Risk Factors Associated with Acquisition of ESBLEscherichia Coli Infection, Detection and Treatment, a Case Report

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Abstract

ESBL group of organisms are beta lactamase enzyme producing organisms capable of breaking the beta lactam ring in antibiotics hence are resistant to usually cephalosporins and few other antibiotics. In these E.coli is the most common bacteria that lives in gut harmlessly but causes Urinary tract infection and in severe cases blood poisoning, septicemia or bacteremia leading to serious sepsis. When not treated it leads to inflammation of body parts, blood clots, blocking oxygen supply and ultimately causing death. In present study report a 51 years old Indian tourist patient was admitted in a Wake Med Health hospital at USA, with symptoms of UTI.In hospital she was diagnosed with ESBL E.coliUTI infection with>100,000 colonies /ml and blood culture showed positive result. In this case the Sepsiswas resulted as secondary infection. She even suffered with chronic anemia. The previous medical history of subject showed several risk factors for acquisition of infection. These include elder age, female gender,chronic anemia, recent hospitalization, surgical procedure (due to hysterectomy), intravenous catheterization, intensive careand prolonged usage of high potency antibiotics.All these factors are established as predictive and prognostic risk factors for acquisition of infection and also results in colonization of organism.

Index terms— ESBL, escherichia coli, CLSI, MIC method, PICC line cephalosporinsand ertapenem.

Risk Factors Associated with Acquisition of ESBLEscherichia Coli Infection, Detection and Treatment, a Case Report Dr. Gadangi Indira Abstract-ESBL group of organisms are beta lactamase enzyme producing organisms capable of breaking the beta lactam ring in antibiotics hence are resistant to usually cephalosporins and few other antibiotics. In these E.coli is the most common bacteria that lives in gut harmlessly but causes Urinary tract infection and in severe cases blood poisoning, septicemia or bacteremia leading to serious sepsis. When not treated it leads to inflammation of body parts, blood clots, blocking oxygen supply and ultimately causing death. In present study report a 51 years old Indian tourist patient was admitted in a Wake Med Health hospital at USA, with symptoms of UTI.In hospital she was diagnosed with ESBL E.coliUTI infection with>100,000 colonies /ml and blood culture showed positive result. In this case the Sepsiswas resulted as secondary infection. She even suffered with chronic anemia. The previous medical history of subject showed several risk factors for acquisition of infection. These include elder age, female gender,chronic anemia, recent hospitalization, surgical procedure (due to hysterectomy), intravenous catheterization, intensive careand prolonged usage of high potency antibiotics.All these factors are established as predictive and prognostic risk factors for acquisition of infection and also results in colonization of organism. The antibiotic sensitivity test was done by using CLSI, MIC method on Ampicillin, Cefazolin, Cefepime, Celfazidine, Celtriaxone, Ciprofloxacin, Levofloxacin, Tobramycin showed resistant, Nitroflurantoin showed semi resistant and Ertapenem, gentamicin,Amikacin showed susceptibility. Hence the subject was treated with Doripenemas Intra Venous administration for 15 days with the help of a peripherally inserted central catheteri.e., PICC line.In this case study report,the excessive usage of high dose antibiotics for longer period made the organism resistant or immune. This factor was considered as the primary

risk factor followed by hospitalization and gender. In conclusion the study of risk factors help in identification of high-risk cases of UTI positive infection. But still individualization is needed for identification of risk factors.The drug used for the treatment is expensive and often not available in developing countries. The drug sensitivity tests helps in establishing an empirical antibiotic policy.

