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Infective Endocarditis in Morocco's Souss-Massa Region: Epidemiological Trends

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Abstract **Original Research Article**

Infective endocarditis (IE) remains a life-threatening condition with high morbidity and mortality despite advances in diagnosis and therapy. Its epidemiology varies across regions, reflecting demographic and socioeconomic factors. This study aimed to describe the epidemiological profile of IE in the Souss Massa region of Morocco. We conducted a retrospective descriptive study in the cardiology department of the Souss Massa University Hospital from September 2022 to May 2025. Twenty-six patients aged ≥16 years, fulfilling the modified Duke criteria and investigated with transthoracic and/or transesophageal echocardiography, were included. The mean age was 46.2 years (25–75), with a male predominance (sex ratio 1.6). Predisposing cardiac conditions were present in 80.7% of patients, mainly rheumatic or degenerative valvulopathies (34.6%) and congenital heart disease (19.2%). Prosthetic valve endocarditis accounted for 11.5% of cases, and device-related infections for 3.8%. Febrile dyspnea was the most common presenting feature (69.2%). Valvular involvement predominantly affected the left heart: the mitral and aortic valves were each involved in 30.7% of cases, while combined mitro-aortic involvement was found in 19.2%. Right-sided endocarditis occurred in 11.5% of cases, and one exceptional case of biventricular involvement with a right atrial–aortic fistula was documented. Compared with international registries, patients in our series were younger, reflecting the ongoing burden of rheumatic heart disease in Morocco. These findings emphasize the need for reinforced prevention strategies and the development of national registries to improve the management of infective endocarditis in low- and middle-income settings.

Keywords: Infective endocarditis, Souss Massa, Morocco, Epidemiology, Rheumatic heart disease, Echocardiography.

INTRODUCTION

Infective endocarditis (IE) is defined as a disease of the endocardial surface of the heart, with infection primarily involving the cardiac valves (native or prosthetic), the mural endocardium, a septal defect, or an indwelling cardiac device [1]. It remains a complex condition due to its sometimes challenging diagnosis, its frequent complications, and its persistently high morbidity and mortality despite therapeutic advances [2].

Its epidemiology may vary according to context, influenced by demographic, socioeconomic, and healthcare factors [3-9]. Such variations can be observed between regions within the same country, across countries on the same continent, and in comparison with international trends, where predisposing conditions and clinical features may differ [5].

At the national level, the diversity of patient profiles highlights the need for better documentation of this disease across different regions. In this perspective, the present study aims to describe the epidemiological profile of patients hospitalized with infective endocarditis at the Souss Massa University Hospital in Agadir, in order to contribute to a better understanding and more appropriate management of this condition in our context.

MATERIALS AND METHODS

This retrospective descriptive study was conducted in the cardiology department of the Souss Massa University Hospital over a period of two years and eight months, from September 2022 to May 2025. The objective was to describe the epidemiological characteristics of IE cases diagnosed and managed at the Souss Massa University Hospital, in order to identify regional specificities of this condition. Patients aged 16 years or older with a definite or possible diagnosis of IE according to the modified Duke criteria, and who underwent transthoracic and/or transesophageal

echocardiography during their management, were included. Exclusion criteria were patients under 16 years of age, those in whom the diagnosis was ruled out according to the same criteria, and cases with incomplete medical records that did not allow reliable data collection.

A total of 26 patients meeting these criteria were included. Data were systematically collected from medical records and supplemented by echocardiographic reports, films, and archived images. All data were processed with strict adherence to patient anonymity and confidentiality, in accordance with current ethical standards.

RESULTS

A total of 26 patients meeting the inclusion criteria were included in the study. The mean age was 46.2 years (range 25–75), with a male predominance (sex ratio 1.6). Most patients (21 cases, 80.7%) had pre-existing cardiac conditions predisposing to infective endocarditis. Patients at high risk of IE included three with a documented history of infective endocarditis (11.5%) and three with prosthetic valve endocarditis (11.5%). Patients at intermediate risk of IE comprised nine cases of rheumatic or degenerative valvulopathies (34.6%) and one pacemaker-related case (3.8%) (Figure 1). Additionally, five untreated non-cyanotic congenital heart diseases (19.2%) were identified, including three ventricular septal defects, one atrial septal defect, and one case of Laubry-Pezzi syndrome.

