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Comparison of Growth in Children with Cyanotic and Acyanotic Congenital Heart Disease in a Tertiary Care Hospital

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Summary:

Background: *Congenital heart disease (CHD) is the commonest of all congenital lesions and is the most common type of heart diseases among children. Anthropometric evaluation is very important for early recognition of growth failure in children with cyanotic and acyanotic congenital heart diseases.*

Methods: *This comparative cross sectional study was undertaken with the objective to compare the growth of children with cyanotic and acyanotic congenital heart disease using anthropometric measurement in Department of Paediatrics, Sylhet MAG Osmani Medical College Hospital from March, 2014 to September, 2014. Sixty children aged 6 months to 60 months with CHD, were included in this study, where 30 children with cyanotic and 30 children with acyanotic CHD, confirmed by Echocardiogram.*

Results: *All the children (100%) with cyanotic congenital heart disease were underweight (Weight for age Z score). Among them, 23.33% had moderate and 76.67% had severe underweight. In children with acyanotic congenital heart disease, 93.33% had underweight. Among them, 20% had moderate and 73.33% had severe underweight. The p-value was 0.35008. In cyanotic congenital heart disease, 96.67% children had stunting. Among them, 13.33% had moderate and 83.33% had severe stunting. In acyanotic congenital heart disease, 43.33% children had stunting. Among them, 33.33% had moderate and 10% had severe stunting. There was significant statistical deference in between the two groups, (p-value was <0.0001). In cyanotic congenital heart disease, 43.33% children had wasting. Among them, 30% had moderate and 13.33% had severe wasting. In acyanotic congenital heart disease, 76.67% children had wasting. Among them, 30% had moderate and 46.67% had severe wasting. There was significant deference in the groups (p value was 0.0077).*

Conclusion: *Growth failure was common in children with both cyanotic and acyanotic congenital heart disease. There was no significant difference in weight for age Z score (WAZ) of patients with cyanotic and acyanotic CHD but stunting was significantly higher in patients with cyanotic CHD and wasting was significantly higher in patients with acyanotic CHD.*

Key words: *Congenital heart disease (CHD), cyanotic congenital heart disease, acyanotic congenital heart disease, TOF (Tetralogy of Fallot), VSD (Ventricular septal defect), underweight, stunting, wasting, WAZ (Weight for Age Z score).*

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Introduction:

Congenital heart diseases (CHD) are structural problems that arise from abnormal formation of the heart or major blood vessels.[1] It is the commonest of all congenital lesions and is the most common type of heart diseases among children.[2] The incidence of congenital heart disease is approximately 8 per 1000 live birth with a higher rate in stillbirth, spontaneous abortion and prematurity. And this incidence has remained constant worldwide.[3] A hospital based study in a tertiary care hospital of Bangladesh found the incidence of CHD was 25/1000 live births, that was higher in preterms as compared to full term.[4]

Growth retardation is a common health problem associated with congenital heart disease in children. Even children born with an appropriate birth weight for gestational age soon fall off their birth percentiles for weight and or/ height.[5] Risk factors for poor growth in CHD are multifactorial and may include the increased metabolic demands of congestive heart failure,

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insufficient nutrient intake, the physiologic impact of the primary cardiac defect, and associated genetic and non cardiac disease.[6] It is important to keep this in mind as at present most of the CHD can be corrected if diagnosed early and timely intervention is provided. This will result in normalization of their growth early due to decreased caloric requirement, better absorption, reduction in lower respiratory tract infections, etc.[7] In developing country, prevalence of pre-operative growth delay in children with CHD was up to 45 %.[8] Infants with CHD and growth impairment typically show caloric deprivation and a reduction in adipose stores[9]. Anthropometric evaluations are very important for early identification of the patients with high risk for malnutrition. For this reason, it is necessary to measure at least weight and height of the newly hospitalized patients, and to calculate the required anthropometric values.[10] The growth patterns of children with cyanotic and acyanotic congenital heart diseases are not well documented to us due to lack of adequate study. There are some studies in other countries but to the best of our knowledge, no such data about growth patterns of children with cyanotic and acyanotic congenital heart diseases are available in our country. This study was done to report and compare the growth patterns of patients with cyanotic and acyanotic congenital heart diseases.

Materials and Methods:

This comparative cross sectional study was done at department of Paediatrics, Sylhet M A G Osmani Medical College Hospital, (SOMCH), Sylhet during March 2014 to September 2014 on all patients with Echocardiographically proven cyanotic and acyanotic congenital heart disease aged 6 to 60 months, who admitted into Department of Paediatrics and satisfied the inclusion & exclusion criteria. Children with any chronic illness (i.e. TB, malabsorption syndrome, etc.), children with other congenital anomalies, seriously ill child and unwillingness to participate in the study were excluded. Each patient interviewed after taking informed consent from the parents about the purpose of the study. Detailed history was taken meticulously by using structured questionnaire and was assessed thoroughly by using clinical variables. Chest X-ray and echocardiography were done. After enrollment, weight of each case was measured in empty stomach at morning by Beam scale, Hanging scale and Stadiometer according to the age, in metric system. If age of cases were <2 years, then length was measured by Infantometer and if age was >2 years, height was measured by Stadiometer in metric system. Then weight and length/height was plotted in WHO growth chart and growth pattern assessed by using Z score of weight for age, length/height for age and weight for length/height and comparison of growth pattern between the children of cyanotic and acyanotic congenital heart disease was done. Collected data were checked and coded manually and analyzed using computer based software, SPSS version 21.

