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# A CLINICO-MICROBIOLOGICAL PROFILE, ECHOCARDIOGRAPHIC FINDINGS, AND OUTCOMES OF INFECTIVE ENDOCARDITIS IN A TERTIARY CARE HOSPITAL

**Dr. Raees Ahmed, Dr. Sibani Behera, Dr. Umar Rashid Khan, Dr. Nashra Afaq, Dr. Mukesh Kumar Patwa, Dr. Keerti, Dr. Deepak Shukla***

Assistant Professor[1], Department of Microbiology, Sudha Medical College and Hospital, Jagpura, Kota, Rajasthan.
Senior resident[2], Department of Microbiology, K.G.M.U, Uttar Pradesh, India.

Assistant Professor[3], Department of Microbiology, Integral Institute of Medical Sciences & Research Hospital, Lucknow, Uttar Pradesh, India.
Assistant Professor[4], Department of Microbiology, Rama Medical College Hospital and Research Centre, Kanpur, Uttar Pradesh, India. . ORCID ID: 0000-0002-0069-6111
Senior resident[5], Department of Microbiology, Autonomous State Medical College, Gonda, Uttar Pradesh, India.
Senior Resident[6], Department of Physiology, Autonomous State Medical College, Gonda, Uttar Pradesh, India.
Anesthesiologist & Critical Care Specialist[*], Department of Anesthesia, Indian Naval Hospital Kalyani, VIZAG, Andhra Pradesh, India.

**Corresponding Author: Dr. Deepak Shukla***
**Email ID:captdeepakamc@gmail.com**

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## ABSTRACT

**Background:** Infective endocarditis (IE) remains a serious and potentially fatal disease despite major advances in diagnostic and therapeutic modalities. Changing epidemiological patterns, increasing healthcare-associated infections, and antimicrobial resistance necessitate continuous regional evaluation.

**Objectives:** To evaluate the demographic characteristics, clinical presentation, microbiological profile, echocardiographic findings, and clinical outcomes of patients diagnosed with infective endocarditis in a tertiary care hospital.

**Materials and Methods:** This hospital-based observational study included 40 consecutive patients diagnosed with infective endocarditis based on modified Duke's criteria. Detailed demographic, clinical, microbiological, and echocardiographic data were collected. Blood cultures were processed using standard microbiological techniques, and outcomes were assessed during hospitalization.

**Results:** Males predominated (65%), with most patients belonging to the third and fifth decades of life. Native valve endocarditis constituted 72.5% of cases. Blood cultures were positive in 70%, with Staphylococcus aureus being the most common isolate. Vegetations were detected in 85% of patients. While 65% recovered with medical therapy, 20% required surgical intervention and mortality was observed in 15%.

**Conclusion:** Infective endocarditis continues to pose a significant clinical challenge. Early diagnosis, prompt microbiological confirmation, and a multidisciplinary management approach are crucial for improving outcomes.


**Keywords: Infective endocarditis, blood culture, echocardiography, Staphylococcus aureus, tertiary care hospital**

## INTRODUCTION

Infective endocarditis (IE) is a microbial infection of the endocardial surface of the heart, most commonly involving the cardiac valves. Despite remarkable progress in antimicrobial therapy, diagnostic imaging, and cardiac surgery, IE remains associated with considerable morbidity and mortality worldwide [1]. The reported global incidence ranges from 3 to 10 cases per 100,000 person-years, with an increasing trend over recent decades [2,3].

Traditionally, IE was considered a disease of young individuals with rheumatic heart disease, particularly in low- and middle-income countries. However, contemporary epidemiology indicates a paradigm shift. In developed nations, IE now predominantly affects elderly individuals with degenerative valvular disease, prosthetic valves, intracardiac devices, and frequent healthcare exposure [4,5]. In contrast, developing countries such as India experience a dual burden, with persistent rheumatic heart disease coexisting with emerging healthcare-associated risk factors [6]. A targeted empirical antibiotic therapy necessitates routine evaluation of the microbiological organisms causing and their antimicrobial resistance [6].

The microbiological spectrum of IE has also evolved substantially. Earlier studies identified viridans group streptococci as the predominant etiological agents, especially in community-acquired infections [7]. However, recent data from Europe, North America, and Asia demonstrate a clear predominance of Staphylococcus aureus, attributed to increased invasive procedures, intravascular devices, hemodialysis, and prolonged hospital stays [8–10]. This shift is clinically significant, as S. aureus endocarditis is associated with aggressive disease, rapid valvular destruction, embolic complications, and higher mortality [11].

