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Pattern of Infectious Diseases in the Western Region of Saudi Arabia; A Study of 495 Hospitalized Patients

Aisha A. Alghamdi, FACP**, Omer S. Alamoudi,** FRCP**, Tawfik M. Ghabrah**, PhD, and **Mohammed A. Al-Kassimi,** FRCP(UK)
Department of Medicine, Faculty of Medicine
King Abdulaziz University, Jeddah, Saudi Arabia
aalghamdius2009@hotmail.com

Abstract. To determine the pattern of infectious diseases and length of stay among hospitalized patients; and to detect the medical disorders commonly associated with infectious diseases. This is a retrospective study of all patients who were admitted to King Abdulaziz University Hospital with a diagnosis of infections over a five year period. The total number was 495 patients. A special form was used to collect information from patients' medical records including age, sex and nationality; discharge diagnosis according to 10th revision of the International Classification of Diseases; other associated diseases and the length of stay in hospital. The most affected age group was 26 - 45 years (39.8%). Pneumonia (18.8%), PUO (16.6%), Pulmonary TB (9.7%) have the highest prevalence among hospitalized patients. Pneumonia and UTI were higher among females (54.8%, 66.6%) than males (45.2%, 33.3%) respectively while pulmonary TB, bronchopneumonia, meningitis, and malaria were higher among males (66.7%, 100%, 66.7%, and 66.7%) than females (33.3%, 0.0%, 33.3%, and 33.3%) respectively ($P < 0.001$). *Diabetes mellitus* (17.6%) and hypertension (7.5%) were the most prevalent associated diseases. In 80% of the patients the length of stay ranged between one to two weeks. Pneumonia, PUO, and pulmonary TB were the leading causes of hospitalizations among patients with infectious disorders, while diabetes and hypertension were the most commonly associated diseases. Infectious diseases formed about 9% of total internal medicine admissions.

Keywords: Infectious diseases, Pattern, Pneumonia, Length of stay, Hospital admission, Saudi Arabia.

Correspondence & reprint request to: Dr. Aisha A. Alghamdi
P.O. Box 80215, Jeddah 21589, Saudi Arabia
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Introduction

Infections are the largest cause of morbidity and mortality worldwide[1]. The course and severity of infection depend on a variety of factors, including the virulence of the strain of infecting organism, the resistance of the individual, which may be reduced by famine or intercurrent disease. Plus, social factors such as lack of sanitation, poor housing and contaminated water supply; and the availability of medical facilities providing vaccination or diagnosis and treatment[1].

Community-acquired pneumonia (CAP) is a common and potentially serious illness[2]. It is associated with considerable morbidity and mortality, particularly in elderly patients and those with significant co-morbidities[1]. CAP is the number one cause of death from infectious diseases[3]. According to the National Center for Health Statistics in the year 2001, pneumonia accounted for over 1.3 million hospitalization in the United States and, when combined with influenza, was listed as the seventh leading cause of death[3], while in North America the overall rate of CAP ranges from 8 to 15 per 1000 persons per year; the highest rates are at the extremes of age[4].

Pyrexia of unknown origin (PUO) is mainly caused by three general categories of illness[5-6]; infections, connective tissue diseases and malignancy. Prospective studies of PUO in USA and Europe showed that the most common cause after infectious diseases was no diagnosis followed by neoplasia, rheumatological and miscellaneous conditions[7-9]. Tuberculosis (TB) remains the most infectious cause of death in adults worldwide, and the World Health Organization (WHO) has declared it a global emergency.

Public health measures and effective chemotherapy have substantially reduced the incidence and prevalence of TB in the United States[10]. Nevertheless, certain segments of the population remain at increased risk for TB. These include foreign-born persons from areas with high TB prevalence, homeless persons, or those residing in underserved sections of inner cities. Plus, current and former residents of correctional facilities, persons with history of substance abuse, and the elderly in long term facilities[11]. Besides HIV-infected individuals, TB is increasingly concentrated in persons of lower socioeconomic status. Low income, crowded living conditions, unemployment, and lower educational attainment account for much of the elevated risk for TB that

has been noted among African-, Hispanic-, Asian-, and Native-Americans[12].

Acute viral hepatitis (AVH) is caused by one of the hepatitis viruses [13] (HAV, HBV, HCV, HDV, HEV). Hepatitis G virus has recently been described, however, evidence suggests that it is not pathogenic and is not responsible for cases of non-A-E hepatitis[14]. Other viruses; Epstein-Barr virus, Cytomegalovirus and Herpes simplex virus can cause AVH[13]. Meningitis is usually caused by infection through micro-organisms. Most cases are due to infection with viruses[15], followed by bacteria, fungi, and parasites[16].

