

Pediatric cardiac procedures in India: Who bears the cost?

The realm of pediatric cardiac care in India presents a poignant paradox. On the one hand, there exists a growing awareness and expertise in treating congenital heart disease (CHD), providing hope for countless families grappling with the diagnosis of CHD in their kids. On the other hand, the financial burden associated with these procedures often threatens to overshadow this hope, leaving families navigating through a maze of uncertainty.

The costs associated with diagnosis, surgery, postoperative care, and long-term management of most of the CHDs are substantial, often exceeding the financial capabilities of average Indian families. They are usually forced to make agonizing choices between their financial stability and the life-saving treatment of their children. For many, selling assets, borrowing money, or depleting savings becomes the only viable option, plunging them into a cycle of debt and poverty. Moreover, the impact of this financial burden extends far beyond immediate medical expenses.^[1] Families often must contend with additional costs such as travel, accommodation, and loss of income due to prolonged hospital stays.

An Indian retrospective study^[2] of 644 children admitted for cardiac surgery showed that the median expense for admission and surgery was INR 201,898, almost equal to the annual family income of affected patients. The median loss of person days was 35, and the number of job days was 15. One in two families reported overwhelming to high financial stress during the admission period for surgery. Approximately half of the families borrowed money during the follow-up period after surgery.^[2]

In our quest to understand the dynamics of funding for pediatric cardiac care in India, we conducted a survey that included 24 pediatric cardiac centers spread across the country [Figure 1]. This survey aimed to delve into various aspects, including the cost of standard procedures, sources of funding, and the number of patients receiving financial aid from different sources. The detailed methodology of the survey and the study pro forma are available in Appendix 1. We included the public and private sectors and charitable hospitals, ensuring a holistic view of pediatric cardiac care financing in the country.

COST OF PEDIATRIC CARDIAC PROCEDURES IN INDIA

In our survey, we analyzed the costs incurred by the patients for common interventions and surgeries for CHD, which are presented in Tables 1 and 2,

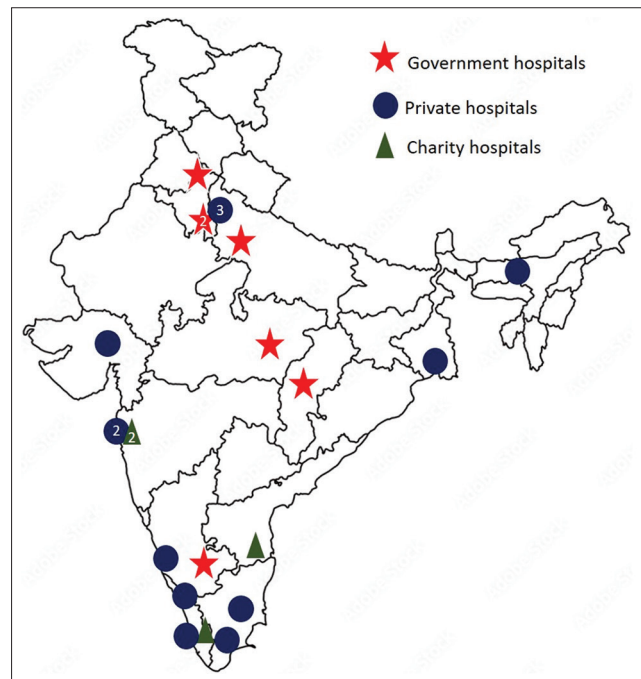


Figure 1: Hospitals participating in the survey

respectively. The cost of pediatric cardiac interventions and surgeries depends on various factors, including the type of procedure, implants/devices used, hospital infrastructure, and geographic location, apart from whether the hospital is private, government-run, or a charity hospital.^[3] Even among the private hospitals, the cost varied significantly depending on the infrastructure, level of super specialization, utilization of resources, and type of ward chosen. It is crucial to recognize that the costs mentioned represent the expenses borne by the patient and their families rather than the comprehensive cost of the procedure. In some government hospitals, patients pay only for consumables such as medicines and disposables, and the government subsidizes or covers the costs associated with establishing, staffing, and maintaining a pediatric cardiac unit.

PEDIATRIC CARDIAC PROCEDURES IN INDIA – WHO PAYS FOR THEM?

In our survey of the 24 hospitals, six were run by the government, where most patients underwent procedures under the various central and state government schemes (60%), and the breakup is presented in Figure 2a. Out-of-pocket spending was the primary source among one-fourth of patients. In our survey, four charity hospitals participated, where most pediatric cardiac procedures were performed under state government

Table 1: Cost of interventions for congenital heart disease among various Indian centers*

Interventions	Government hospitals	Charity hospitals	Private hospitals
ASD device closure	80,000–100,000	135,000–175,000	130,000–305,000
PDA device closure	45,000–100,000	72,000–85,000	100,000–200,000
PDA piccolo device	70,000–100,000	80,000–125,000	130,000–250,000
AVBD	45,000–75,000	50,000–65,000	90,000–200,000
PVBD	45,000–75,000	50,000–65,000	75,000–200,000
Balloon atrial septostomy	4000–100,000	15,000–60,000	30,000–200,000
RVOT stent	50,000–100,000	50,000–150,000	110,000–400,000
Coarctation stent	80,000–350,000	90,000–175,000	200,000–380,000
Transcatheter pulmonary valve	1,500,000–2,500,000	1,500,000–1,800,000	1,500,000–2,600,000

