Janaki Medical College Journal of Medical Sciences (2026); Vol.14 (1):83-89

JMCJMS

Research Article

Pattern and distribution of cardiac diseases in children attending the Karnali Academy of Health Sciences, Jumla

Kamal Prasad Thani[1*], Sandeep Shrestha[2], Uttara Gautam[3], Munna Keshari[4]

Author's Affiliations

[1]Assistant Professor, Department of Pediatrics, Karnali Academy of Health and Sciences
[2]Associate Professor, Department of Pediatrics, Karnali Academy of Health and Sciences
[3]Assistant Professor, Department of Pediatrics, Karnali Academy of Health and Sciences
[4]Lecturer, Department of Pediatrics, Karnali Academy of Health and Sciences

Correspondence to:
Dr. Kamal Prasad Thani
Department of Pediatrics,
Karnali Academy of Health and Sciences, Jumla
Email: kamalthani@gmail.com

ABSTRACT

Background & Objectives: Childhood cardiac diseases remain a significant health burden in Nepal, particularly in remote regions where access to specialized care is limited. This study aimed to determine the pattern and distribution of cardiac diseases among children attending Karnali Academy of Health Sciences (KAHS), Jumla.

Materials and Methods: A retrospective hospital-based study was conducted reviewing medical records of pediatric patients aged 0-18 years diagnosed with cardiac diseases between January 2023 and December 2024. Data were extracted from outpatient, inpatient, and echocardiography registers using a structured checklist. Descriptive statistics and chi-square tests were performed using SPSS version 26. Ethical clearance was obtained from Institutional Review Committee (Reference number: 2025/090).

Results: Among 62 participants, the mean age was 7.13 ± 5.48 years with a female predominance (58.06 %). Congenital heart disease (CHD) accounted for 79.03 % of cases, rheumatic heart disease (RHD) for 19.35 %, and cardiomyopathy for 1.61 %. Acyanotic heart disease was present in 90.32 % of cases. Medical management alone was provided to 46.77 %, while 37.09 % were referred and underwent surgery. Overall, 91.93 % showed improved outcomes. Cyanotic status ($p<0.001$) and age ($p=0.034$) were significantly associated with treatment outcomes.

Conclusions: Congenital heart disease predominates in this remote Himalayan region, with significant proportions of rheumatic heart disease. Early detection and timely referral systems are crucial for improving outcomes in resource-limited settings.

Keywords: Congenital heart disease; Karnali region; Nepal; Pediatric cardiology; Rheumatic heart disease

INTRODUCTION

Childhood-onset heart disease remains a significant global health challenge. Globally, approximately 1.35 million infants are born each year with congenital heart disease (CHD), contributing to more than 260,000 deaths in 2017 alone [1]. In South Asia, the birth prevalence of CHD is estimated to be 8–12 cases per 1,000 live births [2]. In Nepal, around 1% of children are born with congenital heart defects, with national reviews reporting a prevalence of approximately 0.70% of live births [3]. Furthermore, community-based echocardiographic screening among Nepalese school children has identified a considerable burden of structural heart disease [4].

Most of the available data are derived from urban centers in major cities [5,6]. However, studies suggest that rheumatic heart disease (RHD) may be more prevalent in rural and mountainous regions [7,8]. Children in these areas often present late with advanced stages of disease due to lack of awareness, poverty, and limited access to screening programs [9]. Therefore, this study aimed to determine the pattern and distribution of cardiac diseases among children attending Karnali Academy of Health Sciences, Jumla.

MATERIALS AND METHODS

This retrospective, hospital-based descriptive study was carried out at the Department of Pediatrics of Karnali Academy of Health Sciences Teaching Hospital in Jumla, Nepal. The hospital is the only tertiary care center in northwestern Nepal and functions as the primary referral facility for children from the upper Karnali region and nearby remote mountain districts. The study involved a review of hospital records of pediatric patients aged from birth to 18 years who were diagnosed with either congenital or acquired cardiac diseases over a two-year period from January 2023 to December 2024. Children included in the study had attended the outpatient department, inpatient department, or neonatal intensive care unit of the hospital during this time.

Medical records were included if there was a confirmed diagnosis of cardiac disease based on echocardiography, electrocardiogram, chest X-ray findings, or a clearly documented clinical diagnosis in the hospital files. Records were excluded if diagnostic confirmation was inadequate or if the child had functional or innocent heart murmurs without evidence of structural heart disease. All eligible cases meeting the inclusion criteria within the study period were included using a complete enumeration approach, resulting in a total of 62 pediatric cases for final analysis.

