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قسم

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Nutritional Support using High Energy Infant Formula in Pediatric Congenital Heart Disease Patients with Faltering Growth

Thesis

Submitted for Partial Fulfillment of Master Degree in Pediatrics

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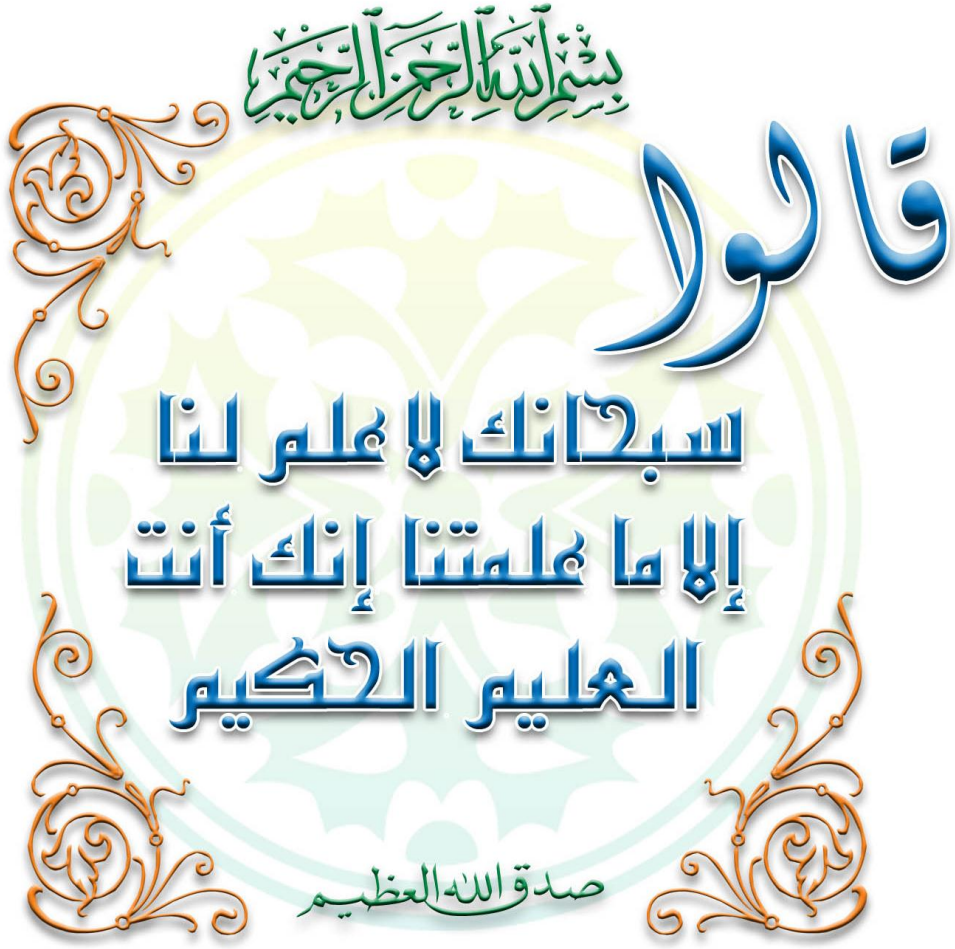

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ABSTRACT

Background: Providing High Energy Infant Formula (HEIF) in critically ill infants promotes a higher and more adequate nutrient delivery and improves energy and nitrogen balance. It promotes adequate catch-up growth in infants with faltering growth. The work will study the impact of nutritional support with HEIF in pediatric patients with Congenital Heart Disease (CHD) suffering from faltering growth on anthropometric measures and on renal function.

Objective: To investigate the impact of nutritional support with HEIF in pediatric patients with congenital heart disease suffering from faltering growth and its impact on renal function compared to those receiving regular standard formula.

