EDITORIAL

Optimal Nutrition in ICU! Less is More? Food for Thought or Feed for Survival!

Akshaykumar A Chhallani

Keywords: Energy intake, Enteral nutrition, Intensive care unit, Randomized controlled trial.
Indian Journal of Critical Care Medicine (2024): 10.5005/jp-journals-10071-24841

Critically ill patients experience significant amount of malnutrition and crucial muscle loss during their intensive care unit (ICU) admission, affecting recovery. Nutrition is likely to play a pivotal role in alleviating the development and progression of malnutrition accountable for lean tissue wasting.

The physiological fasting in healthy individual is entirely different from pathological fasting in ICU patients. The catabolic stress response in acutely ill may be more detrimental on the background of dominant inflammation and strong endocrine response. Standard protocol for nutritional support is the basic pre-requisite of any good quality critical care unit.

The energy requirement can be accurately measured by indirect calorimetry. It is crucial to estimate calories on a daily basis because a patient's calorie requirements can vary depending on the stage of their illness and the natural course of their disease. It is difficult to measure the protein demand in patients who are extremely catabolic. Regarding the ideal nutritional diet for individuals who are severely ill, there is no clear consensus.

The two professional bodies differ in their recommendation about daily intake of protein. The approved dose is 1.2 and 2.0 gm protein/kg/day, as per The American Society of Enteral and Parenteral Nutrition (ASPEN); whereas The European Society of Enteral and Parenteral Nutrition (ESPEN) recommend the increasing protein dose to achieve the target of 1.3 gm/kg/day.[1,2]

It will pose a critical dilemma for the clinicians to decide the caloric intake in the first seven days of ICU admission. The ESPEN has suggested hypocaloric feeding (70% of the total caloric requirement) in the early acute phase (Days 1–2) and titrated to 80–100% of the total energy requirement in the late acute phase.

It is a matter of discussion whether hypocaloric/hyperproteic enteral feeding affects mortality, infection rates, or mechanical ventilation duration in acutely ill patients. It is not very easy to achieve the desired targets of enteral protein intake in ICU in spite of optimum efforts.

In the ICU, patients often receive less than the prescribed quantity of enteral nutrition. Interruption of feeding is not uncommon in ICU because of diagnostic procedures, gastro-intestinal events. These patients do not achieve their calculated nutritional goals. Heterogenicity of patient population, different phases of critical illness, multifaceted medical or surgical issues, severity of disease makes it challenging to decide the nutrition plan in the first 7 days of intensive care admission. For many years, it has been a perpetual issue; whether to focus on calorie or protein.[3,4] In an open label RCT, more than 200 patients with diagnosis of respiratory failure were allotted to receive either trophic feeds or full energy nutrition. Clinical recovery which was the primary outcome was similar in both groups. Mortality at hospital discharge was 19.6% for the full-energy group, compared to 22.4% for the trophic group.[5]

It's possible that benefits that have long been attributed to a high caloric content may be actually because of higher protein levels.

A single centered clinical trial (TICACOS) studied 56 mechanically ventilated patients in each control and study group. Control group received 25 kcal/kg/day while study group received caloric intake as per repeated indirect calorimetry measurements. The primary outcome was hospital mortality, which was lower in study group.[6]

Over the past ten years, studies have been developed with the goal of providing greater enteral nutrition at an earlier stage of severe disease.[7] Two sizable cluster randomized trials that included 462, and 1,118 patients, respectively, examined how these methods affected clinical results.[7,8] A total of 462 patients were included in a cluster randomized experiment to examine the impact of evidence-based dietary recommendations. It has been demonstrated to enhance the provision of nutritional assistance and has been associated with improved clinical results; possible benefits include shorter hospital stays and lower hospital mortality (non-significant).[7]

Another cluster trial gave 1,118 patients protocol-based nutrition, which led to an earlier start of feeding and a higher achievement of calorie targets. However, there was no benefit in terms of mortality or duration of stay in the ICU from this approach. An open label multicentric trial (EDEN) was conducted across 44 hospitals to access the effect of trophic versus full enteric feeding on 1,000 young patients. They all were mechanically ventilated, and the primary outcome was ventilatory free days (VFDs). When

Department of Critical Care Medicine, Apollo Hospitals, Navi Mumbai, Maharashtra, India

Corresponding Author: Akshaykumar A Chhallani, Department of Critical Care Medicine, Apollo Hospitals, Navi Mumbai, Maharashtra, India, Phone: +91 9224687893, e-mail: akschhmrd@yahoo.com

How to cite this article: Chhallani AA. Optimal Nutrition in ICU! Less is More? Food for Thought or Feed for Survival! Indian J Crit Care Med 2024;28(11):999–1001.

