Open Journal of
Clinical & Medical
Case Reports

Volume 1 (2015)
Issue 10

ISSN 2379-1039

Nutrition in Liver Transplant Recipients: Case Series

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Abstract

Malnutrition is almost universally present in End Stage Liver Disease patients undergoing liver transplantation. Medical nutrition therapy is necessary and beneficial during all phases of liver transplantation. Three adult male patients were followed from their pre–liver transplant phase till chronic post transplant phase (three months after the transplant). Nutrition assessment by various tools showed deranged results. Improvement in nutrition status, quality of life and performance status was seen from pre transplant to chronic post transplant phase. Gradual increase in calorie and protein intake was seen in the acute post transplant phase due to provision of day to day nutrition support. Aggressive nutrition monitoring/ strict nutrition support were lacking in the pre and chronic post transplant phase for all three patients.

Keywords

Nutrition; Malnutrition; Nutrition status; Nutrition support; Liver transplant

Abbreviations

LT: Liver Transplantation; ESLD: End Stage Liver Disease; HCV: Hepatitis C Virus; CLD: Chronic Liver Disease; LDLT: Living Donor Liver Transplant; CTP: Child Turcotte Pugh; MELD: Model for End Stage Liver Disease; MUAC: Mid Upper Arm Circumference; MAMC: Mid Arm Muscle Circumference; TSF: Triceps Skin Fold; MUAC: Mid Upper Arm Circumference; BMI: Body Mass Index; SGA: Subjective global Assessment; HGS: Hand grip strength; GI: Gastro Intestinal; SNAQ: Simplified Nutritional Appetite Questionnaire; ECOG: Eastern Cooperative Oncology Group; QoL: Quality of Life; POD: Post Operative Day

Introduction

Liver transplantation (LT) is the only treatment for End Stage Liver Disease (ESLD) patients [1]. Malnutrition prevalence in ESLD is estimated as 65%-100% [2, 3]. Malnutrition has been associated with adverse outcomes, including post-transplant survival and decreased patient and graft survival after LT [4,5]. Moderate-to-severe malnutrition was associated with prolonged ventilator support, increased incidence of tracheostomy, and longer intensive care unit and hospital stays [6, 7]. An aggressive approach to nutritional repletion is necessary to improve the metabolic reserves, hepatic function, and better outcome after LT [8]. Hence, timely nutrition assessment and interventions may improve outcomes surrounding LT.

Medical Nutrition Therapy by a registered dietician is crucial step in all the phases of LT for improved surgical outcomes [9].Nutrition intervention/ therapy for LT are divided into three phases:

1.) A pre-transplant nutrition assessment which should include a variety of parameters including physical assessment, history, anthropometric measurements, and laboratory tests to provide the complete nutrition picture of LT patients [5, 10]. Nutrition intervention before LT should focus on provision of adequate nutrients without aggravating ESLD symptoms like ascites, anorexia, encephalopathy etc [9].

2.) Acute Post transplant - Catabolism occurs in the acute post-transplant phase due to surgery and corticosteroid administration [11]. Hypermetabolism may be an indicator of a high risk population characterized by more severe malnutrition, greater hemodynamic abnormalities and a poorer outcome after transplantation [12]. Administration of high energy and protein feed through various routes to achieve adequate nutrients intake is the key nutrition recommendation.

3.) Chronic Post transplant- The focus of nutrition management in chronic post-LT phase is prevention. Hence, aggressive nutrition therapy for improved survival and better Quality of Life (QoL) after LT is of utmost importance [9].

Case Series Presentation: Case 1

Pre-transplant phase: A 54 year Indian male patient diagnosed with Hepatitis C Virus (HCV) related Chronic Liver Disease (CLD) underwent Living Donor Liver Transplant (LDLT) (Child Turcotte Pugh (CTP) Score [13] 10, Model for End Stage Liver Disease (MELD) Score [14] 22). Medical history showed patient suffered from jaundice (two years), ascites (four months) and excessive fatigue (15-20 days). The patient was admitted 1day before LT. Pre-LT biochemical parameters depicted deranged results (Figure 1 to 3).

Nutrition status assessment (Table-1) by anthropometry depicted moderate malnutrition by Mid Upper Arm Circumference (MUAC) [15], mild malnutrition by Mid Arm Muscle Circumference (MAMC) and severe malnutrition by Triceps Skin Fold (TSF) [16]. Body Mass Index (BMI) showed normal nutrition status [17] and severe malnutrition by BMI for ascites [18]. Subjective Global Assessment (SGA) showed moderate malnutrition [19]. Hand Grip Strength (HGS) (both hands) depicted severe malnutrition [20]. Body composition analysis portrayed a standard physique of the patient with normal body composition [21].

Diet history depicted that patient was not suffering from any gastro intestinal (GI) symptoms, dental or oral problem, food allergies and alcoholism. Simplified Nutritional Appetite Questionnaire (SNAQ) score was 16 and showed no significant risk of weight loss [22]. Oral normal diet with supplements providing 2300 kcal and 94 gram of proteins with salt (2gram) and fluid restriction (1.5 litre/day) was recommended [9]. Patient intake was only 1807 kcal and 78 grams and of protein which indicated consumption of 78.5% of the recommended calories and 82.9% of recommended protein intake.

ECOG (Eastern Cooperative Oncology Group) Performance Status score was 4 which indicated that the patient was completely disabled; could not carry on any self-care activity and was totally confined to bed or chair [23]. QoL assessment by Short Form-36 (SF-36) interview showed lower scores

in its all eight dimensions which depicted lower QoL status of the patient (figure-4) [24].

Acute post transplant phase: Current levels of blood parameters are required to plan the nutrition therapy programme. Deranged biochemical parameters are presented in Figures 1-3. The patient was in ICU for 4 days. The day to day nutrition profile of the patient showed that after extubating the patient within 24 hours 200ml of 20% albumin and KCL 35ml was provided intravenously as the albumin levels were low (figure-1). On Post Operative Day (POD)-3, KCL 40 ml was provided intravenously along with oral liquids (250 kcal). At POD-4 oral liquids provided 476 kcal and 24 grams proteins and 264 kcal and 30gm proteins were given from oral supplements. On POD-5, oral high protein soft diet with supplements providing 2730 Kcal and 117 grams of protein along with 100ml of 20% albumin intravenously was provided to the patient. From POD-6 till discharge the patient followed an oral high protein normal diet with supplements providing 2730 kcal and 117 grams protein. Because of lower albumin levels after LT (Figure-1) 200ml of 20% albumin was given intravenously from POD-8 to POD-14. The patient could not complete his meals especially the main meals like lunch and dinner because of nausea. Gradual improvement in the energy and protein intake indicated in figure 5-6; depicted an increasing trend of energy consumption which showed patient in positive nutrition balance. After POD-8 a small decrease in the intake was seen that improved gradually. Intake from supplement showed a steep decrease after POD-12 as the patient refused intake of supplement. From POD-13 there was steep decrease in potassium levels hence a high potassium diet was recommended (figure-3). The patient met 61.7% of the recommended calorie intake and 75.6% of the recommended protein intake. The patient was discharged on a high protein, potassium rich normal diet, 2730 kcal and 117grams of proteins out of which 528 kcal and 30 grams of protein was recommended through nutrition supplements [9]. He was recommended multivitamins and medications, regular glucose monitoring and avoiding outer source of infection as other discharge advice.