*In Indian rupees; for comparison, 1000 USD is=83,500 INR at 1 USD=83.5 INR. ASD: Atrial septal defect, PDA: Patent ductus arteriosus, RVOT: Right ventricular outflow tract, AVBD: Aortic valve balloon dilatation, PVBD: Pulmonary valve balloon dilatation

Table 2: Cost of surgeries for congenital heart disease among various Indian centers*

Surgeries	Government hospitals	Charity hospitals	Private hospitals
ASD closure	65,000–200,000	80,000–150,000	220,000–450,000
VSD closure	65,000–200,000	85,000–180,000	200,000–350,000
PDA ligation	10,000–100,000	40,000–100,000	100,000–200,000
ASO	80,000–300,000	150,000–250,000	275,000–450,000
TAPVC repair	65,000–300,000	130,000–250,000	200,000–400,000
BT shunt	30,000–200,000	50,000–250,000	120,000–350,000
BDG shunt	65,000–300,000	50,000–225,000	160,000–350,000
Fontan	65,000–300,000	150,000–250,000	250,000–500,000
Single valve replacement	120,000–400,000	125,000–300,000	250,000–500,000
Coarctation repair	30,000–200,000	75,000–250,000	150,000–300,000

*In Indian rupees; for comparison, 1000 USD is=83,500 INR at 1 USD=83.5 INR. ASD: Atrial septal defect, VSD: Ventricular septal defect, PDA: Patent ductus arteriosus, TAPVC: Total anomalous venous connection, BT: Blalock–Taussig, BDG: Bidirectional Glenn, ASO: Arterial switch operation

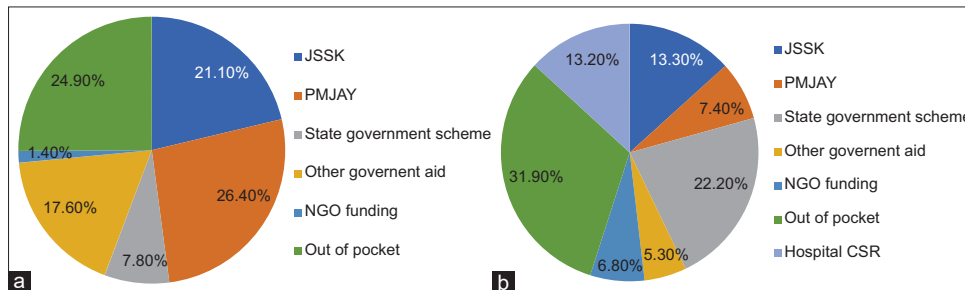


Figure 2: (a) Funding sources for pediatric cardiac procedures in government hospitals (b) Funding sources for pediatric cardiac procedures in private hospitals. JSSK: Janani Shishu Suraksha Karyakram, AB-PMJAY: Ayushman Bharat Pradhan Mantri Jan Arogya Yojana, NGO: Nongovernmental organization, CSR: Corporate social responsibility

schemes (48%) and funding from nongovernmental organizations (NGOs) (35%). The remaining procedures were covered by hospital corporate social responsibility initiatives, the Ayushman Bharat-Pradhan Mantri Jan Arogya Yojana (AB-PMJAY), and other government aids.

In our survey, 14 pediatric cardiac centers from the private sector participated. Private hospital patients utilize more diverse funding sources than other types of hospitals. Approximately one-third of patients underwent treatment with out-of-pocket expenditure (35%) [Figure 2b].

IMPORTANCE OF THE PROBLEM

Every year, about 200,000 children are born with CHD in India.^[4] About one-fifth of these children require

early intervention or surgery. Only a few government hospitals offer interventional or surgical treatment for CHD.^[5] Government-run pediatric cardiac centers often have limited capacity in terms of infrastructure, medical equipment, and staff. This leads to longer waiting times for surgeries and interventions and overcrowding in facilities. Geographical disparities, budget constraints, and quality of care also limit them.^[4-6]

Indian pediatric cardiac programs have successfully provided life-saving cardiac interventions at a fraction of the cost compared to Western countries, making cardiac care more accessible to children from all socioeconomic backgrounds.^[6] For instance, an arterial switch surgery costs as low as USD 1000 in some governmental setups to USD 3600 in most private establishments [Table 2], in contrast to the range of USD 25,000–500,000 in Western

nations with a median cost of USD 82,360.^[7] However, the mismatch between the per capita income in India and the cost of cardiac procedures underscores the profound economic challenges families face when confronted with pediatric cardiac conditions. While witnessing gradual growth over the years, India's per capita income remains significantly lower than developed nations. According to the Ministry of Statistics and Programme Implementation, India's per capita income is less than INR 100,000 in 2023,^[8] reflecting the economic realities for a vast population segment.

Lack of adequate paying jobs is emerging as the most critical factor for dissatisfaction among newer qualified Indian pediatric cardiologists.^[9] Optimization of cost and public funding to make pediatric cardiac services widely accessible are the most critical factors that would enable more centers to be set up across India.^[4,10,11] This would not only improve the outcome of children with CHD but also create adequate job opportunities for the next generation of pediatric cardiologists.^[10,11] There are limited jobs in the government sector, and the private sector cannot afford to employ many people with high salaries and limited income. Unless there is enough compensation for all the diagnostic and therapeutic procedures, the newer specialty areas cannot be developed, and there will not be trained people in specialties.

