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COMPARATIVE STUDY OF NUTRITIONAL INTAKE AND OPTIMUM NUTRITIONAL REQUIREMENTS IN PEDIATRIC INTENSIVE CARE OF A TERTIARY CARE HOSPITAL IN RAWALPINDI

Nabeela Fazal Babar, Iftikhar Ahmed*, Sabat Babar*, Hafsa Khalil*

Foundation University Medical College, Rawalpindi, Pakistan, *Armed Forces Institute of Cardiology / National Institute of Heart Diseases / National University of Medical Sciences (NUMS) Rawalpindi, Pakistan

ABSTRACT

Objective: To compare the difference in caloric and protein intake versus optimum protein and caloric requirements at pediatric ITC of AFIC. To see the difference in protein and caloric intake in patients on oral intake versus nasogastric feeding.

Study Design: Retrospective observational study.

Place and Duration of Study: Armed Forces institute of Cardiology and National Institute of Heart Diseases from 1st Feb 2015 to 1st Jul 2015.

Methodology: This retrospective study was conducted on post operative patients of pediatric ITC of AFIC. Total 102 patients who met the study criterion were included in the study sample. Data was collected from hospital records and FFQ.

Result: Mean caloric intake on 1st 2nd and 3rd post operative day was 353,438,570 k/cals respectively where as mean protein was 11,11,12 grams on 1st 2nd and 3rd post operative day respectively. The difference in the mean caloric intake on 1st, 2nd and 3rd post operative day were statistically significant whereas difference in the mean protein intake was not significant statistically. The caloric intake was high with patients on oral feeding than ones on nasogastric tube feeding where as Protein intake in patients with naso gastric tube feeding was high than those on oral feeding.

Conclusion: The caloric and protein intake in study subjects was below the recommended level both in nasogastric and oral feeding. A constant monitoring of nutritional status of post operative patients especially in post operative children is mandatory for optimal wound healing and survival of patient.

Keywords: Intensive Care (ITC), Optimum Caloric and protein intake, Food frequency questionnaire (FFQ), Nasogastric tube feeding, Oral feeding.

INTRODUCTION

Post operative nutritional care plays a crucial role in wound healing specially in pediatric population[1]. Nutritional requirements in post operative pediatric patient do not differ quantitatively from normal subjects. The quantitative requirement of individual nutrients differ from normal values. Primary objective of nutritional study in surgical patient is to define quantity of these nutrients that is appropriate for these patients in post operative phase[2]. There is a consensus on the fact that early post-operative nutritional support benefits surgical patients by reducing septic morbidity, improving healing of wound and maintenance of immuono competence[1]. Treatment of surgical patient during last two centuries has been improved tremendously which has led to better survival, safety and scope of operative procedures. Growing understanding of the metabolic response of the body in injury and infection has developed in parallel with nutritional advances[3]. An important cause of morbidity and mortality in surgical setting is defective responses to nutritional deprivation. These responses when overlooked by the clinician results in more protracted and even jeopardize surgical convalescence[4].

The many causes of growth failure in the cardiac infant population include delayed onset

Correspondence: Dr Nabeela Fazal Babar, Foundation University Medical College, Rawalpindi, Pakistan
Email: drnabeelababar@yahoo.com

of enteral feedings, increased metabolic stress of cardiac surgery, cyanosis, low cardiac output, increased energy expenditure from physiologic stress. For optimal rehabilitation and wound healing, the body needs to be in an anabolic state[5]. The body requires extra nutrients to heal, so focusing on nutrition can mean the difference between bouncing back and a lengthy recovery. After surgery, drugs, fatigue, and complications can make eating unappealing. The mouth and throat can be soar or dry, medicines can make food taste metallic, and even sense of smell can be diminished[4]. On average, a person can expect to lose 5 to 10 percent of total body weight after surgery. There is a need to infuse the body with calories and nutrition. Protein is needed to repair tissue, slow muscle catabolism and decrease the inflammatory phase. Post operative requirement for protein is 1.5 grams per kilogram of body weight. For elective surgery, where as the energy requirment for 1-6 yrs of age is 75-90 k/cal per kg of body weight and that for children from 7-12 yrs is 40-60 k/cals/kg of body weight the low end of the range is sufficient, for major surgery, the higher end of the spectrum is more appropriate[6].

Attention to nutrition response is especially important in pediatric surgical patients. Despite its importance, adequate nutrition delivery remains a challenge and enteral feeding problems remain poorly understood in this fragile infant population. This study was planned to find the gap in optimum caloric and protein requirements and the actual intake in post operative patients in Pediatric Cardiac ITC.