Chronic post transplant phase: Gradual improvement in all the biochemical parameters was seen after 3 months of LT (Figure 1-3). The patient regularly visited Hepatologist after the surgery but never visited the dietician. The patients' intake was 1794 kcal and 96 grams of protein from oral diet and 264 kcal and 30 grams protein from nutrition supplement. The recommended intake amounts to 2730 kcal and 117 grams of protein [9]. Hence, patient met 87.9% of recommended calorie requirements and 82% of the recommended protein requirements. The patient was not having any GI problem; he was able to perform daily routine functions. The SNAQ score was 17 which showed no significant risk of weight loss [22]. QoL assessment depicted improvement of all the eight dimensions three months after LT (figure-4) [24]. ECOG performance status score improved from 4 to 1 [23]. Nutrition status depicted in table-1 showed, MUAC [15] became normal after the transplant, and MAMC [16] showed improvement from mild malnutrition to normal. TSF was similar with severe malnutrition after LT [16]. BMI was normal [17]. BMI for ascites depicted severe malnutrition in both the phases of LT [18]. SGA scores improved from moderate malnutrition to normal [19]. HGS (both hands) showed severe malnutrition similar to pre transplant phase [20]. Body composition analysis depicted normal levels after three months of LT [21].

Case Series Presentation: Case 2

Pre-transplant phase: A 54 year Indian male patient diagnosed with Ethanol and HCV related CLD underwent LDLT (CTP Score [13] 8, MELD Score [14] 14). Medical history showed patient suffered from

jaundice (two years), ascites (three months) and excessive fatigue (15 days). The patient was admitted 12 days before LT. Biochemical parameters before LT depicted deranged results (Figure 7-9).

Nutrition status assessment depicted in table-1 showed mild malnutrition by MAMC, severe malnutrition by TSF [16] and normal nutrition status by MUAC [15], BMI [17] and BMI for ascites [18]. SGA showed Moderate Malnutrition [19]. HGS (both hands) showed severe malnutrition [20]. Body composition analysis showed standard physique of the patient with normal levels [21].

Diet history depicted that patient was not suffering from any GI symptoms, dental or oral problems, food allergies. SNAQ score was 16 hence there was no significant risk of at least 5% weight loss within six months [22]. The patient was alcoholic (CAGE score >2) [25]. He was recommended oral normal diet with supplements providing 2700 kcal and 115 grams of proteins with 2 grams salt and fluid restriction (1.5 litre/day) [9]. Patient intake was 1100 kcal and 40 gram protein indicating consumption of 40.7% and 34.7% the recommended calories and proteins respectively.

ECOG Performance Status score of 3 indicated that patient was capable of only limited self care and unable to carry out any work activities that was ≥ 50% of working hours [23]. QoL was low before the LT as the patient had lower scores in all the eight dimensions of QoL assessment (figure-4) [24].

Acute post transplant phase: Deranged biochemical parameters in this phase are presented in Figure 7-9. The patient was in ICU for 3 days. The day to day nutrition profile of the patient showed that at POD-1 patient was extubated within 24 hours and was provided with *Propofol* 45ml (1kcal/ml) and Dextrose Normal Saline 440ml (17kcal/100ml), KCL 45ml intravenously. On POD-2 only 120 kcal was provided through 120ml of *Propofol* intravenously. On POD-3 KCL 40ml along with oral liquids (250 kcal) was given. POD-4, oral high protein normal diet with supplements (2700 Kcal and 115 gram protein) was provided. After POD-9 there was an abnormal rise in potassium levels hence the patient was recommended low potassium diet (Figure-9). The patient could not complete meals (especially lunch and dinner), because of nausea and taste of food. An increasing trend of energy and protein consumption after LT during hospital stay is indicated in figure 10-11. The patient met 76.4% and 103% of the recommended calorie and protein intake respectively. On POD-15 patient got discharged on a high protein, low potassium, normal diet (2700 kcal and 115 grams proteins) [9] out of which 375 kcal and 36 grams of protein were from low potassium nutrition supplements and about 352 kcal and 24 grams protein through high calorie-protein biscuits. He was also recommended multivitamins and potassium binding medications, regular glucose monitoring and to avoid outer sources of infection.

Chronic post transplant phase: Gradual improvement in all the biochemical parameters was seen after 3 months of LT (Figure 7-9). The patient regularly visited Hepatologist after the surgery but never visited the dietician. The patients' intake was 1983 kcal and 78.9 grams protein from oral diet without any nutrition supplement. The recommended intake amounts to 2280 kcal and 76 gram of protein [9]. Hence, patient met 83.9% and 103.8% of calorie and protein requirements respectively. The patient was not having any GI problem; he was able to perform daily routine functions. The SNAQ score was 16 which showed no significant risk of at least 5% weight loss within six months [22]. QoL assessment depicted improvement of all the eight dimensions three months after LT (figure-4) [24]. ECOG performance status assessment improved from a score of 3 to 1 which indicated that the patient was restricted in physically strenuous activity but was ambulatory and able to carry out work of a light or sedentary nature [23].

Nutrition status assessment is depicted in table-1. Anthropometric examination showed similar results as of pre-transplant in MUAC [15], MAMC [16], BMI [17] and BMI for Ascites [18]. Triceps improved from severe malnutrition to normal range [16]. SGA scores improved from moderate malnutrition to normal [19]. Body composition analysis depicted higher levels of fat%, fat free mass after three months of LT [21] HGS (both hands) showed severe malnutrition similar to pre transplant phase [20].

Case Series Presentation: Case 3

Pre-transplant phase: A 64 year Indian male patient diagnosed with Decompensated Ethanol related CLD with Coronary Artery Disease underwent LDLT (CTP Score [13] 9, MELD Score [14] 14). Medical history showed that patient suffered from jaundice (6 months), ascites and dark urine (three months) and excessive fatigue (15 days). The patient was admitted 1 day before LT. Biochemical parameters before LT depicted deranged results (Figure 12-14).

Nutrition status assessment by anthropometry depicted normal state by MUAC [15] and MAMC but severe malnutrition by TSF [16]. BMI [17] showed normal state but BMI for ascites showed severe malnutrition [18]. Moderate Malnutrition by SGA [19], HGS (both hands) showed severe malnutrition [20] and Body composition analysis depicted low levels of fat%, fat mass [21] (Table-1).

Diet history depicted that patient was not suffering from any GI symptoms, dental or oral problem and food allergies. SNAQ score was 15 hence there was no significant risk of weight loss [22]. The patient was alcoholic (CAGE score >2) [25]. He was recommended oral normal diet with supplements providing 2695 kcal and 115 grams of proteins with salt (2gram) and fluid restriction (1.5 litre/day) [9]. Patient intake was 1170 kcal and 75 grams protein indicated consumption of 43.4% and 65.2% of the recommended calories and proteins respectively.

ECOG Performance Status score of 2 indicates that patient was "ambulatory and capable of all self-care but unable to carry out any work activities" [23]. QoL assessment depicted low levels in its eight dimensions (figure-4) [24].

Acute post transplant phase: Biochemical parameters showed deranged results in this phase (Figure 12-14); these altered blood parameters were considered to exercise the appropriate nutrition therapy plan. The patient was in ICU for 9 days. At POD-1 patient was extubated within 24 hours and was provided with *Propofol* 117ml (117 kcal) + KCL 85ml+ 20% Albumin 200ml intravenously. On POD-2 the patient was started with liquid diet with supplement providing 676 kcal and 48 grams of protein. On the POD-5, the patient was started with soft diet providing 2695 kcal and 115 grams of protein. The patient was progressed to normal diet by POD-8. On POD-10 the patients' potassium levels were high and were given high protein low potassium normal diet orally till discharge. The patient could not consume his meals completely especially the main meals like lunch and dinner; the reason for low intake was primarily nausea. Gradual improvement in the energy and protein intake is indicated in figures 15-16. This depicted an increasing trend of energy and protein consumption indicating patient in the positive nutrition balance after the transplant. The patient met 57.5% of the ideal calorie intake and 69.2% of the ideal protein intake.

