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NUTRITIONAL ASSESSMENT OF CHILDREN WITH CONGENITAL HEART DISEASE IN A TERTIARY CARE CENTRE, AURANGABAD, MAHARASHTRA: A CROSS SECTIONAL STUDY

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ABSTRACT Background: Children with congenital heart disease (CHD) have increased prevalence of malnutrition for various reasons. This study aimed to identify prevalence and predictors of malnutrition in children with symptomatic CHD. **Methods:** This study included 110 children with symptomatic CHD (78 acyanotic and 32 cyanotic CHDs). Clinical Evaluation and Laboratory Assessment of Nutritional Status were documented. Anthropometric measurements were recorded and Z scores for weight for age (WAZ), weight for height (WHZ), and height for age (HAZ) have been calculated. Malnutrition was defined as weight, height, and weight/height Z score ≤ -2 . **Results:** The overall prevalence of malnutrition was 87.0 % in patients with CHD. Severe malnutrition was diagnosed in 49 % of cases. In both group of CHD patients, stunting and wasting was high. Malnutrition correlated with pulmonary hypertension, recurrent respiratory tract infections and feeding difficulties but not statistically significant levels. **Conclusion:** Malnutrition is a very common problem in children with symptomatic CHD and presence of feeding difficulties, pulmonary hypertension, recurrent lower respiratory tract infections are additional risks for malnutrition.

KEYWORDS : Heart defects, congenital; Anthropometry

INTRODUCTION

Children with congenital heart disease (CHD) have increased prevalence of malnutrition for various reasons. Mechanisms for malnutrition in CHD has multiple factors including associated genetic anomalies and syndromes, inadequate nutrition due to improper feeding techniques and poorer nutritional absorption from digestive tract due to congestive heart failure, increased myocardial and respiratory neurohumoral functions in CHD cases. Chronic heart failure and hypoxia in CHD disturbs the cellular metabolism and growth, while repeated chest infections increase the metabolic requirements⁽¹⁾.

In children with congenital heart disease, the haemodynamic changes provoke certain changes in nutritional status, brings about growth deficit and complicates the post-surgical survival. These deficiencies lead to increased morbidity and mortality rates and causes consequent final damage to organ⁽¹⁾.

Total energy requirements in the infant and children who are born with heart disease is increased to maintain metabolism and energy required for growth. The child with CHD contends with potential hypermetabolism, decreased mesenteric perfusion, difficulty in feeding. Providing optimal nutrition in this population can improve surgical outcomes. Children with pulmonary hypertension are prone to growth retardation and malnutrition⁽²⁾. malnutrition in children with CHD, an aggressive evidence based management must be enacted. Proper nutritional management provides a good opportunity to significantly affect these parameters⁽²⁾.

While some children improve on nutritional counselling there are some who cannot have large amount of high energy feeds hence need a different approach⁽³⁾.

MATERIALS AND METHODS

An observational, cross sectional study was performed in paediatric patients between ages 6 months to 5 years presenting with congenital heart disease at outpatient department/Inpatient Department of MGM Hospital, Aurangabad, from 1st December 2016 to 1st October 2018. Information including demographic data, cardiac problems, feeding problems and growth parameters was obtained from patient records and parental interview. A total of 110 children suffering from some congenital heart disease were enrolled in the study after taking an informed consent from the parents.

All children with congenital heart disease attending pediatric cardiology outpatient department or admitted in hospital for lower respiratory tract infection or any other sequelae of heart disease/malnutrition who were stable were included in the study. Those who had undergone either catheter or surgical based corrective interventions for heart disease, those with secondary malnutrition due to HIV, TB and other chronic illnesses were excluded from the study.

To prevent the morbidity and mortality associated with

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Signs and symptoms of heart disease (as per NADAS criteria) were screened after thorough clinical evaluation. Anthropometric measurements including weight(kg), height/length(cm), head circumference(cm), mid upper arm circumference (cm), chest circumference(cm), US/LS ratio, BMI and weight/height were taken as per WHO procedures. Z scores for weight for age (WAZ), weight for height (WHZ), height for age (HAZ) were calculated. After calculation of WAZ, HAZ, WHZ the studied groups will be classified into normal nutrition or malnutrition (WHO)* or severe acute malnutrition (SAM).

 \leq -2sd to \leq -3sd WAZ OR HAZ OR WHZ will be classified as underweight or stunted or wasted and \leq -3sd WAZ OR HAZ OR WHZ will be classified as severely underweight or severely stunted or severely wasted. From these classified individuals, patterns of malnutrition will be assessed in specific type of lesions with and inference will be made on which groups are predominantly stunted and which are wasted.

STATISTICAL ANALYSIS

The collected data was compiled in Excel sheet 2007. SPSS version 20 software was used for analysis of this data. Qualitative data was represented in the form of frequency and percentage. The quantitative data was represented in the form of mean and standard deviation. For comparison of two groups T-test was applied, p value was checked at 5% level of significance.

RESULTS

In this study out of 110 cases of congenital heart disease who were representative of the general population of Marathwada and having different types of heart diseases, 78 (70.9%) of the cases had acyanotic heart disease (Table 1). There was increased male preponderance (M: F: 1.2:1) with 41.8 % patients 2nd by birth order. Only 38 (43.66%) of the cases had Pulmonary arterial hypertension while 32 out of 78 (41.02%) cases had history of recurrent lower respiratory tract infections. Out of 110 children, 96 children (87%) had malnutrition while 14 (12.73%) children had normal nutrition (Table2) indicating very high percentage of children had malnutrition. Out of 78 children with ACHD, 68 were underweight and 10 were normal weight whereas out of 32 children with CCHD, 28 were underweight and 7 were normal weight (Table 3). Out of 78 children with ACHD, 36 were stunted and 42 were normal height whereas out of 32 children with CCHD, 12 were stunted and 20 were normal height (Table 4). Out of 78 children with ACHD, 49 were wasted and 19 were normal weight for height whereas out of 32 children with CCHD, 21 were wasted and 11 were normal weight (Table 5).

