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Nutritional assessment of children with congenital heart disease in a tertiary care centre

Abstract

Background: Malnutrition in children has been shown to negatively impact growth and neurocognitive development. This is particularly evident in children with congenital heart disease (CHD). Malnutrition is common in children with CHD due to increased energy requirements in addition to poor feeding and inadequate caloric intake. Insufficient protein and energy intake results in loss of both skeletal and myocardial muscle, contributing to cardiac decompensation, and failure. With progression of CHD, poor growth is exacerbated due to decreased peripheral perfusion with tissue hypoxia and acidosis, and sequelae such as recurrent pulmonary infections, and pulmonary hypertension. Corrective cardiac surgery in patients with CHD has been demonstrated to have a positive impact on weight gain. So early intervention with corrective surgery can help in these patients. Yet, a suboptimal nutritional state in itself may undermine the outcomes of corrective surgery, leading to increased peri-operative morbidities, and mortality. As nutritional status is a potentially modifiable risk factor, optimizing a child's pre-operative nutritional status could potentially lead to improved short- and long-term outcomes.

Keywords: Malnutrition, Congenital Heart Disease (CHD), Nutritional assessment, Nutritional status, Corrective surgery, Pre-operative, Post-operative, SGA screening tool, STRONG kids screening tool, Height, Weight, Mid upper arm circumference, Head circumference, Hemoglobin, Albumin, Length of hospital stay, Grade of complication

Introduction

Congenital heart disease (CHD) is the most frequently occurring congenital disorder. A few decades ago, only a minority of patients with moderate and severe CHD reached adulthood. CHD is defined as a gross structural abnormality of the heart or great vessels. A well-organized and useful classification scheme, adapted in 2001, is being used nowadays to classify patients into CHD of great complexity, CHD of moderate severity, and simple CHD. Congenital heart disease (CHD) is a structural abnormality of the heart and great vessels that is present at birth. It is the most common birth defect, affecting approximately 1% of all live born infants. CHD results from perturbation of the normal program of cardiac development. Approximately one third of patients with CHD have disease that is categorized as severe (comprising univentricular hearts, heterotaxy, conotruncal defects, atrioventricular canal defects, total anomalous pulmonary venous return, LVO obstruction, and right ventricular outflow obstruction except isolated valvar pulmonary stenosis) and require intervention in the first year of life.

Despite progress in medical and surgical treatments, CHD remains the leading cause of mortality from birth defects in the developed world. Furthermore, among the world's poorest populations, CHD has a greater contribution to cardiovascular disease-associated disability-adjusted life years than ischemic heart disease or stroke.

The natural history of severe congenital heart disease (CHD) was altered dramatically by the performance of the first systemic to pulmonary artery shunt procedure by Helen Taussig, Vivien Thomas, and Alfred Blalock. Since then, an almost universally lethal condition has become progressively more approachable through a combination of surgical, catheter-based, and medical interventions. In the modern era, adult in developed countries undergoing CHD surgery, including those with complex CHD, have 10-year survival exceeding 80%. This has resulted in an ever-increasing population of adults who are living with CHD, and there are now more people over the age of 18 years with CHD than children with CHD.

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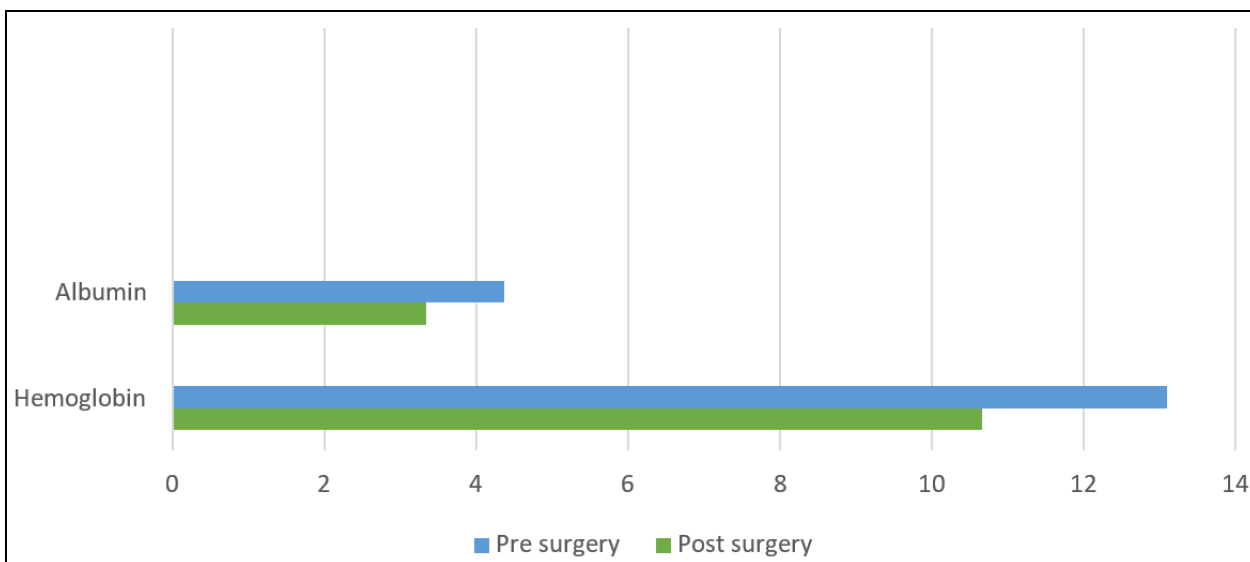
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Materials and Methods: It was a retrospective cohort study enrolling children under 12 years of age who underwent corrective heart surgery for congenital heart disease at a tertiary care center from January 2022 to June 2022. Nutritional assessment was done using STRONG kids nutritional screening form, SGA nutritional screening form, anthropometric measurements and biochemical parameters like hemoglobin and albumin. The Pre-surgery nutritional status of the children were compared with the immediate post-operative outcomes, like length of hospital stay and grade of complication.