Malaria is the most common vector-borne disease in more than 100 countries[17]. Annually there are 300-500 million cases worldwide and 1.5-3.5 million deaths[18]. Travelers to endemic areas are at moderate risk for acquiring infection (>1 case in 200 travelers, but <1 in 10 travelers)[19]. Increasing geographic spread of resistance of malaria to chloroquine and other antimalarial drugs is causing major problems in the management and the control of the disease[18].

In the western region of Saudi Arabia, the prevalence and the pattern of infectious diseases for our patients is unknown. Therefore, the objectives of this study were; to determine the most prevalent infectious diseases among patients hospitalized in our hospital; to assess which medical disorders commonly were associated with infectious disease; to correlate the distribution of infectious diseases among hospitalized patients by age, sex, and nationality; and to assess the mean length of their stay in hospital and comparing it with hospital stay of other medical illnesses at KAUH.

Patients and Methods

A total of 495 hospitalized patients were studied and analyzed for age, sex, and nationality. The main causes of hospital admission and other associated diseases were coded according to the International Classification of Diseases (ICD). The review was done for patients hospitalized in the medical wards of the King Abdulaziz University Hospital (KAUH) over a five year period, from January 2000 to the end of December 2004. KAUH is a general teaching hospital in the western region of Saudi Arabia with total capacity of 800 beds, 250 of which are

allocated for internal medicine. The catchment area of the hospital is about half a million people of different nationalities and social classes.

Data Collection

A structured form was used to collect information from patients' medical records, including demographic data (such as age, sex, and nationality). The main causes of hospital admission, and other associated diseases were coded according to the International Classification of Diseases- 10^{th} revision and were used for calculations.

Statistical Analysis

Data were entered and analyzed using SPSS package (Release 10.01, 1999, Chicago, Illinois). Descriptive statistics were performed as appropriate, including frequencies for variables, mean ± standard deviation and cross tabulations. Statistical significance was set at <0.05 throughout the analysis.

Results

Records of 495 patients with diagnosed infectious disorders were reviewed. Comprising of 8.8% of hospital patients admitted to the medical wards at KAUH during the 5 year study period; one in 11 of admissions were for an infectious disease. Of these patients 53.9% were males and 54.0% were Saudis. The age group, 26-45 years had the highest prevalence (39.8%), followed by the age groups 13-25 years (23.3%), and 46-65 years (22.7%). The least age group affected was above 65 years (14.3%). Table 1 shows ranking of diagnosis among the hospitalized patients with infectious disorders. By far, pneumonia has the highest prevalence (18.8%), followed by PUO (16.6%), pulmonary TB (9.7%), AVH (8.4%) and chronic viral hepatitis (CVH) (7.3%). Figures 1-3 show the distribution of the ten most prevalent infectious diagnoses encountered by age group, sex, and nationality, respectively. Pneumonia and UTI were more prevalent among females (54.8%) than males (45.2%). In contrast, pulmonary TB, bronchopneumonia, meningitis and malaria were prevalent among males (66.7%, 100%, 66.7%, and 66.7) than females (33.3%, 0.0%, 33.3%, and 33.3%) respectively ($P < 0.05$). Pneumonia, PUO, and bronchopneumonia were more prevalent among Saudis, while pulmonary TB was more prevalent among non-Saudis ($P < 0.05$). The most affected age group among the ten most frequent

infectious diseases was 26 – 45 years while the most affected age group in bronchopneumonia patients was above 65 years. However, UTI was almost equally prevalent among all age groups ($P < 0.001$). Table 2 shows the distribution of hospitalized infectious disease patients with associated conditions. One hundred fifty nine patients (32.1%) had one or more associated disease. The ten most frequent diseases as an associated condition among infectious disease patients are shown in Table 3. By far, *diabetes mellitus* (DM) (17.6%) and hypertension (7.5%) were the most prevalent associated diseases. Respiratory conditions account for a good proportion (12.5%) as an associated condition. As shown in Fig. 4 almost 2/3 (63.0%) of pneumonia patients stayed for 1-7 days and about 10% stayed for 2-3 weeks. More than 80% of patients with PUO stayed for 1-3 weeks. Almost 60% of pulmonary TB patients stayed for 1-2 weeks while up to 30% of patients stayed for 3-4 weeks. Up to 60% of AVH patients stayed for 1 week and 25% of patients stayed up to 2 weeks. Similar pattern was observed in patients with CVH. For the rest of the ten most frequent infectious diseases almost 80% stayed for 1-2 weeks while other medical illnesses hospital stay was 1week.

