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PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 17 (10): 1089-1097, 2014
ISSN 1028-8880 / DOI: 10.3923/pjbs.2014.1089.1097

Nutritional Status, Assessment, Requirements and Adequacy of Traumatic Brain Injury Patients

[1]Ghazi Daradkeh, [1,2]Musthafa Mohamed Essa, [2,3]S. Samir Al-Adawi, [1,2]Selvaraju Subash,
[4]Lubna Mahmood and [1]Parvathy R. Kumar
[1]Department of Food Science and Nutrition, CAMS, Oman
[2]Ageing and Dementia Research Group, Oman
[3]Department of Behavioral Medicine, CHMS, Sultan Qaboos University, Oman
[4]Department of Nutritional Sciences, Qatar University, Qatar

Abstract: Traumatic Brain Injury (TBI) has been considered as a serious public health problem. Each year, traumatic brain injuries are contributing to a substantial number of cases of permanent disability and deaths and it can be classified according to the severity into penetrating and closed head injury. Symptoms, beside to be unconscious can be defined as vomiting, nausea, headache, dizziness, lack of motor coordination, difficulty in balancing, blurred vision and lightheadedness, bad taste in the mouth, ringing in the ears, fatigue and lethargy as well as changes in sleep patterns. The brain is known to be the functional regulator for all the metabolic activities inside the body and TBI patients mostly have a complex metabolic alterations including aberrant cellular metabolism, abnormal metabolic processes, changes in hormones functions and inflammatory cascade. The TBI patient's status needed to be assessed medically and nutritionally since the medical status of the patients can affect the nutrition part. Data from the four assessment tools are needed to be correctly used and interpreted in order to make a proper nutritional diagnosis, clinical assessment, biochemistry as well as anthropometric measurements. Regardless the methods used for assessing TBI patients, having adequate intake and medical care can lead to a reduction in hospital costs, numbers of day hospitalized, numbers of hours of mechanical ventilation and in the overall infection rates.

Key words: Traumatic brain injury, critical care, nutrition adequacy, head trauma, nutritional assessment

INTRODUCTION

Traumatic Brain Injury (TBI) has been considered as a serious public health problem. Each year traumatic brain injuries are contributing to a substantial number of cases of permanent disability and deaths. Every year at least 1.7 million TBIs occur either as an isolated injury or along with other injuries (Faul *et al*., 2010). Brain trauma injury can occur due to a consequence of a focal impact upon the head through a sudden acceleration and deceleration within the cranium or via., a complex combination of both sudden impact and movement. Beside the brain damage that can occur at the moment of injury, other injures may happen later which can be defined as a variety of events that take place in the days following the day of injury including pressure within the skull as well as alterations in the cerebral blood flow (Visca *et al*., 2006). TBI can be classified according to the severity into penetrating and closed head injury. The perpetrating which is also known as open head injury occur when an object penetrates the skull and breaks the dura mater as well as the outermost membrane surrounding the brain. While the closed head injury which is known as 'blunt' or 'non-penetrating' occurs when the brain is not exposed (Blissitt, 2006).

The intensity, type, direction and the duration of the forces are all contributing to the severity and the characteristics of TBI. These forces may include angular, translational forces, shear and rotational that contributes to TBI. Forces may involve the head striking, impact loading or termed contact, being struck by something are all the causes of most focal injuries and the movement of the brain within the skull (Milders *et al*., 2003). The TBI patient's status needed to be assessed medically and nutritionally. The medical status of the patients can affect the nutrition part, that's why it is important to assess the patients' current diagnosis and organs functioning. The different indicators that are related to the health and

Corresponding Author: Musthafa Mohamed Essa, Department of Food Science and Nutrition, P.O. Box 34, CAMS, Sultan Qaboos University, Al-Khoud, Muscat, P.C. 123, Sultanate of Oman
Tel: +968 2414 3604 Fax: +968 2441 3418

nutrition include both anthropometric measurement and blood chemistry (Schiesser *et al*., 2009). Anthropometric measurements are used to determine both height and weight either actual or estimated for conducting the body mass index, assessing the patient situation that is associated with clinical conditions such as under nutrition or obesity and to calculate the exact patients need for his intake (Dickerson *et al*., 2004).

