MDR Enterobacteriaceae in community acquired infections

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Objectives

- Introduction
- Case presentation
- Epidemiology
- Raising awareness about CA-MDRO
- Clinical impact of CA-MDRO

Family Enterobacteriaceae

- Important Genus/species include
  - E.coli
  - Enterobacter
  - Klebsiella
  - Morganella
  - Proteus
  - Salmonella
  - Serratia
  - Etc.

Family Enterobacteriaceae

- These organisms are widespread in nature.
- Natural habitat for many medically significant members of this family is in the lower GI tract.
- They also colonize the orophayrnx of alcoholics, diabetics and hospitalized patients.
- Vaginal colonization in postmenopausal women and those who use diaphragms and/or spermicidal agents.

The ISSUE

- Rising incidence for Community acquired MDR Enterobactericeae infection.
- Rising incidence of ESBL gram E.coli and Klebsiella.
- Increased morbidity, mortality, need for hospitalization and increasing cost.

Case

- 50 year old with PMHx. Of dentist underwent prostate Bx.
- He received Prophylaxis with Levofloxacin 1.5 hours prior to the procedure.
- He was admitted 2 days later to ICU with high grade fever and hypotension with impression of sepsis
- Was started empirically on Meropenem.

Case Cont.

- BC grew ESBL E.coli
- Couple of days later he had B/L pulmonary infiltrate and pleural effusion. DDs was fluid overload, pulmonary infiltrate secondary to sepsis or Hospital acquired pneumonia.
- Stayed in ICU for 4 days and other 5 days on floor.
- DC in stable condition back to home.

Epidemiology

- ESBL producing gram-negative organisms isolated from patients with urinary tract infection (UTI) at Almana General Hospital, Eastern Province, Kingdom of Saudi Arabia, during the period August 2003 to October 2004.
  - 2302 urinary gram-negative isolates for the presence of ESBL.
    - E. coli 9.6%
    - K. pneumoniae 11.3%
    - Enterobacter species 10.14%
    - P. aeruginosa isolates 2.97%

- Saudi Med J. 2005 Jun;26(6):956-9.

Epidemiology

- ESBL- producing Enterobacteriaceae among patients in the United Arab Emirates, at Al Qasimi Hospital.
  - 130 Enterobacteriaceae comprising of Escherichia coli (n = 83), Klebsiella pneumoniae (n = 45) and Klebsiella oxytoca (n = 2) was studied.
    - 41% were identified as having ESBL phenotype.

      - Med Princ Pract. 2008;17(1):32-6.

Epidemiology of extended-spectrum beta-lactamase-producing Escherichia coli and Klebsiella pneumoniae isolates in the United Arab Emirates

- 662 Escherichia coli and Klebsiella pneumoniae samples were collected from three UAE hospitals between January and December 2008.
- 36% samples were identified as ESBL producers
- Majority of the strains 199 (87%) expressed the CTX-M-15 gene
- SHV-28 gene was detected in 29 (13%) of the strains.

- Med Princ Pract. 2011;20(2):177-80. Epub 2011 Jan 20.

Epidemiology

- ESBL Enterobacteriaceae isolated from blood culture, Armed Forces Hospital, Riyadh, Kingdom of Saudi Arabia during the period between January 2003-December 2004.
  - tested a total of 601 isolates of the family Enterobacteriaceae.
    - 15.8% of the isolates were ESBL producers.
    - 48.4% were Klebsiella pneumoniae. followed by 15.8% of both Escherichia coli (E. coli) and Enterobacter cloacae.

      - Saudi Med J. 2006 Jan;27(1):37-40.

Fecal carriage ESBL producing bacteria in a community in KSA

- 716 fecal samples (505 healthy, 211 community patient)
- 12.7% isolates were ESBL producers
- 95.6% of these isolates were ESBL producers.
- 4.4 % were Klebsiella
- No statistical difference between healthy individuals and patients.
  - Kader AA, East Mediterr Health J. 2009 15(6) 1365-70

Risk factors for community-onset bacteremia due to ESBL producing E. coli

- Health care associated infection
- urinary catheter use
- recent antimicrobial use, mainly fluroquinolones and cephalosporins
  - 75 case patients (79%) werfound to have been exposed to 1 of them,
  - 34 (36%) to 2
  - 6 (20%) to 3;
  - 20 (21%) were not exposed to any of them

- CID 2010:50 (1 January) • Rodrı´guez-Ban˜o et al

Epidemiology

- Risk factors for community-onset bacteremia due to ESBL producing Klebsiella pneumoniae
  - 25/33 were classified as HCAI
  - corticosteroid use p <.009
  - percutaneous tube p <.01
  - prior receipt of antibiotics p<.01

- Microb Drug Resist. 2011 Jun;17(2):267-73

Severe community-acquired Enterobacter pneumonia

- Prospective epidemiological monitoring, including all patients admitted for CAP, from 01/01/2002 until 31/12/2004 (over 3 years) in a 16 bed French ICU.
- CAP was defined by the presence of symptoms of lower respiratory tract infection along with two of the following signs:
  - fever (>38.3°C) or hypothermia (≤36°C),
  - Leukocytosis or leukopenia
  - new infiltrates on chest X-ray,
  - patient not hospitalized.
    - Boyer et al. BMC Infectious Diseases 2011, 11:120

- EnCAP was confirmed if Enterobacter was isolated from sputum, bronchoalveolar lavage, pleural effusion or Blood cultures

  - Boyer et al. BMC Infectious Diseases 2011, 11:120

Severe community-acquired Enterobacter pneumonia

- 134 patients were admitted to medical ICU microbiologically-documented severe CAP.
- Ten patients (7.5%) had EnCAP.
- Empirical antimicrobial therapy did not differ significantly between the two groups
- For EnCAP, empirical therapy was appropriate in only 20% of patients compared to 97% in other CAP (P < .01)
    - Boyer et al. BMC Infectious Diseases 2011, 11:120

