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COMPARISON OF NUTRITIONAL PATTERN AND USE BETWEEN COVID AND NON-COVID INTENSIVE CARE PATIENTS

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Abstract
Nutrition is important for our immune system. The COVID-19 pandemic further supported this, as the hyper-catabolic state presented an extremely difficult challenge. Multiple studies have been conducted that demonstrate how crucial adequate nutrition is in COVID-19 patients. The study included 941 patients, of which 599 were diagnosed with COVID-19, and 342 were non-COVID patients. Scientific powder-based feeding formula was prescribed using the iNutrimon™ software. COVID-19 patients who tolerated oral feeds were given scientific enteral feeding formula and in non-COVID patients supplemental nutrition was added only if they did not achieve at least 50 % of the prescribed diet at the end of 72 hours. Towards the end of our study, we observed that COVID-19 patients had longer ICU stays and increased use of TPN and supplemental nutrition compared to non-COVID patients. The daily nutritional expenditure for COVID-19 patients was also higher than non-COVID patients. In conclusion, in comparison between COVID-19 patients and non-COVID patients, it was seen that in COVID-19 patients, there was an increased use of scientific feeding formulas and TPN. The majority of non-COVID patients were managed without TPN compared to COVID-19 patients. Further studies are needed to provide insight into the impact of scientific feeding formulas in the recovery of COVID-19 patients after discharge from the ICU.

KEYWORDS- protein concentration plus, carbohydrates plus, coronavirus pandemic; cost-benefit analysis; nutrition

Introduction
In the recovery of critically ill patients, nutrition plays a pivotal role. In this aspect, the healthcare system faced an enormous challenge during the COVID-19 outbreak. The hyper-catabolic state

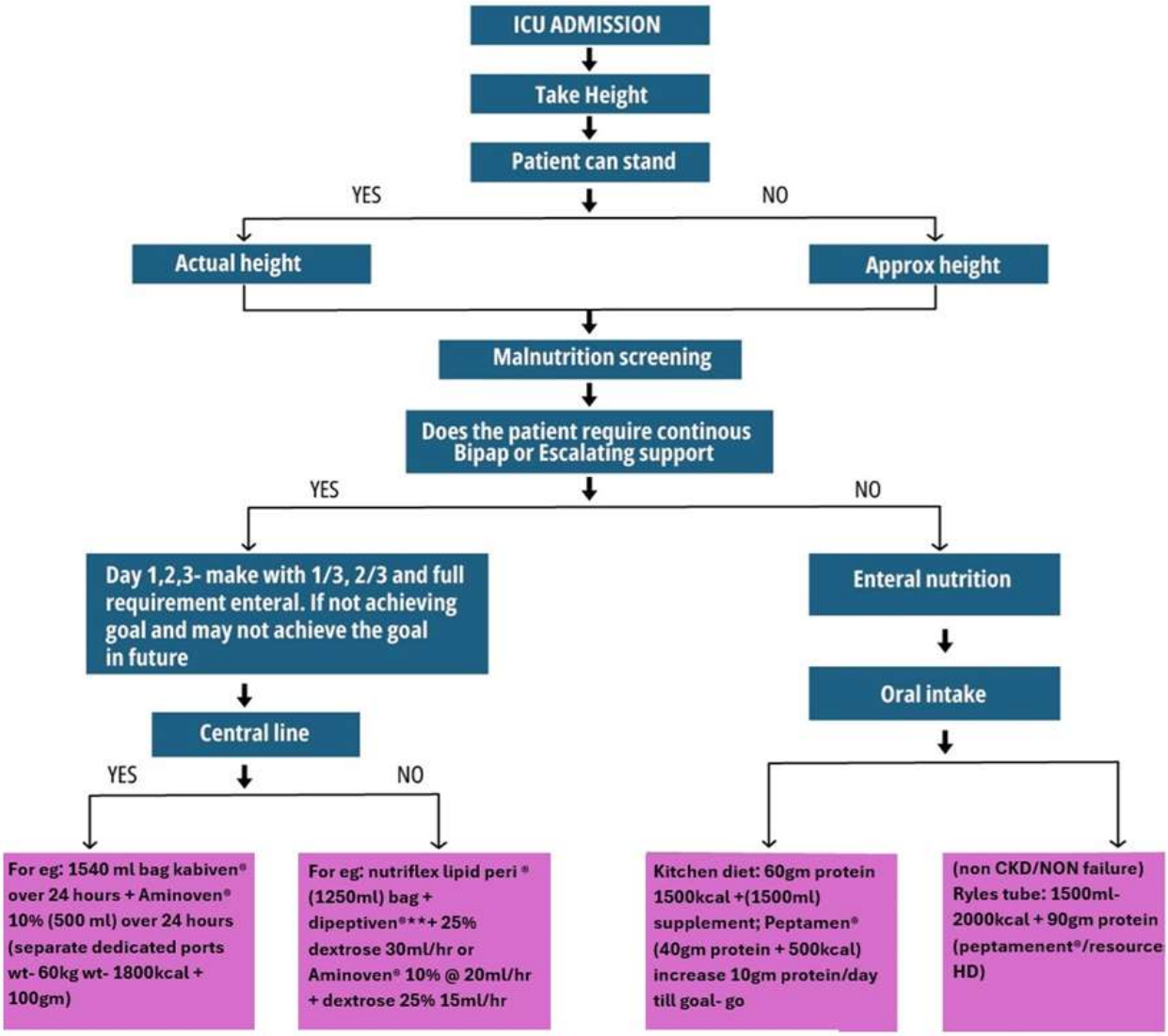
induced by infection, reduced food intake due to associated anorexia and dysgeusia along with prolonged immobilization predispose these patients to loss of muscle mass and malnutrition [1-3]. As a consequence, this may lead to a precipitous decline of respiratory muscle function, depression of the immune system, and increased susceptibility to secondary infections. Patients suffering from obesity are at a higher risk of malnutrition due to increased protein catabolism, increased energy expenditure, and hence optimal nutrition with high protein intake is warranted in these patients [3]. COVID-19 presents as a multifaceted disease with a diverse range of symptoms. The disease primarily involves the respiratory system but patients with preexisting comorbidities and older individuals often present with complications involving multiple organs. This leads to increased rates of hospitalization resulting in exhaustion of resources. Secondly, the highly contagious nature of the disease requires the implementation of isolation practices making the task of monitoring the nutritional status of patients difficult. In this background of crisis, nutrition often takes a backseat in most of the hospitals [4].