In ICU, the energy needs for TBI patients can be determined by estimation process which can be based on a variety of guidelines. The energy demand is a function of different parameters including age, sex, body size and composition which can all be used through different formulas in order to calculate the energy demand. Furthermore, the most well-known and used formula is 'Harris-Benedict equation' it has been developed to take into account many abnormal physiological states such as burns, mechanically ventilated and trauma that may markedly affect the metabolic demands of the patients (Finfer *et al*., 2009). For TBI patients, to ensure the nutritional adequacy is achieved, most often that are provided with nutritional supplements through parenteral or enteral feedings. Critically ill patients may often have feeding intolerance and swallowing requires multiple neurologic inputs in order to perform correctly and damage to these circuits may happen as a result of TBI in more than 60% of patients. Moreover, Patients with moderate or severe TBI require mechanical ventilation, which is abrogating the possibility of the oral intake (Rosenfeld *et al*., 2012). Early tube feedings were associated with reduction in hospital costs, numbers of day hospitalized, numbers of hours of mechanical ventilation and in the overall infection rates. Whereas, many studies showed that critically ill patients who received early recommended eternal or parenteral feeding, they had improved the survival rate around six months after hospitalization (Singer *et al*., 2009).

TBI patients in general are suffering from impaired cognition as well as physiological deficits that can affect the mechanism of swallowing. It has been reported that more than 60% of TBI patients develop dysphagia, apart from that they might have many multi injuries and complications including neurologic injury, facial fractures and dental fractures that may delay initiation of an oral diet (Kattelmann *et al*., 2006). Receiving oral diet when needed can diminish the severity of injury, guarantee and avoidance of complications associated with EN and enteral access devices and overall greater recovery after injury (Boullata *et al*., 2007; Kattelmann *et al*., 2006).

What qualifies as TBI?: Traumatic Brain Injury (TBI) has been considered as a serious public health problem. Each year traumatic brain injuries are contributing to a substantial number of cases of permanent disability and deaths. Every year at least 1.7 million TBIs occur either as an isolated injury or along with other injuries (Faul *et al*., 2010). It can be also known as 'Intracranial injury' which can be occurred when the brain is traumatically injured by any external force and it can be classified depending on the mechanism, locations and severity TBI is considered as a broader category as since it can be involved in structure damages in other area including skull and scalp not only the brain (CDC, 2003). Recent studies demonstrated that TBI is the major cause of disability and death all over the world, especially among young adults and children. Moreover, females sustain traumatic brain injuries less frequently than do males and it can occur mostly due to falls, violence and vehicle accidents (Brain Trauma Foundation, 2007).

Brain trauma injury can occur due to a consequence of a focal impact upon the head through a sudden acceleration and deceleration within the cranium or via., a complex combination of both sudden impact and movement. Beside the brain damage that can occur at the moment of injury, other injures may happen later which can be defined as a variety of events that take place in the days following the day of injury including pressure within the skull as well as alterations in the cerebral blood flow (Visca *et al*., 2006).

Nutritional status followed neurological injury: The brain is known to be the functional regulator for all the metabolic activities inside the body and TBI patients mostly have a complex of metabolic alterations including aberrant cellular metabolism, abnormal metabolic processes, changes in hormones functions and inflammatory cascade (Rosenfeld *et al*., 2012). Mainly, those abnormal metabolic processes include hypercatabolism, glucose intolerance and hyper metabolism which can complicate the initial period of both stabilization as well as hospitalization which impact the rehabilitative treatment negatively. Nutrition support has been appreciated as a significant adjunctive therapy for those TBI patients suffering from metabolic disorders (Cook *et al*., 2008). Although, nutritional support is generally underestimated and neglected in the subgroup of TBI patients, still it is considered as an important issue for them, nutritional support for TBI patients mainly is including the appropriate formula of feeding as well as the route and timing (Bistrian *et al*., 2011).