Patients and Methods: This case control study was performed at Ain-Shams University, Childrens Hospital, cardiology Clinic. It included 40 infants in two groups, 20 patients with congenital heart disease suffering from faltering growth (HEIF group) received HEIF, and 20 age, sex and weight percentile matched patients who received regular standard formula (STD group).

Results: HEIF group showed a significant increase in weight, length and head circumference compared to baseline. This significant improvement reflected on z-score for weight as it was significantly increased, while z-score for length and head circumference showed non significant difference. STD group showed significant increase in weight, length and head circumference compared to baseline, but unfortunatley, z-score of the three growth parameters showed no significant difference. Infants in HEIF group had a significant increase in weight z-score when compared to those in STD group at the end of the study, while, There was no significant difference in length or head circumference on z-score and percentiles of both groups. As regards renal functions of both study groups, no significant change in serum creatinine level and the estimated glomerular filteration rate (eGFR) calculated by the modified Schwartz formula from baseline.

Conclusion: CHD patients are in need for special nutritional care plans including, nutritional intervention with high energy infant formula, nutritional sessions for their care-givers to encourage appropriate feeding practice, introduction of complementary feeding if infant is ready, medical control of their cardiac status or any other condition if present, and regular follow up for re-assessment and changing nutritional care plan to achieve growth catch-up. The use of HEIF described in this study is safely able to increase nutrient intake and to promote weight gain in CHD infants with faltering growth.

Keywords: Congenital heart disease, chronic kidney disease, high protein

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List of Abbreviations

Abb.	Full term
AAP	American Academy of Pediatrics
ARA	Arachidonic acid
ASD	Atrial septal defect
BAV	Bicuspid Aortic Valve
BMI	Body mass index
CHD	Congenital heart diseases
CHF	Congestive heart failure
CKD	Chronic kidney disease
CM	Cardiomyopathy
cm	Centimetres
DHA	Docosahexaenoic acid
EBF	Exclusive breastfeeding
ECG	Electrocardiography
FTT	Failure to thrive
GFR	Glomerular Filteration Rate
HC	Head circumference
HEIF	High Energy Infant Formula
HP	High Protein
ICU	Intensive care unit
kg	Kilograms
LV	Left ventricle
NDF	Nutrient-dense formula
PDA	Patent ductus arteriosus
REE	Resting energy expenditure
STF	Standard term formula
TAPVR	Total anomalous pulmonary venous return

List of Abbreviations Cont...

Abb.	Full term
TEE	Total energy expenditure
TGA	The great arteries
TOF	Tetralogy of Fallot
TTE	Transthoracic echocardiography
VCFS	Velocardiofacial syndrome
VSD	Ventricular septal defect
WAZ	Z-score for weight

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INTRODUCTION

Congenital heart disease (CHD) represents one-third of all major congenital anomalies, with a reported prevalence of 9 per 1000 live births. During the past 50 years, there have been significant improvements in the medical and surgical management of CHD, with more children now reaching adulthood. In particular, growth failure during the first 2 years of life is considered to be a significant concern in infants with CHD. World Health Organisation definitions of persistent malnutrition in children include "stunting", with a height for age $\leqslant -2$ z scores, and "underweight", with a weight for age $\leqslant -2$ z score. Persistent malnutrition in childhood is important as it has been linked to shorter adult height, increased all-cause mortality, as well as poorer neurodevelopmental outcomes among young children with CHD ***(Marino et al., 2018).***

The basis of growth failure or underweight in CHD appears to be multifactorial and may differ in aetiology from patient to patient. It includes the underlying cardiac anomaly, haemodynamic factors, hypoxaemia, inadequate calories, or macronutrient intake, increased energy expenditure relative to intake, increased inflammation or associated comorbidities that include gut dysfunction, respiratory infections, associated genetic syndromes, and reduced growth potential ***(Argent et al., 2017).***

The poor preoperative nutritional state of these patients is often exacerbated postoperatively as the metabolic response is characterized by altered energy demands, a complex