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Original Research Article

A retrospective cross sectional study on neurological profile of children with congenital heart disease

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ABSTRACT

Background: Children with Congenital Heart Disease have associated structural neurological abnormalities and those surviving infancy are even subjected to various environmental factors which might contribute to neurological abnormalities. Hence the objective is to study the neurological abnormalities of children with Congenital Heart Disease.
Methods: A retrospective cross-sectional observation study was conducted over the period of 3 years (June 2016-May 2019). Data were collected from medical records department of 121 children of 2-12 years of age diagnosed with congenital heart disease. Neurological examination findings and neuro imaging and EEG findings where relevant were noted. To assess the association of adverse neurological outcome and congenital heart disease, data analysis was performed using Fisher's exact test.
Results: 38% children of 2-12 years of age with congenital heart disease had adverse neurological profile. Neurological abnormalities were significantly associated with cyanotic heart disease (p value 0.0001). Statistically significant association were found between congenital cyanotic heart disease and seizure (p value=0.04), hemi paresis (p value=0.039), brain abscess (p value=0.012) and coma (p=0.01).
Conclusions: Congenital cyanotic heart disease has significant associations with neurological abnormalities in children. These results demand attention for the neurological health of the largely uncorrected cardiac disease in Indian children.

Keywords: Brain abscess, Coma, Congenital heart disease, Cyanotic heart disease, Hemiparesism, Seizure

INTRODUCTION

The birth prevalence of Congenital Heart Disease (CHD) worldwide is 8 per 1000 live birth.[1,2] Nearly 180000 children are born with CHD in India.[3,4] Structural brain abnormalities are more common in children born with CHD than general population.[5] On the other hand, infants surviving CHD are manifesting with neurological complications originating from injury in hemodynamically unstable preoperative period or periods of intra-operative hypoperfusion Neurological complications contribute significantly to the mortality and morbidity from congenital heart disease with serious long term sequel.[6] In developing countries like India, majority of congenital heart disease remains uncorrected and major neurological complications are frequently encountered. Varieties of neurological disturbances are now being increasingly recognized and current the

subject of intense investigations.[7] Improving the short term mortality and morbidity in congenital heart disease is an important goal, at the same time ongoing research has focused on defining the impact of congenital heart disease on brain development and improving the long term outcome.[8] Several articles are available in literature about neurological abnormalities in children with CHD who have undergone some form of cardiac intervention.[9-14] Though preoperative neurological abnormalities have been described in literature, they are limited to the newborn period.[15,16] In a developing country like India, prevalence of malnutrition and infectious diseases in children is high. Children with CHD are prone to malnutrition and growth failure.[17] Children with CHD surviving infancy are subjected to various environmental factors which might contribute to neurological abnormalities. With the above background in mind, this study was designed to assess the relationship between adverse neurological profiles with congenital heart disease in children of 2-12 years of age.

METHODS

This retrospective cross-sectional study was conducted o ver a period of three years (July 2016 to June 2019) by collecting data from MRD of outpatient and inpatient department of pediatrics of IQ City medical college and hospital, Durgapur, West Bengal. Children of 2-12 yrs. of age already diagnosed with congenital heart disease were included. Known or diagnosed case of chromosomal anomaly or genetic syndrome and any history of cardiac intervention were excluded from the study. Clearance was collected from the Ethical committee of the hospital. Age, sex, age of diagnosis, diagnosis of congenital heart disease, neurological complications, and detailed neurological examination findings were recorded. Neuro-imaging and EEG findings were also noted. To assess the association of adverse neurological outcome and congenit al heart disease, data analysis was performed using fisher's exact test on graph pad 2x2 contingency table.

RESULTS

The study population consisted of 121 children of 2-12 years of age diagnosed with congenital heart disease. 74% (n=89) of the study population was males, while 26% (n=32) was females. Among 121 children, 24 % of the children had cyanotic heart disease (n=29) and 76% had acyanotic heart disease (n=92). Table 1 shows detailed distribution of congenital heart disease in the study population. Among 121 children, 46 children had neurological abnormality (38%). Table 2 shows detailed neurological profile of those children who had neurological abnormality.

