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Full Length Research Paper

The most common bacteria causing ocular infection in North-East of Iran between 2005-2011 and their antibiotic resistance pattern

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Surveying causative agents of infections and their antibiotic resistance pattern is important for policy making in health systems. Today, antibiotic resistance among ocular pathogens is increasing. Among these, *staphylococcus* is an important nosocomial pathogen distributed extensively across the world. In this work, 300 ocular infection samples are collected from patients in Ghaem hospital. Bacterial specimens are isolated and identified at genus and species level by laboratory tests. The antimicrobial susceptibility test is performed for all samples using standard disc diffusion method. Our results show that the most common bacteria causing ocular infection are *Coagulase-Negative Staphylococci* and *K.pneumonia*, and they are resistant against antibiotics. Due to the fact that the most samples are isolated from neonatal department as well as the most common bacterium that causes ocular infection is CoNS, it could be concluded that prenatal or contaminated hands are the first candidates for being responsible for bacteria transition.

Key words: Ocular infection, antibiotic resistance pattern, antimicrobial susceptibility, bacterium, neonatal department.

INTRODUCTION

The eye is an anatomically and functionally complex structure, with variable and unique infectious manifestations (Di Bartolomeo, Higa et al., 2005). Bacterial infections of the eye are common. Although eye has normal flora; *Corynebacterium*, *staphylococcus* species, non-pathogen *Neisseria*, *clostridium*, (WILSON, 2005).

The conjunctival flora is normally held in check by the flow of tears, which contain antibacterial lysozyme (Brooks, Carroll et al., 2013).

Modification in this normal flora contributes to different ocular infections. Neonatal conjunctivitis is one of the most important consultation reasons in the first days of life (Di Bartolomeo, Higa et al., 2005).

For treatment of bacteria, isolation and identification of them along with antibiotic susceptibility spectrum is essential. The most common bacterial pathogens are *Staphylococcus aureus, Haemophilus influenzae, Streptococcus pneumoniae,* and *Pseudomonas aeruginosa* (Winn and Koneman, 2006).

Among these, *staphylococcus* is an important nosocomial pathogen distributed widely across the world (Zhang, Sparling et al., 2004).

Recently many of hospital pathogens show high resistance to antibiotics.

Antimicrobial resistance against these pathogens is a global public health threat (Hsu, Tan et al., 2010). Antibiotic resistance among ocular pathogens is increasing due to misuse of antibiotics (Sharma, 2011).

Surveying causative agents of infections and their antibiotic resistance pattern is important for policy making in health systems.

In this study we survey resistance pattern of ocular pathogens that could help clinicians in selecting antimicrobial agent for empirical therapy.

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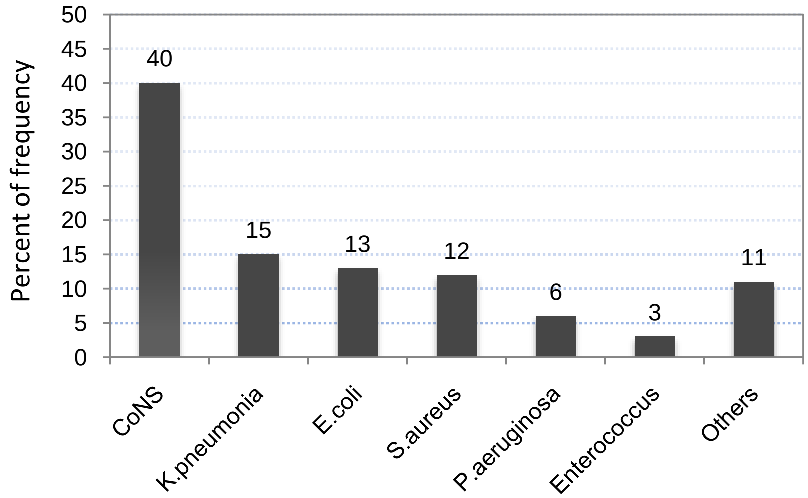

Figure 1. Percents of frequency of bacteria between 2005-2011.