Blood culture remains the cornerstone for etiological diagnosis and is a major criterion in the modified Duke's diagnostic framework [12]. However, culture-negative endocarditis continues to present a diagnostic challenge, accounting for 10–40% of cases in various studies, particularly in developing countries [13,14]. Prior antibiotic exposure, fastidious organisms, and limited access to advanced diagnostic modalities contribute significantly to this problem.

Echocardiography plays a pivotal role in the diagnosis, risk stratification, and management of IE. Transthoracic echocardiography (TTE) and transesophageal echocardiography (TEE) enable visualization of vegetations, abscesses, valve perforation, and regurgitation, thereby guiding

therapeutic decisions [15,16]. The widespread use of echocardiography has significantly improved early diagnosis and reduced diagnostic delays.

Despite improved diagnostic strategies, IE continues to be associated with severe complications such as heart failure, systemic embolization, stroke, and sepsis [17]. Mortality rates range from 10% to 30%, depending on patient characteristics, causative organism, and access to surgical intervention [18]. Hence, regional studies analyzing the clinico-microbiological profile and outcomes of IE are essential to guide empirical therapy and optimize management strategies.

## MATERIALS AND METHODS

A hospital-based observational study conducted at a tertiary care teaching hospital for a period of 12 months i.e, August 2024 to August 2025 in the Department of Cardiology with collaboration with Department of Microbiology and Department of Medicine. A total of Forty consecutive patients diagnosed with infective endocarditis were studied.

### Inclusion Criteria

1. Patients fulfilling modified Duke's criteria for definite IE
2. All age groups and both sexes

### Exclusion Criteria

1. Patients not meeting Duke's criteria
2. Incomplete clinical or microbiological data

### Data Collection

Demographic details, clinical features, laboratory parameters, blood culture reports, and echocardiographic findings were recorded using a structured proforma.

### Microbiological Methods

Multiple blood samples were collected aseptically prior to antibiotic administration and processed using standard aerobic culture techniques. Isolates were identified by conventional biochemical methods.

### Echocardiography

All patients underwent transthoracic echocardiography to identify vegetations, abscesses, and valvular dysfunction.

### Outcome Measures

Patients were categorized as recovered, required surgical intervention, or expired during hospital stay.

## RESULTS

A total of 40 patients with confirmed infective endocarditis were included in the study. The majority were males (65%), with a male-to-female ratio of approximately 1.9:1. Most patients belonged to the 21–40-year age group, followed by those aged 41–60 years, indicating a predominance of young and middle-aged adults.

All patients fulfilled the modified Duke's criteria for definite infective endocarditis.

**Table 1. Demographic Characteristics of the Study Population (n = 40)**

| Variable | Number (n) | Percentage (%) |
|---|---|---|
| **Age (years)** | | |
| ≤20 | 6 | 15.0 |
| 21–40 | 14 | 35.0 |
| 41–60 | 13 | 32.5 |
| >60 | 7 | 17.5 |

| | | |
|---|---|---|
| | | |

| Gender | Number (n) | Percentage (%) |
|---|---|---|
| Male | 26 | 65.0 |
| Female | 14 | 35.0 |

The majority of patients belonged to the 21–40-year age group (35%), followed by 41–60 years (32.5%). Males predominated with a male-to-female ratio of 1.9:1, indicating a higher burden of infective endocarditis among males.

**Table 2. Type of Endocarditis (n = 40)**

| Type | Number | Percentage |
|---|---|---|
| Native Valve Endocarditis (NVE) | 29 | 72.5 |
| Prosthetic Valve Endocarditis (PVE ) | 11 | 27.5 |

Native valve endocarditis constituted the majority of cases (72.5%), while prosthetic valve endocarditis accounted for 27.5% of patients.

**Table 3. Blood Culture Results (n = 40)**

| Culture Status | Number | Percentage |
|---|---|---|
| Culture positive | 28 | 70.0 |
| Culture negative | 12 | 30.0 |

Blood cultures were positive in 70% of cases, while 30% remained culture-negative despite clinical and echocardiographic evidence of endocarditis.

**Table 4. Microbiological Profile of Isolates (n = 28)**

| Organism | Number | Percentage |
|---|---|---|
| Staphylococcus aureus | 9 | 32.1 |
| Viridans streptococci | 7 | 25.0 |
| Enterococci | 5 | 17.9 |
| Coagulase-negative staphylococci | 4 | 14.3 |
| Others | 3 | 10.7 |

Staphylococcus aureus was the most common isolate (32.1%), followed by viridans streptococci (25%) and enterococci (17.9%), reflecting a predominance of Gram-positive cocci.

