

PEDIATRIC CARDIOLOGY AND CHILDREN'S HEART CARE IN NEPAL

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ABSTRACT

Pediatric cardiology is an established sphere of modern medicine; however, Nepal presently has limited facilities and skilled practitioners dedicated to this subspecialty of pediatric medicine. The purpose of this review is to analyze present status of pediatric cardiology and children's heart care in Nepal. Observation of the children consulted and those admitted to the cardiac unit of Kanti Children's Hospital (KCH), as well as the review of hospital records and existing scientific literature, have revealed that majority of cardiac diseases afflicting Nepalese children originate from infections that are preventable to a great extent. Congenital heart problems are the second leading source of cardiac disease in the Nepalese pediatric population. In order to develop pediatric cardiology as a successful field in Nepal in the coming years, the major issues to address include: early diagnosis, systematizing long-term antibiotic prophylaxis to patients who require it, improving referral and patient transportation securing, funding for the long hospital stays required, expenditure, training health personnel for the tender pre and post-surgical care, and expanding and improving patient and community heart health education. Several national and international organizations could provide important assistance for controlling the preventable and treatable infections associated with pediatric cardiac disease and heart defects as well as care of children with heart problems.

Key Words: *Children, congenital heart disease, heart, Nepal, pediatric cardiology, rheumatic heart disease.*

BACKGROUND AND HISTORY OF PEDIATRIC CARDIOLOGY

Several specialty and super-specialty fields of medical science have been developed rapidly in recent decades, and these are inter-linked with multidisciplinary areas of natural and social sciences researches. Cardiology, the study of the heart, has interested scientists of all disciplines for hundreds of years. Some astronomers, for example, believe that Sun, Moon and Mars are important in the regulation of heart health and disease in humans, while the art and science of palmistry views the hand as an indicator of heart health, function and disease. Physicians and medical scientists view the heart as both a dynamic electromechanical pump that functions through

automaticity, contractility, and rhythmicity to propel blood throughout the body¹ and a sensitive receptor capable of responding to various environmental stimuli, such as temperature, air content and pressure, as well as emotional states, such as happiness, grief, fear and sorrow.

Many heart diseases - particularly those acquired congenitally - start either in the prenatal, natal or postnatal life. Furthermore, some adult heart diseases start their course either in childhood or in fetal life. Large numbers of heart diseases are either associated with inflammation² or inactivity in some point of time. Human cardiac disease is the result of complex interaction between genetic susceptibility and environmental stress.³

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Modern medicine has created and utilized large numbers of simple and sophisticated instruments and medicines to cure and prevent heart diseases and promote heart health. Since Sir William's discovery of human circulation in 1628 AD, cardiology has made tremendous progress in diagnostic tools, therapeutic and prophylactic techniques, and medications. In 1929, Forssmann, a medical student in Germany first showed that heart can be approached in a human by insertion of a tube into the vein of an arm. Later this technique was developed into the diagnostic and therapeutic techniques of cardiac catheterization and he was awarded Nobel Prize.

Pediatric cardiology is the super-specialty that deals with heart of the children⁴ that emerged from the dual sciences of pediatrics and medical cardiology.⁵⁻⁷ Modern pediatric cardiology can be traced to the work of Canadian physician Dr. Maude E. Abbott, whose important contributions appeared in 1936 (Atlas of Congenital Heart Disease). For all her original contributions, including the publication of the book Congenital Malformation of the Heart (1947), Dr. Helen B. Taussig, Director of Children's Cardiac Clinic at John Hopkins University, is considered the founder of pediatric cardiology.⁴ Development of sophisticated echocardiography has led to significant advances in the field, particularly in the diagnostic arena of pediatric cardiology.⁸ Recently, efforts are underway on genetic and molecular searches to diagnose and treat heart ailments both in children and in adults. However, thoughtful use of hands and the stethoscope are still the major tools of diagnosing diseases in countries short on modern medical resources, like Nepal.

PEDIATRIC CARDIOLOGY IN NEPAL

Various government and private institutions have been working to improve cardiac care for adults and the elderly,⁹ however, few have been involved specifically for the cause of pediatric cardiac care in Nepal. With the increasing detection of congenital heart diseases due to availability of trained manpower and better equipment, there is an expanding population of pediatric cardiac patients, which is accompanied by a rise in the demand for proficient and professional cardiac care.¹⁰ Furthermore, a rapidly increasing number of medical graduates and pediatricians in Nepal (135 pediatricians practicing in 2004)^{11,12} have created a need for pediatric subspecialty care, such as, pediatric cardiology, in the country. At the time of writing this article there is only one academically qualified and Nepal Medical Council registered pediatric cardiologist in the country.¹³