A global comparison

In a review encompassing 193 countries, India falls into Group 2, indicating that pediatric cardiac surgery is available within the country, but accessibility remains a challenge for a significant proportion of children with CHD. As identified, there is a considerable reliance on out-of-pocket spending, reflecting the financial burden on individuals seeking pediatric cardiac care.^[12] In contrast, Group 1 countries, which included developed economies such as North America and Europe, have pediatric cardiac services that are available and accessible to all children with CHD. In these countries, financing pediatric cardiac surgeries is often facilitated through insurance schemes or direct government funding, ensuring broader access to essential cardiac care without imposing significant financial constraints on patients and their families.^[12]

INITIATIVES THAT ARE IMPROVING THE SITUATION IN INDIA

Government of India initiatives

According to India's National Health Account estimates for 2019–2020, there has been a notable shift in health-care financing trends in India. The proportion of out-of-pocket health-care expenditure decreased from 62.6% in 2014–2015 to 47.1% in 2019–2020. Conversely, the share of government health expenditure increased

from 29% in 2014–2015 to 41.4% in 2019–2020. The government's budgeted spending on the health sector touched 1.35% in 2019–2020 compared to 1.13% in 2014–2015.^[13]

Government aid for pediatric cardiac care has also improved. The Government of India, recognizing the importance of addressing CHD, has launched various programs to provide financial assistance and subsidized treatment to economically disadvantaged families. Schemes such as the AB-PMJAY,^[14] Janani-Shishu Suraksha Karyakram (JSSK),^[15] and Rashtriya Bal Swasthya Karyakram (RBSK)^[16] have been instrumental in extending health-care coverage to millions of children and are summarized in Table 3. However, the reach and effectiveness of these schemes still need to be improved. Administrative bottlenecks, inadequate infrastructure, and disparities in implementation often hinder their ability to cater to the entire spectrum of pediatric cardiac care needs.

The Ayushman Bharat-Pradhan Mantri Jan Arogya Yojana program: Is it the game-changer?

The AB-PMJAY program is the world's most extensive government-funded health assurance program. It is making rapid strides in improving access to quality secondary and tertiary care for those in need, the bottom 50% of the Indian population. The AB-PMJAY is now widely accepted across 33 states and union territories, except Delhi, Odisha, and West Bengal. The AB-PMJAY scheme encompasses over 1500 health-benefit packages, with around 150 dedicated to cardiac surgeries and interventions.^[19] Among cardiothoracic and vascular surgeries, 121 procedures are included, out of which 50 are for CHD. AB-PMJAY covers almost all congenital heart surgeries. However, the scheme does not include a few interventions, such as coarctation stenting and transcatheter valve implantations. The average reimbursements offered for different procedures are summarized in Table 4.

State government programs

In India, health is a state subject. Hence, many state governments have launched a few initiatives to enhance CHD screening, diagnosis, and management with somewhat different names [Table 5]. One notable program is "Hridayam," the flagship initiative in the state of Kerala.^[21,22] Under this program, a comprehensive strategy is devised to address CHD, encompassing prenatal screening, pulse oximetry screening for newborns, diagnosis of CHD, establishing a referral system, stabilization and transportation of patients, treatment at designated centers, and posttreatment follow-up. Over 3 years, the implementation of this comprehensive program resulted in a significant reduction in infant mortality rate and mortality attributed explicitly to CHD, with declines of 21% and 41%, respectively.^[21]

Table 3: Government of India schemes that support pediatric cardiac procedures

Scheme	Eligibility criteria	Packages covered
AB-PMJAY ^[14]	The households included are based on the deprivation and occupational criteria of the Socioeconomic Caste Census 2011	Rs. 500,000 per year per family
JSSK ^[15]	All children <1 year of age	Free treatment, including diagnostics, drugs, consumables, user charges, and transport
RBSK ^[16]	All children <18 years with congenital heart disease or rheumatic heart disease	Free treatment is available in government hospitals or in collaboration with private hospitals in some states
RAN ^[17]	Below poverty line patients with major life-threatening illness – subject to income criteria	Treatment costs up to Rs. 200,000; Higher costs need the approval of the Central Committee
Health Minister's Discretionary Grant ^[18]	Annual income less than Rs. 125,000	Treatment in government hospitals – partial financial assistance

AB-PMJAY: Ayushman Bharat - Pradhan Mantri Jan Arogya Yojana, JSSK: Janani-Shishu Suraksha Karyakram, RBSK: Rashtriya Bal Swasthya Karyakram, RAN: Rastriya Arogya Nidhi

Table 4: Package costs under the Ayushman Bharat-Pradhan Mantri Jan Arogya Yojana scheme in public tertiary hospitals*^[20]

Procedures	Mean total package cost	Distribution of mean cost of procedures			
		Human resource	Equipment	Implant	Diagnostics, consumables, and drugs
Interventions					
Coarctation balloon dilatation	130,649	38,992	52,396	23,500	10,211
AVBD	101,798	40,440	20,550	23,500	11,649
PVBD	100,081	40,420	20,828	23,500	9117
Balloon atrial septostomy	71,330	50,291	4138	0	9600
ASD device closure	144,004	35,617	33,198	62,000	7614
VSD device closure	141,673	51,168	4528	72,000	7504
PDA device closure	133,415	41,855	48,299	30,000	7381
PDA stenting	84,188	41,373	2969	20,150	15,259
PA stenting	87,907	42,339	3079	23,500	11,832
PA stenting – double	111,407	42,339	3079	47,000	11,832
RVOT stenting	77,019	47,471	3085	7923	12,403
Surgeries					
ASD closure	70,461	15,843	6743	0	38,952
Coarctation repair	116,803	16,779	19,314	30,000	40,520
VSD closure	116,807	19,146	9683	36,571	40,681
AVSD repair	130,148	20,207	10,532	47,000	41,939
AP window repair	145,505	21,052	13,069	47,000	53,395
Intracardiac repair of TOF	130,213	20,883	9627	47,000	41,439
PDA ligation	66,786	14,133	6689	0	39,153
TAPVC repair	136,897	21,580	11,169	47,000	45,267
ASO	174,014	28,814	29,811	47,000	54,383
Double-switch operation	183,334	29,798	23,540	47,000	69,549
Truncus repair	172,916	28,756	21,290	47,000	61,833
Mitral valve repair	122,613	18,936	9703	43,250	40,269
Tricuspid valve repair	126,002	18,446	12,135	43,250	41,909
Aortic valve replacement	130,568	18,943	10,018	49,000	41,731
Mitral valve replacement	130,938	18,943	10,690	49,000	41,430
Double valve replacement	136,674	21,352	11,114	41,600	51,023
BT shunt	96,808	17,852	21,499	5239	42,518
Glenn procedure	101,244	20,814	20,299	4417	45,235
Fontan	148,551	22,702	16,701	45,600	51,922
Ross procedure	211,112	21,117	13,276	120,000	46,610

