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ORIGINAL ARTICLE

Clinical and microbiological profiles of infective endocarditis in a tertiary hospital in Aseer region, Saudi Arabia

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Abstract *Objectives:* We aimed to evaluate demographic data, underlying cardiac abnormalities, clinical profile, microbiological features, treatments and complications of infective endocarditis (IE) in a tertiary hospital in Aseer region, Saudi Arabia.

Methods: A retrospective study of all cases with the diagnosis of definite endocarditis according to modified Duke Criteria admitted to ACH between May 2002 and April 2007. Data were reviewed on demographic and clinical data, underlying cardiac disease, microbiological findings, treatments and complications of IE.

Results: The study included 44 patients (28 males and 16 females; mean age 31.1 ± 16 years; range 13–65 years). Infective endocarditis developed on a native valve in 31 (70.5%), a mechanical prosthetic valve in 10 (22.7%), mitral valve prolapse in 2 (4.5%) and ventricular septal defect in 1 (2.3%). Rheumatic heart disease in 31 cases (70.5%) was the most common preexisting valvular abnormality in native valve endocarditis. The mitral valve was the most commonly affected valve 28 (63.6%). Fever occurred in 40 (90.9%) of the cases. Electrocardiography was abnormal in 34 cases (77.3%). Trans-thoracic and/or trans-esophageal echocardiography showed a vegetation in 22 (50%). Staphylococci in 10 cases (22.7%) and Streptococci in 8 cases (18%) were the most common causative agents and cultures were negative in 20 cases (45.5%). Twenty-two patients

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(50%) underwent surgical treatment. Congestive heart failure occurred in 16 (36.4%) cases, atrial fibrillation in 6 (13.6%) cases, and cerebrovascular accidents in 4 (9%) cases.

Conclusion: Our data reflects the clinical and microbiological profiles of IE in a tertiary hospital in Aseer region, Saudi Arabia.

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1. Introduction

Infective endocarditis (IE) is an infection of the endocardium or the cardiac valves which is caused by different microbiological organisms mainly bacterial but can be fungal, or less commonly other rare organisms like Chlamydia and Mycoplasma. Culture-negative endocarditis is considered to be an important clinical entity (Houpikian and Raoult, 2005). Despite the recent advances in diagnosis and treatment of patients with infective endocarditis, IE remains a serious life threatening infection with a poor prognosis and a high mortality rate approaching 25% (Mylonakis and Calderwood, 2001). This high mortality rate could be attributed to changing in the microbiologic virulence of different organisms, increased use of prosthesis and increased rate of invasive procedures (Hoen et al., 2002; Moreillon and Que, 2004; Mouly et al., 2002; Devlin et al., 2004).

Streptococcus species is the main causative microorganism. However, recently, other pathogens have gained importance (Ako et al., 2003). The modified Duke diagnostic criteria have been used for case definition as definite or possible IE (Li et al., 2000). The literature on profile of infective endocarditis in Saudi Arabia is scarce.

The Aseer region (population of 1200,000) is located in the southwest of Saudi Arabia covering an area of more than 80,000 km². The region extends from the high mountains of Sarawat (with an altitude of 3200 m above the sea level) to the Red Sea. Health services delivery in Aseer region is provided by a network of 244 primary health care centers, 16 referral hospitals and one tertiary hospital, Aseer Central Hospital (ACH). ACH, with 500 beds, is run by the Ministry of Health and the College of Medicine of King Khalid University (KKU) Abha.

In this study we aimed to evaluate the demographic, clinical and microbiological profiles of IE in a tertiary hospital (Aseer Central Hospital – ACH), Aseer Region, Saudi Arabia, during the period between May 2002 and April 2007.

2. Methods

2.1. Study design

A systematic retrospective review of medical records of all patients admitted to ACH from May 2002 to April 2007 with the diagnosis of definite endocarditis according to the modified Duke criteria was included. Local institutional ethical approval was obtained.

2.2. Demographic and clinical data

Data from medical records were collected on the following demographic variables: age, gender, nationality and site of residency (high vs. low altitude area). Clinical presentation data

including symptoms, signs and ECG findings were noted. Trans-thoracic or trans-esophageal echocardiography was performed and data collected regarding; site and size of vegetation, valvular abnormality, type of underlying cardiac abnormalities and any other abnormalities.

Pattern of antibiotics use and the rate of surgical intervention as well as variable complications were reviewed and recorded.

2.3. Microbiological data

Data were collected on all blood culture results, type of microorganism and antibiotics sensitivity. The laboratory used the standard methods to identify the microorganism and the antimicrobial sensitivity.

2.4. Statistical analysis

Descriptive statistics: (using means and standard deviations for continuous variables and frequencies for qualitative variables), using SPSS software package.