Source of support: Nil

Conflict of interest: None

compared to full enteral feeding, initial trophic feeding for up to 6 days did not decrease mortality or increase the number of VFDs.[4]

These surprising findings led to the concept that while giving non-protein calories to a target for energy is pointless or perhaps detrimental, particularly in the early stages of serious illness.[9,10] This hypothesis was supported by few trials endorsing hypocaloric enteral feeding in patients who were previously well nourished for up to seven days during the acute phase of sickness.[11]

Results from one pilot study indicated that limiting non-protein calories while ensuring a sufficient intake of protein could in fact improves survival.[12]

Arabi et al.[13] studied the impact of conventional enteral feeding (70–100%) and permissive underfeeding (40–60% of predicted caloric requirements) in medical, surgical and trauma critical care units. keeping same amount of protein in both groups. The primary outcome, i.e., 90 day mortality was similar in both groups. Al Dorzi conducted a systematic review and meta-analysis which revealed no correlation between hospital mortality and the amount of calories consumed by critically ill adult patients. This meta-analysis examined 21 trials, evaluating 2,365 patients in the lower calorie intake group and 2,352 patients in the higher calorie intake group.[14]

The possible beneficial effect of lower caloric intake was on infectious complications and renal replacement therapy. Also bloodstream infections and renal replacement therapy were less common in those with decreased calorie intake. The total caloric intake, feeding timing, route and heterogeneity in the design, would have possibly interfered with the interpretation of these meta-analysis results.

Giving hypocaloric (15 kcal/kg per day) or normocaloric enteric (25 kcal/kg per day) nutrition while maintaining the same hyperproteic intake (1.7 gm of protein/kg per day) did not alter the result of the RCT done by Rugeles et al.[15]

In this issue from IJCCM; Chito C Permejo from Philippines University, Manila did a meta-analysis to explore the effect of hypocaloric/hyperproteic enteral feeding vs normocaloric feeding on the survival of critically ill patients in the acute phase of ICU stay. It included randomized Controlled Trials; adult patients who were critically ill and/or mechanically ventilated for a minimum 1 week, who required enteral nutrition for at least 48 hours. The authors found that there are no significant differences in mortality, length of ICU stay, days of mechanical ventilation, or infection complications between the above two groups.[16] Applicability of ESPEN and ASPEN guidelines to decide the caloric and protein requirements in developing countries is matter of debate; it would have been ideal to have some consensus about low- and middle-income countries as the nutritional practices are little different as compared to western population and developed countries.

Protein deficiency is a major contributor to dietary inadequacies in low- and middle-income nations, which have a negative impact on health, especially in the pediatric population.[17]

In order to determine the appropriate protein and energy consumption in the early phases of a critically ill patient, more research in this field of nutrition is necessary, with a focus on hypocaloric and hyperproteic enteral feeding.

This study should concentrate on carefully designed randomized controlled trials that address important outcomes, such as mortality and significant end points. It will be difficult and easier said than done to strike a balance between underfeeding and overfeeding in very ill individuals until we have sufficient evidence.