Chronic post transplant phase: Gradual improvement in all the biochemical parameters was seen after 3 months of LT (Figure 12-14). The patient regularly visited Hepatologist after the surgery but never

visited dietician. The patient did not suffer from any other medical problem after LT. 1559 kcal and 73.6 grams of protein from oral diet and 264 kcal and 30gm protein from supplement was the patient's intake. The recommended intake amounted to 2310 kcal and 77 grams of protein [9]. Hence, patient met 67.4% of calorie requirements and 95.5 % of the protein requirements. The patient was not having any GI problem; he was able to perform daily routine functions. The SNAQ score was 18 which showed no significant risk of weight loss [22]. QoL assessment depicted improvement of all the eight dimensions three months after LT (figure-5) [24]. The performance status assessment by ECOG improved from a score of 2 to 1 [23].

Nutrition status assessment is depicted in table-1. Anthropometric examination through, MUAC [15], MAMC [16] and BMI [17] showed similar results in both phases of LT and that was normal. TSF improved from severe malnutrition to normal range [16]. Severe malnutrition was depicted by BMI for ascites in both phases of LT [18].SGA scores improved from moderate malnutrition to normal [19]. Body composition analysis depicted normal levels of fat %, fat free mass after three months of LT [21]. HGS (both hands) showed severe malnutrition similar to pre transplant phase [20].

Discussion

In general, patients with ESLD have significant malnutrition before LT. Accurate estimation of the nutritional status in patients with ESLD presents a major challenge due to fluid retention found in patients and the effect of liver function on protein synthesis [26]. The metabolic disturbances in ESLD patients show improvement after successful LT. The operative stress, malnutrition, surgery complications and fasting periods before the LT suggests early nutrition support after LT [27]. In chronic post phase aggressive nutrition therapy can improve the common post-transplant problems of obesity, hyperlipidemia, hypertension, diabetes mellitus, and osteoporosis [28-32]. In India, LT is a relatively new area and there is lack of data about the general and nutritional profile of patients undergoing LT. Hence, these case reports provide the information on the day to day nutrition profile and the medical nutrition therapy of LT recipient with the aim of improving surgery outcomes.

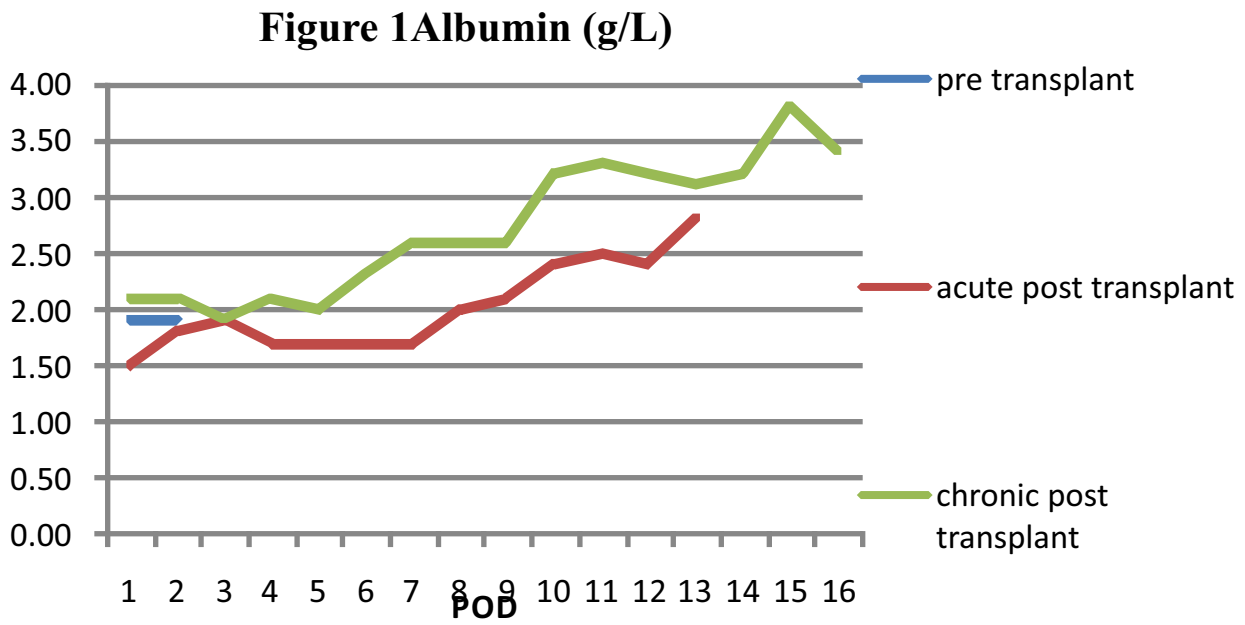
A gradual improvement in the nutrition, biochemical and functional capacity of the patients were seen with continuous follow up and care after the three months of the transplant. The pre transplant assessment depicted patients as malnourished with low levels of dietary intake. During the acute post transplant phase, the patient was under the continuous observation of the medical and nutrition experts; hence the nutrition needs were met through various routes of feeding. But the difference in the calorie and protein intake in chronic post transplant phase is because of lack of counselling from a nutrition expert.

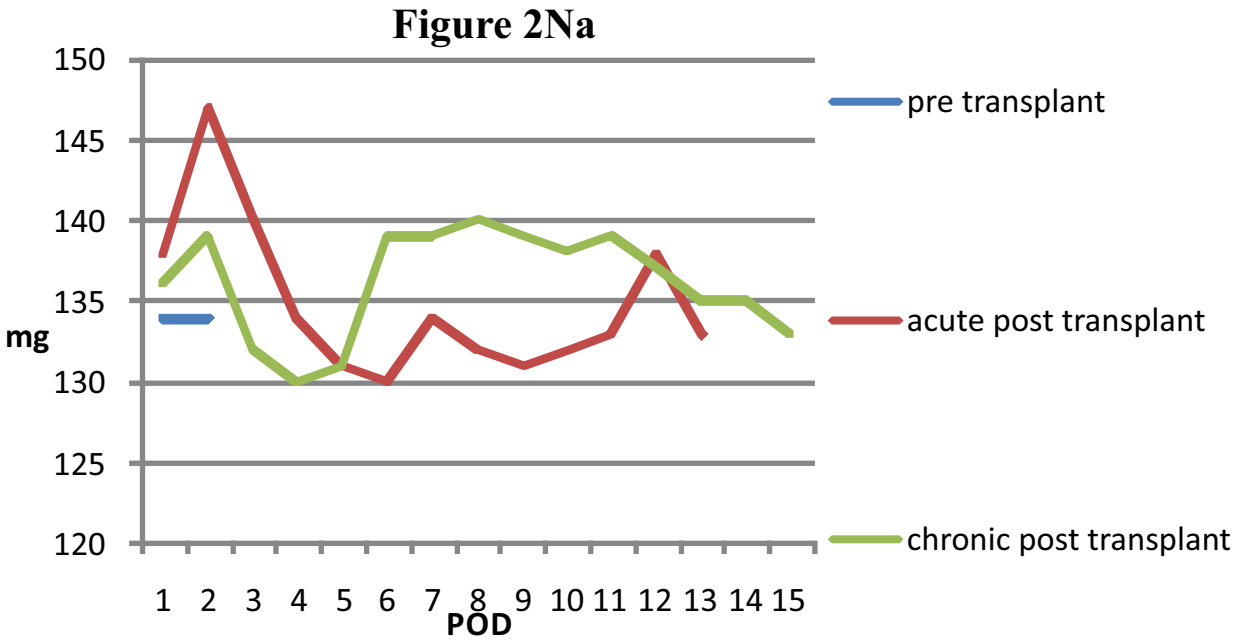
Considering the importance of nutrition therapy in all the phases of LT [9, 27] proper nutrition monitoring is required throughout transplant to maintain the overall health of the patient. Frequent follow ups with the dietician can improve the nutritional health of the patient in the pre-LT phase and chronic post transplant phase.

