglycosides. In European hospitals 45% of neonates received penicillins, 37% aminoglycosides, 14% other beta-lactam antibacterial, 2% sulfonamides and trimethoprim, 2% other antimicrobials and 1% macrolides.

4. Discussion

This work provides an overview of data collected as part of the first Macedonian PPS of antibacterial usage in secondary care hospital. It has been estimated that between 20–50% of antibiotic use in community and health care settings is inappropriate [1]. Irrational use of antibiotics is a risk factor for developing antimicrobial resistance such as vancomycin-resistant *Enterococci*, methicillin-resistant *Staphylococcus aureus*, multiresistant *Pseudomonas aeruginosa*. Antibiotic resistance is dangerous for the population and increases the cost of care [4,5].

Comparison between Prilep General Hospital and other European hospitals showed difference in the percentage of children under antibiotic therapy on the day of survey. 100% of prescribed antibiotics were given parenterally and were empirically prescribed. Bactygul et al. in their research conducted in secondary health-care level in Kyrgyz Republic reported that almost three-quarter of the antibiotics were used parenterally and concluded that antibiotic prescriptions were inappropriate [6].

If misuse and overuse of antibiotic is identified, it is important to understand the reasons behind inappropriate prescribing. Repeated point-prevalence surveys within the same institution are a useful instrument to monitor prescribing trends and effectiveness of interventions to promote rational antibiotic use [7,8].

A systematic review of the available literature by Irwin and Sharland identified eighteen studies and revealed high exposure of hospitalised children to antibiotics [9]. Naughton et al. compared PPS data from four regional/general hospitals in Ireland and identified 29% to 37% of paediatric and neonatal patients on antibiotics.

The World Health Organization reports that interventions involving both an educational and a managerial component were more effective than those involving only one strategy [10]. Reduction of antibiotic misuse and over use has to be done by the implementation of strategies involving both provider and consumer education coupled with enhanced health worker supervision

5. Conclusion

Using Point Prevalence Surveys as standardised methodology could facilitate both local audit and national benchmarking to monitor antibiotic use.

Assessment of current antibiotic use in general hospitals is very important for further work on antibiotic prescribing. A key step in improvement of antibiotic use requires the surveillance and assessment of current antimicrobial usage This work identifies clear targets for quality improvement in antibiotic prescribing in Prilep General Hospital such as reduction of 3th generation cephalosporines prescribing in the pediatric department, consideration for the high proportion of parenteral antibiotic use, narrow versus broad spectrum antibiotic choice in pediatric and neonatal units. Because overuse and misuse of antibiotics is a serious global problem, intervention to improve antimicrobial use must start locally and extend further.

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