*In Indian rupees; for comparison, 1000 USD is=83,500 INR at 1 USD=83.5 INR. Differential provider payment system enables more payment for teaching hospitals, hospitals in tier 1 cities and aspirational districts, and hospitals with quality accreditation from a national board. These are the costs of common procedures and surgeries. There are additional packages that include a combination of procedures (e.g., ASD closure with pulmonary valvotomy and Glenn surgery with atrial septectomy). The costs vary according to the combination of procedures. An unspecified surgical package covers up to INR 100,000 for surgical ailments not included. ASD: Atrial septal defect, VSD: Ventricular septal defect, PDA: Patent ductus arteriosus, RVOT: Right ventricular outflow tract, AVSD: Atrioventricular septal defect, AP window: Aortopulmonary window, TOF: Tetralogy of Fallot, TAPVC: Total anomalous venous connection, BT: Blalock-Taussig, AVBD: Aortic valve balloon dilatation, PVBD: Pulmonary valve balloon dilatation, PA: Pulmonary artery, ASO: Arterial switch operation

The Chief Minister's Comprehensive Health Insurance Scheme in Tamil Nadu offers health insurance coverage for various medical procedures, including congenital heart surgeries.^[23] Through the Sishu Saathi^[25] scheme in West Bengal, nearly 28,000 children have undergone

various procedures over 10 years.^[32] Similar initiatives by state governments include the Mahatma Jyoti Rao Phule Jan Arogya Yojana^[26] in Maharashtra, the Mukhyamantri Amrutum Yojana^[27] in Gujarat, and the Mukhyamantri Chiranjeevi Yojana in Rajasthan.^[30] These schemes have

Table 5: Selected state government schemes that support pediatric cardiac procedures

Scheme	State	Eligibility criteria	Type of hospitals	Packages covered
Hridayam for little hearts ^[21,22]	Kerala	All children (<18 years of age) with CHD and residents of Kerala. No income criteria	Impaneled public and private hospitals	Free treatment, including diagnostics, drugs, consumables, user charges, and transport in designated government and private cardiac centers
Chief Minister's Comprehensive Health Insurance Scheme ^[23] and Ilam Sirar Irudaya Padukappu Thittam – Free Heart Surgery Scheme for Infants ^[24]	Tamil Nadu	Residents of Tamil Nadu Annual income criteria	Impaneled public and private hospitals	INR 500,000 per year per family
Sishu Saathi ^[25]	West Bengal	All children (<12 years of age) with CHD and residents of West Bengal. No income criteria	Impaneled public and private hospitals	Free treatment, including diagnostics, drugs, consumables, user charges, and transport in designated government and private cardiac centers
MJPJAY ^[26]	Maharashtra	Residents of Maharashtra state belonging to below the poverty line	Impaneled public and private hospitals	INR 150,000 per year per family
Mukhyamantri Amrutum Yojana ^[27]	Gujarat	Residents of Gujarat state belonging to below the poverty line	Impaneled public and private hospitals	INR 500,000 per year per family
Dr YSR Arogyasri scheme ^[28]	Andhra Pradesh	Residents of Andhra Pradesh state belonging to below the poverty line	Impaneled public and private hospitals	INR 250,000 per year per family
Rajiv Arogyasri Scheme ^[29]	Telangana	Insurance coverage to families below the poverty line of the Telangana state	Impaneled public and private hospitals	INR 1,000,000 per year per family
Mukhyamantri Chiranjeevi Swasthya Yojana ^[30]	Rajasthan	Residents of Rajasthan state belonging to below the poverty line	Impaneled public and private hospitals	INR 2,500,000 per year per family
Mukhya Mantri Himachal Health Care Scheme-HIMCARE ^[31]	Himachal Pradesh	Insurance coverage to families below the poverty line of the Himachal Pradesh state	Impaneled public and private hospitals	INR 500,000 per year per family

CHD: Congenital heart disease, MJPJAY: Mahatma Jyotirao Phule Jan Arogya Yojana

made substantial contributions to the care and treatment of Indian children with CHD.^[33]

Charitable hospitals

Charitable trust hospitals are vital in filling India's pediatric cardiac care gap, particularly for underserved populations. Their commitment to affordable and accessible health-care services reflects a broader commitment to social welfare and health-care equity. Some of the hospitals (e.g. Sathya Sai Hospitals) offer high-quality care at no cost to the patient. However, only a few groups have established hospitals at multiple locations. The critical challenges for these charitable institutions are sourcing finances, long waiting lists, and retaining trained human resources. Despite these shortcomings, some of these institutions are playing a pivotal role in not only treating many children with CHD but also in training the workforce.