MATERIAL AND METHODS

A Retrospective observational study was conducted in Pediatric ITC of Armed Forces institute of Cardiology and National Institute of Heart Diseases between 1st Feb 2015 to 1st July 2015. Data was collected from hospital records and FFQ (food frequency questionnaire) The study population was divided into two groups. Children between 1 to 6 years of age and second between 7-12 years of age. The reason behind dividing study subjects in two groups was the fact that protein and energy requirement of children of age less than 6 years is different from those above 6 years of age[6]. Optimal post operative energy and protein requirement of the patients was calculated[7,9] for both the groups (1-6) years and (6-12 years) were calculated. It was then compared with the actual protein and energy intake on first three post operative days[7].

All post operative patients in pediatric ITC had started oral/N.G feed from 1st post operative day were included in the study where as those patients who did not survive till 3rd post operative day and patients with history of renal problems or metabolic illnesses.

Reference protein and caloric intake was calculated for each patient and actual caloric and protein intake was calculated for all the study subjects on 1st, 2nd and 3rd post operative day.

RESULTS

A retrospective chart review was conducted of daily protein and caloric intake in the cardiac intensive care unit of AFIC Rawalpindi. The study consisted of 102 patients between the age of 1-12 years with mean age of 6.5 years ± 5.6 years. Of 102 study subjects 38 were females where as 64 were male children. The study subjects were divided into 2 groups on basis of their age. The first group consisted of children between 1-6[9]. years of age and in 2nd group consisted of children from 7-12 years

Mean caloric intake on 1st, 2nd and 3rd post operative day was 353,438,570 k/cals respectively recommended caloric intake of all the subjects were calculated the difference in the Mean caloric intake on 1st, 2nd and 3rd post operative day was found much less than the mean recommended caloric intake. The difference was statistically significant (p=0.001).

Mean caloric intake in children of group 1 (age 1-6 years) on day 1 was 283 k/cals where as in group 2 (age 6-12) was 481 k/cals on day 2 in group 1 mean caloric intake was 356 k/cals and of group 2 was 569 k/cals and the mean caloric

intake on day 3 for group 1 was 416 k/cals whereas that of group 2 was 702 k/cals. The difference in mean caloric intake in both the groups on all 3 days was statistically significant *p*=0.05 as shown in table-I.

Mean protein intake on 1st, 2nd and 3rd post operative day was 11, 11, 12 grams respectively. Recommended protein intake of all the subjects were calculated the difference in the Mean protein intake on 1st, 2nd and 3rd post operative day was less than the recommended protein 2 groups on 1st, 2nd and 3rd post operative day were statistically significant. The difference in the mean protein intake between 1st and 2nd groups on 1st, 2nd and 3rd post operative day were statistically not significant.

Mean caloric intake of 32 patients who were on nasogastric feeding was 246,320 and 377 k/cals where as mean caloric intake of patients on oral feeding was 402,490 and 581 respectively, as shown in fig. The difference in the caloric intake was statistically significant on all 3 post

Table-I: Comparison of caloric intake with optimum caloric requirement in post operative pediatric patients.

Group wise caloric intake in take	Mean caloric intake in k/cals	Recommended caloric in take	*p*-value
Group 1			
1st post operative day	283		
2nd post operative day	356	923	<0.05
3rd post operative day	416		
Group 2			
1st post operative day	481	1390	<0.05
2nd post operative day	569		
3rd post operative day	702		

Table-II: Comparison of protein intake with optimum caloric requirement in post operative pediatric patients.

Group wise protein intake in take	Mean protein intake in gms	Recommended protein intake in take	*p*-value
Group 1			
1st post operative day	12.4	17	<0.05
2nd post operative day	12.4		
3rd post operative day	12		
Group 2			
1st post operative day	9	38	<0.05
2nd post operative day	10		
3rd post operative day	13		

intake but the difference was found statistically significant (*p* =0.04, 0.03 and 0.04 respectively) as shown in table-II.

Mean protein intake in children of group 1 (age 1-6 years) on day 1 was 12.4 gms where as in group 2 (age 6-12) was 9 gms on day 2 in group 1 mean protein intake was 12.4 gms and of group 2 was 9.9 gms and the mean protein intake on day 3 for group 1 was 12.1 gms whereas that of group 2 was 13.4 gmsThe difference in the mean caloric intake between the operative days where as caloric intake was high with patients on oral feeding than ones on nasogastric tube feeding. Protein intake in patients with naso gastric tube feeding was high than those on oral feeding but the difference was statistically significant on 1st post operative day.

DISCUSSION

A study was conducted to compare the protein and caloric intake and optimum requirement in postoperative patients in pediatric ITC as Feeding in post operative patients is an

important process in support of nutritional requirement of patient.

Healthy children need regular nourishment, including energy (i.e. carbohydrates and fat), protein, vitamins, and minerals, for maintenance and growth. Nutrition therefore is essential for maintenance of physiologic homeostasis and growth. Hypermetabolic states lead to a depletion of body stores, with decreased immune competence and increased morbidity and mortality. Surgical patients need nourishment for optimal wound healing. When an organ is injured, the healing process involves the growth of new blood vessels. Since the cells lining the interior of blood vessels and blood cells themselves are important for developing new vasculature[8].