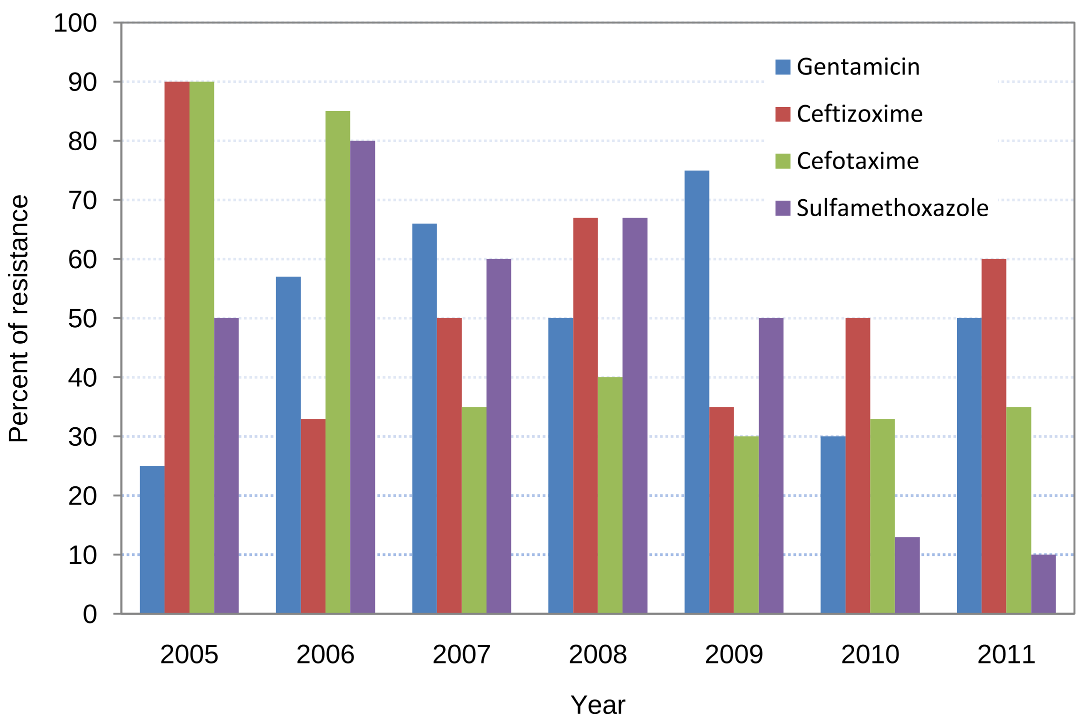

Figure 2. Percents of resistance to 4 antibiotics for *S. aureus* during 7 years.

MATERIAL AND METHODS

Three hundred ocular infection samples were obtained from patients in Ghaem hospital. Bacterial specimens were isolated and identified at genus and species level by laboratory tests. Gram staining, culture on blood agar (hemolyse), oxidase and catalase tests were performed for all of microorganisms. The isolates of *S. aureus* and Coagulase-Negative staphylococcus (CoNS) were identified by mannitol fermentation, coagulase and DNase tests by standard laboratory procedures. IMVIC tests was performed for diagnosis of *K. pneomoniea*, *E. coli*, *P. aurogenosa* (Mahon, Manuselis et al., 2007) Entrococcus was identified by bile esculin hydrolysis, growth on sodium chloride, susceptibility to optochin (Khalili, Dashti-Khavidaki et al., 2012). The antimicrobial