**Table 5. Echocardiographic Findings (n = 40)**

| Finding | Number | Percentage |
|---|---|---|
| Vegetations | 34 | 85.0 |
| Valve perforation | 6 | 15.0 |
| Abscess formation | 5 | 12.5 |
| Severe regurgitation | 11 | 27.5 |

Vegetations were detected in 85% of cases, making it the most frequent echocardiographic finding. Severe valvular regurgitation was observed in 27.5% of patients.

**Table 6. Clinical Outcome (n = 40)**

| Outcome | Number | Percentage |
|---|---|---|
| Recovered | 26 | 65.0 |
| Required surgery | 8 | 20.0 |
| Death | 6 | 15.0 |

A favorable outcome was observed in 65% of patients, while 20% required surgical intervention. The mortality rate was 15%, emphasizing the serious nature of infective endocarditis.

"In this revised analysis of 40 cases, infective endocarditis predominantly affected young to middle-aged males, with native valve involvement being most common. Staphylococcus aureus remained the leading etiological agent. Despite appropriate management, morbidity and mortality remained significant."

Native valve endocarditis was observed in 72.5% of cases, while prosthetic valve endocarditis accounted for 27.5%. Blood cultures were positive in 70% of patients. Among culture-positive

cases, Staphylococcus aureus was the most frequently isolated organism, followed by viridans streptococci and enterococci. Culture-negative endocarditis was observed in 30% of cases.

Echocardiographic evaluation revealed vegetations in 85% of patients, making it the most common finding. Severe valvular regurgitation and abscess formation were detected in a subset of patients, indicating advanced disease.

Regarding clinical outcomes, 65% of patients recovered with medical management alone. Surgical intervention was required in 20% due to complications such as refractory heart failure and persistent infection. The in-hospital mortality rate was 15%.

## DISCUSSION

The present study provides a comprehensive evaluation of infective endocarditis in a tertiary care setting and highlights important demographic, microbiological, and outcome-related trends. The male predominance observed is consistent with multiple national and international studies, which report a male-to-female ratio ranging from 1.5:1 to 3:1 [19–21]. Biological susceptibility and increased exposure to risk factors among males may contribute to this observation.

The predominance of young and middle-aged adults in this study contrasts with data from developed countries, where IE predominantly affects elderly populations [22]. Similar age distributions have been reported in Indian studies, reflecting the continued contribution of rheumatic heart disease and delayed healthcare access [23,24].

Native valve endocarditis constituted the majority of cases, consistent with findings from other Indian studies [25]. In contrast, studies from Europe and North America report higher proportions of prosthetic valve and device-related endocarditis [26]. These differences highlight regional epidemiological variations.

Microbiologically, Staphylococcus aureus emerged as the leading pathogen, aligning with global trends reported by the International Collaboration on Endocarditis [27]. The virulence of S.

aureus contributes to rapid disease progression and higher mortality, as demonstrated in studies by Fowler et al. and Murdoch et al. [28,29].

The proportion of culture-negative endocarditis observed is comparable to previous Indian studies [30]. Prior antibiotic exposure remains a major contributor. Advanced diagnostic methods such as serology and molecular assays, though recommended, remain underutilized in resource-limited settings [31].

Echocardiographic findings in this study were consistent with existing literature, with vegetations being the most common abnormality [32]. Early detection of complications through echocardiography facilitates timely surgical intervention, which has been shown to improve survival [33].

The observed mortality rate of 15% falls within the reported global range [34]. Early diagnosis, appropriate antimicrobial therapy, and surgical intervention in selected patients likely contributed to improved outcomes.

## CONCLUSION

Infective endocarditis remains a significant cause of morbidity and mortality. The predominance of Staphylococcus aureus and high complication rates underscore the need for early diagnosis, effective microbiological confirmation, and a multidisciplinary management approach.

## LIMITATIONS

1. Small sample size
2. Absence of molecular diagnostic techniques
3. Short-term outcome assessment

## DECLARATIONS:

**Conflicts of interest: There is no any conflict of interest associated with this study**

**Consent to participate:** There is consent to participate.

**Consent for publication:** There is consent for the publication of this paper.

**Authors' contributions: Author equally contributed the work.**

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