3. Results

3.1. Demographic and clinical data

A total of 44 patients were admitted with the diagnosis of definite endocarditis (28 men and 16 women); mean age 33.1 ± 16 years; and the range was 13–65 years. Table 1 shows demographic data, clinical profile, treatments and complications in patients with infective endocarditis – Aseer Central Hospital–Saudi Arabia.

In our series the majority of patients were Saudis (77.3%) and living in a high altitude area (77.3%). All symptoms and signs were nonspecific and occurred in a significant number of patients. These symptoms included dyspnea in 24(54.5%), cough in 16 (36.4%), sweating in 12 (27.3%), anorexia in 8 (18.2%), weight loss in 8 (18.2%), fatigue in 8 (18.2%), myalgia in 4 (9%) and headache in 4 (9%) patients. But fever was a constant clinical feature in 40 (90.9%) patients.

The ECG was abnormal in 34 (77.3%) patients. Different ECG abnormalities observed included: left ventricular strain in 14 (31.8%), left atrial enlargement in 8 (18.2%), Sinus tachycardia in 8 (18.2%), atrial fibrillation in 6 (13.6%), right axis deviation in 6 (13.6%) and others (supra-ventricular tachycardia, right ventricular strain, ventricular bigeminy, bundle branch block and T-wave changes) in 4.5% of patients.

All patients received at least two intravenous antibiotics according to the culture results, and in cases of culture-negative endocarditis, empirical antibiotics therapy was applied.

Surgical treatment was required in 22 (50%) patients, out of them 12 (54.5%) patients required mitral valve replacement and 10 (45.5%) patients required aortic valve replacement.

Table 1 Demographic data, clinical profile, treatment and complications in patients with infective endocarditis – Aseer Central Hospital–Saudi Arabia.

	N	%	Mean + SD
Age (years)			34.5 + 16
Gender			
Male	28	63.6	
Female	16	36.4	
Nationality			
Saudi	34	77.3	
Non-Saudi	10	22.7	
Site of residency			
High altitude	34	77.3	
Low altitude	10	22.7	
Presence of fever			
Yes	40	90.9	
No	04	9.1	
Abnormal ECG			
Yes	34	77.3	
No	10	22.7	
Surgery performed			
Yes	22	50	
No	22	50	
Complications			
Heart failure	16	36.4	
Atrial Fibrillation	6	13.6	
Stroke	4	9	
SVT (Supraventricular tachycardia)	2	4.5	
Pneumonia	2	4.5	
Renal failure	2	4.5	
Peripheral septic emboli	2	4.5	

Table 2 Distribution of the underlying cardiac lesion and type of valve involved in patients with infective endocarditis – Aseer Central Hospital–Saudi Arabia.

	N	%
Underlying cardiac lesion		
Rheumatic	31	70.5
Prosthesis	10	22.7
MVP	2	4.5
VSD	1	2.3
Valve involved		
Native	33	75
Prosthetic	10	22.7
Native valves:		
Mitral	20	45.5
Aortic	12	27.3
Tricuspid	1	2.3
Prosthetic valves		
Mitral	8	18.2
Aortic	2	4.5

The commonest complications were congestive cardiac failure in 36%, atrial fibrillation in 13.6% and stroke in 9% of patients.

Table 3 Distribution of the causative microorganisms in patients with infective endocarditis – Aseer Central Hospital–Saudi Arabia.

Microorganism	N	%
<i>Staphylococcus aureus</i>	8	18.2
<i>Streptococcus viridians</i>	6	13.6
<i>Enterococcus faecalis</i>	4	9.1
<i>Staphylococcus epidermidis</i>	2	4.5
<i>Streptococcus pneumoniae</i>	2	4.5
<i>Mycoplasma</i>	2	4.5
Culture negative	20	45.5

Trans-thoracic and/or trans-esophageal echocardiography was/were performed on all patients and showed vegetations in 24 (54.5%) of patients. The average size of vegetations was +6.9 mm. Vegetations were seen on the mitral valve in 16 (36.4%) patients and on the aortic valve in 8 (18.2%) patients.

Other echocardiographic findings included moderate to severe mitral regurgitation in 18 (40.9%) patients, moderate to severe aortic regurgitation in 14 (31.8%) patients, mitral stenosis in 12 (27.3%) patients, severe tricuspid regurgitation in 8 (18.2%) patients, aortic stenosis in 2 (4.5%) patients, mitral valve prolapse in two patients (4.5%) and ventricular septal defect in one patient (2.27%).

Table 2 shows distribution of the underlying cardiac lesion and type of valve involved. Rheumatic heart disease (70.5%) was the commonest underlying cardiac problem, while prosthesis was the underlying problem in (22.7%) of patients.

Mitral valve was the most commonly affected valve in our series, in both native valves (45%) and prosthetic valves endocarditis (18.2).