Objective

Our objective is to do a comparison of patterns and dietary practices between COVID-ICU and non-COVID ICU in our tertiary care hospital We included 941 patients of which 599 had COVID and 342 were non-COVID patients. A specific scientific feeding formula was devised by iNutritimon™ software and implemented in the hospital [4,5]. COVID-19 patients tolerating oral feeds were given enteral feeding formula for appropriate nutrition while supplements were added to non-COVID patients only if they did not achieve at least 50% of the prescribed diet at the end of 72 hours over and above this all patients were prescribed 1.8g/kg of proteins that was calculated using simple predictive equations.

Methodology

This study was a prospectively conducted study which included 941 patients admitted to the mixed intensive care unit of a tertiary care hospital in Mumbai, India. Of the 941 patients, 599 were admitted with a diagnosis of COVID-19, and 342 were admitted for causes other than COVID in the period from April 2020 to June 2021 from the patient hospital nutrition management database solution "iNutrimon™" [4,5]. Considering the multiple obstacles met during the assessment, conduct and delivery of adequate nutrition to patients suffering from COVID, a specific feeding strategy was devised and implemented in the hospital (Fig 1) [4,5] . In COVID patients tolerating oral feeds, scientific enteral feeding formula was used to deliver appropriate nutrition while supplements were added to non-Covid patients only if they did not achieve at least 50 % of the prescribed diet at the end of 72 hours. All patients included in the study were prescribed 1.8 g/kg of proteins using simple predictive equations to prescribe the required energy (i.e., 25 kcal/kg) in non-ventilated patients. In mechanically ventilated patients the resting energy expenditure was measured using the Carescape R860 ventilator™ using the respiratory module and the indirect calorimetry measurement software. The protocol for nutrition (enteral and parenteral) remained the same for both COVID-19 and non-COVID patients. Scientific powder-based nutrition was prescribed based on the requirements of macronutrients and volume with the help of the "iNutrimon™ .



*Clinical judgement is important to avoid refeeding and adjust dose ** avoid in RF/Liver failure

Follow up for enteral :–
8:00 am : call from ICU regarding G.I tolerance and acceptance.
8:30 : discussion with Chief dietitian.
1:00 pm : new charts at the covid ICU fire exit door.