- Clinical improvement was delayed
- 2 additional days between the initiation of empirical antimicrobial therapy and subsequent definitive appropriate antimicrobial therapy ($p < 0.01$)
- Increase length of mechanical ventialtion and ICU stay

  - Boyer et al. BMC Infectious Diseases 2011, 11:120

- All patients in the EnCAP group were classified retrospectively as HCAP as prior hospitalization within the preceding 12 months.
- All patients were living at home but one was considered as a home care patient since he received intravenous therapy at home
  - Boyer et al. BMC Infectious Diseases 2011, 11:120

- HCAP criteria, and particularly history of previous hospital admission, should be systematically and thoroughly investigated at the time of admission of such patients.

  - Boyer et al. BMC Infectious Diseases 2011, 11:120

- HCAI criteria comprised one of the following
  - Admission from a nursing home or other long-term nursing care facility;
  - Receiving outpatient haemodialysis, peritoneal dialysis or infusion therapy
  - Requiring regular visits to a hospital-based clinic;
  - prior hospitalization within the preceding 12 months

Case 2

- 23 year old unmarried Indian female was admitted to hospital with high grade fever.
- She recently came back from India.
- Gives hx. Of having diarrhea and abd. pain at India.
- On admission Temp. was 39 ^{0} celsius. BP 110/70, mild abd. tenderness, rest of PE was unremarkable.

Case 2 cont.

- BC grew Salmonella enterica, serovar Typhi, sensitive to Ciprofloxacin
- Was started on Cipro. Defervesced in 4 days and was discharged home in stable condition to complete 10 days of Cipro.
- Was re-admitted 10 days later again with high grade fever and BC again was + ve for Salmonella enterica, serovar typhi.

Case 2 cont.

- The organism was again sensitive to Ciprofloxacin but resistant to Nalidixic acid and Ceftriaxone
- She was started on Azithromycin 10mg/kg/day for 7 days.
- The hospital course was non complicated.
- Stayed asymptomatic on f/u at one and three months.

Treatment

- Randomized Controlled Comparison of Ofloxacin, Azithromycin, and an Ofloxacin-Azithromycin Combination for Treatment of Multidrug-Resistant and Nalidixic Acid-Resistant Typhoid Fever.
- Azithromycin is superior to Ofloxacin or Ofloxacin/Azithromycin combination for MDR Salmonella in terms of fever resolution, earlier hospital discharge, failure and clearance of fecal cultures.
  - **ANTIMICROBIAL AGENTS AND CHEMOTHERAPY, Mar. 2007, p. 819–825**

Treatment

- In ciprofloxacin-susceptible S. enterica isolates, nalidixic acid resistance has been proposed as an indicator that infection with such a strain may not respond to fluroquinolone treatment.

Case # 3

- 72 year old male admitted 10/8/10 at referring hospital as a case of NSTEMI complicated by pulmonary edema and sepsis. Required mechanical ventilation, pressor support and antibiotics.
- Transferred to Tawam on 27/8/10. Improved on treatment. Extubated two days after arrival at Tawam.
- Sputum culture from admission grew carbapenemase producing K. pneumoniae. Blood and urine cultures were negative.
- Significantly, two weeks prior to his presentation at Kalba Hospital, the patient underwent a TURP and UGI endoscopy procedure in India. Details from that hospitalization are not available for review.

Case # 4

- 26 yrs old Iranian male was admitted on 4/9/10 to the ICU with high fever and acute respiratory failure with a new diagnosis of AML.
- Was intubated and started on broad spectrum Abs. Has pulmonary infiltrate which was felt to be leukemic infiltrate. Resp. culture showed normal resp. flora.
- Improved with hydroxurea and pharesis and was extubated.

Case 4 cont.

- Readmitted to ICU 2 days later in sepsis.
- BC grew MRSA and sputum culture later grew MDR Klebsiella pneumoniae.
- Patient died few days later inspite of full supportive measures and broad spectrum anitibiotic coverage.
- This patient was in a room next to the earlier described patient with NDM1 KP

Case 3 & 4

- Both patients were infected by NDM1 K.pneumoniae .
- Both strains were 100% identical on PGFE and ERIC PCR.

- These two cases highlight the presence of NDM1 KP in Al Ain
- It also shows that these organisms can spread if there is any breach in Infection control practice.

- NDM-1 producers are likely to become highly prevalent in future.
- It is possible that the dissemination of the NDM-1 gene will mirror the spread of the CTX-M-15 gene, and that thousands of South Asian people may be carriers of multidrug- or pan-resistant E. coli isolates expressing the NDM-1 gene in their faecal flora

  - J Antimicrob Chemother 2011; 66: 689–692

- One of the major risk is hospitalization in Indian subcontinent.
- There is contamination of urban water.
- Fecal colonization of population from or visiting the area of high incidence is fairly possible
- It is matter of time when we will see more infections like UTI and diarrhea in the community.

What need to be done?

- WHO 2000 comprehensive recommendations for curbing antibiotic resistance
  - national surveillance programmes
  - Rigorous infection control policies
  - banning of non-prescribed antibiotics
  - prudent antibiotic usage in hospitals
  - increased international collaboration

Summary

- A thorough medical hx. is very important that should include travel, hospitalization in last 12 months, recent use of Abx. and contact with health care services either at home or clinics.
- Prudent use of Antibiotics
- The rising concern is NDM1 producers which is going to effect the whole world keeping in view the amount of international travel.

Thank

You