3.2. Microbiologic data

Table 3 shows distribution of the causative microorganisms isolated from blood cultures. Staphylococci (22.7%) and streptococci (18.2%) were the most commonly isolated causative agents of IE, accounting for a total of 40.9% of all the isolated microorganisms. Cultures remain negative in 20 cases (45.5%).

4. Discussion

In our series a total of 44 patients who fulfilled the modified Duke criteria for definite IE were reviewed. The mean age of our patients was 33.1 ± 16 years which is similar to the mean age reported in Tunisia which was 32.4 ± 16.8 years (Letaief et al., 2007), but younger than the mean age reported in Europe which was more than 50 years (Hoen et al., 2002; Hill et al., 2007; Cecchi et al., 2004). The discrepancy of age is likely due to the decreased incidence of rheumatic heart disease in Europe while it is still a common problem in developing countries.

The majority of cases in our study were living in a high altitude area (77.3%). An old animal study suggested that high altitude is a risk factor for development of IE in dogs but human studies are lacking (Altland and Highman, 1957).

The majority of patients in our series were males (63.6%). Male sex predilection as a risk factor for the development of I.E has been observed in previous studies, and it was found this gender preference decreases with aging (Durante-Mangoni et al., 2008). The well recognized protective effect of female hormones on endothelial cell function and platelet aggregation thus protecting from atherosclerosis may affect the likely hood of developing IE (Tsang et al., 2000).

Among the presenting symptoms, fever was observed in the vast majority of our patients (90.9%), which is similar to observations from earlier literature (Ferreiros et al., 2006; Chu et al., 2004; Schulz et al., 1996). However, absence of fever cannot rule out the diagnosis of IE as patients without fever may still have IE (Loupa et al., 2004).

The role of echocardiography in diagnosing IE is well established with a very high rate of specificity approaching 98% (Cabell et al., 2002). In our series echocardiography was the mainstay of diagnosis of IE.

Staphylococci species especially *Staphylococci aureus* was the most prevalent causative microorganism in our study (22.7%), followed by Streptococci species in (18.2%) of cases. This shift of pattern from the usual prevalence of streptococci species has been reported in recent studies (Mouly et al., 2002; Fowler et al., 2005; Baddour et al., 2005). It seems that in the last decade staphylococci have exceeded the streptococci species in causing IE with concomitant decrease in the incidence of *Streptococci viridance* (Ferreiros et al., 2006; Chu et al., 2004; Loupa et al., 2004; Cabell et al., 2002; Fowler et al., 2005; Lerakis and Martin, 2005). Previous studies showed that culture negative endocarditis accounts for 30–45% of all cases of IE (Letaief et al., 2007; Krcmery et al., 2007). In our series it accounted for 45.5% of cases. This high rate in our series could be attributed to prior antibiotics therapy and lack of optimal culture techniques that isolate rare microorganisms. A study on culture negative IE showed that most of the cases (48%) were associated with *Coxilla Burnetii*, and 78% were associated with intracellular bacteria (Houpikian and Raoult, 2005).

The outcome of endocarditis is affected negatively by the presence of complications mainly heart failure and stroke (Iung et al., 2007; Eishi et al., 1995). These tow complications occurred in a significant proportion of our patients (36.4% and 9%), respectively. Among complications in our series we found relatively a high rate of atrial fibrillation (A.F) 13.6%, which can be explained by the high rate of rheumatic heart disease which can predispose to A.F.

In our series 50% of patients required surgery mainly valve replacement. Similar rate was observed in other studies (Hoen et al., 2002; Mouly et al., 2002; Tornos et al., 2005). This relatively high rate of surgical intervention may reflect the severe nature of the disease we observed in this cohort of patients.

Rheumatic heart disease still remains the most prevalent underlying cardiac risk factor for developing IE and it occurred in 70.5% of cases in our series. Globally, an estimated 12 million people are affected by acute rheumatic fever and rheumatic heart disease. In contrast, rheumatic heart disease has markedly decreased in prevalence in last few decades in developed countries. The estimated annual incidence of acute rheumatic fever in underdeveloped countries (up to 150 cases per 100,000 population vs. that of developed countries < 1 case per 100,000 population) has been reported (World Health Organ. Tech. Rep. Ser., 2004).

The commonest valve affected in our series was the mitral valve; this predilection of mitral valve was reported in the other study (Hoen et al., 2002). This is likely due to the predilection of mitral valve by rheumatic heart disease.

The main limitations of this study are its retrospective nature and the relatively small sample size.

In conclusion, literature on IE in Saudi Arabia is scarce, and we believe this study shed some light on the protean nature of IE in Asseer region, Saudi Arabia. It described the clinical and the microbiologic features of this disease. Our patients are of younger age group and had more severe form of the disease. Rheumatic heart disease is still the main cardiac risk factor. Efforts in preventing acute rheumatic fever will likely contribute to decrease in the incidence of rheumatic heart disease and thus the incidence of IE.

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