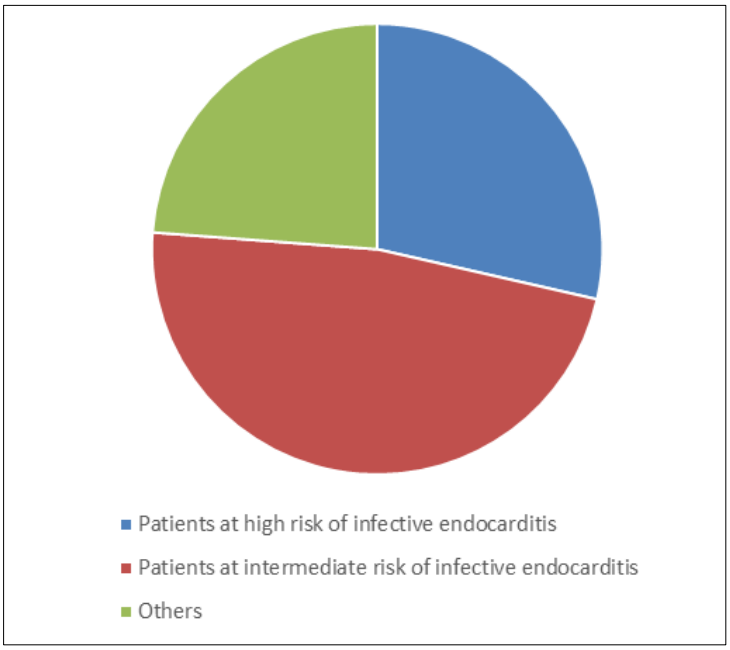

Figure 1: Populations at risk of infective endocarditis identified in our study

The presenting circumstances were dominated by febrile dyspnea, observed in 69.2% of patients. Isolated dyspnea without fever accounted for 11.5% of cases, while isolated fever and incidental discovery during the workup of an ischemic stroke were each noted in 7.7% of patients. Finally, isolated abdominal pain represented the mode of presentation in one case (3.8%).

Table 1: Presenting circumstances of infective endocarditis in the study population

Presenting Circumstance	Patients (%)
Febrile dyspnea	69.2%
Isolated dyspnea without fever	11.5%
Isolated fever	7.7%
Incidental discovery during ischemic stroke workup	7.7%
Isolated abdominal pain	3.8%

With regard to valvular involvement, the most frequent locations were the mitral and aortic valves, each affected in eight patients (30.7%), while combined mitral–aortic involvement was observed in five cases (19.2%). Right-sided endocarditis was less common, with three cases involving the pulmonary valve (11.5%). In the case with a pacemaker, infection was localized to both atrial and ventricular leads with concomitant tricuspid valve involvement. Biventricular involvement was exceptional, observed in only one patient (3.8%), affecting both the aortic and tricuspid valves and complicated by the formation of a right atrial–aortic fistula (Figure 2).

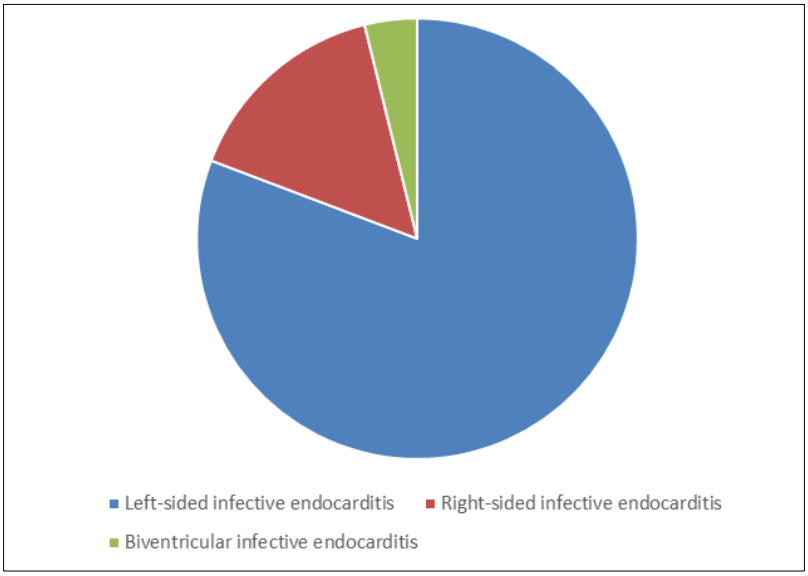

Figure 2: Valvular involvement in infective endocarditis

DISCUSSION

Infective endocarditis (IE) is an infection of the cardiac endothelium. Its annual incidence is estimated at 3 to 10 cases per 100,000 inhabitants, with a 30-day mortality rate reaching up to 30% [6, 7]. Globally, a rising trend in incidence has been observed despite advances in diagnostic techniques and therapeutic management [8].

