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Evolutionary steps of pediatric echocardiography in India

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ABSTRACT

In India, an estimated 26 millions of children had born every year and as per census 2011, the share of children (0–6 years) accounts 13.12% of the total population in the country. Approximately 1.8–2.0 lakh infants born every year with congenital heart disease, out of them 78,000 infants die due to inadequate heart care facilities and insufficient infrastructure which can bear only 10% of the patient load at its best. Congenital heart defects are seen in 8-10 children out of 1000 live-born children. However, the hopeful part of progressing pediatric echocardiography is that almost all of them can be treated if diagnosed early and majority of them would have a normal life in future. Hence, the higher life expectancy after surgical procedures are luring the Indian pediatric cardiologist for more efficient treatment. In past decade, India has taken a big leap which is a good indication of progress in pediatric cardiology.

Key words: Congenital heart disease, echocardiography, pediatric cardiology, diagnosis

INTRODUCTION

As per the WHO report nearly 5% of neonates (0–27 days) and 8% of post-neonates (1–59 months) dies due to congenital heart defects (CHDs). Most of the newly born with critical CHD exhibit the symptoms and identified soon after birth; some are not diagnosed until after they are discharged from the hospital. Thus, the screening of CHD immediately after birth is very important. In the diagnosis of CHDs, echocardiography came up with revolution. It is an important test for both diagnosing a heart problem and following the problem over time. The heart's structure and how the heart is reacting to the problem is observed by echo. Furthermore, the pediatric cardiologist decides if and when treatment is needed. M-mode and Doppler imaging were the old methods of echocardiography with their limited ability to define the defects. The advancement in fetal echocardiography, two dimensional 2D and now 3D, 4D have made diagnosis more effective and clear.[1,2] Fetal echocardiography allows to see the structure and function of unborn child's heart. It is typically done in the second trimester, between weeks 18 and 24. Now the revolutionized fetal intelligent navigation echocardiography has added new dimensions to the diagnosis. Also the painful invasive tests such as cardiac catheterization and angiography are being discouraged.[3] Moreover, the establishment of the Indian Academy of Echocardiography the innovations and research has put a step forward to child heart care in India too.[20]

BRIEF HISTORY OF DEVELOPMENT

The credit for the startup with echocardiography goes to Sir Inge Edler, the father of echocardiography. In India, the credit for the inception of pediatric cardiology goes to professor Savitri Shrivastava of all India institute of medical sciences who is at present working with Escorts Hospital New Delhi. She is also the founder of pediatric cardiac society of India and the 1st person in the country to perform the highly complex balloon mitral valvotomy procedure. She contributed exceptionally to the field of interventional cardiology in congenital and structural heart diseases. In 2006 and 2008 Dr. Shrivastava received the "lifetime achievement award" for her outstanding contribution to cardiology from Dr. APJ Abdul Kalam and Mrs. Pratibha Patil, respectively, the erstwhile President of India. She is the 1st Indian and the 1st woman as well to receive "lifetime achievement award" at the annual (pediatric interventional cardiology society) meeting held in Miami, Florida on January 21, 2013. Not forgetting the contribution of the great team of 10 members in December 1994 at the conference at Chennai got together and formed the IAE under the leadership of Dr. Savitri Srivastav and Dr. SK Parashar. Now, there are facilities with both transthoracic and transesophageal approach for Doppler study, 3D echocardiography, fetal echocardiography, Tissue Doppler Imaging, Strain Imaging, and stress testing. Few doyens in the gestation period of echocardiography, Dr. Thanikachalam and Dr. Alagesan of Tamil Nadu, Dr. Sanjib Mukherjee and Dr. TD Bhattacherjee of West Bengal, Dr. SK Parashar of New Delhi, and Dr. Vijayraghavan of Kerala, were instrumental in spreading the knowledge and use of echocardiography across the country.[21]

STATUS OF CONGENITAL HEART DISEASES (CHDS) IN INDIA

Pediatric surgery as a specialty is about 50 years old in India but the inception of pediatric cardiology as a subspecialty started 5–6 years back in 2012 only, by the support of Government

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Table 1: Few evidences of pediatric echocardiography use in India