Privately funded hospitals

In the private sector, where a significant proportion of pediatric cardiac procedures are performed, the burden of payment falls squarely on the shoulders of families. Despite the improvement in health insurance coverage in India, the coverage for pediatric cardiac conditions is often limited, with high premiums, sub-limits, and exclusions. Most of these insurances do not cover neonatal and infantile surgeries. The one insurance product covering these procedures warrants enrollment

before conception,^[10] and the product is poorly advertised and unpopular. Most of the private pediatric cardiology units in India are cost-neutral or loss-making. Yet, the management chains are running them as part of their commitment and social responsibility. However, situations like the COVID-19 pandemic exposed the fragile ecosystem.^[34] Charitable foundations and NGOs are crucial in bridging the gap, providing financial assistance, fundraising support, and facilitating access to subsidized or free treatment programs. However, their resources are finite, and the demand for aid consistently outweighs the available support.

HOW DO WE IMPROVE THE PRESENT SITUATION IN INDIA?

Addressing the deficits in pediatric cardiac care in India requires a multipronged approach that involves various stakeholders, including the government, health-care providers, NGOs, the private sector, and the community. Three significant reforms that can be transformative for managing the cost for Indian children undergoing heart surgery are presented in Figure 3.

Universal coverage under the Ayushman Bharat-Pradhan Mantri Jan Arogya Yojana program

The eligibility criteria for benefits under AB-PMJAY schemes may exclude certain families, leaving them to

AB-PMJAY Universal coverage	Hospital cost rationalization	Make AB-PMJAY packages acceptable by most hospitals
<ul style="list-style-type: none"> • All under 5 children with CHD across India • All states to at least match the program • Active engagement with public and private hospitals 	<ul style="list-style-type: none"> • More cost-effective measures • Decision-making based on cost-effectiveness and cost-benefit analysis • More centers in Tier 2 and Tier 3 cities 	<ul style="list-style-type: none"> • Upward revision of charges for specific lesions • More realistic pricing for resource-intensive neonatal surgeries • Active two-way engagement

Figure 3: Reforms in financing mechanisms that can be transformative for Indian children undergoing heart surgery. CHD: Congenital heart disease, AB-PMJAY: Ayushman Bharat Pradhan Mantri Jan Arogya Yojana

pend for themselves. Often, needy patients do not know how to enroll in the AB-PMJAY program. Most hospitals ask for too much documentation for initial treatment, and valuable time is lost, which should be minimized. Hence, we propose that *“all children under the age of 5 diagnosed with CHD should receive free treatment at either government or private facilities, irrespective of their financial circumstances or geographic location.”* The Pediatric Cardiac Society of India (PCSI) and our leaders in the field should approach the government to implement the same. Various state schemes should be improved to match the AB-PMJAY scheme’s coverage and reimbursement rates. The government must enhance the coverage and scope of other public health schemes, such as the RBSK and JSSK, to include comprehensive coverage for pediatric cardiac procedures. Both state and central governments should actively engage government and private hospitals across India to make this universal coverage a reality. Complete and uniform coverage across states will enable seamless state-to-state transfer of patients for advanced care.

Hospital cost optimization

The data in Tables 1 and 2 reveal nearly 200%–300% variability in the cost of similar treatment for the same condition in different settings. If every patient is entitled to the same standard of treatment, the cost variation between different hospitals should be within a reasonable band. Hospitals should strive to make the processes more cost-effective. Setting up newer centers in tier 2 and tier 3 hospitals could cut costs and enable patients to travel less to get a tertiary level of pediatric cardiac care. We need to help the government identify areas that need pediatric cardiac services and have centers in those areas. That will help in reducing out-of-pocket expenditure.

The cost-effectiveness of various therapies is poorly evaluated in pediatric cardiology, and such studies are rarely reported in India. Resources are limited, and the demand is increasing as more patients with CHD live longer. In the future, one needs to look at cost-effectiveness in relation to functional recovery and optimum utilization of available resources. This is a tricky area. However, funding heart transplantation or a complicated Fontan is not the same as operating

an infant with a large ventricular septal defect (VSD). Public money should be spent on the greatest good of a maximum number of people. To begin with, as a community, we may avoid doing off-label procedures like perimembranous VSD device closure for small VSDs under government schemes.^[35]

Universal acceptance of the Ayushman Bharat-Pradhan Mantri Jan Arogya Yojana program

A simple comparison of the costs provided by AB-PMJAY [Table 4] and the average cost of the procedures [Tables 1 and 2] shows a large gap, especially between the private-funded hospital charges and the current reimbursement rates. Most private institutions feel that the reimbursement by the government schemes is very low and do not perform procedures under the AB-PMJAY or other government schemes. While these packages are suitable for private hospitals handling low-risk procedures such as atrial septal defect closure and patent ductus arteriosus ligation, they may fall short for complex procedures, given the expenses associated with the procedure and postoperative care. Hence, the package costs for such procedures should be revised upward, acknowledging their complexity and the necessity for postoperative care. The cost of neonatal surgery should also be separately documented and made appropriate for resource utilization. Many packages do not allow supplementation by parallel or combined funding from multiple sources since the government feels that the very purpose of these schemes would be defeated. The packages must allow financing combined from different sources, especially for situations such as prolonged ventilatory care, intensive care unit stay, and others.