Table 1: Nutrition Assessment of the Case I, II, III

		Nutrition Assessment by various nutrition assessment methods									Body Composition analysis by BIA				
		Weight (kg)	Height (cms)	MUAC (cms)	TSF (cms)	MAMC (cms)	BMI (kg/m²)	BMI for ascites	SGA (Score)	HGS	Weight (Kg)	Fat%	Fat mass (kg)	Fat Free Mass (kg)	Muscle Mass (kg)
CASE I	Pre-LT	74.7	178	22	0.85	19.3	24.9	24.9	6	18 Kg	79.35	19.7	15.65	63.7	60.4
	Evaluation			Moderate malnutrition	Severe Malnutrition	Mild malnutrition	Normal	Severe malnutrition	Moderate malnutrition	Severe malnutrition	Normal	Normal	Normal	Normal	Normal
	Chronic Post-LT	62	178	23.3	0.63	21.3	21.7	21.7	3	18 Kg	60.7	16	9.70	51.05	48.4
	Evaluation			Normal	Severe Malnutrition	Normal	Normal	Severe malnutrition	Normal	Severe malnutrition	Low	Normal	Normal	Normal	Normal
CASE II	Pre-LT	73.9	176	23.8	0.56	22	23.2	23.2	6	44	72.55	22.5	16.3	56.25	53.35
	Evaluation			Normal	Severe Malnutrition	Mild malnutrition	Normal	Normal	Moderate malnutrition	Severe malnutrition	Normal	Normal	Normal	Normal	Normal
	Chronic Post-LT	78.6	176	26	1.5	21.2	24.5	24.5	2	28	76.6	28	21.45	55.15	52.3
	Evaluation			Normal	Normal	Mild malnutrition	Normal	Normal	Normal	Severe malnutrition	Normal	High	High	Low	Low
CASE III	Pre-LT	67.8	177	24.3	0.61	22.3	21.6	21.6	8	28	67.3	9	6.10	61.25	58.1
	Evaluation			Normal	Severe	Normal	Normal	Severe malnutrition	Moderate	Severe malnutrition	Normal	Low	Low	Normal	High
	Chronic Post-LT	62	177	23.3	0.63	21.3	21.7	21.7	3	31	69.35	20.1	13.95	55.4	52.5
	Evaluation			Normal	Severe	Normal	Normal	Severe malnutrition	Normal	Severe malnutrition	Normal	Normal	Normal	Normal	Normal

(BIA: Bioelectrical Impedance Analysis MUAC: Mid Upper Arm Circumference, TSF: Triceps Skin Fold, MAMC: Mid Arm Muscle Circumference, BMI: Body Mass Index, SGA: Subjective Global Assessment, HGS: Hand Grip Strength)





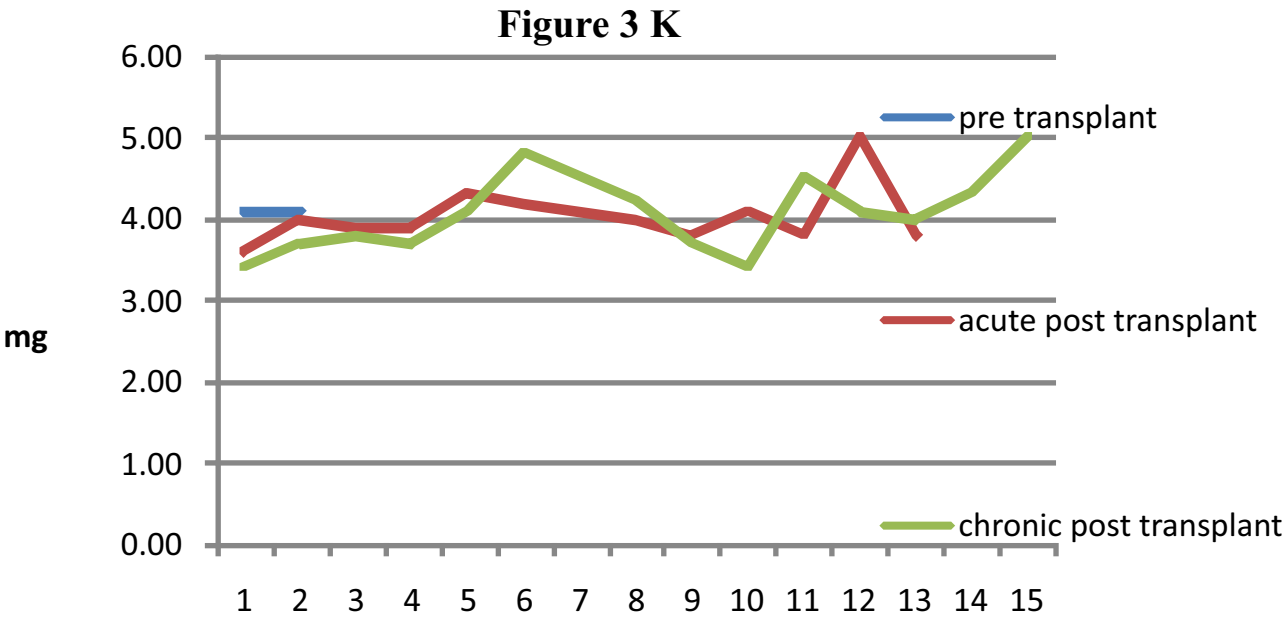


Figure 1-3: Case I profile of Albumin, Sodium, and Potassium.

