

# Clinical study of infective endocarditis in children: a 3 years experience from MGM Hospital, Warrangal

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## Abstract

**Background:** The impact of endocarditis in childhood accompanies many cardio-vascular disorders. Infective endocarditis (IE) is the most frequently occurring form of endocardium inflammation. Prevailing among the agents are Str. Viridans, Str. Haemolyticus, Staph. Aureus, Staph Epidermidis, Enterococcus, etc. **Objective:** This study will explore the outcome of children diagnosed with infective endocarditis for a better guidance in management. **Methods:** This was a prospective study from warrangal from January 2013 to December 2015. 50 patients with definite IE based on modified Duke's criteria were recruited into the study. Clinical presentation, risk factors, echocardiography and outcome were obtained. **Results:** A total of 50 IE patients were included within the study. The mean age was  $6 \pm 5.45$ . Most patients (80.39%) were diagnosed within the first week of admission. *Staphylococcus aureus* was the most common pathogen (38%) and the mitral valve was predominantly affected (68%). Complication were common and in hospital mortality remains high (27.3%). **Conclusions:** Mortality remains relatively high in children with infective endocarditis. The most common complication is cardiac deficiency (70%), and pleuropericardial effusions and lung embolism

**Keywords:** Infective endocarditis, Children, Clinical evolution, Complications

## Introduction

Infective endocarditis (IE) continues to be a major challenge in modern medicine. Although the overall incidence of infective endocarditis in the paediatric population is considered to be low, over the last 20 years a rising trend in infective endocarditis has been observed among children. This could be due to several reasons including the availability of improved diagnostic techniques, use of continuous central venous catheters and cardiac implants increasing the risk of infection, and the survival of a greater number of infants with congenital heart disease as a result of improved medical management. Despite major advances in both diagnostic and therapeutic procedures, mortality rates have not changed in the past 25 years [1-6]. It presents acutely with high rates of *Staphylococcus aureus* infection and complications such as cardiogenic shock and embolization [2-4]. One study from a low middle income region highlighted a high incidence of IE in patients with rheumatic heart disease.

Infective Endocarditis remains a serious issue in early age. A few factors come to support this worrying statement: the disorder occurrence over the past few years has become more frequent, in relation to the larger number of children with heart operations; protracted and expensive treatment; complications as a result from the disorder, sometimes including a re-operation, and a still high rate lethality.

So the main objective of this study was to prospective analyze the IE evolution and outcome in children in our tertiary care hospital.

## Methods

**Study Population-** All patients admitted to MGM Hospital, Warangal between January 2013 to December 2015 with definite IE according to modified Duke's criteria were included [5]. 50 IE cases were at the age from 1 to 13 years were selected. This study received ethical approval from the institutional ethics committee.

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**Inclusion and exclusion criteria-** All patients who were diagnosed with definitive IE, as outlined by the modified Duke criteria were included. According to Duke criteria a definitive clinical diagnosis is made based on the presence of 2 major criteria, 1 major criterion and 3 minor criteria, or by 5 minor criteria. A possible clinical diagnosis is made based on the presence of 1 major criterion and 1 minor criteria or by 3 minor criteria. In cases of recurrent IE, only the index case was included in the present analysis. A history of congenital heart disease, previous cardiac surgery, or the presence of prosthetic graft material was not considered a criterion for exclusion.

The definition for IE complications such as severe valve dysfunction, heart failure, septic shock and embolization are based on contemporary guideline. The type of echocardiography (transthoracic, transoeso-phageal or both), valve involved and presence of vegetation were recorded. The valve involved was determined by the presence of vegetation, abscess and fistula on echocardiogram.

Demographic data consist of age, sex, underlying heart disease, past medical history including previous palliative or corrective surgery for cardiac disease, CHD and surgery for complications of IE, predisposing

**Results**

Fifty-four medical records fulfilled the search criteria. Four patients did not fulfill the Duke’s criteria for definite IE and were excluded.

In the study group (n=50), the mean age was 6 ± 5.45 Standard Deviation (SD). The majority were male 37 (74%) and diagnosed with infective endocarditis within the first week of admission to hospital (table 1).

**Table-1: Patients’ characteristic and clinical examination findings.**

	N (%)
Gender	
Boys	37 (74)
Girls	13 (26)
Valvular heart disease	5(12)
Previous mitral valve repair	1
Secondary to previous IE	2
Rheumatic valve	1
Mitral valve prolapsed	1
Congenital heart disease	3(6)
Atrial septal defect	1
Ventricular septal defect	1
Truncus arteriosus	1

conditions for bacteremia, complications, outcome and treatments were recorded. Clinical data consist of information regarding the sign and symptoms of patients at the time of admission were noted.

Laboratory data consist of complete blood count (leukocytosis), C-reactive protein (CRP), erythrocyte sedimentation rate (ESR) and microscopic hematuria.

Microbiological data consist of all blood cultures used to evaluate IE obtained by the Microbiology Laboratory of the MGM Hospital and processed by using Automated Bactec 9240.