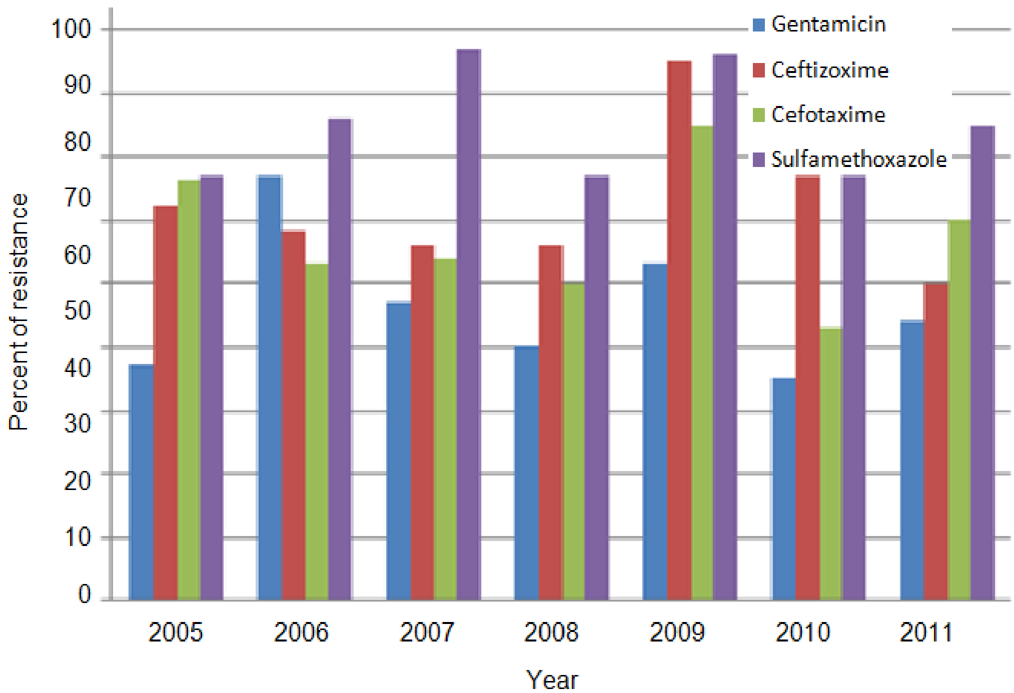

Figure 3. Percents of resistance to 4 antibiotics for CoNS during 7 years.

Table 1. Percentage of resistance bacteria against antibiotics.

Antibiotics Bacteria	Cefazolin	Gentamicin	Penicillin	Vancomicin
K.pneumonia	66%	65%	------	------
P.aeruginosa	57%	10%	------	------
E.coli	40%	25%	------	------
Enterococcus	------	------	100%	50%

susceptibility test was performed for each of 300 isolates using Kirby-Bauer disc diffusion method.

Disks were used to determine the susceptibility of isolates to penicillin (10 µg/disk), erythromycin (5 µg/disk), gentamicin (10 µg/disk), sulfamethoxazole (25 µg/disk), ceftizoxime (30 µg/disk), cefotaxime (30 µg/disk), cefalothin (30 µg/disk), cefazolin (30 µg/disk), and vancomicin (30 µg/disk).

The diameter of the zone of inhibition produced by each antibiotic disc after incubation was measured and interpreted using the zone diameter interpretative standards of the Clinical and Laboratory Standard Institute (CLSI) (Dowzicky and Park, 2008).

RESULTS

Between 2005-2011 nearly 90% of isolates were collected from neonatal department and other wards such as obstetrics and gynecology department. The most common isolated bacteria were *Coagulase-negative staphylococcus* (n=120, 40%), *K.pneumonia* (n=45, 15%), *E.coli* (n=39, 13%), *S.aureus* (n=36, 12%), *P.aeruginosa* (n=18, 6%), Enterococcus (n=9, 3%), and other bacteria (n=33, 11%) (Figure 1).

The antimicrobial resistance pattern among *S. aureus* and CoNS isolates were as follow respectively: 95%, 86% of isolates were resistance to penicillin, 80%, 70% to erythromicin. Pattern of resistance against gentamicin has increased and there was intermediate resistance to vancomicin (5%).

