IJPSR (2020), Volume 11, Issue 2 **(Case Study)**

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 25 April 2019; received in revised form, 08 August 2019; accepted, 27 January 2020; published 01 February 2020

A MULTIDISCIPLINE MANAGEMENT OF A CHILD WITH CHRONIC PYELONEPHRITIS CAUSED BY MULTIDRUG-RESISTANT *E. COLI*: A CASE STUDY

A. Almohammadi

Department of Pharmacy Practice, P. O. Box – 80260, Faculty of Pharmacy King Abdul-aziz University, Jeddah 21589, Saudi Arabia.

Keywords:

Urinary tract infection, Cephalexin, Pharmacist, Prophylaxis, Patient information, Multidisciplinary team

Correspondence to Author:
Ameen Almohammadi

Associate Professor,
Department of Pharmacy Practice,
Faculty of Pharmacy King Abdulaziz University, P. O. Box - 80260,
Jeddah - 21589,

E-mail: amalmohammadi@kau.edu.sa

ABSTRACT: *Escherichia coli* is the predominant isolated type of bacteria in urinary tract infections in children. Multidrug resistance of this kind of infection is associated with an increased risk of kidney injury and, therefore, an increase in morbidity and mortality. This report presents a case of a 6-year-old child with recurrent pyelonephritis with multidrug-resistant *E. coli*. She was followed, in a teaching hospital and was successfully treated with daily cephalexin prophylaxis for about four years as a result of the collaboration of healthcare providers. Continued teamwork between health care providers, especially collaboration between the treating pediatric nephrologist and the clinical pharmacist, yielded better decisions to overcome the multidrug-resistant bacteria over the course of the disease in such a vulnerable child patient. This case lends support for the use of suppression therapy in pediatric patients with severe recurrent bladder and renal infections as well as support for the patient-centered approach in achieving improved pharmacotherapy and patient outcomes.

INTRODUCTION: *Escherichia coli* (*E. coli*) is a predominant isolated type of bacteria in a urinary tract infection (UTI), a bacterial infection that commonly affects Saudi females [1]. Multidrug resistance of *E. coli* is associated with an increased risk of kidney injury and, therefore, an increase in morbidity and mortality [2]. In some cases, such an infection may proceed to more serious sepsis and septic shock and may lead to death [3, 4]. Anatomical causes such as a short urethra in females and vesicoureteric reflux are important risk factors that may increase the prevalence and seriousness of UTIs, especially in children [5].

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.11(2).930-33

This article can be accessed online on www.ijpsr.com

DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.11(2).930-33

Usually, infection is asymptomatic if still in the lower tract, but there porting of symptoms is difficult to obtain in infants and young children. Also, cystitis may be difficult to detect because symptoms are not specific routinely and fever is the only sign. If the bacteria move up to the urethra and kidneys, the infection then becomes more serious and severe. The child with pyelonephritis may have fever, chills, pain in the lower back, nausea, and vomiting. This acute pyelonephritis is more likely to result in permanent renal scarring.

Recurrent pyelonephritis will result in the development of renal scars at the same site as the previous infection in the kidney [5]. Acute pyelonephritis needs hospital treatment with IV antibiotics, and some need surgical intervention if the recurrent infection results from an abnormal structure of the urinary tract. Moreover, UTIs in children need optimal management to preserve normal kidney growth.

This report is a retrospective case analysis of the diagnosis and management of a 6 year old child with recurrent pyelonephritis with multidrug-resistant *E. coli*. She was admitted to the ER, pediatric clinic, and pediatric ward, in a teaching hospital and was successfully treated with daily cephalexin prophylaxis for about four years as a result of the collaboration of her healthcare providers. This case lends support to the use of suppression therapy in pediatric patients with severe recurrent bladder and renal infections.

Case Report: A 6-year-old girl presented to the pediatric clinic with a fever that started 2 days after receiving amoxicillin for dental treatment. After clinical assessment and a few hours of observation, the patient was admitted to the ER with escalating fever and flank pain.

Nitrituria was confirmed, and prompt empirical therapy with Co-amoxiclav was received for one week. A week later, the child displayed a fever and shivering. The pediatrician prescribed Further, co-amoxiclav treatment for two weeks. After 2 weeks of therapy, a new episode of infection necessitated another two weeks of treatment with a referral to a pediatric nephrologist. He recommended continuing co trimoxazoleat 40 mg/ 200 mg q 12 h and then as a prophylaxis 40 mg/ 200 mg daily. A kidney-bladder ultrasound showed normal kidneys and a thickened bladder wall.