Figure 4: Quality of Life

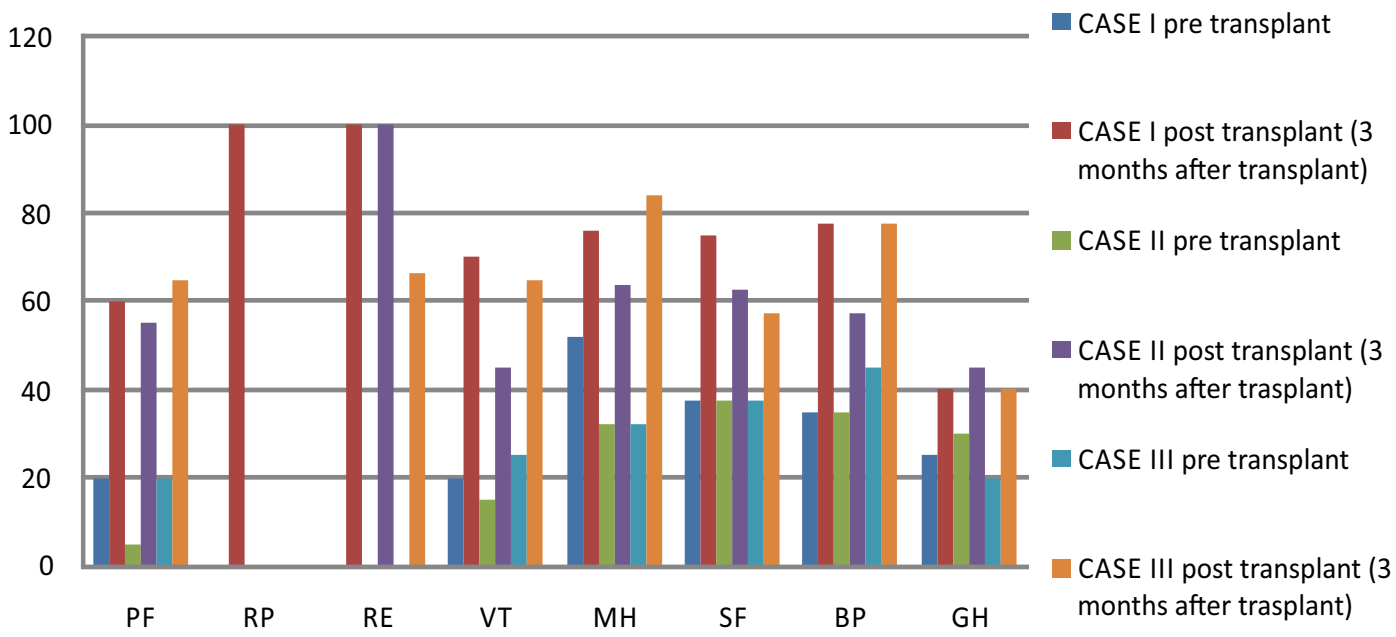
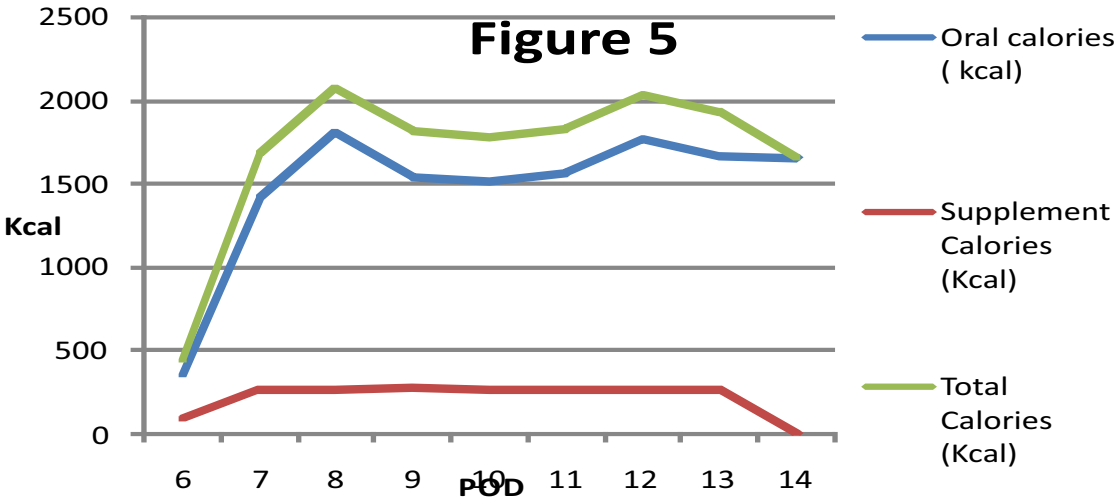


Figure 4: Comparison of QoL by SF-36 questionnaire pre and post transplant (Case I,II,III) (PF: Physical functioning, RP: Role limitation due to physical health, RE: Role limitation due to emotional problem, VT : Vitality, MH: Mental Health, SF: Social Functioning, BP: Bodily Pain, GH: General Health)



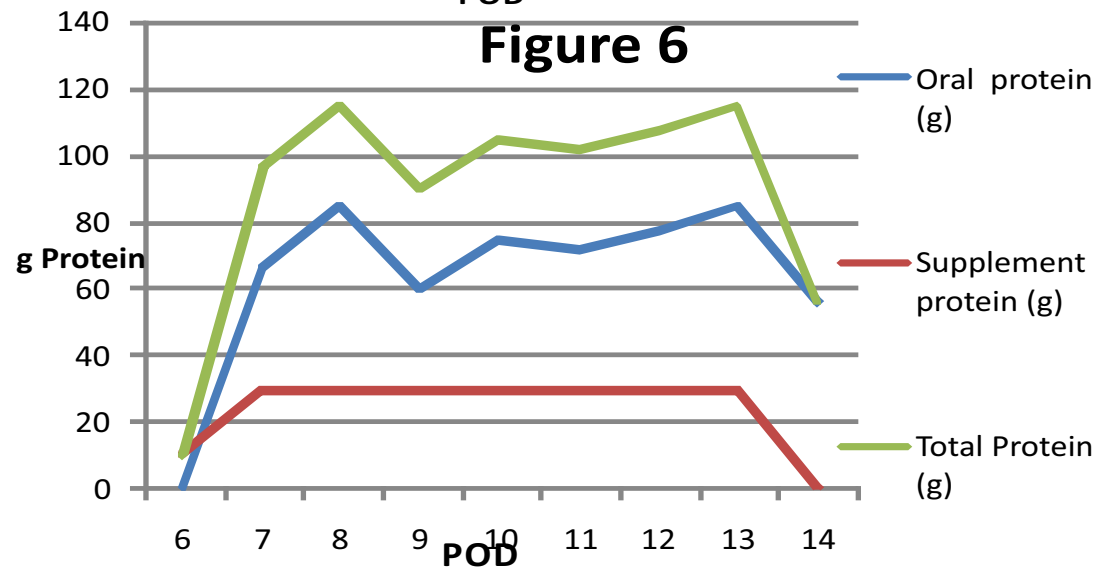
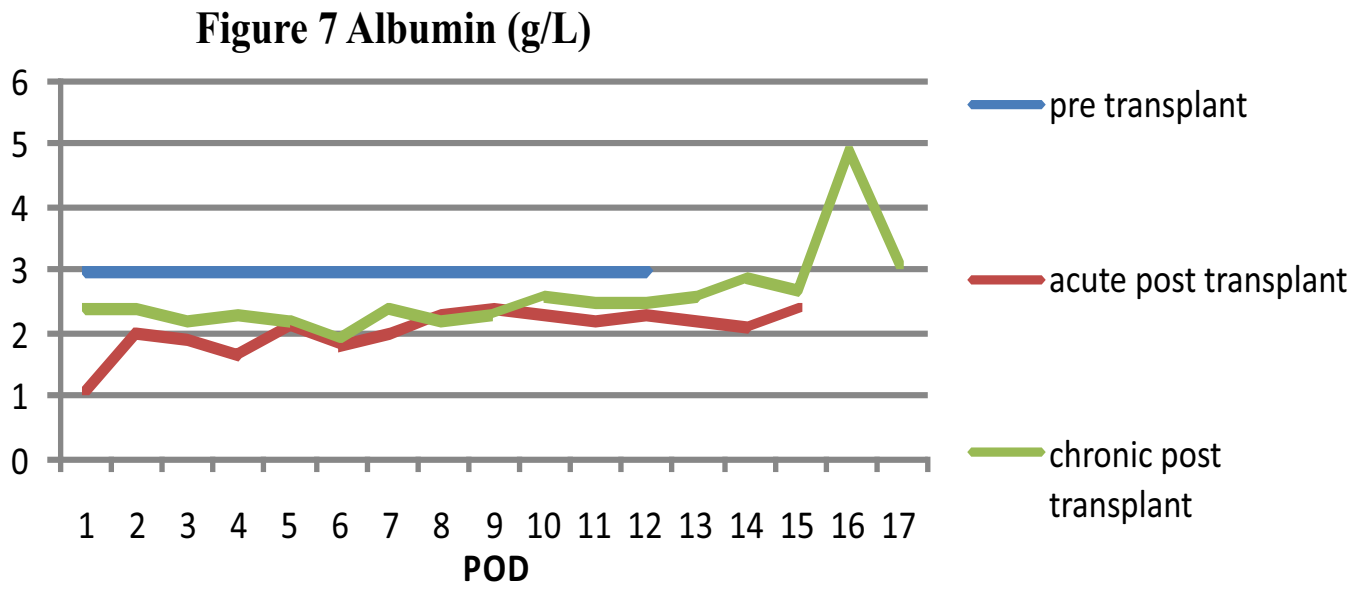
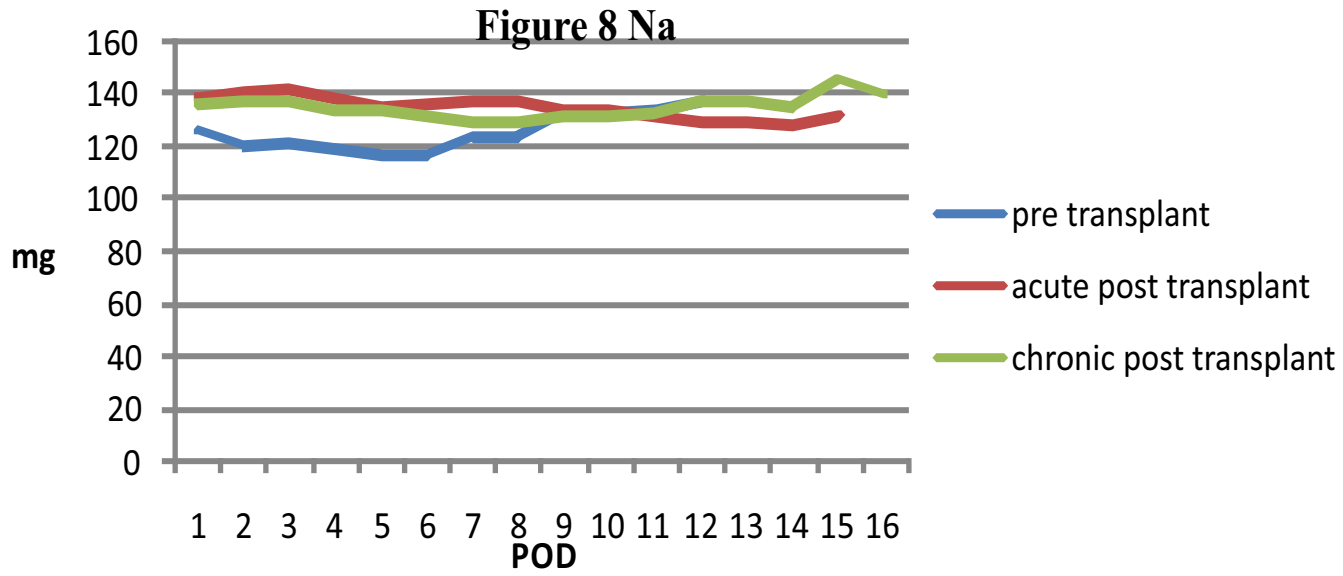


