Five years of prospective surveillance of nosocomial infections in a Saudi Arabian General Hospital

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ABSTRACT
Objective: To determine the incidence of nosocomial infection by service and site and the distribution of pathogens involved during a five year period. Setting: Hospital-wide, Intensive Care Unit and Burns Unit of Qatif Central Hospital. Subject: Patients with proven nosocomial infections. Methods: Analysis of patient's data collected by active surveillance using a combination of case finding methods. Results: The overall rate of nosocomial infection was 2.2%. According to the hospital services the rates of nosocomial infection ranged from 0.8% to 28%. The highest rates were seen in the Burns Unit (28%) and Intensive Care Unit (24%); the major sites of nosocomial infections were, urinary tract (29%), post operative wound infection (24%), respiratory tract infection (18%) and blood-stream infection (11%). Pseudomonas spp. was the most frequently isolated nosocomial pathogen (18.9%), followed by S. aureus, (16.5%) Klebsiella spp. (13.5%), E coli (9%), Candida spp. (5.5%), Coagulase negative staphylococci (5.3%) and Enterococci (5.5%). Nosocomial infection is a problem in Burns Units and in high dependency areas. In Saudi Arabia, like other countries, prospective active surveillance and dissemination of information to health care staff may identify areas where infection control prevention effort should be focused.


Keywords: Infection - nosocomial infections.

Hospital acquired infection has recently become a growing concern for many hospital physicians in developed countries. Between 5-10% of all hospitalized patients develop a nosocomial infection, which can increase morbidity and mortality, therefore, prolonging their stay in hospital can add significantly to the economic burden of managing the underlying diseases.

The sites of infection and the nosocomial pathogens involved differ in frequency; morbidity and mortality also vary with hospitals, countries and season. Most of the present information on nosocomial infection is based on studies conducted in major teaching or research institutions in the more developed countries. Despite the interest in nosocomial infection in developing countries, studies are limited with few published data. The purpose of this study was to determine the overall rate of nosocomial infection, the frequency of different types of infections and the distribution of pathogens involved in hospital-wide and intensive care unit surveillance at Qatif Central Hospital in Saudi Arabia.

Methods This study was carried out in Qatif Central Hospital (QCH); it is located on the gulf in the eastern province of Saudi Arabia and is a 400 bedded referral hospital that provides all medical services.

The day-to-day infection control duties were performed by the infection control team which consisted of the medical microbiologist and two infection control nurses. Active prospective surveillance was performed using a combination of case finding methods, including daily review of positive microbiology reports. This was followed by a review of the patient's chart to determine whether the case met the nosocomial infection definitions. The infection control officer often discussed, the case with the physician or nurse to obtain additional information necessary to make a final determination.

By the end of each month data were tabulated, analyzed and fed back to all hospital departments and presented to the infection control committee which meets four times a year. Nosocomial infection was defined as any infection which is acquired during hospitalization and which was not present or incubating at the time of admission.

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or an infection which is acquired in the hospital and becomes evident after discharge from the hospital. A newborn infection which is the result of passage through the birth canal is also considered to be nosocomial infection. Infection control teams use standard definitions developed at the Centers for Disease Control and prevention (CDC). Microorganisms isolated were identified by standard techniques. For this study data were analyzed for the period of August 1990 through August 1995. Attempts were made to determine the overall infection rate, the incidence of nosocomial infections by site and service and to compare hospital-wide pathogens with those reported from intensive care units.

Results During the period of study, a total of 71,094 patients were discharged from the hospital, their distribution is shown in Table 1. Of these patients 1,587 were found to have acquired infection in the hospital, giving an overall rate of 2.2% for nosocomial infection.

According to the hospital services the rates of nosocomial infection ranged from 0.8% to 28%, the highest rates were seen in the Burns Unit and Intensive Care Unit, while low rates were observed in the Obstetric, Gynecology and Pediatric Wards. The major sites of nosocomial infection were urinary tract 29%, post operative wounds 24%, respiratory tract 18%, blood 11% and others (skin, subcutaneous tissue, bone joint, eye) 18%. Pseudomonas spp. was the most frequently isolated (18.9%) of all nosocomial pathogens. This was followed by Staphylococcus aureus (16.5%). Twenty two (22%) of S. aureus isolates were resistant to methicillin (MRSA). Other frequently reported organisms were Klebsiella spp. (13.5%) E coli (9%), Candida spp. (5.5%), coagulase negative staphylococci (5.3%), enterococci (5%), less frequently encountered pathogens were Enterobacter spp. (4.8%), Proteus spp. (4.5%), Acinetobacter spp. (3%), Haemophilus spp. (2.7%) Group “B”, beta haemolytic streptococci (2%) and Serratia spp. (1%). Resistance to aminoglycosides among gram negative bacilli ranged from 18% to 30%, the highest being among Pseudomonas spp. (30%), Klebsiella spp. (23%). The distribution of nosocomial infection by anatomical site, pathogenic organisms and place of acquisition is shown in Table II. In nosocomial urinary tract infection Pseudomonas spp., E. coli, and Klebsiella spp. were the most frequent organisms. For post operative wound infection, S. aureus, Pseudomonas spp., Klebsiella spp. and E. coli were the most frequently isolated. In respiratory tract infection, the most organisms encountered were S. aureus, Pseudomonas spp. and Klebsiella spp., while in blood stream infection the most frequent reported organisms were Klebsiella spp., Coagulase negative staphylococci and S. aureus.