The child developed abdominal pain and fever after being on a daily prophylaxis dose of co trimoxazole for two weeks and then changed to a trimethoprim suspension 50 mg every night for 12 days. She was admitted directly to the ER, where a urine sample was taken for culture and then started empirical treatment with oral co-amoxiclav. The urine culture showed *Escherichia coli* growth with resistance to ampicillin and co-trimoxazole **Table 1.**

TABLE 1: RESULTS OF URINE CULTURE

Organism Identification: *Escherichia coli*			
Antibiotic sensitivity		**Antibiotic sensitivity**	
Meropenem	Sensitive	Cefepime	Sensitive
Amikacin	Sensitive	Gentamicin	Sensitive
Ampicillin	Resistant	Imipenem	Sensitive
Co-amoxiclav	Sensitive	Levofloxacin	Sensitive
Aztreonam	Sensitive	piperacillin	Sensitive
Ciprofloxacin	Sensitive	Co-trimoxazole	Resistant
Ceftriaxone	Sensitive	Ceftazidime	Sensitive
Nitrofurantoin	Sensitive	Tetracycline	Sensitive

After finishing treatment, her pediatric nephrologist and clinical pharmacist decided to continue her on suppression therapy with cephalexin at a 125 mg daily dose for one year. Hygiene information about voiding habits and advice on observing the child's body temperature and urine odor and the color were given to the parents. Next, an ultrasound evaluation showed a previous exposure to cystitis and normal kidneys. Left renal scarring appeared in nuclear medicine images. After one year, the daily nighttime dose of cephalexin was stopped, and the parents were told to carefully monitor their child's temperature. A few weeks later, the child was admitted to the ER with a high fever 40 ºC, abdominal pain, and vomiting, with tenderness over the right lumbar area. She was hospitalized and received ceftriaxone 1 g IV daily for 14 days. Ultrasound showed mild dilatation of the left renal pelvis and proximal left ureter. A flu-voiding cystourethrogram (voiding cystometrogram) showed incomplete emptying of the bladder with mild trabeculation and no evidence of vesicoureteric reflux.

Then at discharge, the child was again put on suppression therapy with cephalexin at a 125mg daily dose for one year, with hygiene and close observation information given to the parents. One year later, the daily cephalexinprophylaxis was stopped with tight control this time by a weekly direct nitrite dipstick and an analysis check of freshly sampled urine and a laboratory urine culture. In the third week of checking, investigations showed amber, turbid urine with positive nitrite and a high bacteria count (5901/ul, normal 0-200/ ul) associated with an increase in the child's fever.

This time, the patient was treated with oral co-amoxiclav for 14 days and Paracetamol. Again, the child started suppression therapy with cephalexin at a 125 mg daily dose for one year. A year later (four years from the onset of the first infection episode), prophylaxis was stopped. The child was kept under tight observation, where the biweekly urine analysis and culture showed no growth for three consecutive months. Follow-up visits showed an absence of any further infections events for the past years as well as normal blood pressure and kidney functions. Recently, the patient married at the age of nineteen years old, and she was advised to

always watch her urine color and odor and her blood pressure and check for any signs of urinary infection, especially if pregnancy occurred.

DISCUSSION: In this case, continued teamwork between health-care providers, especially collaboration between the treating pediatric nephrologist and the clinical pharmacist, yielded better decisions to overcome the multidrug-resistant bacteria throughout the disease in such a vulnerable child patient. The presence of the *E. coli* bacterial strain and its resistance to antibiotics definitely will increase the risk of serious infection in a child patient. This clinical risk of pyelonephritis to the patient, the choice of antibiotics, and the promptness of treatment for multidrug-resistant bacteria requires careful consideration. The literature showed only little benefit from prophylaxis in acute pyelonephritis and did not support routine practice. Moreover, they conclude that prophylaxis with antibacterial drugs is not highly effective in preventing UTI recurrence or new renal scar formation and may lead to the development of resistant organisms. Here in the management of this case, the close collaboration and prompt antibiotic therapy improved the pharmacotherapy outcome and the parents' knowledge and understanding of this serious infection. Usually, pyelonephritis is misdiagnosed in children and therefore leads to more complications or a delay in proper treatment [6]. However, a delay in therapy can increase the likely hood of renal damage. The involvement of the clinical pharmacist, in this case, led to a better treatment outcome and preserved the child's kidneys.