For a meaningful discussion, we need to understand the process of estimating the health system packages under AB-PMJAY. The charges are calculated using bottom-up cost calculations using a consultative process and are seemingly scientifically sound. The AB-PMJAY packages are structured to cover expenses encompassing human resources, capital, furniture, equipment, medications, consumables, diagnostics, and implants [Table 4]. Cost calculations of pediatric cardiac procedures in public and private hospitals are now made public.^[20] In

2022, a differential provider payment system was also introduced under AB-PMJAY, but many more additional factors seem to determine the cost of a procedure in India.^[36] However, real-time reference cost data for the various procedures are lacking in India. Recently, a few studies and surveys^[37,38] have been initiated to estimate some of the critical missing data, including the unit costs of health-care service delivery in India, what new packages should be included, generating evidence for the utility of a procedure, and finally to set up an ongoing digital patient cost surveillance systems.^[39]

There must be a positive change, and it needs to be uniform across all the states. Matching the calculated cost to the supply-side hospital characteristics may make more private hospitals willing to get empaneled under the scheme and provide care to those enrolled. Professional bodies, including PCSI, must do advocacy for optimizing the procedural costs for some of the infantile and neonatal cardiac surgeries and other interventions.^[11]

OTHER SUGGESTED MEASURES

Government initiatives

1. Establishing a nationwide system with a chain of care for CHD, including screening, diagnosis, referral, transport, and treatment. The success of the Hridayam scheme in Kerala is mainly due to the government's active initiative and partnership with centers. This kind of initiative is necessary to implement these programs in other states
2. Increased funding: The government should allocate more funds for pediatric cardiac care, focusing on infrastructure development, training programs for health-care professionals, and subsidies for treatment costs
3. Establishment of specialized centers: Build dedicated pediatric cardiac centers with state-of-the-art facilities and a multidisciplinary team to provide comprehensive care for children with heart conditions.

Innovative financing mechanisms

1. Health insurance: Promote the uptake of health insurance among vulnerable populations by subsidizing premiums, expanding coverage for pediatric cardiac procedures, and reducing out-of-pocket expenses^[40]
2. Microinsurance schemes: Introduce microinsurance schemes tailored to the needs of low-income families, offering affordable coverage for pediatric cardiac care.

Capacity building

1. Training programs: Develop and implement training programs for health-care professionals,

including pediatric cardiologists, cardiothoracic surgeons, nurses, and technicians, to enhance their skills in diagnosing and treating pediatric cardiac conditions^[41,42]

2. Task-shifting: Empower primary health-care providers and community health workers with essential knowledge and skills for early detection and referral of pediatric cardiac cases to specialized centers.^[21,43]

Partnerships and collaboration

1. Public-private partnerships (PPPs): Foster collaborations between the government and private sector to improve access to pediatric cardiac care. This can involve leveraging private sector resources and expertise to expand service delivery and reduce costs.^[32,36] Expanding PPP initiatives to encompass additional centers and enhancing existing programs by addressing issues such as reduced package costs, prompt payment processing, and the provision of subsidized consumables to private hospitals
2. NGO support: Encourage partnerships with NGOs and charitable organizations to provide financial assistance, advocacy, and support services for families affected by pediatric cardiac conditions.

Regulatory reforms

1. Price regulation: Implement price regulation mechanisms to control the cost of medical procedures, equipment, and pharmaceuticals related to pediatric cardiac care
2. Quality assurance: Strengthen regulatory frameworks to ensure adherence to quality standards and safety protocols in pediatric cardiac centers and health-care facilities.

By implementing these solutions in a coordinated and sustained manner, India can significantly improve the accessibility and affordability of high-quality pediatric cardiac care, reduce the burden on affected families, and enhance the overall health outcomes of children with heart conditions. Ultimately, the question of who pays for pediatric cardiac procedures in India transcends mere financial considerations – it embodies the moral imperative of ensuring equitable access to life-saving health care for every child, irrespective of their socioeconomic status. It is a question that demands urgent attention, concerted action, and unwavering commitment from all quarters of society. The answer lies not just in financial transactions but in the collective resolve to safeguard the health and well-being of future generations.