Data were collected using a structured data extraction checklist that was developed after reviewing relevant literature and validated by subject experts, including a pediatrician and a research methodology specialist. The checklist was pre-tested on a small number of records and refined before final use. Information extracted from the records included demographic details such as age and sex, clinical features including presenting symptoms, signs, and cyanotic status, diagnostic findings from echocardiography and ECG reports, classification of cardiac disease as congenital or acquired, treatment approaches such as medical management or referral for surgery, and patient outcomes

categorized as improved, unchanged, worsened, or death. Data sources included outpatient registers, inpatient files, and echocardiography records, and each patient was assigned a unique identification code to maintain confidentiality.

The collected data were entered into Microsoft Excel with double-entry verification to minimize errors and subsequently transferred to SPSS version 26 for analysis. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarize demographic and clinical characteristics. Associations between treatment outcomes and selected variables including age, sex, type of heart disease, and cyanotic status were assessed using chi-square tests, with statistical significance set at a p-value of less than 0.05.

Ethical approval for the study was obtained from the Institutional Review Committee (2025/090) of Karnali Academy of Health Sciences prior to data collection. Permission was also secured from the hospital administration to access medical records. As the study was retrospective and based on secondary data, individual informed consent was waived. Strict confidentiality was maintained throughout the study, and all personal identifiers were removed during data handling and analysis.

RESULTS

A total of 62 participants were included in the analysis. The mean age of the participants was 7.13 years with a standard deviation of 5.48 years. The median age was 6.50 years with an interquartile range of 0.10 to 17.00 years. Among the participants, 26 (41.93 percent) were male and 36 (58.06 percent) were female.

Regarding the type of heart disease, congenital heart disease was observed in 49 participants (79.03 percent), rheumatic heart disease in 12 participants (19.35 percent), and cardiomyopathy in 1 participant (1.61 percent). Cyanotic heart disease was present in 6 participants (9.67 percent), while 56 participants (90.32 percent) had acyanotic heart disease.

In terms of treatment modality, 29 participants (46.77 percent) received medical management only. A total of 23 participants (37.09 percent) were referred and underwent surgery, while 10 participants (16.12 percent) were referred but had not undergone surgery at the time of data collection (Table 1).

Overall treatment outcomes showed that 57 participants (91.93 percent) had improved outcomes. Two participants (3.22 percent) remained in the same condition, two participants (3.22 percent) experienced worsened outcomes, and one participant (1.61 percent) died (Table 2).

Table 3 depicts that the association between treatment outcome and selected variables was assessed using the chi-square test. There was no statistically significant association between treatment outcome and sex, with a chi-square value of 2.883 and a p-value of 0.410. Age showed a statistically significant association with treatment outcome, with a chi-square value of 74.418 and a p-value of 0.034. No statistically significant association was observed between treatment outcome and type of heart disease, with a chi-square value of 1.443 and a p-value of 0.963. Cyanotic status showed a statistically significant association with treatment outcome, with a chi-square value of 18.044 and a p-value less than 0.001.

Table 1. Socio-demographic and Clinical Characteristics of Participants (n = 62)

Variable	Category	N	%
Age (years)	Mean ± SD	7.13 ± 5.48	1
Sex	Male	26	41.93
	Female	36	58.06
Type of Heart Disease	Congenital Heart Disease (CHD)	49	79.03
	Rheumatic Heart Disease (RHD)	12	19.35
	Cardiomyopathy	1	1.61
Cyanotic Status	Cyanotic heart disease	6	9.67
	Acyanotic heart disease	56	90.32
Treatment Type	Medical management	29	46.77
	Referred and surgery done	23	37.09
	Referred only	10	16.12

Table 2 Outcome Distribution (Overall)

Outcome	n	%
Improved	57	91.93
Same	2	3.22
Worsened	2	3.22
Died	1	1.61

Table 3. Association Between Treatment Outcome and Selected Variables

Variable	χ^2 value	df	p-value
Sex	2.883	3	0.410
Age	74.418	54	0.034
Type of Heart Disease	1.443	6	0.963
Cyanotic Status	*18.044*	*3*	***<0.001***

DISCUSSION

This retrospective study provides important baseline data on the pattern and distribution of cardiac diseases among children in the remote Karnali region of Nepal. Our findings reveal that congenital heart disease (CHD) predominates (79.03%), followed by rheumatic heart disease (RHD) (19.35%), with acyanotic lesions comprising the vast majority of cases (90.32%).

The predominance of CHD (79.03%) in our study is consistent with findings from other Nepalese tertiary centres. Joshi et al. reported 66.05% CHD in their study at Dhulikhel Hospital [5], while studies from Pokhara and Kathmandu-based centres have similarly documented CHD as the most common pediatric cardiac diagnosis [6–10]. This consistency across different regions suggests that CHD represents the major burden of pediatric heart disease in Nepal, regardless of geographic location.