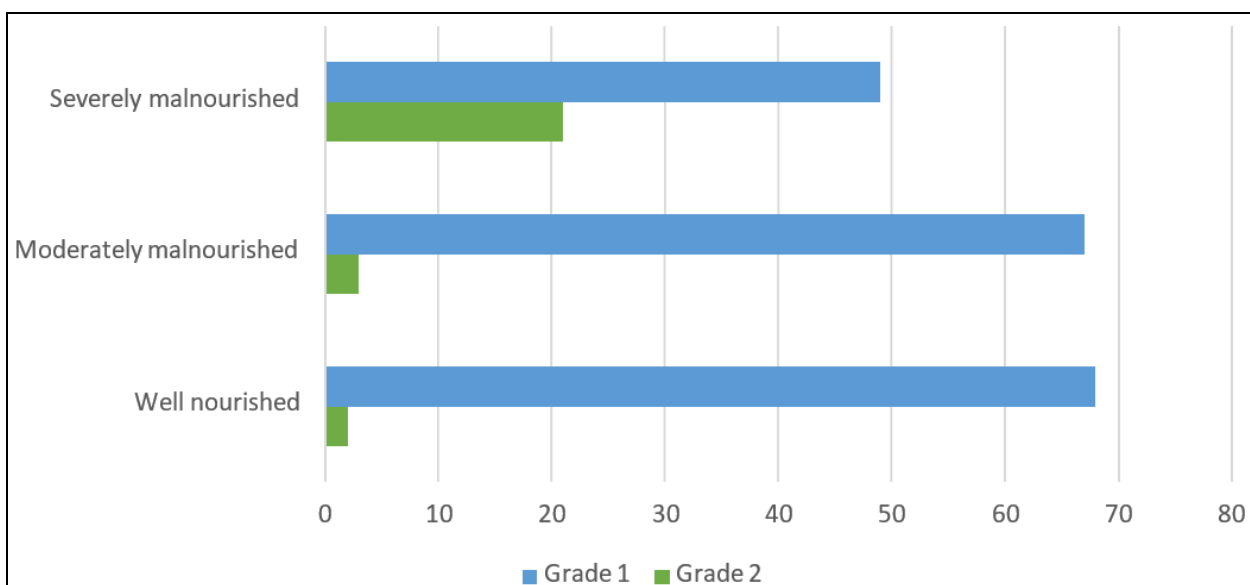
Results: A total of 210 children were studied, it included 70 children each from well nourished, moderately malnourished and severely malnourished category. The mean age of the study population was 49.45±42.69 months. VSD (Ventricular Septal Defect) was the most common type of CHD. Mean height of the study population was 95.2±26.8 cm, weight was 15.35±9.95 kg, HC (Head Circumference) was 39.43±4.49 cm and MUAC (Mid Upper Arm Circumference) was 12.6±3.41 cm. There was a mean drop in the biochemical parameters

i.e., Hemoglobin and albumin post the corrective cardiac surgery. The mean Hemoglobin before surgery was 13.09±1.76 and post-surgery the mean Hemoglobin was 10.65±0.96. The mean albumin before surgery was 4.37±0.25 and post-surgery mean albumin was 3.34±0.44. The overall mean reduction was 2.44±1.76 for Hemoglobin and 1.02±0.43 for albumin. 184 patients had grade 1 complications post-surgery and 26 patients had grade 2 complications. Grade 2 was the maximum grade of complication and it was seen more in the severely malnourished category of children. Grade of complication and degree of malnourishment was statistically significant with a p value of <0.001.