Catabolism and hyper metabolism: Mostly after neurological injury, an increase in catabolic hormones has been noticed including cortisol, glucagon, epinephrine and norepinephrine. The elevation of those hormones seemed to be related directly to increasing the catabolic rate inside the body (Casaer *et al*., 2011). Increasing the catabolic rate will result in increasing the mobilization of amino acids from skeletal muscle which is known as gluconeogenesis, increased nitrogen excretion with accelerated muscle wasting and weight loss (Heidegger *et al*., 2013). On the other hand, hyper metabolism also can be a result of the hyper dynamic state that follows a sever neurological injury which is characterized by the elevation of catecholamine that is leading to an elevation of cardiac work and output, hypertension, tachycardia as well as increased oxygen delivery and pulmonary function (Bratton *et al*., 2007).

As a consequence of increased catabolism/hyper metabolism state, many changes can be noticed including hyperglycemia, decreased proteins (i.e., total protein, creatinine, albumin, pre albumin and transferrin) and increased C-reactive protein, followed by decreased wounds healing and decreased cell-mediated immune function. Urinary zinc lose increases with depressed serum zinc (Naval *et al*., 2011).

Hyperglycemia: TBI patients with a stress response usually generate a hyper catabolic state which leads to a rapid breakdown of the muscles, protein and hyperglycemia. Deleterious effects in neutrophil and macrophage function occur and sometimes an axonal dysfunction can happen also. The mechanism still unclear whether it's a hyperglycemia followed a metabolic stress response or it's due to lack of insulin (Bratton *et al*., 2007). Despite the mechanism happened inside the body after a neurological injury, it has been determined that an adequate level of blood glucose is associated with better outcome and lower rate of morbidity and mortality (Merenda and Bullock, 2006).

One research done through a randomized large group of surgical ICU patients and demonstrated that the control of blood glucose level reduced the rate of mortality regardless of whether or not there was a history of hyperglycemia or diabetes (Holbein *et al*., 2009). Furthermore, studies showed that the rate of intracranial pressure was increased with TBI patients who had hyperglycemia and it was associated with longer stay at hospital reduced survival as well as worse neurological outcomes and there were around 30% reduction in the mortality rate among ICU patients with head injury through the introduction of a protocol regarding the glucose level control for maintaining the blood glucose from 4-7 mmol L^{-1} (Heidegger *et al*., 2013; Holbein *et al*., 2009). Now a days, checking and controlling the blood glucose has become a part of the routing management among ICU patients (Bratton *et al*., 2007).

Metabolic response and Immuno-nutrition: The metabolic response to the head injury is different from those of starvation. During starvation the body starts to compensate through decreased metabolic rate and glycogen stores are depleted within the first 24 h and fat is becomes the main energy source, whereas proteins will be started to be converted in the late processes (Perel *et al*., 2006). In contrast, in most TBI patients, the metabolic process seemed to be a hyper metabolic state which is characterized by significant rapid negative balance and the loss from muscle mass and protein tissue in TBI is two to three times that lost during starvation state. Furthermore, lipolysis is reduced with progressive elevation of glucose tolerance and insulin levels which cause a high level of circulating glucose and this can be considered as a use of less energy especially for traumatized patients with TBI (Meierhans *et al*., 2010). Inadequate intake can be a significant problem for TBI patients as well as over intake, the over provision of calories can lead to hyperglycemia also with increased metabolic rate and oxygen consumption, fluid imbalance also may occur due to fats infiltrated liver, hyperosmotic load and fluid overload (Junpeng *et al*., 2011).

In another words, the prolonged ventilator dependence and immunosuppression can be caused by increase production rate of CO_2 as well as electrolyte imbalance, this can clarify the importance of giving ideal calories for preventing the increase of CO_2 rate and the hepatic fat deposition (Chauhan and Gatto, 2010).