Results:

Mean age (± standard deviation) of patients with cyanotic CHD was 28.88 (±15.12) and acyanotic CHD was 24.41(±14.91) months. The p-value was 0.4823, which was not significant in between groups. In cyanotic CHD, 66.67% patients were male and 33.33% patients were female whereas 53.33% patients of acyanotic CHD were male and 47.67% patients were female. The p-value was 0.2918, which was not significant in between the two groups. Most of the patients of cyanotic and acyanotic CHD belonged to middle class socioeconomic status with p value 0.5979, which was also not significant in between the two groups (Table I).

Commonest type of cyanotic congenital heart disease was TOF (63.33%) and then TGA (13.33%) and TAPVC (13.33%) (Table II). Commonest type of acyanotic congenital heart disease was VSD (53.33%) and then PDA (20%) (Table III). In cyanotic congenital heart disease 100% children had underweight. Among them, 23.33% had moderate and 76.67% had severe underweight. In acyanotic CHD, 93.33% children had underweight, where 20% had moderate and 73.33% had severe underweight. The p-value was 0.35008, which showed no significant differences in between the groups (Table IV). In cyanotic congenital heart disease, 96.66% children had stunting. Among them, 13.33% had moderate and 83.33% had severe stunting. In acyanotic congenital heart disease 43.33% children had stunting. Among them, 33.33% had moderate and 10% had severe stunting. The p-value was <0.0001, which was highly significant in between the groups (Table V). In cyanotic congenital heart disease, 43.33% children had wasting. Among them, 30% had moderate and 13.33% had severe wasting. In acyanotic CHD, 76.67% children had wasting, among them, 30% had moderate and 46.67% had severe wasting. The p-value was 0.0077, which was highly significant in between the groups (Table VI).

Table-I

Baseline characteristics

Baseline characteristics	Cyanotic CHD	Acyanotic CHD	Significance(p value)
Mean Age ± SD	28.88±15.12	24.41±14.91	0.4823
Sex	0.2918		
Male	20 (66.67%)	16 (53.33%)	
Female	10 (33.33%)	14(47.67%)	
Socioeconomic status	0.5979		
Poor	12(40%)	13(43.34%)	
Middle class	18(60%)	17(56.76%)	

*chi-square test was done

Table-II

Distribution according to type of Cyanotic CHD

Type of Cyanotic CHD	Frequency	Percent
TOF	19	63.33
TGA	4	13.33
TAPVC	4	13.33
TA	3	10
Total	30	100

Table-III

Distribution according to type of Acyanotic CHD

Type of Acyanotic CHD	Frequency	Percent
VSD	16	53.33
PDA	6	20
ASD	4	13.33
TR	1	3.33
CoA	1	3.33
PS	1	3.33
AS	1	3.33
Total	30	100

Table-IV

WAZ (Weight for age Z score) of CHD patients

WAZ	Cyanotic CHD (n=30)		Acyanotic CHD (n=30)		Significance (p value)
	Frequency	Percent	Frequency	Percent	
Well Nourished (+2 to -2)	0	0	2	6.67	0.35008
Moderate Underweight (-2 to-3)	7	23.33	6	20	
Severe Underweight (<-3)	23	76.67	22	73.33	
Total	30	100	30	100	

*chi-square test was done

Table-V

HAZ (Height/Length for age Z score) of CHD patients

HAZ	Cyanotic CHD (n=30)		Acyanotic CHD (n=30)		Significance (p value)
	Frequency	Percent	Frequency	Percent	
Well Nourished (+2 to -2)	1	3.33	17	56.67	<0.0001
Moderate Stunting (-2 to -3)	4	13.33	10	33.33	
Severe Stunting (<-3)	25	83.33	3	10	
Total	30	100	30	100	

*chi-square test was done

Table-VI

WHZ (Weight for Height/Length Z score) of CHD patients

Wasting (WHZ)	Cyanotic CHD (n=30)		Acyanotic CHD (n=30)		Significance (p value)
	Frequency	Percent	Frequency	Percent	
Well nourished (+2 to -2)	17	56.67	7	23.33	0.0077
Moderate wasting (-2 to -3)	9	30	9	30	
Severe wasting (<-3)	4	13.33	14	46.67	
Total	30	100	30	100	

*chi-square test was done

Discussion:

Most of the patients with cyanotic and acyanotic CHD belonged to 13-36 months age group. Hoque et al[11] found in their study most of the CHD patient's age group was 29 days to 12 months. Varan et al[7] found mean age of patients with cyanotic CHD was 17.9 months and 27.4 months in patients with acyanotic CHD. These finding are consistent with present study.