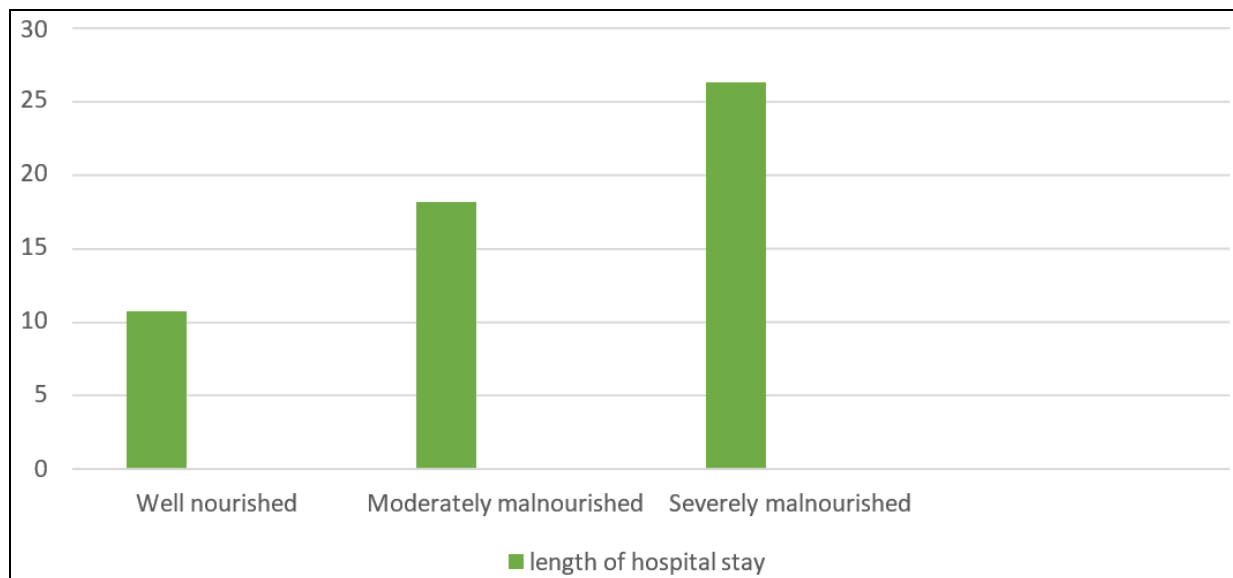
The mean length of hospital stay for the population studied was 18.44 with minimum length of hospital stay being 5 days and maximum length of hospital stay being 38 days. It was statistically significant with a p value of 0.000. The well-nourished category of children had the least hospital stay compared to moderately malnourished and then severely malnourished children before surgery.



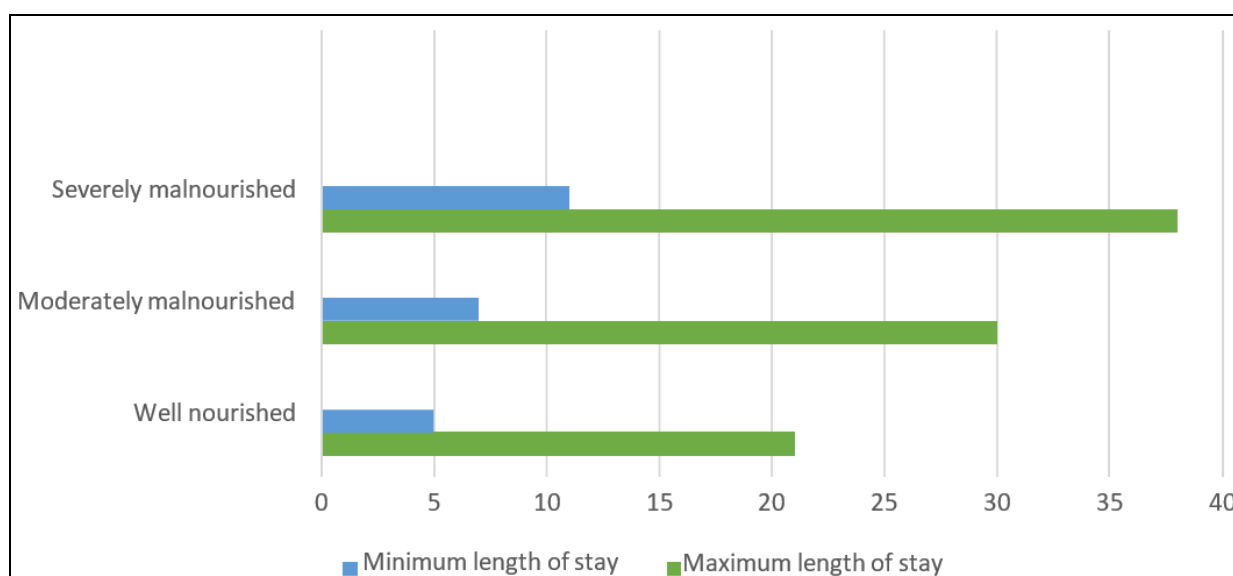
Mean reduction in the Biochemical parameters



Grade of complication post operatively in comparison with nutritional status



Length of hospital stay in comparison with pre-operative nutritional status



Minimum and Maximum length of stay for each category of nutritional status

Conclusion: It was found that the length of hospital stay and grade of complication was high in the C i.e., severely malnourished category of children. And length of hospital stay and grade of complication reduced in the B i.e., moderately malnourished category and it was further reduced in the A i.e., well-nourished category of children thus concluding that malnourishment had an impact in the post-surgical outcomes.

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