The pharmacist's suggestion to use cephalexin with a higher prophylaxis dose was based on many factors. First, susceptibility testing guided the pharmacist to choose the cephalosporin group, as this infection caused by multidrug-resistant *E. coli* was sensitive to all generations of tested cephalosporin [7]. Factors related to the drug were safety and the effectiveness of the high bactericidal concentrations in the urinary tract related to the minimal risk of the resistance of gram-negative bacteria flora to cephalexin [8]. In their study, P fauand Sacks strongly recommended the use of cephalexin as a prophylaxis for recurrent UTI in pregnant women [9].

Even though, at the time of the decision, cephalexin was not widely used in children, the recommended prophylaxis dose was 125 mg daily at night in adults. The pharmacist recommended the same dose for this child case to decrease the chance of resistant development similar to what happened with the other antibiotics [10]. However, the suppression therapy here may help the innate immune response of a child's urinary tract during pyelonephritis until his immune system development is complete when she reaches an age older than 8 years [11].

On the other hand, medical information related to the child's conditions, which was given to her parents, counseling about the importance of keeping the child's body temperature under observation and emphasizing the importance of adherence to the antibiotic dose are all important factors in the successful management of this case.

CONCLUSION: The use of cephalexin for the prophylaxis of recurrent pyelonephritis caused by *E. coli* resistance to the first-line antibiotic may be beneficial in preventing renal damage. In this case, informing and educating parents was an important factor in the promptness of the therapy and the full adherence to treatment and medical recommendations. Moreover, the involvement of a multi-disciplinary team in the management, such as a specialist pharmacist, will definitely optimize the rational use and safety of the medication and thereby improve the pharmacotherapy and patient outcomes.

ACKNOWLEDGEMENT: The author wishes to thank the patient and her parents and doctors who participated in this case study

CONFLICTS OF INTEREST: The author declared no conflict of interest**.**

REFERENCES:

1. Eltahawy AT and Khalaf RMF: Urinary tract infection at a University hospital in Saudi Arabia: Incidence, Microbiology and Antimicrobial Susceptibility 1988; 8(4): 261-66.
2. Hsiao CY, Yang HY, Hsiao MC, Hung PH and Wang MC: Risk factors for development of acute kidney injury in patients with urinary tract infection. PLOS One 2015; 10(7): e0133835.
3. Rosser CJ, Bare RL and Meredith JW: Urinary tract infections in the critically ill patient with a urinary catheter. Am J Surg 1999; 177(4): 287-90.

4. Śledzińska A, Mielech A, Krawczyk B, Samet A, Nowicki B, Nowicki S, Jankowski Z and Kur J: Fatal sepsis in a pregnant woman with pyelonephritis caused by *Escherichia coli* bearing Dr and P adhesins: diagnosis based on postmortem strain genotyping. BJOG 2011; 118: 266-69.
5. Jakobsson B, Jacobson SH and Hjalmas K: Vesico-ureteric reflux and other risk factors for renal damage: identification of high- and low-risk children. Acta Paediatr 1999; 88: 31-39.
6. Van den Bruel A, Aertgeerts B, Bruyninckx R, Aerts M and Buntinx F: Signs and symptoms for diagnosis of serious infections in children: a prospective study in primary care. Br J Gen Pract 2007; 57(540): 538-46.
7. Hawkey PM, Warren RE, Livermore DM, McNulty CAM, Enoch DA, Otter JA and Wilson APR: Treatment of infections caused by multidrug-resistant gram-negative bacteria: report of the british society for antimicrobial chemotherapy/healthcare infection society / British infection association joint working party. J Antimicrob Chemother 2018; 1: 73 (suppl 3): iii2-iii78. doi: 10.1093/jac/dky027.
8. Sandberg T and Brorson J: Efficacy of long-term antimicrobial prophylaxis after acute pyelonephritis in pregnancy**.**Sc and J Infect Dis 1991; 23(2): 221-3.
9. Pfau A and Sacks TG: Effective prophylaxis for recurrent urinary tract infections during pregnancy. Clin Infect Dis 1992; 14(4): 810-4.
10. Martinez FC, Kindrachuk RW, Thomas E and Stamey TA: Effect of prophylactic, low dose cephalexin on fecal and vaginal bacteria. J Urol 1985; 133(6): 994-6.
11. Spencer JD, Schwaderer AL, Becknell B, Watson J and Hains DS: The innate immune response during urinary tract infection and pyelonephritis **.**Pediatr Nephrol 2014; 29(7): 1139-49.

How to cite this article:
Almohammadi A: A multidiscipline management of a child with chronic pyelonephritis caused by multidrug-resistant *E. coli*, a case study. Int J Pharm Sci & Res 2020; 11(2): 930-33. doi: 10.13040/IJPSR.0975-8232.11(2).930-33.