Orcid

Akshaykumar A Chhallani https://orcid.org/0000-0001-6321-3167

References

1. Compher C, Bingham AL, McCall M, Patel J, Rice TW, Braunschweig C, et al. Guidelines for the provision of nutrition support therapy in the adult critically ill patient: The American Society for Parenteral and Enteral Nutrition. J Parenter Enteral Nutr 2022;46(1):12–41. DOI: 10.1002/jpen.2267.
2. Singer P, Blaser AR, Berger MM, Casaer M. Hiesmayr M, Bischoff, SC. ESPEN practical and partially revised guideline: Clinical nutrition in the intensive care unit. Clin Nutr 2023;42(9):1671–1689. DOI: 10.1016/j.clnu.2023.07.011.
3. Wang CY, Fu PK, Chao WC, Wang WN, Chen CH, Huang YC. Full versus trophic feeds in critically Ill adults with high and low nutritional risk scores: A randomized controlled trial. Nutrients 2020;12(11):3518. DOI: 10.3390/nu12113518.
4. National Heart, Lung, and Blood Institute Acute Respiratory Distress Syndrome (ARDS) Clinical Trials Network, et al. Initial trophic vs full enteral feeding in patients with acute lung injury: The EDEN randomized trial. JAMA 2012;307(8):795–803. DOI: 10.1001/jama.2012.137.
5. Rice TW, Mogan S, Hays MA, Bernard GR, Jensen GL, Wheeler AP. Randomized trial of initial trophic versus full-energy enteral nutrition in mechanically ventilated patients with acute respiratory failure. Crit Care Med 2011;39(5):967–974. DOI: 10.1097/ccm.0b013e31820a905a.
6. Singer, P, Anbar, R, Cohen, J, Shapiro H, Shalita-Chesner M, Lev S, et al. The Tight Calorie Control Study (TICACOS): A prospective, randomized, controlled pilot study of nutritional support in critically ill patients. Intensive Care Med 2011;37(4):601–609. DOI: 10.1007/s00134-011-2146-z.
7. Martin CM, Doig GS, Heyland DK, Morrison T, Sibbald WJ. Multicentre, cluster-randomized clinical trial of algorithms for critical-care enteral and parenteral therapy (ACCEPT). CMAJ 2004;170(2):197–204. DOI: 10.1177/0115426504019003309.
8. Doig GS, Simpson F, Finfer S, Delaney A, Davies AR, Mitchell I. Effect of evidence-based feeding guidelines on mortality of critically ill adults: A cluster randomized controlled trial. JAMA 2008;300(23):2731–2741. DOI: 10.1001/jama.2008.826.
9. Casaer MP, Mesotten D, Hermans G, Wouters PJ, Schetz M, Meyfroidt G, et al. Early versus late parenteral nutrition in critically ill adults. N Engl J Med 2011;365(6):506–517. DOI: 10.1056/nejmoa1102662.
10. Singer P, Hiesmayr M, Biolo G, Felbinger TW, Berger MM, Goeters C, et al. Pragmatic approach to nutrition in the ICU: Expert opinion regarding which calorie protein target. Clin Nutr 2014;33(2):246–251. DOI: 10.1016/j.clnu.2013.12.004.
11. Casaer MP, Van den Berghe G. Nutrition in the acute phase of critical illness. N Engl J Med 2014;370(13):1227–1236. DOI: 10.1056/nejmra1304623.
12. Arabi YM, Tamim HM, Dhar GS, Al-Dawood A, Al-Sultan M, Sakkijha MH, et al. Permissive underfeeding and intensive insulin therapy in critically ill patients: A randomized controlled trial. Am J Clin Nutr 2011;93(3):569–577. DOI: 10.3945/ajcn.110.005074.
13. Arabi YM, Aldawood AS, Haddad SH, Al-Dorzi HM, Tamim HM, Jones G, et al. Permissive underfeeding or standard enteral feeding in critically Ill adults. N Engl J Med 2015;372(25):2398–2408. DOI: 10.1056/nejmoa1502826.
14. Al-Dorzi HM, Albarrak A, Ferwana M, Murad MH, Arabi YM. Lower versus higher dose of enteral caloric intake in adult critically ill patients: A systematic review and meta-analysis. Critical Care (London, England) 2016;20(1):358. DOI: 10.1186/s13054-016-1539-3.
15. Rugeles S, Villarraga-Angulo LG, Ariza-Gutiérrez A, Chaverra-Kornerup S, Lasalvia P, Rosselli D. High-protein hypocaloric vs normocaloric enteral nutrition in critically ill patients: A randomized clinical trial. J Crit Care 2016;35:110–114. DOI: 10.1016/j.jcrc.2016.05.004.

16. Permejo CC, Evangelista TJP. Clinical outcomes of hypocaloric/hyperproteic vs normocaloric enteral feeding in the acute phase of critical illness among patients admitted in the intensive care unit: A systematic review with meta-analysis. Indian J Crit Care Med 2024;28(11):1069–1083.

17. Vissamsetti N, Simon-Collins M, Lin S, Bandyopadhyay S, Kuriyan R, Sybesma W, et al. Local sources of protein in low- and middle-income countries: How to improve the protein quality, current developments in nutrition. Curr Dev Nutr 2023;8(Supplement 1):102049. DOI: 10.1016/j.cdnut.2023.102049.