Abstract

ABSTRACT

Human life is oscillating constantly across a spectrum of degrees of health and diseases. Genetic heritance and life circumstances may make someone to live relatively healthy life free from major diseases, while conditions may make others to experience various degrees of disease or injury. Thus the body homeostasis under extreme cases may collapse due to external and internal threats culminating a human body to a state of 'severe illness'. Under these circumstances, the homeostasis of the body is totally disrupted as he starts to burn his lean body mass and losses the ability to burn fat stores, thus predisposing to irreversible malnourished condition after which the survival is unlikely. If such patients need surgical procedures they are sure to be in a state of nutritional risk.

Surgery is a high catabolic state. The physiological stress of surgical trauma causes a surge of sympathetic activity and an associated rise in catecholamine secretion. A more prolonged hypermetabolic state is associated with pronounced negative nitrogen balance follows. The catabolism is further increased if there is an underlying inflammatory or infective condition. In such circumstances the nutritional and calories demands of the patients are increased further. They are at a risk of nutrition depletion from nutritional intake, both pre-operatively and subsequent increase in metabolic rate. An estimated 10 % of lean muscle mass can be lost before wound healing and immunity are compromised. A daily deficit of calories and protein has a detrimental effect on the overall health status of the patient. Thus time is critical if form and function to be preserved. The nutrition assessment, support and counseling of patients with G.I diseases provide a unique challenge to the nutrition field. However, the nutrition of gastrointestinal diseases has evolved rapidly in the last 20 years. In some condition especially during surgical conditions nutritional may be a primary therapy. Even when it is supportive therapy it can dramatically improve quality of life. Many theories about nutrition therapy that have been evolved but has one theme in common theme: *the benefit of feeding the patient and feeding the bowel whenever possible.* It is now apparent that unnecessarily restricting the diet or restricting the diet or resting the

bowel may be deleterious to G.I disease. There is now good evidence that perioperative nutritional support is of benefit, particularly to patients with severe malnutrition [*Nichola 2003*] but the optimal route of delivery remains controversial. Parenteral nutrition is now identified as being associated with significantly increased cost and increased patient morbidity when used indiscrimately. However, post-operative enteral feeding has been shown to be both effective, well tolerated and is also associated with specific benefits such as reduced incidence of post-operative infectious complications and improved wound healing response. Nutrition support is expensive and efforts must be made to utilise it appropriately, effectively and efficiently. There are numerous commercially available enteral formulas in the Indian market but they have not gained popularity for regular use due to many factors of which cost is the major one. Provision of nutrition support in the hospital includes the patient the product (enteral or parenteral nutrition system) and health care providers. Nutrition support is not directly reimbursed under prospective payment system. Malnutrition is common in hospitalised. As many as 40 – 50 % are at risk for malnutrition, upto 12 % of them may be severely malnourished. Patients with malnutrition are two-three times more likely to experience morbid complications than well nourished and they are more likely to die. They also have significantly longer length of hospital stay-extended by as much as 90 % in clearly malnourished patients as compared with EN ones. Data strongly suggests that malnutrition is associated with negative health outcome, greater utilisation of resources and increased costs.

This calls for the formulation of low cost kitchen made enteral feeds both effective as well as easy to prepare in the hospital itself. Any success in this direction will have a great impact in Indian scenario.

Current research even considers individual substrates, such as tissue or organ-specific single nutrients to be an alternative and better approach. Indeed delivery of balanced diet including an adequate amount of protein or suitable aminoacid preparation with required substrates might greatly facilitate an anabolic response to life threatening disease including minor/major surgical procedures. Since glutamine is an important metabolic fuel for the cells of the gastrointestinal tract (enterocytes, colonocytes) hence it can enhance barrier function of the gut via preservation and augmentation of the small bowel villus morphology, intestinal permeability and immune

function. It acts as a precursor of protein synthesis as well as is an important intermediate in large number of metabolic pathways. Due to its limited solubility and instability, prevents its addition to presently available amino acid preparation are limited and are high in cost. Hence, formulation of kitchen made enteral feeding formula stands promise. It is expected that such venture will not only help use of glutamine enrich En formulation in a variety of complications but at the same time will enhance the immunostatus of the patients which in turn is expected to help quick recovery and reduced hospital stay.