Nutritional challenges in critically ill patients: The hyper metabolism status that occurs in TBI patients not only complicates the patients' stabilization and hospital duration stay but also it can extend into the rehabilitation period. An explanation for the contained increase in protein loss and metabolic process might include a prolonged immobility due to injury as well as a persistent inflammatory response (Denes, 2004). The muscle tone has an impact on the metabolic need after the acute phase illness of TBI patients, that's why inadequate nutrition intake for TBI patients can result in muscle wasting and malnutrition with many other medical complications (Hartl *et al*., 2008). Most of TBI patients become unable to take in an adequate fluid volume orally for meeting their daily requirements due to altered consciousness or impaired swallowing (Holbein *et al*., 2009; Hartl *et al*., 2008). In general, TBI patients have difficulty in communication as well as motor and cognitive dysfunction. Recent research has demonstrated that less than 30% of TBI patients are able to take their meals independently while more than 40% of them suffer from dysphagia after injury which results to be admitting to rehabilitation centers requiring EN or PN support (Hartl *et al*., 2008).

Nutritional screening vs. assessment for TBI patients

Nutritional screening: For planning a detailed care plan, available data and assessments are used and this process is known as nutritional assessment which differs from the nutritional screening. In contrast, nutritional screening is a quick assessment process which includes selecting the basic data in a large group of patients in order to identify those who may require a nutritional support (Anthony, 2008). Many tools can be used for the aim of screening such as (MUST) that's known as Malnutrition Universal Screening Tool, (Malnutrition Screening Tool (MST), Nutrition Risk Index (NRI), Mini Nutritional Assessment (MNA), Nutritional Risks Screening 2002 (NRS-2002), Short Nutritional Assessment Questionnaire (SNAQ) and Subjective Global Assessment (SGA) (Sungurtekin *et al*., 2008). Whenever a nutritional screening tool is chosen, many factors should be taken into consideration including available resources i.e., the staff as well as the level of their training and the patient population, the validation of the tools and the nutritional screening should be chosen also according to the type of populations and the care setting (Atalay *et al*., 2008). In a term of outcome predicting, some nutritional screening tools can be more appropriate for specific diseases and patients' situation compared to other tools, recent studies showed that NRS-2002 was better for orthopaedic surgery while NRI was useful for capturing both nutritional risk and outcomes (Kuzu *et al*., 2006). On the other hand, other studies have demonstrated that there were no significant difference between SGA, MI, MNA, NRI in predictive value in major surgery (Sungurtekin *et al*., 2008; Kuzu *et al*., 2006).

NUTRITIONAL ASSESSMENT

Nutritional status: The TBI patient's status needed to be assessed medically and nutritionally. The medical status of the patients can affect the nutrition part, that's why it is important to assess the patients' current diagnosis and organs function mainly including the heart, lung, liver, gastrointeste and liver (Schiesser *et al*., 2009). Underlying diseases apart from the head injury should be assessed as well especially for those which interfere with the nutritional processes including diabetes mellitus, hypertension, heart disease and renal failure (Schiesser *et al*., 2008). Nutritional Assessment is used to identify those patients who may benefit from the nutritional support and it can also suggest a specific design for that therapy (Patel and Martin, 2008).

The most difficult patients to be fed is those with multiple injuries with an elevated rate of many hormones usually including cytokines, catecholamine and insulin levels with increased protein turn over and energy expenditure. Consequently, it became so difficult to develop guidelines which are applicable to all critically ill patients especially with multiple injuries (Edelman *et al*., 2008). Data from the four assessment tools are considered, and interpreted in order to make a proper nutritional diagnosis, clinical assessment, biochemistry as well as anthropometric measurements (Higgins *et al*., 2006).

Nutritional related health indicators: The different indicators that are related to the health and nutrition include both anthropometric measurement and blood chemistry. Anthropometric measurements are used to determine both height and weight either actual or estimated for conducting the body mass index, assessing the patient situation that is associated with clinical conditions such as under nutrition or obesity and to calculate the exact patients need for his intake (Dickerson *et al*., 2004).