Pediatric cardiac care is in its infancy in many developing and least developed nations, as is the case in Nepal. At KCH - which, established 42 years ago, continues to be the only

children's hospital in the country¹⁴ - pediatric cardiac diseases were previously managed by general pediatricians and general physicians; specialized care for the pediatric cardiac patient began here with the establishment of a pediatric cardiac clinic in the hospital in 1997 through the support of American pediatric cardiologist Anne Wedemeyer. She also provided short-term training to Nepalese doctors working at KCH and was instrumental in establishing a 6-bed cardiac unit on December 3, 1998.¹⁵ Clinical and managerial support from physicians, paediatricians, general cardiologists and the hospital administration has been noteworthy. The Department of Pediatrics, IoM, Tribhuvan University (TU) also played a role in the initial days of establishing cardiac beds in KCH. Since there was previously no pediatric cardiologist in the country, this unit was then kept under one of the medical divisions of KCH. The addition of a floor in the old building of KCH resulted in the allotment of 12 beds for cardiac patients nearly two years ago (2002). Regular outpatient services and inpatient care have been made available within its limited diagnostic and therapeutic facilities.

Thus far, KCH has been providing medical management for pediatric cardiac patients and continues to be the only facility in the country with staff and resources dedicated exclusively to children with heart disease. Surgical care for pediatric cardiac patients has been provided either by the institutions that have open-heart surgery facilities in the nation (Tribhuvan University Teaching Hospital (TUTH), Sahid Gagalal National Heart Center and Bir Hospital, all in Kathmandu district)¹⁶⁻²² or by Indian and overseas heart centers. The increase in the diagnostic facilities and irreparable heart and lung consequences of congenital and acquired heart diseases demands early cardiac interventions and long-term care;²³⁻²⁵ present facilities cannot meet the existing need for this relatively high-level care, and only those patients who are able to travel to Kathmandu have access to specialized pediatric heart care. More facilities equipped, trained and prepared for this specialized care - particularly outside the Kathmandu valley - are needed to adequately address the burden of disease in Nepal. Since the establishment of the pediatric cardiac OPD and Unit, we have also been providing clinical teaching and exposure to various grades of nursing and medical students.

In addition to the added facilities and trained manpower that will be necessary for the advancement of pediatric cardiology, modern diagnostic, monitoring, and therapeutic equipment will be integral in the establishment of high quality cardiac care in Nepal. Presently, most pediatric facilities lack even some of the most basic pieces of equipment for cardiac evaluation and monitoring (pulse oxymeters, electrocardiograms, basic cardiac monitors) as well as moderate to high end diagnostic devices, such as echocardiography machines, cardiac catheterization devices.

Finally, as discussed above, there has been a lack of research in pediatric cardiology in Nepal. Investigations in this field are essential to further elucidate the burden of disease in Nepal and guide clinicians in diagnosis and treatment. Pediatric cardiac diseases, particularly those of infectious etiologies, may show considerable variance between countries; as a consequence, it is important to collect data and conduct research that is specific to Nepalese children. In order to develop a strong research program for pediatric cardiology in Nepal, international collaborations, which bring both technical training and capacity as well as financial support, should be actively pursued and established.

Various contributions over the past sixty years have made pediatric cardiology a well-developed specialty in the field of modern medicine; however, Nepalese children are still suffering from the infectious and many preventable pediatric cardiac problems. Ultimately, the fundamentals of education and economic development are the keys to a successful program of controlling and preventing infectious diseases including childhood heart disease.²⁶⁻²⁸

PEDIATRIC CARDIAC DISEASE IN NEPAL: A CROSS SECTIONAL SURVEY AND REVIEW OF THE LITERATURE

Our review of the literature on pediatric cardiology and heart care in Nepal revealed a substantial lack of available data on the condition of children's heart disease and treatment in the country. In order to survey the etiologies of cardiac disease encountered in the hospital setting, we have documented, reviewed and analyzed all pediatric cardiac problems encountered in the regular pediatric cardiac unit of KCH.

Previously, a retrospective analysis of pediatric cardiac problems amongst children admitted to KCH over the course of one year (1996-1997) was published, marking the first scientific survey of pediatric heart disease in the country.²⁹ Our observations and experiences, along with several previous reports, have revealed clearly that the majority of the pediatric cardiac health problems are due to rheumatic heart disease,³⁰⁻³⁷ followed by congenital heart disease.³⁸⁻⁴⁵ The pediatric cardiac problems that we encountered in the cardiac outpatient clinic and cardiac inpatient unit of KCH over the course of our survey are outlined in Box A.

Heart diseases derived from consultation of 370 OPD and 54 admitted cardiac patients from 46 districts of Nepal (out of 75 districts) ages 22 days to 14 years in cardiac unit of KCH from June 9, 2004 to December 11, 2004 (Jestha 27, 2061 BS to Mansir 26, 2061 BS) were included. All the diagnoses were

Box A. Etiological classification of pediatric cardiac problems encountered in Kanti Children's Hospital (KCH).