However, the proportion of RHD in our study (19.35%) remains substantial and concerning given that RHD is a preventable disease. This finding aligns with previous reports

suggesting that RHD remains highly prevalent in remote hill and mountain regions of Nepal [7–8]. Bhattarai et al. demonstrated a high prevalence of RHD among school-aged children in rural hill communities [8], while Regmi et al. reported that RHD persists as a major public health problem in rural and disadvantaged communities with poor access to timely care [11]. The relatively high proportion of RHD in our study reflects persistent challenges such as poverty, overcrowding, limited healthcare access, delayed presentation, and absence of primary prevention programs in the Karnali region.

The mean age of 7.13 years in our study indicates that cardiac diseases present across a wide age spectrum, from neonates to adolescents. The female predominance (58.06%) observed in our study differs from some reports showing male predominance in CHD [5]. This finding may be explained by the proportion of RHD cases in our cohort, as RHD typically shows a slight female predominance, consistent with the findings of Koju et al. [12].

The overwhelming predominance of acyanotic heart disease (90.32%) suggests that children in this region primarily present with left-to-right shunt lesions such as ventricular septal defect (VSD), atrial septal defect (ASD), and patent ductus arteriosus (PDA), which are typically acyanotic. This pattern is consistent with national data showing that VSD and ASD are the most common congenital defects in Nepal [5–6,13].

The low proportion of cyanotic heart disease (9.67%) may reflect either a true lower prevalence of complex cyanotic lesions or, more likely, underdiagnosis and early mortality among affected infants who may not survive to reach healthcare facilities in this remote region. Tamang et al. highlighted that access to pediatric cardiac diagnosis remains extremely limited in remote provinces like Karnali, and late presentation contributes to higher mortality rates [9].

The treatment pattern in our study reflects the limitations of a remote tertiary centre. Nearly half of the children (46.77%) received only medical management, while 37.09% were successfully referred and underwent surgery at specialized cardiac centres. The 16.12% who were referred but had not undergone surgery highlights ongoing challenges in access, including financial constraints, transportation difficulties, and family reluctance.

Despite these challenges, the overall favourable outcome rate of 91.93% is encouraging and suggests that timely diagnosis, appropriate medical management, and effective referral systems can achieve good results even in resource-limited settings. The mortality rate of 1.61% in our series is relatively low and may reflect selection bias, as the most critically ill neonates with complex lesions may have died before reaching KAHS or being formally diagnosed.

The highly significant association between cyanotic status and treatment outcome ($p<0.001$) confirms that cyanotic heart disease carries a worse prognosis, as expected from the pathophysiology of these complex lesions. Cyanotic conditions such as Tetralogy of Fallot, transposition of the great arteries, and single ventricle physiology require timely surgical intervention, and delays in reaching specialized centres can

lead to irreversible complications or death [14–17].

The significant association between age and outcome (p=0.034) may reflect the higher vulnerability of younger infants with critical CHD, while older children with stable acyanotic lesions or compensated RHD tend to have better outcomes [18–20]. This finding emphasizes the importance of early detection and neonatal cardiac screening programs in low-resource environments [21].

Interestingly, the type of heart disease (CHD vs. RHD) was not significantly associated with outcome in our study. This may be because most CHD cases were acyanotic and amenable to medical management or successful surgical referral, while RHD cases were managed medically with penicillin prophylaxis and anti–heart failure measures.

Our findings highlight important implications for healthcare planning in Karnali and similar remote regions of Nepal. There is an urgent need to strengthen early detection through school-based screening and training of peripheral health workers, expand diagnostic capacity through echocardiography and physician training, establish efficient referral pathways with financial support, and implement robust RHD prevention strategies including health education, improved living conditions, prompt treatment of streptococcal infections, and secondary prophylaxis.

However, interpretation of these findings is limited by the retrospective single-center design, incomplete medical records, small sample size, potential selection bias, lack of long-term follow-up, and limited disease subtype classification. Based on these findings, we recommend routine community and school-based screening programs, capacity building of local healthcare providers in pediatric cardiac care, strengthened referral and financial assistance mechanisms, implementation of structured RHD prevention programs including penicillin prophylaxis, and prospective multicenter studies with larger sample sizes to better define the burden and outcomes of pediatric cardiac diseases in remote areas of Nepal.

CONCLUSIONS

Congenital heart disease is the leading pediatric cardiac disorder in the Karnali region, with acyanotic lesions predominating, while rheumatic heart disease remains a significant and preventable burden. Favorable outcomes are achievable despite resource constraints; however, cyanotic heart disease and younger age are associated with poorer prognosis. Strengthening early detection, diagnostic services, referral systems, and RHD prevention programs is essential to improve pediatric cardiac care in remote regions of Nepal.