Table 1. The top ten diagnoses among the hospitalized patients with infectious diseases.

Diagnoses	Frequency	Percent
Lobar pneumonia	93	18.8
PUO*	82	16.6
Pulmonary TB	48	9.7
Acute viral hepatitis	42	8.4
Chronic viral hepatitis	36	7.3
Bronchopneumonia	20	4.0
Meningitis	18	3.6
Malaria	15	3.0
Pyelonephritis	15	3.0
UTI*	13	2.0

PUO*=Pyrexia of unknown origin
UTI*=Urinary tract infection

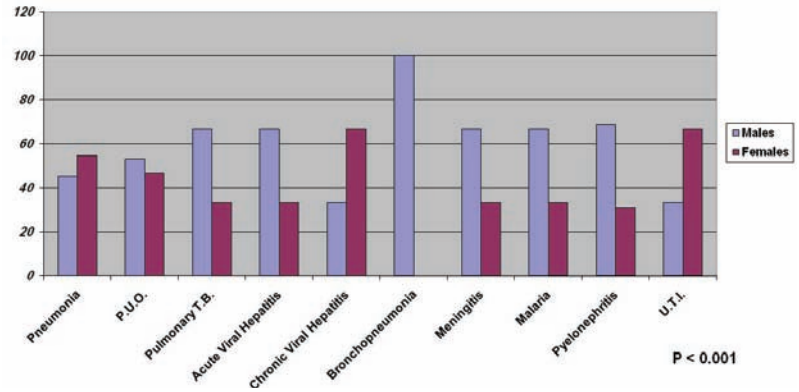

Fig. 1. Distribution of the ten most frequent infectious diseases among hospitalized patients by sex.

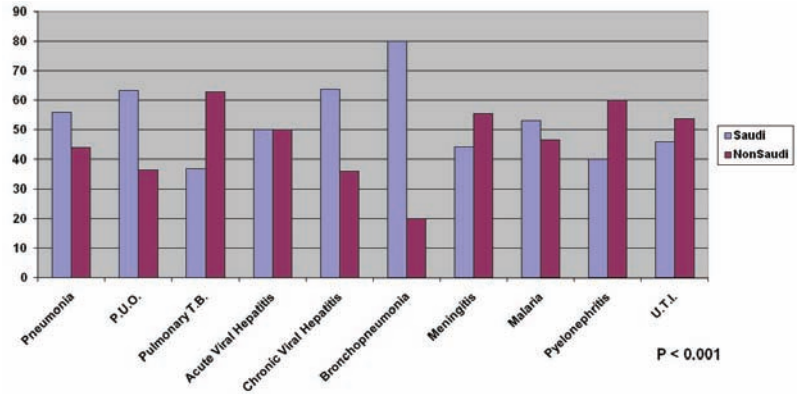

Fig. 2. Distribution of the ten most frequent infectious diseases among hospitalized patients by nationality.

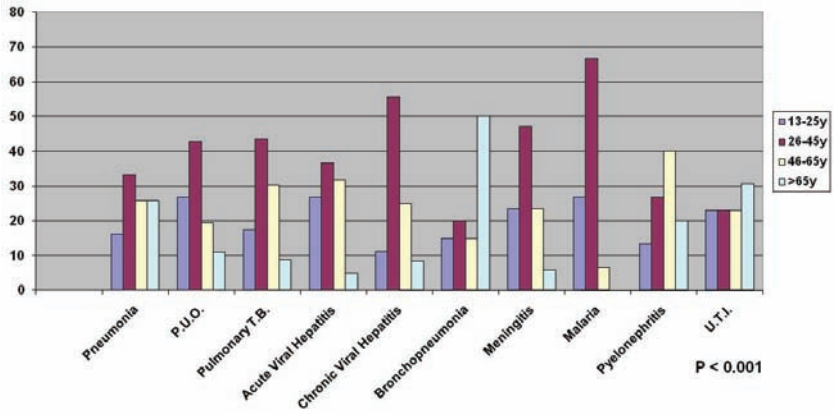

Fig. 3. Distribution of the ten most frequent infectious diseases among hospitalized patients by age group.

Table 2. Percentage distribution of hospitalized infectious disease patients with any associated condition.