In the current study, 20 (66.67%) patients of cyanotic CHD were male and 10 (33.33%) patients were female and 16 (53.33%) patients of acyanotic CHD were male; whereas 14 (47.67%) patients were female. Overall male female ratio of CHD was 1.5:1. This finding was similar with Sharmin et al,[4] Ibrahim et al,[12] and Hoque et al,[11] where male female ratio was 1.3:1,1.2:1 and 1.7:1 respectively.

In the present study, the commonest type of cyanotic congenital heart disease was tetralogy of Fallot (63.33%), on the other hand; ventricular septal defect (53.33%) was the commonest among acyanotic congenital heart disease. This correlated with studies of Hussain et al, [13] Mollah et al [14] and Hoque et al.[11] But this differs from Rahman et al,[15] and Begum et al.[16] They found atrial septal defect as the commonest acyanotic lesion. This difference in observation might be due to including many adult patients by Rahman et al[15] and only preterm babies by Begum et al[16] in their studies.

In this study, 100% children with cyanotic congenital heart disease had underweight (Weight for age). Among them, 23.33% had moderate (-2 to -3 Z) and 76.67% had severe (<-3 Z) underweight. In acyanotic congenital heart disease, 93.33% children had underweight. Among them, 20% had moderate and 73.33% had severe underweight. These results showed no significant differences in between the two groups. Zaman et al[17] showed 87% had underweight in cyanotic lesion, whereas 42.42% children had moderate and

18.18% children had severe underweight. In acyanotic lesion, they found in his study 89% children had underweight, among them 55.22% children had moderate and 23.88% children had severe underweight, which also showed no significant differences in between the two groups. This result correlated with the current study. Carrie et al[6] also found results consistent with the present study. But Varan et al[7] found 23% children with cyanotic congenital heart disease had underweight, among them, 13% had moderate and 10% had severe underweight. They found 31% children with acyanotic congenital heart disease had underweight, among them, 25% had moderate and 6% had severe underweight and there were no significant differences between cyanotic and acyanotic groups. But overall their study found fewer children had underweight which might be due to regional variation.

The current study showed, 96.67% children with cyanotic congenital heart disease had stunting (length/height for age). Among them, 13.33% had moderate (-2 to -3 Z) and 83.33% had severe (<-3 Z) stunting. In acyanotic congenital heart disease, 43.33% children had stunting, whereas, 33.33% had moderate and 10% had severe stunting. This result showed highly significant difference in between the two groups, i.e., cyanotic group was significantly stunted than acyanotic group. These results were consistent with the study of Sjarif et al[18] and Carrie et al.[6] Sjarif et al[18] found 90% children with cyanotic congenital heart disease had stunting. Among them, 54.5% had moderate and 36.4% had severe stunting. In acyanotic congenital heart disease, they found 79.4% children had stunting, whereas, 49.3% had moderate and 30.1% had severe stunting. But Zaman found 66.66% children had stunting in cyanotic lesion and 62.68% had stunting in acyanotic lesion.[17] That study found, 30.3% children with cyanotic congenital heart disease had moderate stunting and 36.36% had severe stunting and in acyanotic congenital heart disease, 23.88% children had moderate stunting and 38.8% had severe stunting, which showed no significant difference in between cyanotic and acyanotic groups.[17] The exact cause of stunting in cyanotic congenital heart disease is not well explained yet. This may be due to fact that chronic cyanosis causes chronic malnutrition.

The present study showed, 43.33% children with cyanotic congenital heart disease had wasting (Weight for length/height). Among them, 30% had moderate (-2 to -3 Z) and 13.33% had severe (<-3 Z) wasting. Whereas, 76.67% children with acyanotic congenital heart disease had wasting. Among them, 30% had moderate and 46.67% had severe wasting. This result showed highly significant difference in between two groups, i.e., acyanotic group was significantly wasted than cyanotic group. Sjarif et al[18] and Carrie et al[6] showed almost similar finding regard this. Sjarif et al[18] found 63.6% children with cyanotic congenital heart disease had wasting. Among them, 40.9% had moderate and 22.7% had severe wasting. In acyanotic congenital heart disease, they found 76.4% children had wasting, whereas, 54.2% had moderate and 22.2% had severe wasting. But Zaman found 33.33% children had wasting in cyanotic lesion and 43% had wasting in acyanotic lesion. Where, 18.18% children with cyanotic congenital heart disease had moderate wasting and 15.15% had severe wasting and in acyanotic congenital heart disease, 20% children had moderate wasting and 23% had severe wasting, which showed no significant difference in between the two groups.[17] The cuases of wasting in acyanotic congenital heart disease is also not clear. Some complications of acyanotic congenital heart diseases may cause acute malnutrition which may manifest as wasting.

Conclusions:

Growth failure was common in children with both cyanotic and acyanotic congenital heart disease. There was no significant difference in WAZ of patients with cyanotic and acyanotic CHD but stunting was significantly higher in patients with cyanotic CHD and wasting was significantly higher in patients with acyanotic CHD. Early recognition and intervention of growth failure can prevent the process of stunting of cyanotic CHD and wasting of acyanotic CHD.

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