Modern nutritional support for the surgical patient comprises numerous stages, including assessment of nutritional status, nutritional requirements, and nutritional therapy. Nutritional assessment is performed utilizing the clinical history, clinical examination, anthropometry, and biochemical evaluation. These parameters are subject to error and are influenced by the rapid changes in body composition in the post-operative period[9]. Critically ill children are at high risk of developing nutritional deficiencies due to imbalance between their energy expenditure and caloric intake[10]. There is a correlation between the accuracy of estimated energy requirement and infection, mortality, and length of stay[5]. Actual energy delivery to the postoperative cardiac surgery child in the pediatric intensive care unit can be further hindered by many procedural and patient barriers. The provision of appropriate caloric requirements may help clinicians correct the metabolic state and promote recovery and anabolism. Therefore, optimizing nutrition intake of the postoperative, cardiac surgical child requires a paradigm shift toward individualized nutrition prescription, in the context of a Pediatric intensive care unit-specific feeding algorithm[11]. It has been documented that nutritional deficiency is associated with compromised immune defense, more infection, growth failure, longer hospital stay, and increased costs[12,13]. Historically, energy needs were estimated using predictive equations with stress factor adjustments[11] to address the changing metabolic state the daily nutritional needs of healthy children are best met by a balanced oral diet. However, it is not always possible to meet the needs of pediatric surgical patients in this fashion. Post operative Nutritional therapy includes enteral and/or parenteral nutrition. Enteral feeding is the first choice for nutritional therapy. The daily nutritional needs of healthy children are best met by a balanced oral diet. If enteral feeding is not feasible only than parenteral nutrition is utilized[9] Among the few studies available that evaluated the influence of adequate protein and calories on postsurgical outcomes, a retrospective clinical practice improvement study by Neumayer et al[14]. It involved eight hospitals and 1007 patients undergoing operations Sufficient nutrition support was defined as at least 60% of

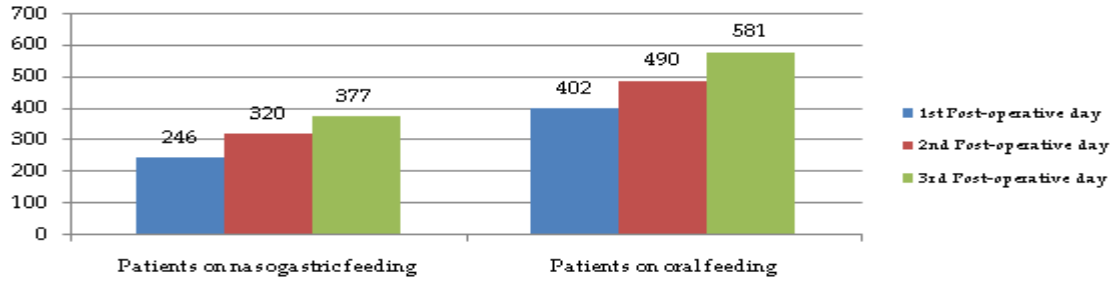

Figure: Caloric intake in patients on naso gastirc versus oral feeding on 1, 2 and 3rd post-OP day.

the patient's calorie and protein goals After controlling for severity of illness, the authors found that early, sufficient nutrition support significantly reduced length of stay and hospitalization fees compared with those patients fed early but not sufficiently or fed sufficiently but not early. Others have made similar conclusions in regard to eternal nutrition[15,16] suggesting that both the amount and timing of nutrition support intervention are important factors in improving clinical outcomes Protein serves an important role in tissue maintenance, wound healing, and slowing endogenous protein catabolism, particularly after major surgery. Postoperative protein requirements typically range between 1.2 and 2 g/kg, with the lower end appropriate for patients after uncomplicated elective surgery and the higher end recommended after major surgery[17]. Severe renal or hepatic dysfunction may require short-term protein restriction below this range, whereas large open wounds or burns can increase protein needs to >2 g/kg17[17]. Studies have demonstrated the feasibility of early eternal nutrition for babies with congenital cardiac malformations, postoperatively with mother's milk. Providing fortification in the form of a calorie dense expressed breast milk to these infants is tolerated and also benefits in better postoperative recovery with less chance of infection and ICU stay, thereby reducing the health-care burden to the individual and the system.

CONCLUSION

The results indicated that The postoperative caloric and protein intake in study subjects was suboptimal both in nasogastric and oral feeding. However protein intake was better in patients on nasogastric feeding than on oral feeding. On the other hand caloric intake was better on in patients on oral feeding. A constant monitoring of nutritional status of post operative patients is mandatory for optimal wound healing and survival of patient We anticipate that this study may result in a better understanding of the caloric needs of neonates after cardiac surgery. Further prospective randomized controlled studies with bigger sample sizes are required to strengthen the evidence.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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