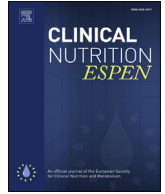




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Customized nutrition intervention and personalized counseling helps achieve nutrition targets in perioperative liver transplant patients

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SUMMARY

Background and aim: Nutritional therapy is an integral part of care in all phases of liver transplantation (LTx). However, there are several factors that make it a challenge to manage malnutrition in these patients including, but not limited to, loss of appetite, dietary restrictions and dietary habits. Dietary habits are guided by personal choice, social, cultural and regional background with diversity ranging from veganism to vegetarianism with the latter predominant in Indian population. Therefore, it is difficult to improve nutritional intake of patients with standard dietary recommendations. We evaluated the effects of implementing personalized dietary counseling and a customized nutrition plan on its ability to enhance oral intake and, thereby improve nutritional status of patients with end stage liver disease (ESLD) being evaluated for LTx. We compared the outcomes with a matched group of patients who were prescribed standard dietary recommendations from a historic database. Primary outcome was measured by number of patients achieving $\geq 75\%$ of recommended energy and protein requirements during hospitalization for LTx. Secondary outcomes included mean energy and protein intake, hours of ventilation, length of stay in Intensive Care Unit (ICU) and hospital, mortality and readmission rate in the acute phase (3months) after LTx.

Methods: This was a prospective observational study, performed at a single LTx centre. All patients >18 years who enrolled for LTx and consented for the study were included.

The study was conducted after obtaining institutional ethics committee approval.

A protocol based nutrition planning was implemented from April'14. According to this protocol, all patients being evaluated for LTx underwent a detailed nutritional assessment by a qualified Clinical Dietitian (CD) and regularly followed up with until LTx. Nutritional intervention, including a customized nutrition care plan and personalized dietary counseling, was provided based on the severity of malnutrition. To evaluate the efficacy of this protocol, we compared the nutritional adequacy (calorie and protein intake) of 65 consecutive patients who underwent LTx between August'14–October'15 (group 1) with a historic database of 65 patients who underwent LTx between January'13 and April'14 (group 2). Patients' demographics, disease severity score, baseline markers of nutritional status (subjective global assessment (SGA), and body mass index (BMI)), were recorded. First, assessment of individual patient's oral energy and protein intake was determined by the daily calorie count during hospitalization. Then the nutritional intervention (oral nutrition supplement (ONS)/enteral nutrition (EN)/parenteral nutrition (PN)) plan was customized according to their spontaneous oral intake. As part of the protocol, health related quality of life was also assessed using short form 8 (SF-8) in group 1. Statistical analyses using Pearson's correlation, Chi-Square test were applied with SPSS version 20.0.

Results: The mean age of group 1 and 2 were 52.6 ± 9.8 , 51.9 ± 10.5 (range 25–70 years) with BMI of 26.8 ± 6.0 , 26.5 ± 5.4 respectively. According to SGA, there was significant improvement in the nutritional status of group 1 patients compared to group 2 on admission for LTx. It was indicated that 88% of group 1 individuals in comparison to 98% in group 2 were malnourished. The calorie intake of group 1 (1740.2 ± 254.8) was significantly higher than group 2 (1568.5 ± 321.6) ($p = 0.005$). The marked improvement in protein intake in group 1 (63.1 ± 12.1) when compared with group 2 (53.1 ± 13.4) was statistically significant ($p = 0.008$). A subset analysis showed that non-vegetarians (consuming meat and

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dairy products) between the groups showed that group 1 had a significantly higher calorie ($p = 0.004$) and protein ($p = 0.0001$) intake compared to individuals in group 2.

Following implementation of study's protocol, the goal of achieving $\geq 75\%$ of the prescribed calories ($p = 0.013$) and protein ($p = 0.0001$) was significantly higher in group 1.

Conclusion: When compared to the standard prescription, an individualized protocol to diagnose, stratify the severity of malnutrition early, and follow up by customized nutrition planning for patients helped to achieve nutritional targets more effectively. In spite of patients' diversity in nutritional habits and reluctance to accept change, it is clear that a qualified and dedicated transplant nutrition team can successfully implement perioperative nutrition protocol to achieve better nutritional targets.

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Liver transplant (LTx) has been established as a viable option for patients with end stage liver disease (ESLD). Nutritional therapy is an integral part of care in all phases of LTx. Although many aspects relating to assessment and stratification of malnutrition in these patients have previously been addressed, it is still challenging to manage malnutrition in LTx patients.

