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Health-Care Associated Infection Rates among Adult Patients in Bahrain Military Hospital: A Cross Sectional Survey

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Background/Objective: Health-care associated infections cause substantial morbidity and mortality with their prevalence varying between countries and hospitals. There are no published studies of health-care associated infections in hospitals in Bahrain and few in general military hospitals.

Setting: Bahrain Defense Force Hospital.

Design: Survey.

The aim study is to establish the prevalence of health-care associated infections in a general military hospital in Bahrain.

Method: A cross-sectional survey of a random sample of 500 medical records in the Bahrain Defence Force Hospital was carried out to ascertain the prevalence of health-care associated infections.

Result: Four health-care associated infections were recorded – a prevalence of 0.87% (95% CI 0.34-2.22). Two of the infections were surgical site infections while the other two were skin infections.

Conclusion: This study revealed that the prevalence of health-care associated infections is lower than recorded in most published studies.

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Health-care associated infections cause substantial morbidity and mortality, prolong the hospital stay of affected patients, and increase direct patient-care costs[1]. Risk factors for health-care associated infections can be classified into 3 groups: iatrogenic (pathogens that are present on medical personnel, invasive procedures, and antibiotic abuse), organizational (contaminated air-conditioning or water systems, staffing and physical layout of the facility) and patient related (severity of illness, underlying immuno-compromised state, and length of stay)[2].

The prevalence of health-care associated infections varies between countries and between hospitals. In the United States of America, there are an estimated 2 million cases of health-

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care associated infections annually affecting about 10% of American hospital patients[3]. Surveys in Europe have established prevalence rates for health-care associated infections of 6.1% in Norway and 4.9% in Lombardy, Italy[4,5]. In the Middle East, an 18 month prevalence survey in a new hospital in the United Arab Emirates gave a rate of 4.7%[1].

A one-day point prevalence survey in King Fahd National Guard Hospital in Riyadh, Saudi Arabia on 562 patients revealed 8% rate[6]. However, in an eighteen month study of the incidence of health-care associated infections conducted at general army hospital of 436 beds in the USA the overall rate was 1.48%[7]. They suggested that the cautious use of intravenous lines, screening of surgical candidates for operative risks and fewer procedures on chronic cancer patients and immuno-compromised hosts were possible reasons for this low rate.

BDF hospital instituted a policy on the prevention of health-care associated infections (based on CDC guidelines) in 1980, which is regularly updated. The infections control office organizes orientation programs for new recruits and holds frequent workshops and seminars for all the staff of the hospital. The office carries out a random audit weekly in the wards and other departments (including the kitchen and the laundry) to monitor for compliance to the infection control policy. The compliance to the policy is about 80% and feedback on this monitoring is given to the physicians, nurses and administrators. Each identified health-care associated infection is investigated, causes determined and feedback given to the consultant physician and other ward staff. There is no policy on the routine use of antibiotics in the BDF hospital but only consultants are allowed to prescribe third generation Cephalosporins.

The aim of this study is to evaluate the prevalence of health-care associated infections in a general military hospital in Bahrain.

METHOD

Bahrain Defence Force (BDF) Hospital is the second largest hospital in Bahrain with 400 beds. In 2005, 64% of patients were Bahrain Defence Force employees and families, 16% from the Ministry of the Interior and National Guard, 14% civilians, 5% from the Royal family and 1% from Embassies and other organizations[8]. The majority of the medical and paramedical staff are military personnel. The total bed occupancy rate for 2006 was 61.7% and the average length of stay was 3.1 days[8].

A cross-sectional survey of the medical records in the BDF hospital was performed. A random sample (computer generated using a study allocated number) of 500 records of all the discharged patients (n=23,800) within one year (February 2006 – January 2007) was taken. Patients below 18 years of age were excluded from the survey. A sample size of 384 completed records was needed for 95% chance of being within 5% of the true result. Five hundred records were taken to allow for possible missing records. These records were searched to ascertain the age, sex, diagnosis, risk factors for infection, infection(s) acquired in the hospital (based on CDC classification) and before coming to the hospital, ward(s), duration in the hospital, invasive procedures, and the use of, duration, and reason for antibiotics. The results were analyzed with JMP IN Version 4.0.4 using descriptive statistics. Ethical approval for the study was obtained from the BDF Research Committee and the Royal College of Surgeons in Ireland - Medical University of Bahrain Research Ethics Committee.

