



ROLE OF TRANSTHORACIC ECHOCARDIOGRAPHY IN EVALUATION OF CHILDREN PRESENTING WITH HEART MURMURS: ORIGINAL ARTICLE

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ABSTRACT Heart murmurs are a frequent finding in paediatric clinical practice, often presenting a diagnostic dilemma. The challenge lies in distinguishing between innocent and pathological murmurs, which has significant implications for management. Transthoracic echocardiography, a non-invasive imaging modality, has emerged as a reliable tool in evaluating murmurs, offering detailed insights into cardiac structure and function. This retrospective observational study evaluates the role of transthoracic echocardiography in assessing murmurs among paediatric patients, analyzing data from 150 children (1 day to 10 years old) at a secondary care hospital of Aligarh (U.P.) in India from November 2023 to November 2024. Transthoracic echocardiography demonstrated a sensitivity of 95.4% and specificity of 97.8% in differentiating pathological murmurs from innocent ones. Transthoracic echocardiography is an invaluable tool in evaluating paediatric murmurs. Its integration into routine paediatric practice can enhance diagnostic accuracy, streamline management, and improve patient outcomes.

KEYWORDS : transthoracic echocardiography; children; heart murmurs**INTRODUCTION**

Heart murmurs are detected in a significant proportion of paediatric patients, with studies indicating a prevalence of up to 77% in school-age children.¹ While many murmurs are benign, an estimated 30% may indicate structural heart anomalies.² Accurate identification of pathological murmurs is crucial to avoid unnecessary investigations in healthy children while ensuring timely intervention for those with underlying heart diseases. Transthoracic echocardiography has revolutionized this process by providing a safe, non-invasive, and precise assessment of cardiac anatomy and function. This study investigates its diagnostic utility and real-world applications in evaluating murmurs among children.

METHODS

This retrospective observational study was conducted at a secondary care hospital at Aligarh (U.P.) in India over a period of one year (November 2023–November 2024). Data were collected from 150 children aged 1 day to 10 years who presented with heart murmurs.

Inclusion Criteria: Paediatric patients with newly detected murmurs referred for echocardiography by local paediatricians.

EXCLUSION CRITERIA:

Patients with previously diagnosed congenital heart disease or those on cardiac medications.

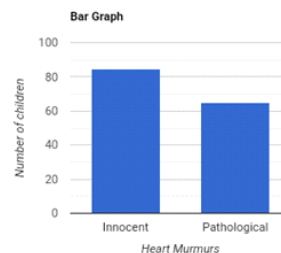
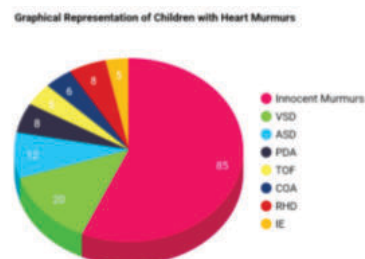
Procedure: All children underwent detailed clinical evaluation, followed by transthoracic echocardiography using a standardized protocol. Ultrasound machine, Versana Balance (GE Healthcare) with paediatric probe 6S was used for doing transthoracic echocardiography. The findings were categorized as:

1. Innocent murmurs.
2. Pathological murmurs caused by congenital or acquired cardiac conditions.

RESULTS

Out of 150 children evaluated, 89 were male and 61 were female. The average age of the children who participated in the research was 1.5 years (1 day - 10 years being the range). Most children [(101 out of 150) (67.3%)], were in the age group of 1 day to 1 year. Innocent Murmurs: 85 cases (56.7%) were identified as innocent murmurs, predominantly Still's murmur and pulmonary flow murmur. Pathological Murmurs: 65 cases (43.3%) had structural abnormalities

Congenital Heart Defects (CHDs): Present in 52 cases (34.7%), including: Ventricular Septal Defect (VSD): 20 cases, Atrial Septal Defect (ASD): 12 cases, Patent Ductus Arteriosus (PDA): 8 cases, Tetralogy of Fallot (TOF): 6 cases, Coarctation of the Aorta: 6 cases. **Acquired Conditions:** 13 cases (8.7%) included rheumatic heart disease (8 cases) and infective endocarditis (5 cases).

Figure 1: Bar Graph**Figure 2:** Graphical Representation of Children with Heart Murmurs: Pie Chart).

Transthoracic echocardiography demonstrated a sensitivity of 95.4% and specificity of 97.8% in differentiating pathological murmurs from innocent ones.

DISCUSSION

Diagnostic Utility: Transthoracic echocardiography provided critical insights into cardiac morphology and hemodynamics, enabling precise differentiation between innocent and pathological murmurs.³ Innocent murmurs were typically associated with normal echocardiographic findings, reducing the need for further investigations.⁴ Pathological murmurs revealed significant structural abnormalities, often requiring surgical or medical intervention.⁵

CASE STUDIES:

1. CASE 1: A 6-year-old boy with a grade 3 systolic murmur and exertional fatigue was diagnosed with VSD. Echocardiography revealed a 6-mm perimembranous defect with left-to-right shunting.

2. CASE 2: A 4-month-old infant with a continuous murmur and failure to thrive was found to have a PDA. Closure via device implantation was successfully performed.

3. CASE 3: An 8-year-old girl with a diastolic murmur was diagnosed with rheumatic mitral valve stenosis. Timely intervention prevented progression to heart failure.

4. CASE 4: A 2-days-old girl with a continuous murmur and

respiratory distress was found to have a PDA. Medical closure via oral Paracetamol was successfully performed.

CLINICAL IMPLICATIONS: Echocardiography significantly reduced diagnostic uncertainty, ensuring appropriate treatment while minimizing parental anxiety in cases of innocent murmurs.

LIMITATIONS:

Operator Dependency: Diagnostic accuracy varied with the experience of the echocardiographer.

ACCESS: Availability of echocardiography remains limited in rural and resource-poor settings.

COST: The financial burden may deter some families from undergoing the test.

RECOMMENDATIONS:

1. Paediatricians should have a low threshold for referring children with suspicious murmurs for echocardiography.
2. Training programs for primary care physicians can enhance early recognition of pathological murmurs.
3. Efforts to subsidize echocardiography in underserved areas are essential to improve access.

CONCLUSIONS

Transthoracic echocardiography is an invaluable tool in evaluating paediatric murmurs, offering high sensitivity and specificity in detecting cardiac abnormalities. Its integration into routine paediatric practice can enhance diagnostic accuracy, streamline management, and improve patient outcomes. Future advancements in portable echocardiography and artificial intelligence-driven interpretation may further expand its accessibility and utility.

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