The epidemiology of IE, however, shows marked variations depending on geographic context, with clear differences between high-income and low- and middle-income countries [8]. Nevertheless, data from the latter remain limited due to the scarcity of large-scale studies dedicated to this issue [8].

At the international level, large registries such as EURO-ENDO and ICE have demonstrated that IE in industrialized countries predominantly affects older patients, most commonly those with degenerative valvular disease or prosthetic valves [9-6]. In our series, the mean age of patients with IE was 46.2 years, considerably younger than that reported in international registries. These findings are consistent with Moroccan data [10, 11]. Similarly, Amri *et al*., in Casablanca reported an etiological variation, with a lower mean age among patients with rheumatic heart disease compared to those with non-rheumatic valvular disease [12]. This epidemiological profile reflects the Moroccan specificity, where the persistence of rheumatic fever continues to affect a younger population.

The male predominance of IE is well established in the international literature, reaching 68.9% in the EURO-ENDO registry and confirmed by the ICE registry [4-6]. In our series, we observed the same trend, with a sex ratio of 1.6. This finding is consistent with data from Rabat, where 60% of patients were male, but contrasts with observations from Tangier and Casablanca, where no significant difference between men and women was reported [10-12].

The evolving epidemiological profile of IE is not limited to patient age or sex but also concerns underlying cardiac conditions. In industrialized countries, the progressive eradication of acute rheumatic fever has led to a marked decline in IE associated with rheumatic valvular disease [15]. At the same time, other risk factors have emerged, including degenerative valvular disease related to aging, prosthetic valves, invasive procedures favoring bacteremia, and intravenous drug use [16].

In Africa, the situation differs: a systematic review and meta-analysis of 42 studies confirmed that IE remains predominantly associated with the sequelae of acute rheumatic fever [13]. In these contexts, rheumatic and congenital heart diseases remain the main predisposing conditions [13, 14]. More recently, in developing countries, an increased use of prosthetic valves and intracardiac devices has also been observed, constituting additional risk factors for IE [14].

In our series, 80.7% of patients had predisposing cardiac disease, mainly rheumatic or degenerative valvulopathies (34.6%) and congenital heart disease (19.2%). Prosthetic valve endocarditis (11.5%) and device-related IE (3.8%) were less frequent, reflecting a profile still strongly influenced by the burden of rheumatic heart disease. These observations are consistent with national data, particularly from Rabat, Tangier, and Casablanca, which confirm the persistence of a predominance of rheumatic valvular disease in Morocco [10–12].

Clinically, fever is still considered the principal initial manifestation of IE worldwide, though in Europe

earlier detection is facilitated by systematic imaging and specialized "endocarditis teams" [6-9]. In Africa, and particularly in Morocco, studies have similarly reported fever and dyspnea as the main presenting signs of IE [10,11]. In our cohort, febrile dyspnea was noted in nearly 70% of patients, reinforcing this trend.

Infective endocarditis most frequently involves the left heart valves, particularly the aortic and mitral, as highlighted by the EURO-ENDO and ICE registries and supported by Moroccan data [10–12]. Right-sided involvement is less common and, in European countries, is most often associated with intravenous drug use or intracardiac devices. In our series, mitral and aortic involvement was observed with similar frequency (30.7% each), while combined mitro-aortic forms accounted for nearly 20% of cases. Right-sided locations were found in 11.5% of patients, including one case of pulmonary valve endocarditis and one device-related case complicating pacemaker implantation. An exceptional observation of biventricular involvement, complicated by a right atrial–aortic fistula, was also reported.

CONCLUSION

Infective endocarditis in the Souss Massa region is characterized by its occurrence in a relatively young population, with a male predominance, and by the persistence of rheumatic valvular disease as the main predisposing factor. This profile contrasts sharply with that of industrialized countries, where degenerative valvular disease and prosthetic valves predominate. Our findings highlight the need to strengthen the prevention of acute rheumatic fever and to promote the establishment of national registries in order to better adapt diagnostic and therapeutic strategies to the Moroccan context.

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