

## Hospitalization among diabetic adults due to infectious diseases in Zahedan

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### ABSTRACT

**Background:** In vitro evidence shows that immune function is compromised in people with diabetes. Therefore, infections are more common and infection-related mortality is higher in this group. Accurate information about the prevalence of infectious diseases in diabetic patients can help in health care policy and support planning. We do not know the spectrum of clinical infectious diseases in our patients. This study was conducted to determine the most common infectious diseases in diabetic patients.

**Patients and methods:** In this cross-sectional study all diabetic patients who were admitted to our hospital in Zahedan (Southeastern Iran) between 2001 and 2006, were evaluated. At first, we selected all of the patients with diabetes. Then all patients files were reviewed retrospectively for demographic factors and duration of diabetes, type of diabetes, cause of admission, prevalence of infectious diseases, duration of hospitalization and mortality rate.

**Results:** A total of 112 patients with diabetes (45 males and 67 females with an age range of 10 to 80) were evaluated. Pneumonia, diabetic foot and tuberculosis were the most common infections. Seventy percent of cases had type 2 diabetes. Duration of hospitalization was between 1 to 20 days.

**Conclusion:** Upon the results emerged from this study, infection is the most frequent cause of hospitalization and death in the diabetic patients. Control of the disease, good health care system and vaccination can decrease the rate of infectious diseases.

**Keywords:** *Infectious diseases, Diabetic patient, Prevalence.*  
(Iranian Journal of Clinical Infectious Diseases 2008;3(2):89-92).

### INTRODUCTION

Many clinicians believe that people with diabetes have an increased susceptibility to infection (1). Several aspects of immunity are altered in patients with diabetes. Polymorphonuclear leukocyte function is

depressed, particularly when acidosis is also present. Leukocyte adherence, chemotaxis, and phagocytosis may be affected (2-4). Antioxidant systems involved in bactericidal activity may also be impaired (1,4). The clinical data on humoral immunity are limited, but responses to vaccines appear to be normal. Cutaneous responses to antigen challenges and measures of T-cell function may be depressed (2-6). Certain rare infections are more common among diabetic patients, including invasive otitis externa, rhinocerebral

Received: 30 June 2007 Accepted: 28 October 2007

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mucormycosis, and emphysematous infections of the gall bladder, kidney, and urinary bladder (1,3). Diabetes predisposes patients to comorbidities, such as foot ulcers, which increase susceptibility to infection, whereas some infections, such as hepatitis C, may predispose individuals to developing diabetes (7). Furthermore, diabetes influences the outcomes of specific infections, such as bacteremia and mortality following pneumococcal pneumonia (4). All previous studies show that the risk of infection-related mortality is notably increased for diabetic adults compared with those without diabetes, but only among people with concurrent cardiovascular disease (5). We decided to conduct this study to determine the prevalence of the most common infectious diseases in our diabetic patients and thus being helpful in health care policy and support planning.

## PATIENTS and METHODS

We reviewed a series of diabetic patients who were admitted to infectious and internal medicine wards in Boo-Ali hospital (a teaching hospital in Zahedan in Sistan and Baluchistan province and a referral center for infectious diseases located in Southeastern Iran), during a period of five years, from November 2001 to February 2006. All diabetic patients were visited by an internist as diabetes type 1 or 2, in diabetes clinic monthly. They were admitted to our hospital because of fever or a presumptive diagnosis of an infectious disease. First we selected all of the diabetic patients with the age of more than 10. Then, all patient files were reviewed retrospectively for initial data including age, sex, duration of disease, type of infectious disease, clinical manifestations and mortality rate. Criteria for diagnosis of tuberculosis included: (a) having two positive sputum smear, (b) positive smear culture, (c) or a positive pathology. Diagnosis of sepsis, urinary tract infection (UTI) or pneumonia was made according to blood, urine or

sputum culture. Finally, data were analyzed using SPSS software (version 11.5, SPSS Inc., USA).