Author and year	Studies done in the year	Number of CHD patients	Percent of CHDs according to age upto 12 years					
			VSD	ASD	PDA	PS	TOF	TGA
Vaidyanathan *et al.*[7]	June 2005–2006	476	23.5	12.2	24.8	3.2	13.2	8.2
Kapoor and Gupta[8]	January 2002–June 2007	10,641	21.3	18.9	14.6	1.1	4.6	1.1
Bhat *et al.*[9]	July 2008–June 2011	36,541	30.45	17.63	9.62	6.41	5.45	5.13
Bhardwaj *et al.*[10]	January 2011–April 2014	34,517	33	19	12.5	1.1	16	1.1
Mundada *et al.*[11]	October 2011–September 2013	100	46	19	24	-	-	-
Jatav *et al.*[12]	July 2008–June 2013	13,554	28.44	18.10	10.34	6.03	6.03	3.44
Abqari *et al.*[13]	February 2014–August 2015	400	38	14.7	9.5	5	18	2
Bhardwaj,[14]	February 2014–August 2015	1,882	33.66	41.66	16.66	1.1	8.33	1.1
Gupta *et al.*[15]	February 2014–August 2015	238	14	31.42	22.86	5.71	35.3	5.88
Doddabasava *et al.*[16]	January 2011–2016	112,372	19.27	38.55	13.7	2.91	58.33	0
Wanni *et al.*[17]	March 2009–December 2012	767,921	31.4	22.9	23.9	7.3	48	0
Anuspandana Mahapatra *et al.*[18]	March 2015–November 2016	231	36.3	16.88	14.71	4.4	11.25	0

CHD: Congenital heart defect, VSD: Ventricular septal defect, ASD: Atrial septal defect, PDA: Patent ductus arteriosus, PS: Pulmonary stenosis, TOF: Tetrology of fallot, TGA: Transposition of the great arteries

of India, Ministry of Health and Family Welfare.[4] The Indian association of pediatric surgeons established in 1965, for the betterment of pediatric surgery a section of association of surgeons of India separated from its parent body and became an independent association in 1994. In the same year IAE, the largest cardiac imaging society in India established. After studying various cases of CHDs in India, the prevalence of cyanotic and acyanotic heart defects is seen almost equal in different pediatric age group [Figure 1].

In continuation with the studies conducted to estimate the prevalence of CHDs in the age group between <1 and 18 years, research trials for several years support the pediatric echocardiographic evidence in India [Table 1]. Studies were conducted by various researchers at various Indian institutions reveals the progress in the field of pediatric cardiology and pediatric echocardiography as well.

THURST AREAS FOR IMPROVEMENT

Pediatric echocardiograms performed at primary centers shows diagnostic errors because the echocardiogram performer was not a pediatric cardiologist. As per the studies were conducted by Saraf *et al*., at non-tertiary center and subsequently referred to the Department of Pediatric cardiology, Narayana Institute of Cardiac Sciences, Bangalore, shows that 92% of the pediatric echocardiograms at non-tertiary center were performed by other than pediatric cardiologists hence, subsequently reports gone for counter checking showed 38% diagnostic errors.[19] Hence, it should be performed at facilities with appropriate equipment and experience, and these echocardiograms should be interpreted by a specially trained pediatric cardiologist who interprets malformations clearly and assess outcomes after surgical procedures.[5] Furthermore, the echocardiogram should be performed in a logical sequence, taking care to delineate the venous drainage, all four cardiac chambers, the septae and all four valves.[6] Thus, to defeat the discrepancies, Government of India, Ministry of Health and Family Welfare need to promote the growth of pediatric cardiology by handing over pediatric cardiology services to pediatricians.[20-22]

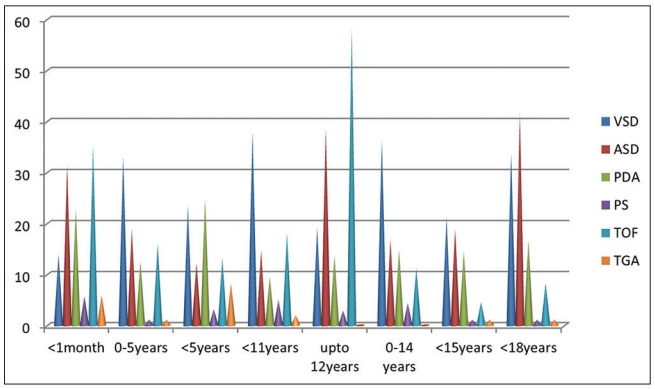

Figure 1: Graph showing prevalence of congenital heart diseases in different age group

CONCLUSION

The echocardiogram is the true stethoscope, that permits to see what occurs beneath the surface of the skin.[21] The study has highlighted the importance of pediatric echocardiography in improving pre-operative mortality and morbidity. Every year thousands of pediatric cardiac surgeries are being done in India at different specialty centers which accounts lakhs of echocardiograms. It is a good indication of progress in pediatric cardiology, so as the pediatric life expectancy. Government of India, Ministry of Health and Family Welfare, need to take action for the widespread use of pediatric echocardiography in India.