Figure 5 & 6: Energy and protein intake of Case I during the hospital stay after LT.





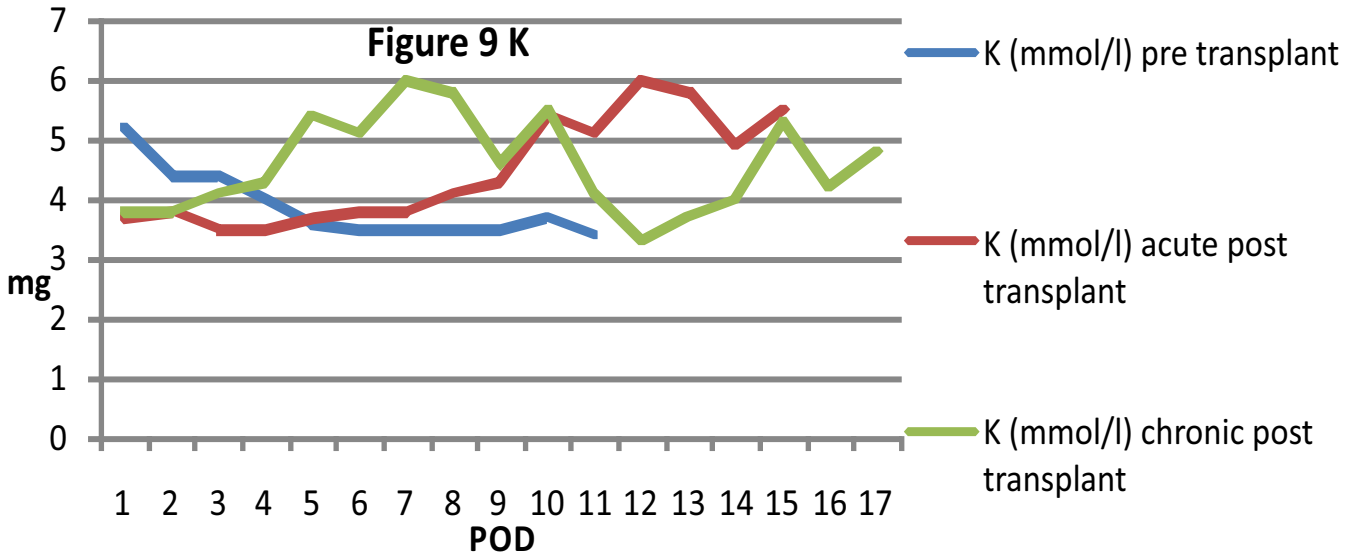


Figure 7-9: Case II profile of Albumin, Sodium, and Potassium.