1 Introduction

SBL group of organisms are beta lactamase enzyme producing organisms capable of breaking the beta lactam ring in antibiotics hence are resistant to usually cephalosporins and few other antibiotics. The emergence these ESBL microorganisms are seen more from the last two decades only. In these E.Coli is the most significantbacteria that lives in gut harmlessly but causes community acquired Urinary tract infection (2) and in severe cases blood poisoning, septicemia or bacteremia are resulted (6, **??**3) leading to serious sepsis. The rate of mortality is also recorded high in ESBL E.coli septicemia than other infections (1) and if not treated it leads to inflammation of body parts, blood clots, blocking oxygen supply ultimately causing death. The literature available on the epidemiology of these infections is inadequate as most of studies are mainly focused on UTIs and bacteremia. Due to the worldwide increasing incidence of ESBL E.coli infection, the study of clinical risk factors is necessary to develop infection management approaches for prevention. Furthermore the therapeutic options are very limited for these infections as these bacteria are resistant to most of the antimicrobial drugs. Hence this paper mainly focused on a case report of anadult female patient who acquired the E.coli Bacteremia and admitted in hospital for treatment. The study of this case is appropriate enough to establish an empirical antibiotic or antimicrobial policy. a) Case report A 51 years old female patient was admitted in Wake Med Hospital, in North Carolina, USA with symptoms of high fever, chills, headache, recurrent vomiting and body rash. She is an Indian Microbiologist and was visiting America on vacation. She went to Emergency Department for fever and vomiting. Her body temperature was 104 o F, but pulse rate and Blood Pressure was recorded normal. Cultures were obtained and patient was note to have pyuria. The subject was discharged on Levaquin. The patient did not get better and continued to feel feverish and had vomiting. As the blood cultures come out positively, she was asked to come to the emergency department for re evaluation. Urine analysis again showed findings consistent with Urinary Tract Infection. The subject was then treated with IV Rocephin, and was admitted for further evaluation and management.

The interim diagnosis stated that she has ESBL E.coli sepsis, ESBL E.coli UTI, chronic anemia, Iron deficiency, Vitamin B12 deficiency and rash on back and right forearm. The ancillary data in laboratory showed Sodium-137, Potassium-3.6, Chloride-108, Bicarbonates-24, BUN-7, Creatine-0.69, Glucose-107, Calcium-8, AST-24 from 75, ALT-42 from 67, Alkaline phosphatase-140, Albumin-3, TSH-1.71, Ferritin-49, Iron-15, TIBC-275, Vitamin B12 of 94, Folate 11.3, WBC Count-5.5, HB-7.9,Platelet count-239,000. Hepatitis panel was negative.

2 b) Cultures

Blood cultures from 2 nd and 3 rd day showed negative result but first day of admission showed positive ESBL E.coli sepsis. Urine cultures from the day one showed positive result.

3 c) Diagnostics

The chest X-ray on second day of admission, negative study for infection and KUB showed no acute abnormalities. Ultra sound bilaterals showed normal kidneys with some debris in the bladder. Hence all the vitals organs were stable and functioning properly. As the clinical laboratory examinations of blood and urine samples showed acute UTI of ESBL E.coli with >100,000 colonies/ml of urine and blood cultures positive, she was referred to Infectious disease doctor for management of the infection. The gram-negative sepsis caused by ESBL E.coli, likely source secondary to urinary tract infection. Initially the patient was treated with Rocephin. As the blood culture grew ESBL E.coli, depending upon the sensitivities, she was treated with Doripenem. Doctor from ID department has guidedin the treatment. The patient, thus far, responded well to the treatment and has been afebrile, with normal white blood cell count. Vomiting and fever has subsided.

For acute anemia work up showed vitamin B12 deficiency hence she was treated with Iron sulphate as well as vitamin B12-1000mcgs IM. Shehas received with three shots of vitamin B12. The skin rash present at the time admission has much improved and it was of unclear etiology.

4 II.

5 Methodology

The blood and urine samples were collected aseptically and subjected for culturing. Identification of microorganism was done on the basis of morphological features and biochemical tests. After detection the antimicrobial and susceptibility assay was performed on Ampicillin, Cefazolin, Cefepime, Celfazidine, Celtriaxone, Ciprofloxacin, Levofloxacin, Tobramycin, Nitroflurantoin, gentamicin, Amikacin and Ertapenem by CLSI, M7-A microdilution MIC method.