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REFERENCES

1. Connor JA, Kline NE, Mott S, Harris SK, Jenkins KJ. The meaning of cost for families of children with congenital heart disease. *J Pediatr Health Care* 2010;24:318-25.
2. Raj M, Paul M, Sudhakar A, Varghese AA, Haridas AC, Kabali C, *et al.* Micro-economic impact of congenital heart surgery: Results of a prospective study from a limited-resource setting. *PLoS One* 2015;10:e0131348.
3. Chauhan AS, Guinness L, Bahuguna P, Singh MP, Aggarwal V, Rajsekhar K, *et al.* Cost of hospital services in India: A multi-site study to inform provider payment rates and health technology assessment. *BMC Health Serv Res* 2022;22:1343.
4. Saxena A. Congenital heart disease in India: A status report. *Indian Pediatr* 2018;55:1075-82.
5. Ramakrishnan S. Being a young pediatric cardiologist in India: Aspirations versus reality. *Ann Pediatr Cardiol* 2023;16:163-7.
6. Ramakrishnan S. Pediatric cardiology: Is India self-reliant? *Ann Pediatr Cardiol* 2021;14:253-9.
7. Pasquali SK, Jacobs JP, Bove EL, Gaynor JW, He X, Gaies MG, *et al.* Quality-cost relationship in congenital heart surgery. *Ann Thorac Surg* 2015;100:1416-21.
8. Available from: <https://www.pib.gov.in/pib.gov.in/Pressreleaseshare.aspx?PRID=1945144>. [Last accessed on 2024 Apr 08].
9. Sachdeva S, Dhulipudi B. Current career perspective of pediatric cardiologists in India. *Ann Pediatr Cardiol* 2023;16:201-3.
10. Tharakan J, Sharma R, Subramanyan R, Saxena A, Kulkarni S, Relan J, *et al.* Being a pediatric cardiologist in India – In search of a holistic solution. *Ann Pediatr Cardiol* 2023;16:448-54.
11. Ramakrishnan S, Maheshwari S. Being a pediatric cardiologist in India – A clarion call. *Ann Pediatr Cardiol* 2023;16:389-92.
12. Katewa A. Pediatric cardiac surgery: A status report on availability, access, and funding across 193 countries. *Indian J Thorac Cardiovasc Surg* 2021;37:190-2.
13. Available from: <https://www.main.mohfw.gov.in>. [Last accessed on 2024 Apr 08].
14. Available from: <https://www.nha.gov.in/PM-JAY>. [Last accessed on 2024 Apr 08].
15. Janani Shishu Suraksha Karyakram. Available from: <https://www.myscheme.gov.in>. [Last accessed on 2024 Apr 08].
16. RBSK-Rashtriya Bal Swasthya Karyakram: National Health Mission. Available from: <https://www.nhm.gov.in>. [Last accessed on 2024 Apr 08].
17. Available from: <https://www.main.mohfw.gov.in/?q=major-programmes/poor-patients-financial-assistance/rashtriya-arogya-nidhi>. [Last accessed on 2024 Apr 08].
18. Available from: <https://www.main.mohfw.gov.in/?q=major-programmes/poor-patients-financial-assistance/health-ministers-discretionary-grant-hmdg>. [Last accessed on 2024 Apr 08].
19. Available from: https://www.pmjay.gov.in/sites/default/files/2020-01/HBP_2.0-For_Website_V2.pdf. [Last accessed on 2024 Apr 08].
20. Available from: https://www.healthconomics.pgispn.in/costing_web/. [Last accessed on 2024 Apr 08].
21. Nair SM, Zheleva B, Dobrzycka A, Hesslein P, Sadanandan R, Kumar RK. A population health approach to address the burden of congenital heart disease in Kerala, India. *Glob Heart* 2021;16:71.
22. Available from: <https://www.hridayam.kerala.gov.in/>. [Last accessed on 2024 Apr 08].
23. Available from: <https://www.cmchistn.com/>. [Last accessed on 2024 Apr 08].
24. Available from: <https://www.nhinp.org/wp-content/uploads/2021/09Coffee%20Table%20Book%202013.pdf>. [Last accessed on 2024 Apr 24].
25. Available from: <https://www.wb.gov.in/government-schemes-details-sishusaathi.aspx>. [Last accessed on 2024 Apr 08].
26. Available from: <https://www.jeevandayee.gov.in/MJPJAY/index.jsp>. [Last accessed on 2024 Apr 08].
27. Available from: <https://www.ma.gujarat.gov.in/index.html>. [Last accessed on 2024 Apr 08].
28. Dr YSR Arogyasri Scheme. Available from: <https://www.yusraarogyasri.ap.gov.in>. [Last accessed on 2024 Apr 17].
29. Rajiv Arogyasri scheme. Available from: <https://www.rajivaarogyasri.telangana.gov.in>. [Last accessed on 2024 Apr 17].
30. Mukhyamantri Chiranjeevi Swasthya Yojana. Available from: <https://www.sso.rajasthan.gov.in>. [Last accessed on 2024 Apr 17].
31. Mukhya Mantri Himachal Health Care Scheme-HIMCARE. Available from: <https://www.hpsbys.in>. [Last accessed on 2024 Apr 17].
32. Das D, Dutta N, Das S, Sharma MK, Chattopadhyay A, Ghosh S, *et al.* Public-private partnership for treatment of congenital heart diseases: Experiences from an Indian State. *World J Pediatr Congenit Heart Surg* 2024;23:21501351231215257.
33. Baranwal AK, Prinja S, Kaur N. Congenital heart disease: Would it be the key driver of infant survival during Amrit Kaal (2022-2047)? *Indian Pediatr* 2023;60:98-102.
34. Kadiyani L, Ramakrishnan S. COVID-19 and heart disease in children: What have we learned? *Ann Pediatr Cardiol* 2023;16:81-6.
35. Sen S, Ramakrishnan S. Minimum requirements for pediatric cardiac procedures in the Indian scenario. *Ann Pediatr Cardiol* 2022;15:439-41.

36. Prinja S, Bahuguna P, Singh MP, Guinness L, Goyal A, Aggarwal V. Refining the provider payment system of India's government-funded health insurance programme: An econometric analysis. *BMJ Open* 2023;13:e076155.
37. Prinja S, Singh MP, Guinness L, Rajsekar K, Bhargava B. Establishing reference costs for the health benefit packages under universal health coverage in India: Cost of health services in India (CHSI) protocol. *BMJ Open* 2020;10:e035170.
38. Bahuguna P, Guinness L, Sharma S, Chauhan AS, Downey L, Prinja S. Estimating the unit costs of healthcare service delivery in India: Addressing information gaps for price setting and health technology assessment. *Appl Health Econ Health Policy* 2020;18:699-711.
39. Prinja S, Chugh Y, Garg B, Guinness L. National hospital costing systems matter for universal healthcare: The India PM-JAY experience. *BMJ Glob Health* 2023;8:e012987.
40. Singh LM, Siddhanta A, Singh AK, Prinja S, Sharma A, Sikka H, et al. Potential impact of the insurance on catastrophic health expenditures among the urban poor population in India. *J Health Manage* 2023;25:996-1008.
41. Kumar RK. Training pediatric heart surgeons for the future: A global challenge. *Ann Pediatr Cardiol* 2015;8:99-102.
42. Subramanyan R. Comprehensive training for the future pediatric cardiologist. *Ann Pediatr Cardiol* 2016;9:1-8.
43. Kumar RK. Delivering pediatric cardiac care with limited resources. *Ann Pediatr Cardiol* 2014;7:163-6.