RESULT

We located 458 of the 500 records (91.6%), see Figure 1. Twenty six (5.2%) of the records were missing and 16 (3.2%) were out in the wards during the time of the survey and could not be accessed. Four health-care associated infections were identified showing a prevalence of 0.87% (95% CI 0.34-2.22). Two of the infections were surgical site infection, while the other two were skin infection. The organisms involved were gram negative bacilli, gram positive cocci and fungi. Thirteen patients (2.84%) had infections prior to admission to the hospital.

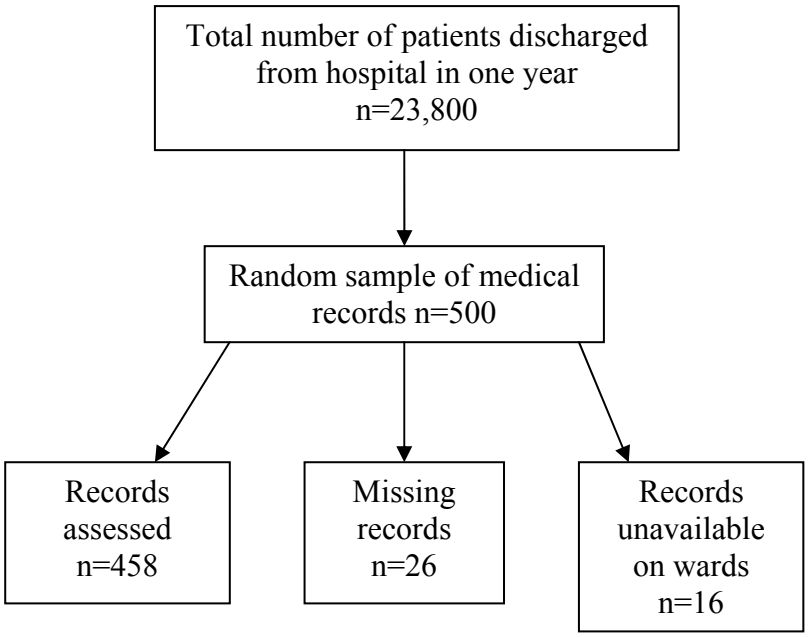

Figure 1: Sampling and Assessment of Medical Records of the Discharged Patients

Tables 1 and 2 show the characteristics data of the patients sampled. The mean age of the patients admitted within the period was 41.6 years (95% CI 39.9 - 43.2) and the median age was 37 years (range 18 - 96 years). The mean length of stay in the hospital was 4.25 days (95% CI 3.9 - 4.6) and the median was 3 (range 1 - 32 days).

Table 3 shows the profile of the patients who had health-care associated infections. The mean age of the four patients with health-care associated infections was 53.25 years (95% CI 8.5 - 98.0) and the mean length of stay in the hospital was 12.25 days (95% CI 0 - 28.4). Two of the patients were on the medical ward. Three of the patients underwent invasive procedures with 108 minutes as the mean length of the procedures. None of the patients with health-care associated infections was on prophylactic antibiotics or had a catheter (urinary or central line) inserted.

Table 1: Characteristic Data of Accessed Patients' Records

Sex	Number of patients	Percentage
Male	183	39.96
Female	275	60.04
Age group		
18 – 29	142	31.00
30 – 49	179	39.08
50 – 69	86	18.78
≥ 70	51	11.14
Diagnosis		
Surgical	107	23.36
Medical	93	20.31
Cardiac	98	21.40
Obs/Gyn	160	34.93
Risk factor for infection		
Prone to infection*	79	17.25
Not prone to infection	130	28.38
None	249	54.37
Length of stay in the hospital		
1 – 3 days	261	56.99
4 – 6 days	120	26.20
7 – 9 days	48	10.48
≥ 10 days	29	6.33
Wards		
Surgical	122	26.64
Medical	62	13.54
Cardiac	100	21.83
Obs/Gyn	167	36.46
Day Case Unit	7	1.53

*Prone to infection - conditions such as immuno-suppression, cancer, diabetes mellitus etc

Table 2: Antibiotic Use, Invasive Procedures, Devices and Their Duration

Antibiotic Justification	Number of patients	Percentage
Underlying infection	31	49.21
Nosocomial infection	4	6.35
Prophylaxis	28	44.44
Total	**63**	
Invasive procedures		
Surgery	225	49.13
Endoscopy/Colonoscopy	5	1.09
Devices		
Catheter	108	23.58
Ventilator	18	3.93
Duration of invasive procedures		
≤ 20 minutes	46	20.00
21 – 60 minutes	104	45.22
61 – 100 minutes	43	18.70
≥ 101 minutes	37	16.09
Total	230	