The preliminary pilot-study **(Section I)** of 1002 patients surveyed in the selected hospitals (due to ethical reasons names are identified as hospital A, B and C) of Ahmedabad, Gujarat, revealed that gastro-intestinal complications (20.45 %) were most common amongst the patients next to cardiovascular diseases (47.60 %).
With this background in mind, an investigation entitled **"Impact of substrate-enriched kitchen-based protein rich polymeric enteral diets with enteral glutamine on the surgical gastrointestinal patients"** was made in a number of hospitals of Ahmedabad between the year 2003 - 2006 with the **main objective** to compare between routine hospital enteral diet and protein rich kitchen-based polymeric diet with sources either from soy, milk and subsequent substrate-enrichment with enteral glutamine to the same respectively, as **specialised post-operative nutrition support (Section II and III)** in improving the overall nutritional support and decreasing length of stay (LOS) in patients undergoing gastrointestinal surgical procedures. A total of 106 patients enrolled were matched on the basis of age, gender, height, weight and randomly allocated to receive one of the six diets (average 13 days): routine hospital enteral (*EnR*) or polymeric kitchen based protein-rich enteral diets with sources either from soya (*EnS*) milk (*EnM*) or *substrate enriched with glutamine* to the above mentioned groups (*GEnR, GEnS and GEnM*) during post-operative stage.

RESULTS: On study entry Nutritional Risk Index (NRI) rated overall on average 53.3 % and 58.9 % patients with and without enteral glutamine as 'severely malnourished' with weight loss of 57 % and 35.6 % more than 10 % of UBW, respectively. *Pre-operative nutrient intake* especially, *energy and protein for the study groups (EnR, EnS, EnM)*

were found to be significantly low as compared to their respective requirement. Further, subgroup analysis also elucidated a low intake in both energy and protein by the respective subcategories of *EnR, EnS and EnM* study groups during pre-operative stage as compared to their requirements though values were non significant whereas, *Pre-operative nutrient* intake in general for *GEnR, GEnS, GEnM* the study groups were adequate in calories but protein intake was found to be significantly low as compared to their requirements Comparisons among the study groups with respect to adequacies of post-operative intake further reflected that calorie and protein intakes were significantly higher in *EnS, EnM, GEnS, GEnM study groups compared to EnR and GEnR study groups.*

In assessment of improvement in biochemical parameters, diets were significantly not equally effective in improving total protein and albumin levels. Moreover, comparisons between the groups showed a significant overall improvement in total protein and albumin in *EnS, EnM* and *GEnS* study groups, whereas improvement in total protein level was observed in *GEnM* study group.

Further, Impact of with (GEnR, GEnS GEnM) (Or) without (EnR, EnS EnM) glutamine supplementation between study groups and comparison among the groups in overall improvement in biochemical outcome clearly revealed that higher percentage of patients in EnS study group [TP : 52.4 %; Alb : 66.7 %] had upward trend in total protein and albumin level but still a much better results were elicitated by patients in GEnS group [TP : 93.3 %; Alb: 86.7 %]. Even percent of patients with a downward trend in total protein and albumin levels were low in GEnS compared to other study groups. A slight improvement could be observed for GEnR study group even though the glutamine groups received above their recommended protein requirements.

The incidence of feed related complications was higher in the enteral fed patients of *EnR, GEnR* study groups compared to their respective study groups. Overall a mean weight loss of 8.66 % was observed for *EnR* study group, whereas a loss of 2.34 % in *GEnR* study group. Weight gain of 3.98 % could be observed for *EnS* and 3.87 % *GEnS* study groups. A weight loss of only 0.02 % could be noted for *EnM* study group whereas *GEnM* study group had gain of 2.56 % at the time of discharge.

Average LOS was longer for *EnR* (22.4 days) than *GEnR* (18.7 days) whereas *GEnS*

had shorter stay (14.5 days) to *EnS* (16.5 days).

CONCLUSIONS: Soya rich polymeric Kitchen made enteral diet and subsequent substrate enrichment with glutamine had shown a trend for overall improvement. Thus results clearly revealed that good quality protein enriched enteral diets will not only prevent further deterioration of the diseased condition but will also help to improve the biochemical parameters with lesser tendency of weight loss and thereby reduction in hospital stay. Subsequent substrate enrichment with enteral glutamine with such EN diets has a promising outcome results for the gastrointestinal surgical patients. These findings also support that only glutamine supplementation will have lesser effect on overall improvement in protein status. Nutrition support for patients undergoing surgical procedures should also include adequate calories and nitrogen to meet and achieve nitrogen balance.

Thus, a balanced nutrient intake administered in postoperative stage will reduce brief negative nitrogen balance promoting a positive effect on the nutritional status. Use of nutrition support to be done by combining knowledge of current nutrition research for positive impact on the patients' health and well-being. Hence, nutritional therapy should be directed to specific goals depending on patient's nutritional status with immediate goals for nutrition maintenance and ultimate goals in restoration of body mass. Whatever the cost of a therapy, if it does not accomplish its goal or is inappropriate, it yields no benefit and (arguably) is not needed. In this study the kitchen based formulas and even kitchen based polymeric EN diet with subsequent enrichment with glutamine was cost effective compared to commercial formulas. We tried to study its effectiveness based on clinical and overall biochemical improvement.