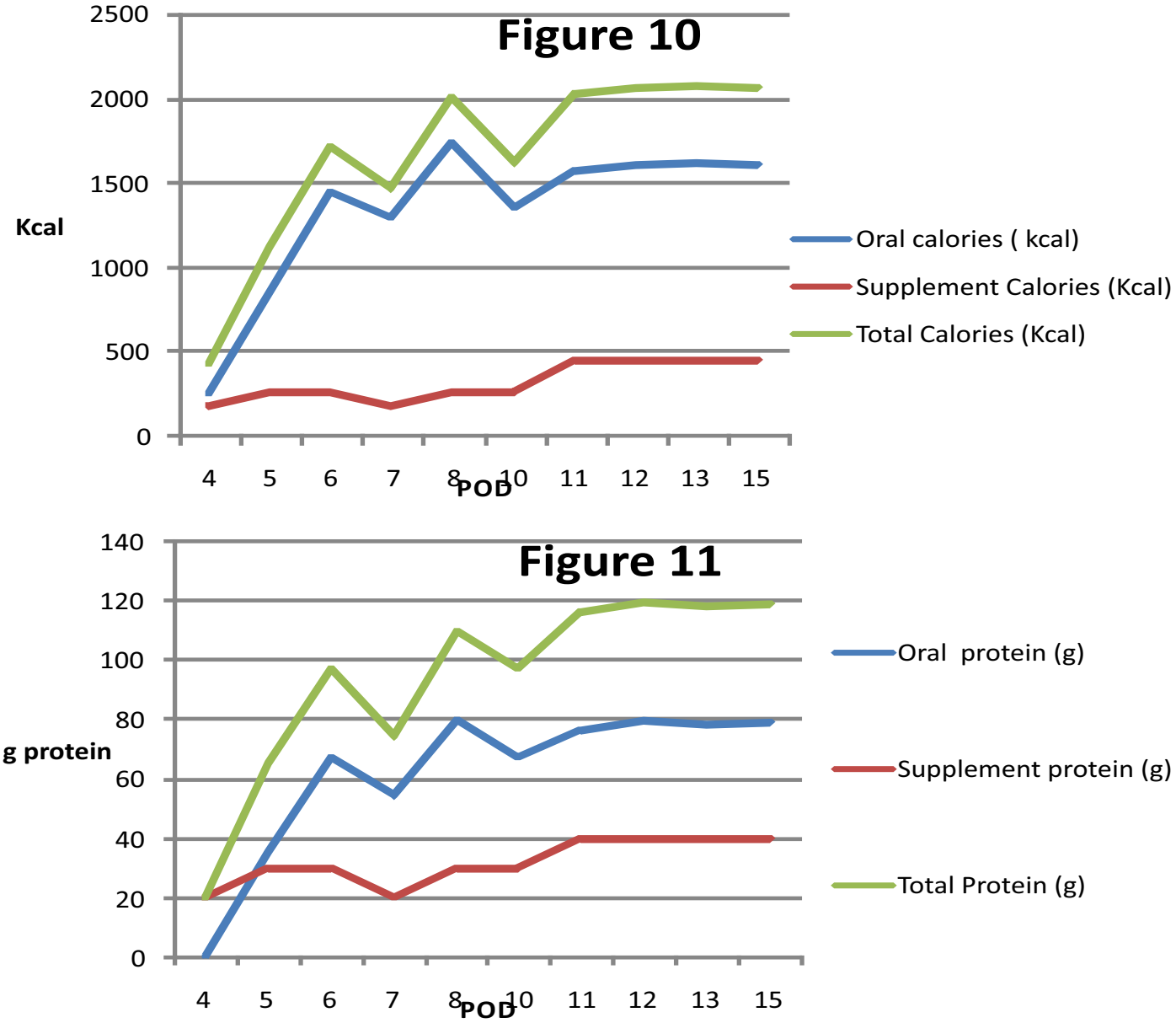


Figure 10,11: Energy and protein intake of Case II during the hospital stay after LT.