REFERENCES

1. Bharucha T, Mertens L. Recent advances in pediatric echocardiography. Expert Rev Cardiovasc Ther 2013;11:31-47.
2. Khalid O, Koenig P. The use of echocardiography in congenital heart surgery and intervention. Expert Rev Cardiovasc Ther 2006;4:263-71.
3. Colaco SM, Karande T, Bobhate PR, Jiyani R, Rao SG, Kulkarni S, *et al.* Neonates with critical congenital heart defects: Impact of fetal diagnosis on immediate and short-term outcomes. Ann Pediatr Cardiol 2017;10:126-30.

4. Lai WW, Geva T, Shirali GS, Frommelt PC, Humes RA, Brook MM, *et al.* Guidelines and standards for performance of a pediatric echocardiogram: A report from the task force of the pediatric council of the american society of echocardiography. J Am Soc Echocardiogr 2006;19:1413-30.
5. Hurwitz RA, Caldwell RL. Should pediatric echocardiography be performed in adult laboratories? Pediatrics 1998;102:e15.
6. Groves AM, Kuschel CA, Knight DB, Skinner JR. Cardiorespiratory stability during echocardiography in preterm infants. Arch Dis Child 2005;90:86-7.
7. Vaidyanathan B, Nair SB, Sundaram KR, Babu UK, Shivaprakasha K, Rao SG, *et al.* Malnutrition in children with congenital heart disease (CHD) determinants and short term impact of corrective intervention. Indian Pediatr 2008;45:541-6.
8. Kapoor R, Gupta S. Prevalence of congenital heart disease, Kanpur, India. Indian Pediatr 2008;45:309-11.
9. Bhat NK, Dhar M, Kumar R, Patel A, Rawat A, Kalra BP, *et al.* Prevalence and pattern of congenital heart disease in Uttarakhand, India. Indian J Pediatr 2013;80:281-5.
10. Bhardwaj R, Rai SK, Yadav AK, Lakhotia S, Agrawal D, Kumar A, *et al.* Epidemiology of congenital heart disease in India. Congenit Heart Dis 2015;10:437-46.
11. Mundada S, Kathwate J, Bajaj M, Raut S. Clinical profile of patients with acyanotic congenital heart disease in pediatric age group in rural India. J Dent Med Sci 2014;12:6-12.
12. Jatav RK, Kumbhare MB, Srinivas M, Rao DR, Kumar GP, Reddy RP, *et al*. Prevalence and pattern of congenital heart diseases in Karimnagar, Andhra Pradesh, India: Diagnosed clinically and by trans-thoracic-two-dimensional echocardiography. Int J Res Med Sci 2014;2:186-92.
13. Abqari S, Gupta A, Shahab T, Rabbani MU, Ali SM, Firdaus U, *et al.* Profile and risk factors for congenital heart defects: A study in a tertiary care hospital. Ann Pediatr Cardiol 2016;9:216-21.
14. Bhardwaj R, Kandoria A, Marwah R, Vaidya P, Singh B, Dhiman P, *et al.* Prevalence of congenital heart disease in rural population of himachal-A population-based study. Indian Heart J 2016;68:48-51.
15. Gupta A, Abqari S, Shahab T, Rabbani MU, Ali SM, Firdaus U. Profile and clinical spectrum of congenital heart defects in NICU. Int Arch Biomed Clin Res 2016;2:25-7.
16. Doddabasava K, Philip P, Shetty B, Jacob CS, Subramanyam K. Gamut of congenital heart diseases in a tertiary center in South India: An ode to echocardiography. Int J Contemp Pediatr 2017;4:1021-6.
17. Wanni KA, Shahzad N, Ashraf M, Ahmed K, Jan M, Rasool S. Prevalence and spectrum of Congenital heart diseases in children. Heart India 2014;3:76-9.
18. Mahapatra A, Sarangi R, Mahapatra PP. Spectrum of congenital heart disease in a tertiary care centre of eastern India. Int J Contemp Pediatr 2017;2:314-6.
19. Saraf RP, Suresh P, Maheshwari S, Shah SS. Pediatric echocardiograms performed at primary centers: Diagnostic errors and missing links! Ann Pediatr Cardiol 2015;8:20-4.
20. Kumar D, Bagri N. Pediatric cardiology in India: Onset of a new era. Indian Pediatr 2015;52:563-5.
21. Singh S, Goyal A. The origin of echocardiography: A tribute to inge edler. Tex Heart Inst J 2007;34:431-8.
22. Das MK, Kumar S, Deb PK, Mishra S. History of cardiology in India. Indian Heart J 2015;67:163-9.

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