Out of 110 children, 62 children did not have pulmonary hypertension but 52 out of these children (83.8%) had malnutrition. Remaining 48 children had pulmonary hypertension and 44 children amongst them (91.6%) had malnutrition. The difference was not statistically significant. (**Table 6**). A total of 34 (30.9%) patients had history of recurrent hospitalization while 76 (69.1%) did not require recurrent hospitalizations. Out of 34 children with recurrent hospitalization 20 children had severe malnutrition, while out of 76 children with no recurrent hospitalizations almost 35 cases had severe malnutrition. So difference was not significant.

Out of 60 cases who were top fed plus breastfed had severe malnutrition in 32 (53.3%) cases, while only top fed children had more of severe malnutrition in 6 (54.54%) cases, while exclusively breastfed children had malnutrition in 18 (46.15%) cases. But the difference was not. Table 1: Table for the most common specific lesion amongst CHD cases

		No. of Patients	Percentage
Acyanotic	VSD	44	40
	ASD	20	18.18
	PDĀ	14	12.72
Cyanotic	TGA	04	3.63
	TAPVC	04	3.63
	TOF	21	19.09
	DORV	03	2.72

Table 2:	: Distributi	on of Patients	accordina to	Nutrition

	No. of Patients	Percentage
Normal Nutrition	14	12.73
Malnutrition	42	38.18
Severe Acute Malnutrition	54	49.09
Total	110	100.0

Table 3: Association between Type of CHD & Status of Underweight

Type of	Status of Underweight			Total	Chi-	p-
CHD	Normal Under-		Severely		square	value
		weight	Under-		value	
		_	weight			
Acyanotic	10	7	61	78	0.586	P=
Cyanotic	4	3	25	32		0.997
Total	14	10	86	110		NS

Table 4: Association between Type of CHD & Status of Stunted

Type of	Status a	of Stunte	ed	Total	Chi-	p-
CHD	Normal	Wasted	Severely		square	value
			Stunted		value	
Acyanotic	42	12	24	78	0.955	P=
Cyanotic	20	3	9	32		0.620
Total	30	28	51	110		NS

Table 5: Association between Type of CHD & Wasting

Type of	Status of Wasted			Total	Chi-	p-
CHD	Normal	nal Wasted Severely squa		square	value	
			Wasted		value	
Acyanotic	19	21	38	78	0.970	P=
Cyanotic	11	07	14	32		0.616
Total	30	28	51	110		NS

Table 6: Association between pulmonary hypertension and Malnutrition

PAH	Status of Nutrition		Total	Chi-	p-value
	Normal Malnutrition			square	
	Nutrition			value	
No PAH	10	52	62	1.74	P=
PAH	4	44	48		0.628
Total	14	96	110		NS

DISCUSSION

This study reports a very high level of malnutrition (87%) in both acyanotic and cyanotic congenital heart diseases. Moreover 49 % of children had severe acute malnutrition. Irrespective of types of cardiac defect and cyanosis, children with CHD are frequently malnourished, presenting commonly with failure to thrive. In study by Vaidyanathan et al, (4), 59 % of children were underweight .VSD and TOF were the most common lesions in CHD in the present study, the same as the previous report by Hoffman et al (5). VSD was the most common acyanotic heart disease in the present study (40%) but still on lower side than 58% reported by Shah et al (6). In a study done by Okoromah et al they observed that out of 48 cases of acyanotic heart disease 34 (70.83%) had severe malnutrition which showed anthropometric z scores for weight for age <-3SD similar to our study (7). In a study done by Hassan et al they reported that 60/94 (71.4%) of the cases of

CHD had severe malnutrition unlike our study where it was found that 54/110 (49.09%) of all CHD cases had severe malnutrition (1).

On the contrary in a study done by Arodiwe et al severe malnutrition was predominantly seen in cases with cyanotic heart disease 8/12 (66.66%) cases of cyanotic CHD, estimating a higher prevalence than our study (8). The prevalence of wasting in this study was on a higher side in children with acyanotic heart disease (74.35%) which was not the case in a study done by Blasquez et al where he found almost all (100%) of cases with cyanosis with pulmonary hypertension had severe wasting (9).

This study thus concludes that maximum children with Congenital heart disease have malnutrition, more commonly seen in those with acyanotic heart disease and maximum children present with wasting hence classified under those having severe acute malnutrition.

We deduce that there are multiple factors that are responsible for malnutrition in children with CHD including, feeding difficulties, pulmonary hypertension, recurrent hospitalizations and recurrent lower respiratory tract infections.

The above mentioned factors have an adverse effect on the progression of disease and vice versa but we need larger studies to get a proper idea on the prognosis of these cases based on these risk factors. There is a need for more research to be done in our country to find out counteractive measures to reduce the prevalence of malnutrition in these children and to see the effect of improved pre-operative nutrition on post cardiac surgery status in children.

Abbreviations- ASD- atrial septal defect, VSD- Ventricular septal defect, PDA-patent ductus arteriosus, TOF- tetralogy of Fallot, DORV-Double outlet right ventricle, TAPVC-total anomalous pulmonary venous connection, TGA-transposition of great arteries, CHD- congenital heart diseases

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