Table 3: Patients' Profile with Health-Care Associated Infections

Sex	Age	Ward	Length of stay	Surgical duration	Ventilator	Infection Risk factor	Pre-admission Infection	Nosocomial infection	Micro-organisms involved
Female	23	Obs/Gyn	5days	40mins	No	No	No	Skin/fungal	Fungi
Male	51	Medical	27days	130mins	No	No	No	Surgical	Gram +ve cocci
Male	48	Surgical	11days	155mins	Yes	Yes*	No	Surgical	Gram +ve cocci & Gram -ve bacilli
Male	91	Medical	6days	None	No	No	Yes	Skin/fungal	Fungi

* Necrotic ulcer on left foot, peripheral vascular disease, diabetes mellitus and hypertension

DISCUSSION

The main finding of this study was a very low prevalence of health-care associated infections in a Bahrain military hospital. This low prevalence could due to the infection control office, which carries out a random audit weekly in the wards and other departments (including the kitchen and the laundry) to monitor for compliance to the infection control policy.

The rate reported in this study is lower than that reported in most literature but comparable with that found in a military hospital in the United States of America[7]. The reasons for the low rate at the BDF Hospital are most likely complex but we would hypothesize that the degree of discipline and rigour imposed by a military establishment into the maintenance of routine procedures may have contributed towards more effective infection control. The high degree of adherence to policies, staff induction, education, audit and feedback in the hospital are most likely a consequence of responsiveness to military discipline. Other factors that may have contributed to the low prevalence include the healthier, younger population attending this hospital, the short lengths of stay, the higher staffing ratios and the judicious use of antibiotics. There are few published studies of health-care associated infections in other general military hospitals to support or negate this hypothesis.

The majority of the patients admitted to the hospital had intravenous access inserted, but intravenous lines are regularly monitored and changed every 48 - 72 hours. The practice of regularly monitoring and changing intravenous lines has been shown to reduce health-care associated infections[7]. The BDF hospital does not have an antibiotic usage policy but a substantial percentage of the patients (44.44%) were given antibiotics for prophylaxis. This preventive measure may have contributed further to the low prevalence rate of health-care associated infections recorded in the hospital.

Other characteristics of the hospital population may also have played a part. Military dependents and active duty personnel may respond more enthusiastically to preventive medical programs and easy availability of health care. Throughout the active duty ranks, there is a priority placed on physical fitness. Thus, the population involved in this study is not only younger but also most likely healthier than many other hospital populations. Seventy percent of patients admitted to the BDF Hospital were aged less than 50 years. It has previously been suggested that the younger and healthier population in military hospitals

may contribute to the lower prevalence rates[7]. The average age of those with health-care associated infections in the BDF was 53.25 years, similar to other studies, which indicates that the majority of patients with health-care associated infections were above the age of 50 years[6]. In addition, only 17% of the patients in this study had risk factors that would have made them more prone to health-care associated infections. Longer lengths of stay also contribute to higher rates of health-care associated infection; the majority of patients in this study stayed in the hospital for less than three days[6,9]. Surgical procedures accounted for most (49%) of the invasive procedures done among the patients admitted during this study. No association was found between the surgical procedures in particular and invasive procedures in general and health-care associated infections detected in the hospital. Surgical patients are at a higher risk for all categories of infections not only surgical site infections (SSI)[5]. Surgical patients in BDF are usually screened closely and discharged early enough to prevent infections. Several studies have recorded a high incidence of nosocomial infections in intensive care units[4,5,6]. The BDF hospital has a policy of maintaining a high nurse to patient staffing ratio of one to one in their intensive care unit – another measure that may contribute to this low rate.

The results of this study should be treated with some caution**.** Using methods of retrospective, passive data collection may produce a clinical endpoint not sensitive enough to delineate some health-care associated infections[7]. Prevalence studies have proved reliable and simple although less informative than the more cumbersome incidence surveys, which have proved to be good indicators for detecting and localizing any problems[4,5,10].

CONCLUSION

This study shows that the level of health-care associated infections is low. Several factors might have accounted for the low level in the BDF hospital. We would suggest that an important factor may be the discipline that is present in military establishments. Further studies of health-care associated infections in military hospitals would be needed to provide further evidence for this hypothesis.

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