



## ANEMIA IN ACYANOTIC CONGENITAL HEART DISEASE: A SIGNIFICANT COMORBIDITY

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**ABSTRACT**

**Introduction:** One such comorbidity is anemia. Heart failure can occur or is aggravated by presence of anemia as a comorbidity in children with CHD. **Materials and methods:** A total of 108 cases of ACHD were studied for presence of anemia using age specific cut off for Hb and RBC indices. **Results:** In our study we found majority of patients had anaemia with mean Hb of  $10.6 \pm 2.7$ ,  $9.5 \pm 2.7$  and  $8.7 \pm 0.1$  gm% in group 1 (age one to 23 months), 2 (age 2 to 9 years) and 3 (age 9 to 12 years) respectively. **Discussion:** In the present study, Hb and HCT was lower limit of normal in group 1 while it was low in group 2 and 3. Also, MCH and MCHC were reduced in all the three age groups. **Conclusion:** Mean Hb and RBC indices were lower in all the three age groups with lower Hb and MCV in group 2 and 3 and MCH and MCHC reduced in all the three groups. Anemia is a significant comorbidity in CHD patients. Early recognition and management of anemia can prevent heart failure in patients of CHD

**KEYWORDS :** Congenital Heart Disease, Acyanotic congenital heart disease, anemia.**INTRODUCTION**

Acyanotic congenital heart disease (ACHD) are characterised by left-to-right shunt, which causes pulmonary hypertension and right heart hypertrophy.

Comorbidity is most often defined in relation to a specific index condition, as defined by Feinstein as "Any distinct additional entity that has existed or may occur during the clinical course of a patient who has the index disease under study" (1). Non-cardiac co-morbidities in patients with CHD can significantly alter the course of the disease. One such comorbidity is anemia.

Anemia is an important comorbidity in CHD and an important cause of morbidity and mortality in CHD patients. Anemia was more common in ACHD while polycythemia was more common in cyanotic CHD (2). Heart failure can occur or is aggravated by presence of anemia as a comorbidity in children with CHD. (3,4)

The aim of the study was to evaluate anemia in pediatric population with acyanotic congenital heart disease from 1 month to 12 years of age using hemoglobin and RBC indices.

**MATERIALS AND METHODS**

This was a cross sectional study conducted in a tertiary healthcare center. A total of 108 cases of diagnosed acyanotic congenital heart disease were studied in patient population between 1 month and 12 years from the period of July 2019 to July 2020. This study was approved by the institutional ethical committee. Written informed consent was taken from parents or caretakers of children. Anemia was assessed using hemoglobin (Hb) (in grams per decilitre) and red blood cell (RBC) indices- Hematocrit (HCT) (in percentage), Mean corpuscular volume (MCV) (in femtolitre), Mean cell Hemoglobin (MCH) (in picograms) and Mean Corpuscular Hemoglobin Concentration (MCHC) (in grams per decilitre). A three-part Sysmex analyser was used to determine the Hb and RBC indices. Patients were divided into 3 age groups- from one to 23 months (group 1), 2 to 9 years (group 2) and more than 9 to 12 years (group 3) in order to use the age specific cut-offs for Hb and RBC indices. The data was coded and entered in Microsoft Excel 2013 and was checked for normality distribution using Shapiro Wilk test. SPSS 20.0 software was used to carry out the statistical analysis.

**RESULTS**

A total of 108 cases of diagnosed CHD were studied of which 57 were male and 51 were female. Among the 108 children with ACHD, 75% belonged to group 1, 22.2% belonged to group 2 and remaining 2.8% belonged to group 3.

**Table 1: Age wise distribution of population**

Age group	Number	Percentage
Group 1 (1 to 23 months)	81	75
Group 2 (2-9 years)	24	22.2
Group 3 (9-12 years)	3	2.8

**Table 2: Range of normal values of Hb and RBC indices in the three age groups.**

	Group 1 (one to 23 months)	Group 2 (2 to 9 years)	Group 3 (9 to 12 years)
Hb	10.5-14	11.5-14.5	12.5-16
Hct	32-42	33-43	36-47
MCV	72-88	76-90	78-95
MCH	24-30	25-31	26-32
MCHC	32-26	32-36	32-36

Anemia in group 1, 2 and 3 was defined as less than 10.5, 11.5 and 12.5 respectively.

**Table 3: Mean of Hb and RBC indices in our patient groups**

Parameter	Group 1 (one to 23 months)	Group 2 (2-9 years)	Group 3 (9 to 12 years)	p-value
Hb	10.6( $\pm$ 2.7)	9.5( $\pm$ 2.7)	8.7( $\pm$ 0.1)	0.12
HCT	32.1( $\pm$ 8.4)	29.8( $\pm$ 11.6)	27.8( $\pm$ 6.1)	0.4371
MCV	76( $\pm$ 13.2)	68.9( $\pm$ 7)	70( $\pm$ 0.9)	0.03
MCH	22.7( $\pm$ 5.3)	19.3( $\pm$ 2.8)	18.6( $\pm$ 0.5)	0.0071
MCHC	22.8( $\pm$ 5.7)	19.2( $\pm$ 3)	23( $\pm$ 4.5)	0.013

**DISCUSSION**

Anemia is one of the major co-morbidities in CHD. The patients with CHD are frequently anaemic and anaemia has a high prevalence among them in the absence of vitamin or mineral deficiency, haemolytic or other definable cause (5). In ACHD, anemia as a comorbidity can result in heart failure. In our study, we studied 108 cases of ACHD. Hb and RBC indices are easily and inexpensively measured parameters. Anaemia is important comorbidity in CHD patients as various studies clearly highlighted that preoperative anaemia gives rise to postoperative cardiac events, complications and death.

In our study we found majority of patients had anaemia with mean Hb of  $10.6 \pm 2.7$ ,  $9.5 \pm 2.7$  and  $8.7 \pm 0.1$  gm% in group 1, 2 and 3 respectively. In group 1, we found HCT, MCV, MCH & MCHC.

In all the three age groups, mean of MCH and MCHC were lower than the normal. While MCV was 72 in group 1, it was reduced in group 2 and 3. Similarly, hematocrit was 32 in group 1 and was reduced in both group 2 and 3.

In a study of hematological and dermatological profile of Pakistani children with VSD by Sarwar S et al. (6), they found that more than 30% of population in all categories of different age group had low hemoglobin. A study by Mukherjee et al(7), reported that the prevalence of iron deficiency anemia was 47.06% in the children with CHDs. Another study by H Amoozgar et al. (5), observed that the patients with congenital heart disease are frequently anemic and anemia has a high prevalence among them in the absence of vitamin or mineral deficiency, hemolytic or other definable causes. They studied 60 patients with ACHD group and noted mean Hb  $13.56 \pm 9.44$ , mean MCV  $80.4 \pm 12.36$ (5) Also, among 60 patients with ACHD, 50.7% had Hb <12 and 40.6% had MCV<80 and also 21.7% had MCV <75. (5)

Strengths of this study included the large sample size of 108 and that it was conducted in a tertiary health care centre.

Limitations of this study included the fact that there was a non-uniform distribution of patients across the three age groups. Also, in this study evaluation of complete hematological parameters, peripheral smear findings, iron studies for nutritional deficiencies are lacking. Follow up of patients were also not taken.

### CONCLUSION

We found that majority of CHD patients were anemic with low RBC indices. Anemia is an important comorbidity in CHD patients and can result in heart failure and hence, important to recognize and manage.

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