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APPENDIX 1: SURVEY ON COST OF PEDIATRIC CARDIAC PROCEDURES IN INDIA

Aims and objectives

This survey aims to investigate the financial origins and funding mechanisms for pediatric cardiac procedures in government and private hospitals across India.

Method of survey

An online survey utilizing a Google Forms platform was employed to gather data. Pediatric cardiac centers were reached out to through email and phone communication. Hospitals were provided with a pro forma and comprehensive study details. Invitations to participate in the survey were extended to approximately 75 pediatric cardiac centers nationwide. However, 24 hospitals participated in the survey. Among these, six were governmental, 14 were private, and four were charity hospitals. Information about the costs patients incurred for interventions and surgeries at these facilities was collected. In addition, details were compiled regarding available funding sources, the approximate monthly caseloads, and their financial origins. The collected data were inputted into MS Excel and analyzed utilizing IBM SPSS Statistics 22. A comparative analysis was conducted between government and private hospitals' procedure costs and funding sources.

Results

Twenty-four hospitals participated in the survey; six were government hospitals, 14 were private hospitals, and four were charity hospitals.

Financial sources

Details regarding the financial sources were compiled. Figures 1 and 2 show various sources of funding and an average number of cases per month in government and private hospitals, respectively.

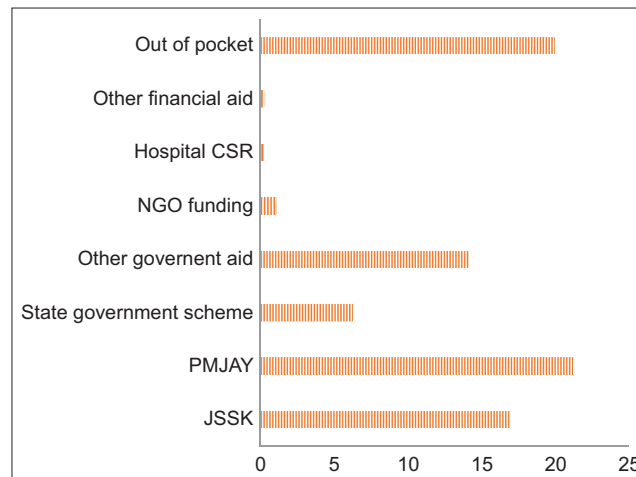


Figure 1: Average monthly number of cases done in government hospitals and their financial source

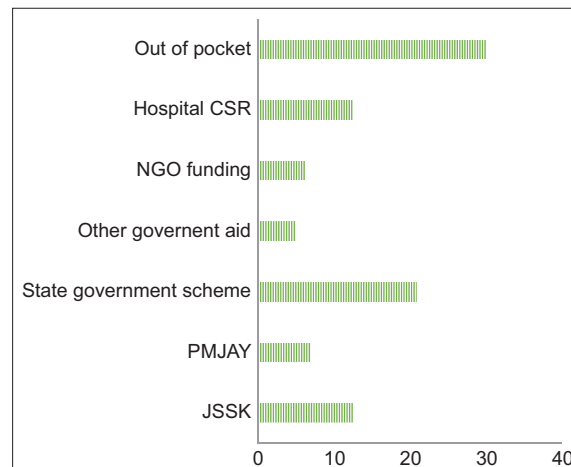


Figure 2: Average monthly number of cases done in private hospitals and their financial source

Survey Pro forma

Hospital Name:

Place:

Government or private or charity:

Person in charge of filling out the form

Name

Designation

Email

Phone no

Faculty in charge of the center

Name

Designation

Email

Phone no

The average cost of a procedure at your hospital

Interventions	Common ward	Private ward/single room
Pulmonary valve		
ASD device		
PDA device		
PVBD		
AVBD		
BAS		
Piccolo device		
RVOT stent		
Coarctation stent		
PDA stent		

PDA: Patent ductus arteriosus, RVOT: Right ventricular outflow tract, AVBD: Aortic valve balloon dilatation, ASD: Atrial septal defect, PVBD: Pulmonary valve balloon dilatation, BAS: Balloon atrial septostomy

Surgery	Common ward	Private ward/ single room
ASD closure		
VSD closure		
PDA ligation		
ASO		
TAPVC repair		
BT shunt		
BD Glenn		
Fontan		
Single valve replacement		
PA band		
Coarctation repair		

ASD: Atrial septal defect, PDA: Patent ductus arteriosus, TAPVC: Total anomalous venous connection, BT: Blalock–Taussig, VSD: Ventricular septal defect, ASO: Arterial switch operation, PA: Pulmonary artery, BD: Bidirectional Glenn

Free programs available at your center (indicate the average number of beneficiaries in a month)

Government schemes	Name	No/ month
JSSK	Yes/No	
PMJAY/Ayushman Bharat	Yes/No	
State Government schemes – scheme name		
Other financial aid from the government – specify		
NGO funding – name		
Hospital CSR		
Others		

JSSK: Janani-Shishu Suraksha Karyakram, PMJAY: Pradhan Mantri Jan Arogya Yojana, NGO: Nongovernmental organizations, CSR: Corporate social responsibility