## RESULTS

The study population included 45 males and 67 females (age range of 10-80 years). They used anti-hyperglycemic agents from one month to 15 years. A total of 70% of patients (77 cases), had diabetes type 2. Fever was the most common symptom (70%) followed by chills (50%) and cough (30%). Patients were hospitalized from 1 to 20 days. Finally, 3 cases died due to severe sepsis. Thirty percent of patients had a history of hospitalization at least once in the past. Twenty-six percent (29 cases) admitted due to non infectious diseases such as pulmonary embolism, hyperosmolar coma, diabetic ketoacidosis and allergic reactions. Seventy-four percent of patients (83 cases) were hospitalized due to infection. Bacterial pneumonia was the most common cause of infection (30%). Diabetic foot and pulmonary tuberculosis were seen in 15.6% and 14.5% of patients, respectively. Six cases had a history of pulmonary tuberculosis in the past. Prevalence of tuberculosis in our patients was 22%. Eighty percent of tuberculosis patients had diabetes type 2. Unfortunately, no one had a history of vaccination against influenza or pneumococcal infection. Other infections included viral infections, urinary tract infections, gastroenteritis, sepsis, exacerbation of COPD, malignant external otitis.

## DISCUSSION

Our results showed that infection is a frequent cause of hospitalization in diabetic patients (74%). Pulmonary infection, diabetic foot and TB were the major causes for hospitalization in our patients. Many individual infections are more frequent in people with diabetes, including pneumonia caused by certain organisms, pyelonephritis, soft tissue

infections including diabetic foot, necrotizing fasciitis, and mucocutaneous candida infections (1, 4). Specific infections, such as those caused by *Staphylococcus aureus* and gram-negative organisms, are more frequent in diabetic patients. According to one study, up to 30% of diabetics are nasal carriers of *S. aureus* as compared with 11% of healthy individuals (8). On the basis of their high nasal carriage rate, diabetic persons are thought to be at an increased risk for *S. aureus* pneumonia. Some infections result in increased severity when they occur in diabetic patients and are associated with increased complications (1,4,8). Data from a study by Bertoni and colleagues suggest that diabetic adults are at greater risk for infection-related mortality (8). Overall, any respiratory infection in diabetic patients is associated with increased mortality. Diabetic persons are 4 times more likely to die from pneumonia or influenza than are nondiabetic persons (8). Diabetes is a risk factor for bacteremia in patients with pneumococcal pneumonia and is associated with increased mortality (9,10). In our study, 4 patients died. Death was due to sepsis. Blood cultures were positive in three cases (gram negative rods).. Diabetic patients have a normal response to pneumococcal vaccination, and vaccination is a cost-effective preventive strategy. There is an increased mortality and increased incidence of bacterial pneumonia and ketoacidosis among diabetic patients during epidemics of influenza pneumonia (11). Reduced pulmonary ciliary clearance in patients with influenza, combined with the high incidence of nasal carriage of *S. aureus* among diabetic patients, leads to an increased incidence of staphylococcal pneumonia. Guidelines recommend influenza and pneumococcal vaccines for all patients with diabetes (12). Unfortunately, none of our patients had a history of vaccination against influenza or pneumococcal infection. In the present study, the age range of diabetic patients was nearly in agreement with Chin-Hsiao Tseng report of 61±15

years (13). In Taiwan study, infection was seen in 6.4% of hospitalized diabetic patients (13). *Mycobacterium tuberculosis* is important agent in the diabetic patients, suggesting that our diabetic patients are prone to progression of tuberculosis. Incidence of tuberculosis was high in our province. It is noteworthy that TB is an endemic disease in this region of Iran. Annual incidence rate for TB and smear positive pulmonary tuberculosis in Zahedan is 70 and 41 per 100.000 of population, respectively (14). Fourteen percent of our patients had pulmonary TB. In several studies in the first half of the 20th century, the incidence of tuberculosis among persons with diabetes was found to be three or four times as high as in the general population (15,16). More recently, in an immigrant Asian community in England, lung cavitation was found to be more common among diabetic than nondiabetic persons (17). Foot infections are the most common soft-tissue infection in patients with diabetes, similar to our findings (9,10,15-17). Since, pulmonary infection was one of the most frequent infections in hospitalized diabetic patients in our study, and influenza and pneumococcal vaccines have demonstrated their efficacy in limiting the broncho-pulmonary infections in these patients, therefore, vaccination is advised for all diabetic population.

It can be concluded that diabetic patients are susceptible to nosocomial and community acquired infections and infections are a frequent cause of hospitalization in this population. Influenza and pneumococcal vaccines can limit the broncho-pulmonary infection in the diabetic patients.

## ACKNOWLEDGMENTS

We would like to thank Mr Mohammad-Reza Rastaie for collecting data. Also, we want to thank Ms. Tayyebeh Metanat who assisted us in this study.

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