Most of the anthropometric measurements are difficult to obtain since the patients are critically ill and many complications will decrease the ability to take accurate measurements, even the estimated measurements may be inaccurate in the presence of a disturbed fluid balance status. Moreover, a low BMI has been shown to be considered as an independent predictor of excess mortality. Weight loss of more than 5% during a month or more than 10% during 6 months is indicating a high nutritional risk (Higgins *et al*., 2006). Different lab test can be done besides the anthropometric measurements to identify the exact patient's situation. Most of the tests done for critically ill patients are albumin, pre-albumin, hemoglobin, magnesium and phosphorus (Dickerson *et al*., 2004). Low levels of albumin for less than 35 g L^{-1} in a critically ill patient indicate a depletion status of the body protein which results in decreased sources of amino acids and protein catabolism. Recent research has showed that a relationship exists between the physical functions and protein nutritional status of patients receiving mechanical ventilation (Sung *et al*., 2004).

The differences in albumin levels between patients who were successfully weaned and others who remain ventilator dependent or died were statistically significant. Serum level of prealbumin with a half life of no more than 5 days are considered as a more immediate indicator of nutrition during hospitalization and physiological stress but in chronically critically ill patients are less frequently monitored than are albumin (Sung *et al*., 2004; Devakonda *et al*., 2008).

There are three additional biochemical indicators which are routinely used for monitoring the nutritional status in critically ill patients includ hemoglobin and trace elements phosphorus and magnesium. Hemoglobin usually used as an indicator of the oxygen carrying capacity in the blood (Ganesan *et al.*, 2009).

Magnesium deficiency can be associated with diarrhea which is a common occurrence in TBI patients who receive enteral feeding. Both magnesium and phosphorus are important for wound healing and energy synthesis and abnormal level of both of them can lead to many neurological, cardiac and neuromuscular disorders (Reddy and Mooradian, 2009).

Energy expenditure: In ICU, the energy needs for TBI patients can be determined by estimation process which can be based on a variety of guidelines. The energy demand is a function of different parameters including age, sex, body size and composition which can all be used through different formulas in order to calculate the energy demand. Furthermore, the most well known and used formula is 'Harris-Benedict equation. It has been developed to take into account many abnormal physiological states such as burns, mechanically ventilated and trauma that may markedly affect the metabolic demands of the patients (Finfer *et al.*, 2009).

Indirect calorimetry is another recommended method for measuring the resting energy expenditure in critically ill patients. It can measure indirectly the heat production through calculating the oxygen consumption and the carbon dioxide production while the values are used in specific equation to yield the exact energy expenditure in kilocalories. To have that precise value, subjects must be at rest for about 30 min or more and no food intake at least 2 h and applying the indirect calorimetry for hospitalized patients will serve values to provide both the nutrient induced thermogenesis and disease state as well (O'Flynn *et al.*, 2005).

Nutritional adequacy: For TBI patients, to ensure that nutritional adequacy is achieved, most often they are provided with nutritional supplements through parenteral or enteral feedings. Critically ill patients may often have feeding intolerance and swallowing requires multiple neurologic inputs in order to perform correctly and damage to these circuits may happen as a result of TBI in more than 60% of patients. Moreover, patients with moderate or severe TBI require mechanical ventilation, which is abrogating the possibility of the oral intake (Rosenfeld *et al.*, 2012). Therefore, most of TBI patients require alternative means of feeding including enteral and parenteral feedings. Many researchers have examined the type of the feeding and the complications, the problems and the barriers that may be associated with supplemental nutrition (Hartl *et al.*, 2008).