Echocardiographic data consist of transthoracic echocardiography (TTE) performed to determine the location of vegetation, type of valve infected and cardiac complications. Outcomes measure were in-hospital mortality and discharge alive. Good outcome is defined as patient discharged alive and poor outcome is defined as in-hospital mortality.

**Statistical analysis-** Obtained data were analyzed using SPSS version 15.0 (SPSS Inc., Chicago, Illinois, USA). For descriptive analysis, measurement of mean and standard deviation were calculated for the numerical data.

**Table-2: Complications developing in the course of disorder.**

Complications	Number(N)
Heart failure	7
Pericardial and pleural effusion	4
Thromboembolism	3
Mediastinitis	1

Forty-nine out of 50 patients (98%) presented with fever. New murmurs and raised inflammatory markers were clues leading to a diagnosis of IE. None of our patients had immunological manifestation of IE such as Osler's node and Janeway lesions.

All patients had at least one set of blood culture taken during hospitalisation. Staphylococcus is the predominant microorganism followed by streptococcus. Echocardiography was performed in all patients and Vegetations were detected in 24 of the IE cases (48.27%), located around the cardiac lesion.

The main complications observed with us are as follows: heart failure in 7 children; pericardial and pleural effusions - in 4 cases; lung or system embolism - in 3 and purulent mediastinitis - 1 case. Complications developed due to infective endocarditis are listed in table 2. Most common complication was cardiac failure. Operative measures were performed in 3 children.

## Discussion

We describe the first series of cases with endocarditis in children from the warrangal region. Overall mortality is high at 27.3%.

Our findings revealed that most patients within this cohort presented without classical signs of infective endocarditis. This is consistent with the findings from The International Collaboration on Endocarditis prospective study in 2009 which showed similar changes in the characteristics of IE [6-9].

This study differs from published literature from the period 1960 to 1980 which documented immunological manifestation in almost 50% of patients with endocarditis [3-10].

The most common causes of IE were non-cyanotic heart disease. From cyanotic heart disease, TOF was the most frequent cause as per studies done by Lertsapcharoen *et al.* in Thailand and some other studies [11,12]. As reported by many studies by improving the survival of CHD and also treatment of rheumatic heart disease in children the causative factors of IE is changed and the feature of the disease in most but not all of developing countries is also changed to that reported in developed countries.[13,14]

*Staphylococcus aureus* was commonest and right sided valves were mainly affected which was consistent with previous published studies [6-10]. However, several studies have studied the role of different organisms in IE,

accordingly Gram-positive organisms, particularly alpha-hemolytic streptococci (*Streptococcus viridans*), *S. aureus* and coagulase-negative staphylococci, are the most common offenders. *S. aureus* is the most common cause of acute bacterial endocarditis [14, 15].

Recent microbiological studies showed that the rate of IE due to infections by *Streptococcus viridians* is decreased and the rate of IE due to staphylococcal infections is increased [16]

Culture negative IE made up to 32% in this study. This is unusually high in comparison to contemporary data which showed rate of culture negative IE between 14-19% [1,2]. This trend was last seen in 1980s. [1]. The use of antibiotics prior to hospital admission might contribute to this occurrence.

The leading complication in 7 of the cases was cardiac deficiency. This is explanatory in view of the preceding congenital cardiopathy and the general prejudicial condition of the children. The remaining complications – the presence of pericardial and pleural effusions were managed conservatively.

The most dramatic and involving hard effort was our battle to contain the cases of embolism and mediastinitis development in one of the cases, where an operation “on the hot” became necessary. Other authors also inform of dramatic development and fatal outcome of the same and

other complications – stroke in seven children [7,8]. Under the circumstances, despite the appropriate symptomatic and surgical treatment, death rate in children with IE remains high. In our survey we have registered lethality of 27.3%, which corresponds to data from other authors [8].

The most common complication, resulting directly into a lethal outcome is the development of a heavy cardiac deficiency in 70% of the cases. The most dramatic and hard was the evolution of the disorder in the presence of system and lung embolism, quoted by other authors [9-11].

The indications for surgical intervention in our study include embolic phenomenon, severe acute mitral regurgitation, large vegetation of more than 1cm, fungal IE and endocarditis in the presence of congenital heart defect. The survival rate seen in post-surgical patients is consistent with prior studies [14,15], emphasising the need for early intervention when indicated especially when medical intervention has failed.

In this study, the diagnosis of IE was performed using Duke criteria. Though many studies have confirmed the utility of this criteria in this regard, but others reported the limitation of these criteria in diagnosing IE in patients with negative blood culture [17,18].

Some studies evaluated the utility of other minor factors that improve the sensitivity of Duke criteria Piere *et al.* have reported that inclusion of some factors as minor criteria such as splenomegaly, petechiae or purpuric rashes, microscopic hematuria and a high CRP value > 100 mg/L would improve the sensitivity of the criteria specially in patients with fever [19].

## Conclusion

IE remains still as a problem for contemporary medicine and in particular pediatric cardiology and cardio surgery. IÅ is a serious disease with lethality in our cases of 29%. The most common complication is cardiac deficiency (70%), and the hardest one - system and lung embolism. Our study highlights the need for further research into disease patterns amongst different healthcare and population environment to gain maximum yield from resource allocation.

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