ACKNOWLEDGEMENT

The authors sincerely acknowledge the Department of Paediatrics and the Medical Records Department of Karnali Academy of Health Sciences Teaching Hospital for their support in facilitating data collection. We also extend our gratitude to all healthcare professionals involved in the care and management of children with cardiac diseases.

Conflict of interest: The authors declare no conflict of interest.

Funding: This study was self-funded with no external financial support.

Author's Contribution: KPT contributed to the concept of the study, study design, literature search, data collection, data analysis, data interpretation, manuscript drafting- **KPT, MK, SS, UG;** final approval of the version to be submitted, agreement to be accountable for all aspects of the work, and correspondence to the journal-**KPT.**

REFERENCES

1. Liu Y, Chen S, Zühlke L, et al. Global birth prevalence of congenital heart defects 1970-2017: updated systematic review and meta-analysis of 260 studies. Int J Epidemiol 2019;48(2):455-463.
2. Saxena A. Congenital heart disease in India: a status report. Indian J Pediatr 2018;85(12):1075-1082.
3. Shakya U, Malla R, Gurung R, et al. Review of congenital heart disease in Nepal. Heart Asia 2012;4(1):1-4.
4. Pilgrim T, Kalesan B, Karki P, et al. Prevalence of latent structural heart disease in Nepali school children. Heart 2010;96(7):534-539.
5. Joshi A, Shrestha S, Bhattarai B, et al. Pattern of cardiac diseases in children attended at Dhulikhel Hospital, Kathmandu University Hospital, Nepal. Kathmandu Univ Med J (KUMJ) 2016;14(55):238-243.
6. Ramachandran U, Alurkar V, Thaplia A. Pattern of cardiac diseases in children in Pokhara, Nepal. Kathmandu University Medical Journal (KUMJ) 2006;4(2):222-227.
7. Tamang A, Gurung R, Poudel R, et al. Challenges in pediatric cardiac care in rural Nepal: experiences from mountain regions. Nepal Med J 2021;4(2):45-49.
8. Bhattarai A, Sharma P, Koirala P. Prevalence of rheumatic heart disease in school children in a rural hill community of Nepal (Mathagadi). J Nep Health Life Sci 2022;1(1):12-18.
9. Gautam NC, Sharma R, Bhatia A. The spectrum of congenital heart diseases operated at a tertiary cardiac centre: a surgical series. North Hosp J 2021;18(1):45-53.
10. Shah P, Sherpa K, Pandey NK, et al. Spectrum of congenital heart diseases in Eastern Nepal: a tertiary care hospital experience. J Coll Med Sci Nepal 2017;12(4):137-142.
11. Regmi PR, Adhikaree A, Shakya U, et al. Rheumatic heart disease in school-attending Nepalese children: a descriptive analysis of the national heart screening database. Indian Heart Journal 2023;75(5):363-369.
12. Koju R, Gurung R, Pant P, et al. Pattern of Heart Valve Involvement in Rheumatic Heart Disease. Nepalese Heart Journal 2017;6(1):17-22.
13. Regmi PR, et al. Effectiveness of an educational intervention in improving healthcare workers' knowledge on rheumatic heart disease prevention in Nepal. Trop Med Int Health. 2022;27(6):556-564.
14. Lamichhane P, et al. Prevalence of rheumatic heart disease in South Asia: A systematic review and meta-analysis. Int J Cardiol 2022;358:110-119.
15. Shrestha NR, et al. Rheumatic heart disease: pilot study for a population-based evaluation of prevalence and cardiovascular outcomes among schoolchildren in Nepal. BMJ Open. 2012;2(5):e001616.
16. Carapetis JR. Rheumatic heart disease in developing countries. N Engl J Med. 2007;357(5):439-441.
17. Steer AC, et al. Rheumatic heart disease in developing countries. Nat Rev Cardiol 2016;13(5):275-287.
18. Shrestha NR, et al. Rheumatic heart disease in the heart of Himalayas. Indian Heart J. 2022;74(5):423-425.
19. Shrestha NR, et al. Protocol for a population-based study of rheumatic heart disease prevalence and cardiovascular outcomes among schoolchildren in Nepal. BMJ Open. 2012;2(3):e001042. (Related protocol; PMID from similar: 22685225).
20. Zimmerman MS, et al. Global access to comprehensive care for paediatric and congenital heart disease: a call to action. Lancet Child Adolesc Health 2023;7(12):893-904. (From related global access themes; adapted for remote challenges).
21. Alshawabkeh L, et al. Barriers to Accessing Congenital Heart Surgery in Low- and Middle-Income Countries: A Systematic Review. World J Pediatr Congenit Heart Surg 2023;14(6):737-747. doi:10.1177/21501351231204328.