- a. Congenital: Septal defects: atrial septal defect (ASD), ventricular septal defect (VSD), atrioventricular septal defect (AVSD), patent foramen ovale (PFO); Obstructive cardiac lesions: mitral stenosis (MS), pulmonary stenosis (PS), aortic stenosis (AS), tricuspid stenosis (TS); Abnormal vascular connection: patent ductus arteriosus (PDA), partial anomalous pulmonary venous return (PAPVR); Regurgitation: mitral valve prolapse (MVP), tricuspid regurgitation (TR), aortic regurgitation (AR), pulmonary regurgitation (PR); Anoxic/cyanotic disorders: Tetralogy of Fallot (TOF), pulmonary stenosis (PS), total anomalous pulmonary venous return (TAPVR), tricuspid atresia
- b. Malposition: Dextrocardia
- c. Congenital heart disease associated with other congenital/genetic diseases/syndromes: Down syndrome, Noonan syndrome, Scimitar syndrome, cleft lip, cleft palate, thumb deformity
- d. Rhythm disorders: Sinus tachycardia, supraventricular tachycardia (SVT), heart block, right ventricular hypertrophy
- e. Myocardial disease: Cardiomyopathy
- f. Hypertension: Systemic hypertension, pulmonary hypertension
- g. Acute Rheumatic Fever and Rheumatic Heart Disease (ARF and RHD): MR, AR, TR, MS; myocarditis; acute pericarditis, pericardial effusion; chorea
- h. Infective: Infective endocarditis, myocarditis, tubercular pericardial effusion
- i. Congestive Heart Failure (CHF): Pneumonia, severe lower respiratory infection, septicemia, enteric fever
- j. Systemic diseases: Nephritis, rheumatoid arthritis, bronchial asthma
- k. Metabolic: Hypokalemia, hypocalcemia
- l. Endocrinal: Hypothyroidism
- m. Pre- and post-surgical evaluation
- n. Innocent murmurs
- o. Miscellaneous: Chest pain, palpitation, tachycardia, failure to thrive, cardiac symptoms in neurological disorder (e.g. cerebral palsy, birth asphyxia), request for cardiac examination in patients with tonsillitis, pharyngitis, sore throat
- p. Treatment-related hypersensitivity/adverse reaction: Penicillin, amoxycillin, erythromycin

confirmed by a pediatric cardiologist based upon appropriate diagnostic methods and tools available in KCH and the hospitals of Kathmandu.

Rheumatic heart disease, congenital heart disease, pericardial effusion, infective endocarditis, and congestive heart failure secondary to pulmonary infections were the major causes of hospital admission. In particular, the finding of infective endocarditis and pericardial effusion as major causes of morbidity in Nepalese children should be noted, as these remain important but often unrecognized causes of mortality in children in Nepal.^{46,47} Less frequently seen diseases during the survey period included natal and perinatal heart problems; however, these conditions account for a significant burden of disease and should not be neglected.⁴⁸⁻⁵⁰ Kawasaki disease has also been previously reported in Nepal⁵¹⁻⁵³ but was not encountered during the period of survey. In addition, reports have appeared on the cardiovascular effect of atherosclerosis and psychophysiological response in stunted Nepalese children.^{54,55}

Male cardiac patients were greater in number than females in our observation and in the published literature. The hospital stay of cardiac patients varied from 3 to 43 days (mean 14.9 days). Of the 54 admissions over the six-month period, three patients died, as a result of the following conditions: ventricular septal defect with congestive heart failure and pneumonia; RHD with infective endocarditis; and rheumatic mitral regurgitation with mitral stenosis.

THE FUTURE OF PEDIATRIC CARDIOLOGY IN NEPAL

Pediatric cardiology is a relatively young field in Nepal, and much work is needed in order to develop the field to successfully serve the need that is reflected in the burden of heart disease in Nepal's children based upon our observation and literature reviews. The challenges in advancing heart care for children in Nepal will be great, and we believe there are four major areas to focus on in the coming years: building institutional capacity, expanding human capacity, obtaining diagnostic and therapeutic equipment, and strengthening research and international collaborations.

In addition, the paucity of pediatricians trained in pediatric cardiology and pediatric cardiac surgeons may further limit the potential of potential pediatric cardiac care in the country. Certainly, pediatric cardiologists and pediatric cardiac surgeons should go hand in hand in the days to come to improve pediatric cardiac care. Furthermore the capacity and skills of nurses in pediatric cardiac care is equally important, since the regular and intensive cardiac care and delicate post-surgical

management required for children is not possible in their absence. Specific and systematic training for nurses in basic cardiac care is an essential component of comprehensive and professional pediatric cardiac care but, to date, has been very limited in Nepal.

Creative hard work, courage, patience, transparent governmental institutional support, international networking and collaboration will help proper and scientific cardiac care of Nepali children. Several national and international organizations could provide important assistance for controlling the preventable and treatable infections associated with pediatric cardiac disease and heart defects and research on pediatric heart disease in this country, which, we think, should be the basis of pediatric cardiology in Nepal today and in future.

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