Resistance of *S. aureus* against sulfamethoxazole has decreased. Resistance of *S. aureus* against cephalosporins was high specially, in last year's (Figure 2).

Resistance to sulfamethoxazole has increased among isolates of CoNS and also moderate resistance against cephalosporins was obsereved in over 55% of isolates (Figure 3).

Resistance percent of CoNS against antibiotics was 74% and for *S. aureus* was 72%. Isolates were at least resistance to 3 or more classes of antibiotics. The pattern of antibiotic susceptibility to first line antibiotics has changed during last year's.

Antimicrobial resistance rates are used against antibiotics for the most common Gram-negative bacilli and *enterococcus* were listed in table 1.

DISCUSSION

Resistance against one or more antibiotics is prevalent among ocular bacterial pathogens. Resistance to antimicrobial agents is of clinical concern because it can lead to treatment failures, it limits therapeutic choices, and it increases health care costs (Haas, Pillar et al., 2011). Zhanel et al in 2010 reported that *E. coli*, *S. aureus*, *P. aeruginosa*, *S. pneumoniae*, *K. pneumoniae*, *H. influenzae*, and *Enterococcus* spp. are the most common bacteria recovered from clinical specimens in Canadian hospitals (Zhanel, DeCorby et al., 2010) which is somewhat similar to our finding.

Chen et al surveyed the resistance pattern of bacteria causing endophthalmitis during a period of 21 years, in the northeastern part of united stated of America. Their results showed that the most prevalent organisms were coagulase-negative Staphylococcus (CoNS) (37.5%, n=60). The most common gram-negative isolates were Klebsiella species (3.1%, n=5), Moraxella species (3.1%, n=5). CoNS showed a decreasing resistance over time to gentamicin (P=0.007) and an increase in resistance to penicillin and tetracycline during 2002-2008 (P=0.003, P=0.040, respectively) (Chen and Adelman, 2012).

In a recent study of microbial keratitis in Oxford UK, 40.1% of bacterial infections were caused by *Staphylococci* and 30.3% *Pseudomonas*. As contact lens associated keratitis is commonly caused by Pseudomonas lower frequency of this bacterium was preditable in neonatal ocular infections. In that study 100% of gram-negative and gram-positive bacteria were sensitive to gentamicin and vancomycin, respectively. In our study, the gram-negative bacteria sensitivity to gentamicin is variable from 35% to 90%. However, it can be used as an appropriate antibiotic against *E.coli* and Klebsiella. Enterococcus resistance in the present work is 50% which reveals that this bacterium is a high-resistance one in Ghaem hospital (VRE). But it could be employed as a suitable antibiotic for staphylococcal isolates in ocular infections (Orlans, Hornby et al., 2011).

In 2012, Falavarjani et al in Rasul Akram Tehran hospital identified the causing pathogens of endophthalmitis. Among 65 samples, there were 36 gram-positive organisms, 28 gram-negative organisms and one fungus. CoNS and Pseudomonas were the most common isolated bacteria, respectively. Only 2% of isolated samples were Klebsiella, while in the present study, this isolation rate is 15% (Falavarjani, Nekoozadeh et al., 2012).

In the study of willcox et al, two of the most common bacteria to cause microbial keratitis were *P. aeruginosa* and *S. aureus* (Willcox, 2011) while that in the study of Haas the most prevalent species was *Haemophilus influenza* (Haas, Gearinger et al., 2012), Due to the fact that the most samples were isolated from Ghaem hospital neonatal department as well as the most common bacteria that caused ocular infection was CoNS, it could be concluded that prenatal or contaminated hands were the causing agent .

In study of kibret on antimicrobial susceptibility patterns of *E. coli* from clinical sources in northeast Ethiopia, 3.4% of isolates were from eye infection that significantly high degree of sensitivity rates to gentamicin (79.6%) was recorded and considered appropriate for empirical treatment of *E. coli* in the study area (Kibret and Abera, 2011).

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