Discussion The general level of health care in any country will dictate the amount of attention paid to the control of nosocomial infection. A recent World Health Organization survey involving countries found that the prevalence rate of nosocomial infection ranged from 3 to 10%. Surveillance of nosocomial infection is a well established tool for reducing the incidence to an acceptably low level. It includes feedback of the results to the health care personnel who can contribute to the prevention of these infections. Despite adequate infection control procedures, the incidence may continue to increase, particularly as advances in medical practice permit aggressive treatment of an ever expanding elderly population.

Our study shows that the overall rate of nosocomial infection during the study period was 2.2% which is similar to the rate reported elsewhere in Saudi Arabia. Several authors have reported varying rates of nosocomial infection in various types of medical services. Recently, Chandrasker reported a rate of 29.8% for the Burns Unit and 35.2% for Intensive Care Unit. A similar rate was observed at our hospital in the Burns Unit (28%) but a lower rate in our Intensive Care Unit (24%); this could be explained by the differences in the type of patients, invasive support, the underlying condition and the duration of hospital stay. Our study shows that urinary tract infections, post operative wound infection respiratory tract infections and blood stream infections, accounted for 82% of the nosocomial infections, and the urinary tract was the most common site to be infected; this is in agreement with the results of other studies from Saudi Arabia and other countries.
The present study shows that gram negative bacilli caused more nosocomial infections accounting for 60% of hospital-wide infections compared to 32.5% for gram positive infections and 5.5% for fungal infections. These findings are similar to those reported elsewhere. It has been found by others that most nosocomial blood stream infections (BSI) are secondary to site of infection elsewhere in the body. Our data shows that gram negative organisms isolated from BSI include Klebsiella spp., E. coli and Pseudomonas spp. as predominant pathogens. These BSI were often secondary to previous infections at a body site such as urinary tract, wound site or respiratory tract, as seen by the distribution of pathogens at these sites. A significant proportion of BSI however were not related to hematogenous spread from infections at such sites and were primary BSI, mostly in immunocompromised and neutropenic patients. These facts attest to the importance of nosocomial urinary tract infection, wound and respiratory tract infections and the need for continued research to find ways of reducing their incidence.

Methicillin, resistant *S. aureus* (MRSA) are frequently seen in hospitals throughout the Middle East and have been designated a high risk area for MRSA. The evidence for this has not been adequately documented in terms of its incidence. However, our study shows that *S. aureus* accounts for 16.5% of all nosocomial infections. Twenty two percent of *S. aureus* isolates were resistant to methicillin (MRSA). This is in agreement with the finding of other investigators from South East Asia, where they found that 25-30% of all *S. aureus* isolates were MRSA.

*Enterococci* has been reported as important nosocomial pathogens accounting for up to 10% of all infections among hospitalized patients, which is in agreement with our data where *enterococci* were encountered in 8% each of urinary tract and wound infections. We conclude that the nosocomial infection rate and the pathogens responsible for these infections are likely to vary with each hospital, by the service provided and patient’s susceptibility. Periodic examination of local surveillance data of the

<table>
<thead>
<tr>
<th>Site</th>
<th>Organism</th>
<th>Percentage of Organism Hospital Wide</th>
<th>Percentage of organism in ICU/SCBU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urinary tract infection 29%</td>
<td>Pseudomonas spp. E. coli Klebsiella spp. Candida spp. Enterococci Proteus spp.</td>
<td>21% 16% 16% 12% 9% 5%</td>
<td>32% 17% 10% 5% 8% 3%</td>
</tr>
<tr>
<td>Wound infection 24%</td>
<td>S. aureus Pseudomonas spp. Klebsiella spp. E. coli Enterococci Proteus spp. Enterobacter</td>
<td>23% 18% 11% 9% 6% 2%</td>
<td>22% 35% 5% 12% 8% 3%</td>
</tr>
<tr>
<td>Respiratory tract infection 18%</td>
<td>S. aureus Pseudomonas spp. Klebsiella spp. Haemophilus spp. E. coli Candida spp. Moraxella catarrhalis</td>
<td>27% 17% 10% 8% 5% 4%</td>
<td>13% 12% 13% 2% 10% -</td>
</tr>
<tr>
<td>Blood (bacteremia) 11%</td>
<td>Klebsiella spp Coagulase negative staphylococci S. aureus Pseudomonas spp. E. coli</td>
<td>21% 16% 14% 10% 9%</td>
<td>22% 19% 18% 8% 6%</td>
</tr>
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distribution of pathogens (by service and site) will be helpful to clinicians and may identify areas where infection control prevention effort should be focused.

References