Table 1: Distribution of congenital heart disease in the study population.

Cyanotic heart disease	No of patient	Acyanotic heart disease	No of patient
Fallots tetralogy	13	Os ASD	41
TGA	5	VSD	25
Congenital corrected TGA	1	PDA	16
TAPVC	3	VSD+PDA	4
TA	1	Congenital AS	1
Single ventricle with PS	3		
Ebstein anomaly	1	COA	2
DORV with PS	2	Ostium primum ASD	3

Table 3 shows distribution of children with neurological abnormalities in cyanotic and acyanotic heart disease group. This table shows neurological abnormalities significantly associated with cyanotic heart disease group (p value 0.0001).

Table 4 shows distribution of different neurological abnormalities among cyanotic and acyanotic heart disease group. This table shows seizure (p=0.039), hemi paresis (p=0.04), coma (p=0.01) and, brain abscess (p=0.012) are significantly associated with cyanotic heart disease. There is no statistically significant association is found between focal neurological defect, dystonia, paraparesis, gross developmental delay, language delay, add with cyanotic or acyanotic heart disease group.

Table 2: Neurological profile of children with neurological abnormality.

Neurological profile	No of patient
Seizure	14
Focal neurological deficit	2
Hemiparesis	4
Paraparesis	1
Ddystonia	1
Coma	5
Brain abcess	3
GDD	9
Language delay	4
ADHD	3
Total	46

Table 3: Distribution of children with neurological abnormalities in cyanotic and acyanotic heart disease group.

Type of heart disease	Cyanotic heart disease	Acyanotic heart disease	Total
Neurological Abnormality	25	21	46
No Neurological abnormality	4	71	75
Total	29	92	121

P value 0.0001

Table 4: Distribution of different neurological abnormalities amongcyanotic and acyanotic heart disease group.

Type of neurological abnormality	Cyanotic heart disease	Acyanotic heart disease	p value
Seizure	7	7	0.039
Focal neurological deficit	1	1	0.42
Hemiparesis	3	1	0.04
Paraparesis	0	1	1.00
Dystonia	1	0	0.23
Coma	4	1	0.01
Brain abcess	3	0	0.012
GDD	4	5	0.215
Language delay	1	3	1.00
ADHD	1	2	0.56

DISCUSSION

In this study, we found that overall prevalence of neurological complications in congenital heart disease is 38% which is higher than the prevalence (25%) in hithe USA.[18] This may be explained by lack of accessible health care facility. This leads to delay in the diagnosis of congenital heart disease and subsequently the neurological complications. Thus, by the time of first consultation with doctor, neurological complications have already set in. Neurologically abnormalities are significantly associated with cyanotic heart disease. In a study by Limperopoulos et al, neurological abnormalities are commonly associated with acyanotic heart disease in newborn as opposed to this study where the association is more with cyanotic heart disease.[15] This may be explained by the fact that cyanotic heart disease in our country remain largely uncorrected in older children resulting hypoxia and microinfract in brain also be contributory. As the study was hospital based it may have selection bias. Temporarily of causal relationship of neurological abnormality and congenital heart disease which has complex interactions with other covariets like infection, malnutrition is difficult to establish in cross-sectional methodology.

Advances in congenital heart surgery have resulted in the increased survival of infants born with complex congenital heart disease. But question remains about neurological profile of these patients and whether they will lead a normal productive lives. The etiology of neurologic deficit in this population appears to be multifunctional.

Not only are the advances in paediatric cardiac surgery but also continued research and attempts to minimize neurologic injury and associated sequele are of primary importance for better survival of patient with congenital heart disease. Ongoing documentation of the long term neurological outcome in the population of congenital heart disease needs to be mandated and ways to minimize the neurological damage in patient of congenital heart disease needs to be investigated thoroughly to increase the quality of life in patient with congenital heart disease.

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