Status	No.	Percent
No association	336	67.9
One condition	127	25.6
Two conditions	29	5.9
Three conditions	3	0.6

Table 3. The ten most frequent diseases as an associated condition among infectious disease patients.

Disease	Frequency	Percent
Diabetes mellitus	28	17.6
Hypertension	12	7.5
Inactive pulmonary TB	8	5.0
Sickle cell anemia	7	4.4
Septicemia	6	3.8
Liver cirrhosis	5	3.1
Bronchial asthma	4	2.5
COPD*	4	2.5
Bronchiectasis	4	2.5
Hodgkin's lymphoma	4	2.5

PUO*=Pyrexia of unknown origin
UTI*=Urinary tract infection

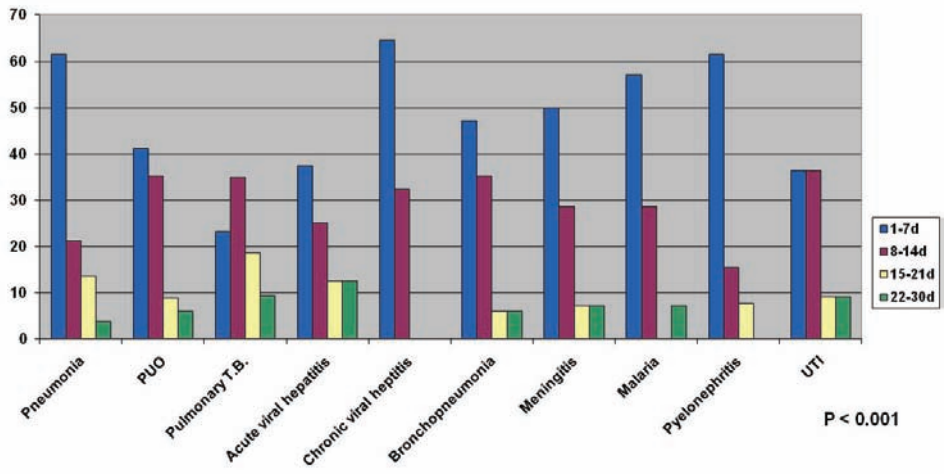

Fig. 4. Length of stay of the ten most frequent infectious diseases among hospitalized patients.

Discussion

This is a retrospective study in 495 patients over 5 years period showed that pneumonia was the most common infectious cause, followed by PUO and Pulmonary TB. Table 1 showed the prevalence of the commonest 10 infectious diseases. As shown in Fig. 3, the highest prevalence of pneumonia was among the age group of 26-45years and a higher rate was found among females. This differs from Wunderink *et al.*[4]; which found a higher rate of pneumonia for men than for women and for black persons compared with Caucasians. Most patients with pneumonia (63%) stayed 1-7days in the hospital (Fig. 4). The second most common infectious cause was PUO 16.6%. It affects the age group 26-45years with a male predominance. Usually the etiology of PUO is not clearly identified, plus the rate of no diagnosis in studies published since 1990 has varied widely from 9 to 51 percent [7-9, 20-25].

Pulmonary TB was the third cause of admission followed by AVH and CVH. As shown in Fig. 3, the most affected age group was 26-45 year in pulmonary TB, AVH, CVH with a male predominance except for CVH, which affected females more. CVH were mostly related to HBV and HCV. Almost 8000 new cases of HBV were reported to the CDC in 2001 and 78000 new infections were estimated to have occurred in that year. It is estimated that approximately 1.25 million people in the United States were chronically infected as of 2001[26]. Two studies examining prevalence among patients in urban teaching hospitals showed a 17-18% positivity rate for HCV antibodies in random samplings[27,28].

The incidence of new HBV declined since the wide spread use of the recombinant HB vaccine was instituted in 1982. Since then about 16,000 HBV infections among children in the United States have been prevented each year[29]. Saudi Arabia has been considered an endemic area for HBV infection. A population-based survey of HBV markers among Saudi children showed an overall prevalence of HBsAg of 6.7% in 1992[30]. By 1997, the prevalence of HBV infection in children had declined to 0.3%[31]. However, TB continues to be a major worldwide health problem, in common with our study, the largest number of reported cases of TB in Canada was among individuals aged 25-44years in 1998[32]. Higher prevalence of TB among non-Saudi males may be related to the increase of international travel and immigration from TB-endemic countries[33]. Kassimi *et al.* study showed a high prevalence of

TB in the Western province (20% +/- 8.7 urban; 1% +/- 1.9 rural). The problem may be caused by the fact that the province receives every year over a million pilgrims, some of whom are known to settle illegally and escape the usual screening for TB imposed on foreign laborers[34].