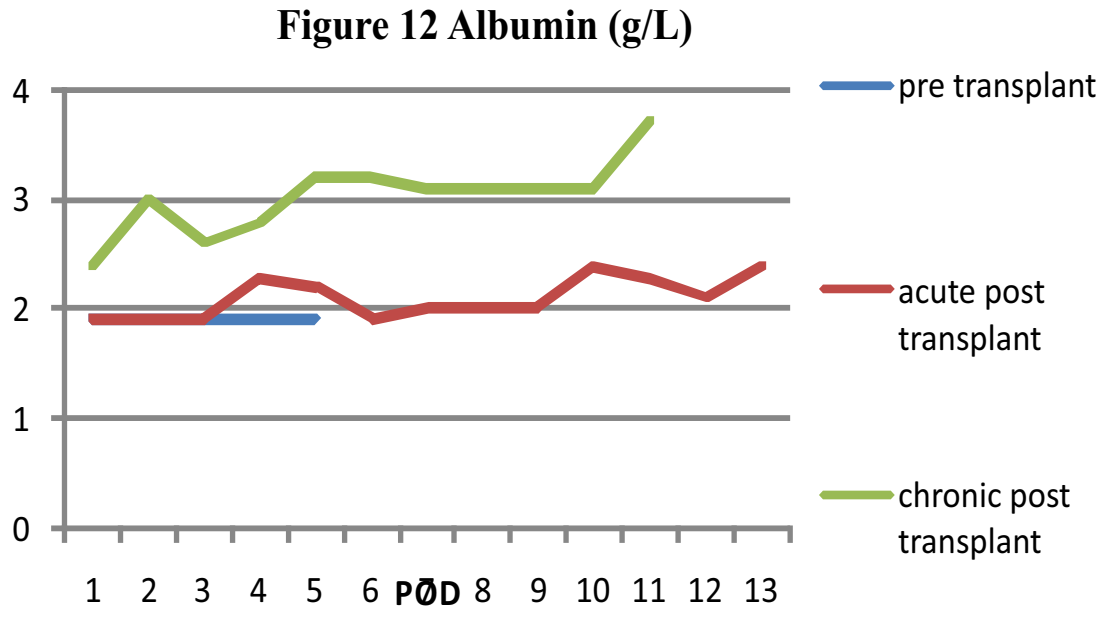


Figure 13 Na

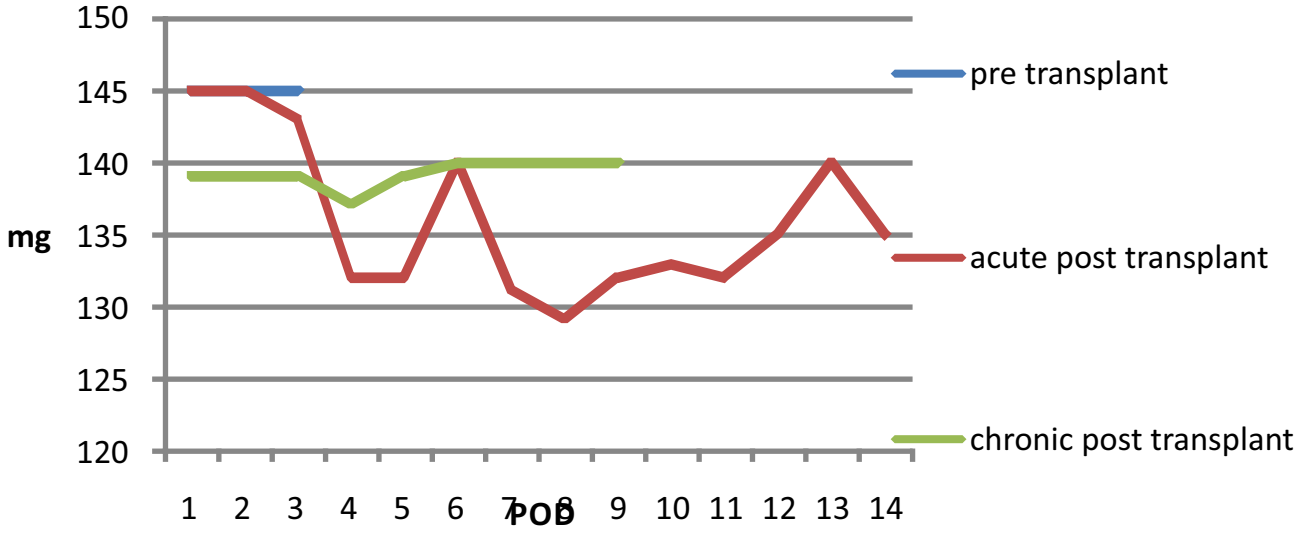


Figure 14 K

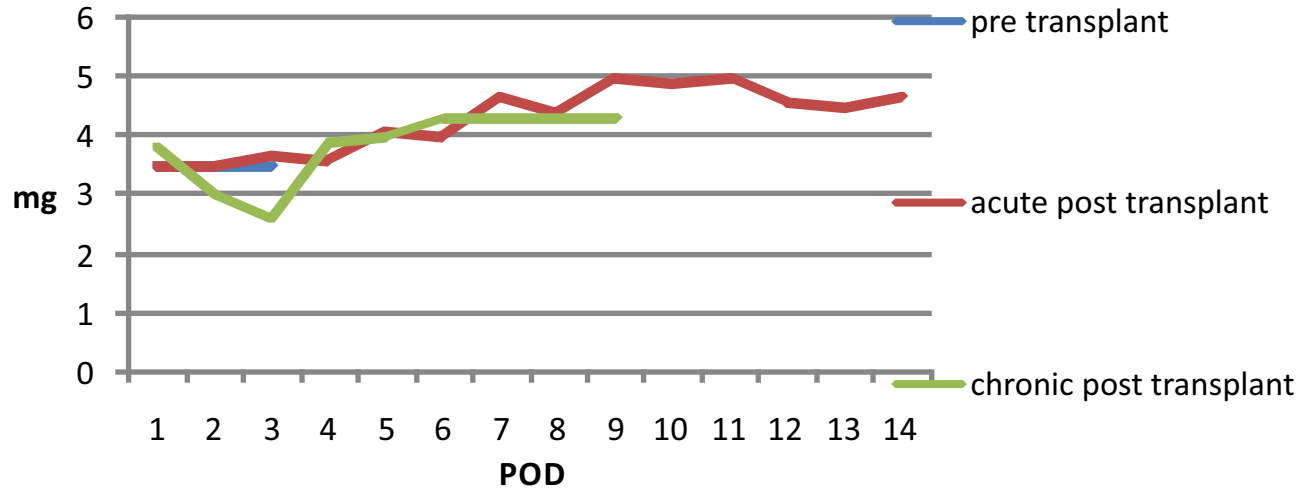
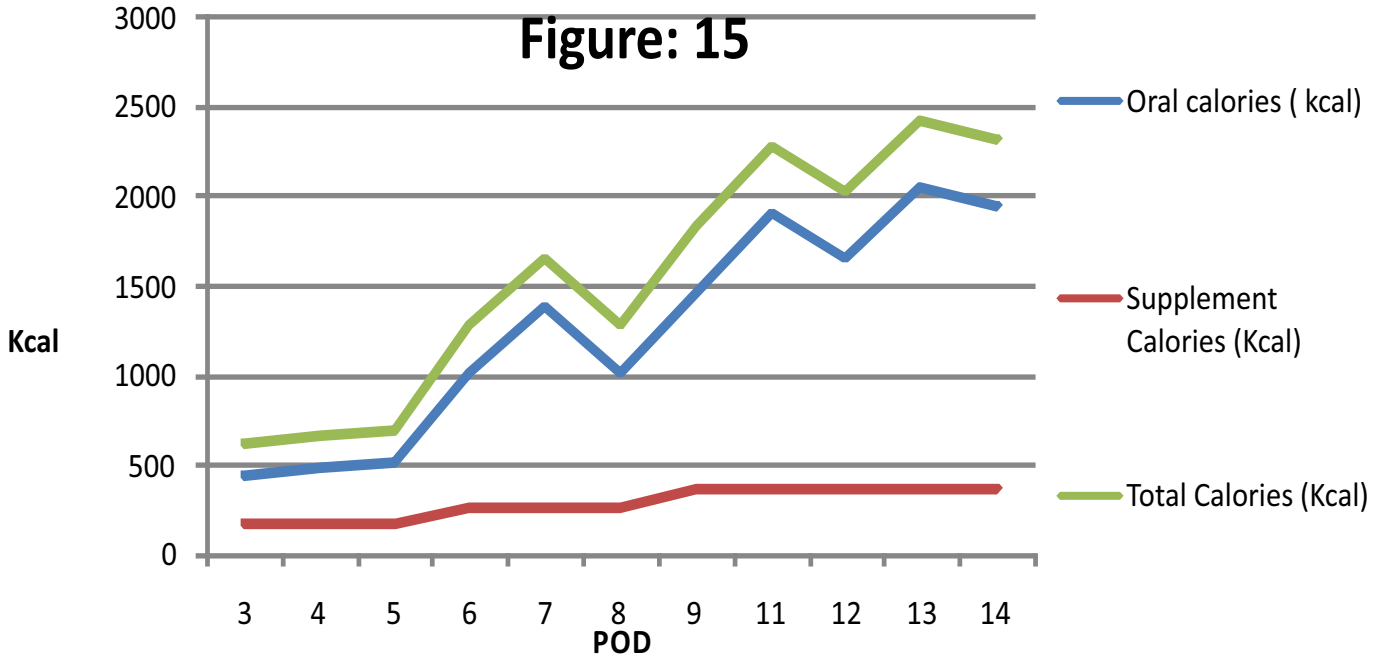


Figure 12-14: Case III profile of Albumin, Sodium, and Potassium.



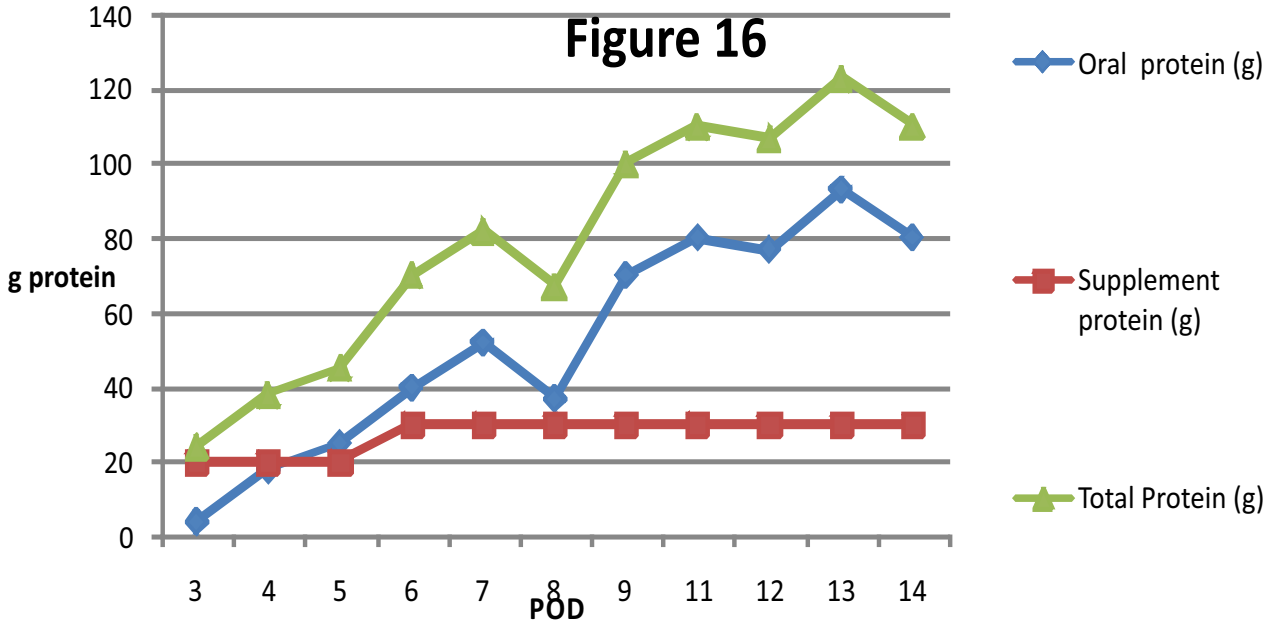


Figure 15,16: Energy and protein intake of Case III during the hospital stay after the transplant.

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Manuscript Information: Received: October 23, 2015; Accepted: December 11, 2015; Published: December 15, 2015

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Citation: Bakshi N, Singh K, Soin AS. Nutrition in Liver Transplant Recipients: Case Series. Open J Clin Med Case Rep. 2015; 1060

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