One study has been done on patients in long term acute care who were receiving the mechanical ventilation. The nutrition adequacy was defined as the energy intake (based on the physician orders calculated in Kilocalories) divided by the energy required (determined through indirect calorimetry). The result showed that 25% of the patients received (90-110%) of their requirements and 58% received (110% of their requirement) and they were overfed while 12% received (<90% of their requirements) and they were (45, 55). In other recent study, the nutrition adequacy has been investigated in 60 patients who were receiving enteral feedings. The nutrition adequacy was defined as the amount of energy consumed by patients divided by the amount required which has been calculated using Harris-Benedict equation. While the indirect calorimetry was used in a subgroup of 25 patients, the results showed that 30% of the patients received their required energy, 60% were over while 2% were underfed. There was a significant difference between the mean daily energy intake and the estimated energy requirements but there was no difference between the energy requirements and the estimated one determined by indirect calorimetry while five variables were taken into account including episodes of emesis, number of episodes of diarrhea, mean gastric residual volume, the number of minutes, tube feedings were with held and feeding tube replacements (Tan *et al.*, 2011). Early tube feedings were associated with reduction in hospital costs, numbers of days hospitalized, numbers of hours of mechanical ventilation and in the overall infection rates. Whereas, showed that critically ill patients who received early recommended eternal or parenteral feeding, the survival rate around six months after hospitalization (Singer *et al.*, 2009).

The advantages and disadvantages of receiving enteral (EN) and parenteral feeding (PN) are well defined. Caution is still defined in the TBI patients who is receiving high dose of vasopressors and EN as a result of case reports of bowel necrosis while it showed that provision of EN with low to moderate dose of vasopressors is safer than initially thought. Moreover, EN can provide a more comprehensive mix of micro and macronutrients such as fibers producing short chain fatty acids and medium chain triglycerides (Bullock and Povlishock, 2007). When EN access cannot be achieved within 72 h in TBI patients, PN may be considered until enteral access can be obtained regardless introducing PN early in critically ill patients are still under debate. Parenteral nutrition is often associated with an immunosuppression, increased risk of infection, hyperglycemia, hepato-steatosis and diminished the Gut-Associated Lymphoid Tissue (GALT) and the GI integrity (Krakau *et al.*, 2007). TBI patients mostly require long-term EN and gastrostomy is a more secured enteral access device and preferred then most other care facilities. TBI patients may not tolerate gastric feedings epically in the early stages, so gastric feeding can be better tolerated as the acute phase subsider (Boullata *et al*., 2007). Moreover, PEG feeding can eliminate the need for nasoenteric access since the prolonged use of the nasal feeding not only increases the likelihood of sinusitis but also increase the risk of tube dislodgement and patient discomfort. Regarding the PEG, the optimal timing of its placement has not yet been determined, although, it is advisable to wait until the TBI patients will have adequate bowel function, feeding tolerance and clinical status has stabilized, and there is no active infection or acute intracranial processes (Krakau *et al*., 2007; Boullata *et al*., 2007).

Oral diet in TBI patients: Since TBI patients in general are suffer from impaired cognition as well as physiological deficits that can affect the mechanism of swallowing. It has been reported that more than 60% of TBI patients develop dysphagia, apart from that they might have many multi injuries and complications including neurologic injury, facial fractures and dental fractures that may delay initiation of an oral diet. Most TBI patients regain their independence in receiving oral feeding within the first six months after the injury. There is a significant correlation between the TBI patient's ultimate outcome and introducing the oral diet (Kattelmann *et al*., 2006). This can diminish the severity of injury, avoidance of complications associated with EN and enteral access devices and overall greater recovery after injury (Boullata *et al*., 2007; Kattelmann *et al*., 2006).

Oral feedings is increasing the quality of a patient's life compared with gastrostomy feedings. The appropriate time for initial swallowing assessment is largely based on the patient's severity of illnesses and it is varying among practitioners. Oral intake has been typically reported to be within 2-4 weeks of injury and TBI patients should be evaluated for an oral diet even if their cognitive function is adequate and if there are no symptoms or obvious signs of dysphagia. Furthermore, the patient's swallowing ability must continue to be assessed and treated until the patient is becoming able to tolerate the least restricted diet (Ward *et al*., 2007).