There are many factors that cause malnutrition in these patients including loss of appetite, dietary restrictions and dietary habits. The diversity of dietary habits are guided by personal choice, social, cultural and regional background. India has more vegetarians than the rest of the world put together [1]. In India, vegetarianism is usually synonymous with lacto vegetarianism. According to the 2006 Hindu-CNN-IBN State of the Nation Survey, 31% of Indians were vegetarian, while an additional 9% consume eggs (ovo-vegetarian) [2]. An official survey conducted by the Government of India, with a sample size of 8858 and the census frame as 2011, indicated India's vegetarian population to be 28–29% of the total population [3]. Compared to a similar survey done almost a decade earlier, India's vegetarian population has increased [4]. In 2007, UN FAO statistics indicated that Indians had the lowest rate of meat consumption in the world [5]. Indians, who do eat meat, do so infrequently, with less than 30% consuming it regularly, mainly due to cultural reasons [6]. These dietary restrictions and variations (vegetarianism & ovo-lacto vegetarianism (49.2%) in the study population) result in differing severity as well as type of malnutrition and therefore diminish the effectiveness of a standardized prescription to achieve uniform compliance and nutritional targets. It is also important to identify and correct nutritional deficiencies and provide adequate nutritional support during the pre & perioperative phase.

The aim of this study was to understand the effects of implementing a customized nutrition plan and personalized dietary counseling to enhance oral intake to ameliorate the nutritional status of patients with ESLD evaluated for LTx. Furthermore, the protocol's influence on post-operative outcomes was compared to a historic database with a standard dietary prescription. The primary outcome was the number of patients achieving $\geq 75\%$ of recommended energy and protein requirements during hospitalization for LTx. Secondary outcomes included mean energy and protein intake, hours of ventilation, length of stay in Intensive Care Unit (ICU), hospital, mortality and readmission rate in the acute phase (3months) after LTx.

1. Methods

This prospective observational study was performed at a single LTx centre and included all patients >18years who were enrolled for LTx and consented to participate in the study. All patients who were evaluated for LTx (either as inpatients in wards (48%) or as outpatients (52%)) were assessed by a qualified Clinical Dietitian (CD) and were regularly followed up with till LTx. Patients were admitted

to the LTx Intensive Care Unit (ICU) from home for the transplant and nutrition assessment was completed within 24 hours of admission by the same Clinical Dietitian who assessed in the pre-operative phase. Nutritional intervention was based on the severity of malnutrition as indicated by the assessment and included a customized nutrition care plan and personalized dietary counseling. A perioperative nutrition protocol was implemented to improve the nutritional intake of ESLD patients in the LTx ICU. To analyze the effect of this protocol on achieving nutritional targets, the prospectively maintained database of 65 consecutive patients who were evaluated since April'14 and underwent LTx between August'14 – October'15 (group 1) were compared to the historic database of 65 patients who underwent LTx between January'13 – April'14 (group 2).

1.1. Nutritional assessment

Subjective Global Assessment (SGA) is a method for evaluating nutritional status based on a practitioner's clinical judgment rather than objective and quantitative measurements. Encompassing historical, symptomatic, and physical parameters, SGA aims to identify an individual's initial nutrition state and consider the interplay of factors influencing the progression or regression of nutrition abnormalities. This method of assessment has been successfully used to assess nutritional status in general medical and surgical patients, it shows good to excellent interobserver reproducibility and good convergent validity [7].

1.2. Dietary intake and assessment

On a daily basis, the CDs evaluated the patients' spontaneous dietary intake, with regard to nutrition requirements, using calorie count during hospitalization. The amounts consumed of each portion of food/beverage were visually assessed and recorded in quartiles (0%, 25%, 50%, 75%, and 100%) by the nursing staff. This is a validated method to assess food intake [8]. During daily rounds, the CDs encouraged and provided nutrition guidance to patients or the nursing staff to support patients' chances of obtaining an adequate nutrition intake. An average intake of estimated energy and protein intakes were recorded in calories and grams per day respectively by the CDs daily and change in care plan was suggested accordingly. The objective was to determine the adequacy of calorie and protein intake per patient with minimum reporting bias. The calculation of calories and protein of food and beverages (composition of the diet) were based on local reference data [9]. Patients on special nutritional support (EN/PN) were monitored daily for nutritional adequacy, interruptions etc., and modification in the nutritional intervention were planned accordingly. As per the ESPEN guidelines, a patient was considered to have met nutritional goal if his or her intake was 35 cal/kg/d of energy and 1.5 g/kg/d of protein and

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