HIV infections were not represented in this study, because HIV cases are admitted to a special center in Jeddah.

Malaria infection is prevalent in our area, also there is a high risk of introducing malaria by pilgrims. Recent studies have demonstrated malaria parasite among Muslim pilgrims visiting the Kingdom[35,36]. Therefore, such studies support that; malaria can be reintroduced to a non-endemic area by pilgrims during Umra or Hajj seasons. As shown in Table 2, more than 25% of patients who were admitted with infectious disease have at least one co-morbid illness, while about 6% of them have two co-morbid illnesses. As shown in Table 3, the most common associated co-morbidities were DM and hypertension. These two conditions represent the 2 most common reasons for admission to medical wards in this part of the world, which is consistent with the studies of Al-Nozha *et al.*[37,38]. Diabetes is an important cause for infection in many cases.

About 10% of pneumonia patients stayed for 2-3weeks. In 1990, the cost of treating pneumonia in USA was estimated at over $8 billion annually; $4.5 billion annually for those over 65 years of age and $3.5 billion annually for those younger than 65[39]. The increasing number of persons > 65 years of age form a special population at risk for community acquired and nosocomial infections[40,41]. In 1900, only 1% of the earth's population was > 65 years of age. By 1992, 6% of the global population was in this category. By the year 2050, these figures will have risen to 20%[42]. Infectious diseases represent the third cause of mortality in patients aged over 65[43]. Our study showed that older patients; age ≥ 65 years who were diagnosed to have bronchopneumonia or UTI were the main age group of patients with longer hospitalization. It was also found by Sharifi *et al.* that geriatric population is susceptible to nosocomial and community-acquired infections. In addition, they were considered frequent causes of hospitalization in elderly people and their longer hospital stay. Specific age-related diseases such as DM and changes in the vaginal colonization and urologic disorders increase the susceptibility to UTI and Pyelonephritis among older population[44,45].

In conclusion, this study demonstrates the pattern of infectious diseases causes among patients admitted in a teaching hospital in the western region of Saudi Arabia, and their ratio to total medical admissions. Also, it shows the most common co-morbidities. A prospective and more informative study design is mandatory to know the exact trend of every infectious disease, the possibility of more than one infection in the same patient and the associated co-morbidities.

The Western Province requires special screening arrangements for expatriates from other areas, which are endemic with TB; this emphasizes those workers should be screened on regular bases as they may import TB on their return from their holiday.

The wide use of primary preventive measures, the recent investigational techniques in preventing, diagnosing infectious diseases early may change the pattern and mortality of infectious diseases in the future.

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دراسة ٤٩٥ مريض في مستشفى جامعة الملك عبدالعزيز، لمعرفة نمط الأمراض الوبائية والأمراض المصاحبة لها في المنطقة الغربية في المملكة العربية السعودية

عائشة عبده الغامدي، و **عمر سعيد العمودي**، و **توفيق محمد غبرة** ، و **محمد عبدالله القصيمي**

قسم الباطنة، كلية الطب، جامعة الملك عبدالعزيز، جدة، المملكة العربية السعودية

المستخلص. تمت دراسة ملفات ٤٩٥ مريض تم إدخالهم في مستشفى جامعة الملك عبدالعزيز الجامعي بجدة، المملكة العربية السعودية، تحت تشخيص الأمراض الوبائية خلال خمس سنوات. وكانت الخلاصة أن ٥٤٪ من المرضى كانوا رجالاً، وكان أكثر الأعمار إصابة ما بين ٢٦ – ٤٥ سنة، وأكثر الأمراض انتشارًا الالتهاب الرئوي، وارتفاع درجة الحرارة مجهولة السبب، والدرن الرئوي.

كانت هناك أمراض أكثر شيوعًا في النساء (الالتهاب الرئوي والتهاب المثانة)، والبعض الآخر في الرجال (مثل درن الرئتين والتهاب السحايا والملاريا)، أما عن أكثر الأمراض المصاحبة للأمراض الوبائية (مرض السكري ومرض ارتفاع ضغط الدم)، وكانت مدة التنويم في ٨٠٪ من المرضى تتراوح مابين أسبوع لأسبوعين، وقد مثلت الأمراض الوبائية نسبة ٩٪ من عدد المرضى المنومين في قسم الأمراض الباطنية في مستشفى جامعة الملك عبدالعزيز بجدة.