Nutritional intake and requirements in TBI patients: It has been recommended to use the 'Harris-Benedict equation' to calculate the BEE for critically ill patient. Although this equation has not been studied specifically for TBI population with unique caloric requirements compared to other critically ill patients. Regardless of the method, calculating the exact needed intake amount of those individuals are very important to overcome under or overfeeding (Boullata *et al*., 2007).

Lipids are known to be calorie dense, isosmotic and useful especially during glucose intolerance while calories from lipid should not exceed 60% of the whole energy requirements, whereas the minimum calorie requirement that must be delivered as lipids in order to prevent fatty acid deficiency is 5%. There has not been an evidence based which can answer the concern regarding the maximal lipid intake or the ideal lipid ratio. If the patient receives intralipids, serum triglyceride levels should be maintained within a normal range (Briassoulis *et al*., 2006). Linoleic acid which is considered as s a major constituent of cell membranes and a precursor of both prostanoids and leukotriene synthesis. It is known as an essential fatty acid. Deficiency causes dermatitis and these deficiencies can be prevented by the minimal Free Fatty Acid (FFA) requirement, which is 5% of total calorie intake. It has an important role in the immune enhancement and it can be served as a substrate for the synthesis of prostanoids (Boullata *et al*., 2007; Briassoulis *et al*., 2006). There is an obligatory loss of 20-30 g of protein per day in a healthy patient without protein intake and protein degradation and synthesis typically increase in concert with a net loss in hyper metabolic critical trauma patients. Since TBI patients lose up to 1% of their body protein per day, 1.5-2.0 g protein kg^{-1} of ideal body weight per day is recommended (Brady *et al*., 2006). Regarding the amino acids, the needed amount of them during a stressful critical illness has been demonstrated by several clinical studies, Glutamine has been the most abundant amino acid in the body but it showed deficits during episodes of severe stress. However, glutamine production is up regulated significantly during times of trauma, stress as well as sepsis. It can serve as a nitrogen donor for ammonia synthesis in the kidney in order to increase the excretion of acid. Furthermore, It can act as a primary fuel for the enterocytes and immunologic cells, also it is important for glutathione synthesis (The safe study Investigators, 2007). Arginine can be considered as another semi essential amino acid that contributes to the immune system and metabolic function. In addition, Branched-Chain Amino Acids (BCAA) are also considered as essential and the primary energy source for the muscles (Vanhorebeek and Van den Berghe, 2004).

According to the fluid need, TBI patients often require intravenous fluid resuscitation shortly after injury to maintain adequate mean arterial as well as cerebral perfusion pressures. Episodes of hypotension in the early period have shown to be deleterious and patients with elevated ICP may receive osmotic diuretics which is also potentiating the need for the intravenous fluid supplementation, although excessive fluid volumes can decrease the cerebral compliance and increase the brain edema. That is why, extensive monitoring of both the blood pressure and the volume status must be considered for patients with moderate or severe TBI.

CONCLUSION

Clearly, treating the TBI patients encompasses many aspects of care, but still the nutritional support appears to be incredibly important and often underappreciated. Enteral feedings has been well established as the optimal route for providing nutrition needed to those individuals. How quickly clinicians should move to parenteral nutrition in the case of enteral intolerance is still not well defined and also the risks of PN as well as the value of early feeding in this population (Patel and Martin., 2008). Oral feeding can be introduced to patients when they are ready to and the type of nutrients that patients can receive depends on each patient's situation (Kattelmann *et al*., 2006). Mainly, the TBI patient exibits hyper metabolism, stress and hyper catabolism. That's why, the provision of adequate calories and protein is critical for recovery. Additional studies are needed in order to confirm the efficacy of early and the type of the nutritional intake and for identify the factors which hinder the provision of adequate nutrition to this compromised population (O'Flynn *et al*., 2005).

ACKNOWLEDGMENT

This study was supported by a research grant from The Research Council Oman (Grant No. RC/AGR/FOOD/11/01) is gratefully acknowledged.

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