6 III.

7 Results

By critical analysis of patient previous history, so many risk factors were noticed for acquisition of infection. The factors associated were i) Elder Age ii) Female gender iii) working atmosphere iv)recently underwent surgery v) admission in Intensive care unit due to surgical procedure and longer hospitalization prior to infection vi) intravenous catheterizationvi) prolonged usage of high potency antibiotics and vii) acute anemia.

The antimicrobial and susceptibility assay was performed on Ampicillin, Cefazolin, Cefepime, Celfazidine, Celtriaxone, Ciprofloxacin, Levofloxacin, Tobramycin, Nitroflurantoin, gentamicin, Amikacin, Ertapenemand Imipenem. As shown in Table-1, the bacteria showed total susceptibility to Amikacin, Ertapenem, Gentamycinand Imipenem whereas these showed intermediate susceptibility to Nitrofurantoin. The bacteria exhibited totalresistance to Ampicillin, Cefazolin, Cefepime, Celfazidine, Celtriaxone, Ciprofloxacin, Levofloxacin, Tobramycin.

8 Discussions

The prevalence of ESBL infections is increasing rapidly from the last two decade only (10). There is a limited detailed epidemiological data was recorded as the cases are reported as out patients in hospital, in many countries. (3,7). Only a few authors have studied the risk factors associated in acquisition of ESBL infection. But to formulate the effective strategies to prevent the outbreak of these ESBL infections as community acquired infections, the study of risk factors involved in acquisition infection is essential.

However there are several significant studies in identifying the risk factors, the data recorded for each patient is independent and has lot of disparity. This disparity may be attributed to the difference in epidemiological outbreaks as well as lack of correlating the risk factors in identifying the colonization of these bacteria.

In the present case report the risk factors listed as female gender, elder age, work atmosphere, previous history of hospitalization, past history of IV catheterization, preceding history of uterine surgery, exposed to high dose of antibiotics usage and travel are the predictive risk factors for acquiring the ESBL E.coli infection (11, **??**4). **??**na et al 2006 (5)in their epidemiological study report has attribute elder age as a risk factor for acquisition of E.coli infection. Even the colonization of these bacteria in adults is high rather than younger ones. (15). As the subject is a microbiologist there is more chance of colonization. The females are more prone to UTI as the males have longer course of urethra and even prostratesecretions show bacteriostatic properties.

The IV and UT catheterization has significantly associated in promoting the ESBL infection (4). Even the surgical procedures involving the urinogenitalorgans are also an independent risk factor in this case reports. The studies by Rodriguez-Bano J 2004 (14) and **??**na J 2006 (5) have corroborated with this risk factor. According to the study report of PairojSaonuam et al 2008 (12), prior usage of antibiotics that too third generation cephalosporins is an important risk factor associated with ESBL infection.

The administration of effective drug is selected basing on the antibiotic sensitivity test and drug of choice in this case report is the doripenem or ertapenem. Several study reports have recognized penem drugs as the choice of treatment for treating the infections caused by ESBL producing isolates (8)). These are most commonly administered drugs to treat the outbreaks of infection. The subject was responded and became healthy by administrating longer duration of IV antibiotic course by PICC line (peripherally inserted central catheter) therapy, after discharging from hospital.

V.

9 Conclusion

The evaluation of risk factors in acquisition of ESBL E.coli infection help in identification of high-risk cases of UTI positive infection. But still individualization is needed for identification of risk factors. It is essential to study the risk factors for formulating new strategies in prevention of more deadly infectionsas septicemia, caused by ESBL E.coli. By studying the sensitivity tests and knowing the drug of choice for the treatment the empirical antibiotic therapy should be established. [1]

Figure 1:

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hospital authorities)

Figure 2: Table 1 :

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