Special circumstances:
1.if intolerance ,diarrhoea/vomiting/gastric distension/abdominalpain/gastric residual volume more than 500 ml was seen then a prokinetic was prescribed, feeds were stropped and fluids were commenced.
2.CKD/LVF/t- will be informed to chief dietitian-
Fixed from kitchen 500ml-protein-30gm-kcal-1500 :variable-SNS
3.Extreme low weight-fixed from kitchen 300ml-protein-20gm and kcal-500/variable SNS.
4.Patient not taking adequately- see step B

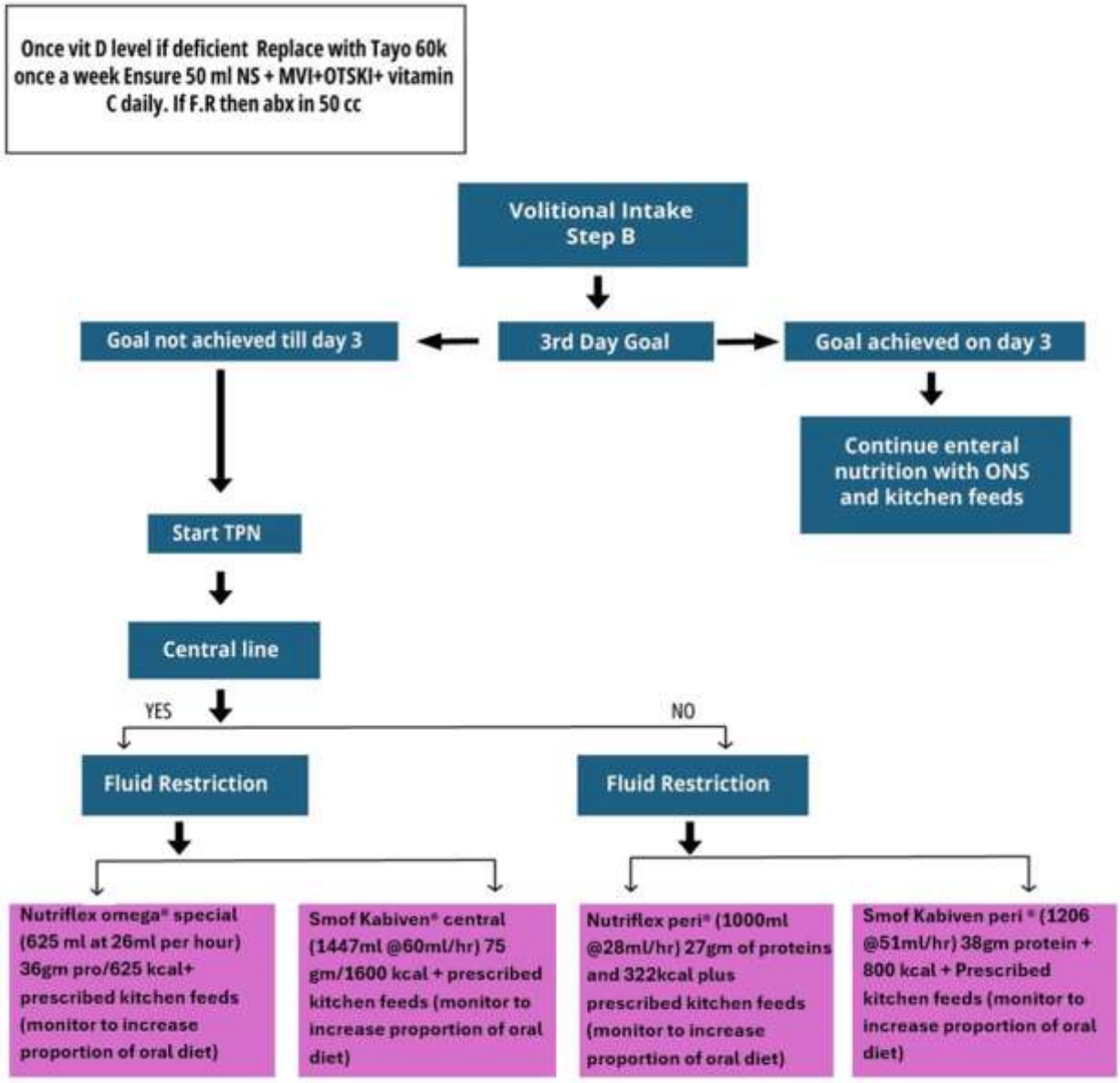


Figure 1. ICU NUTRITION PROTOCOL

ICU=Intensive care unit; RF=Renal Failure; GI=Gastrointestinal; CKD=Chronic Kidney Disease; LVF=Left Ventricular Failure; vit D=Vitamin D; NS= Normal Saline; M.V.I= Multi Vitamin Infusion; TPN=Total Parenteral Nutrition

CONSENT AND ETHICS

The included patients were provided with informed consent, and the study was conducted in accordance with the principles of Declaration of Helsinki after the approval of the Institutional Ethics Committee.

RESULTS

Our study included 941 patients comprising of 599 COVID patients and 342 non-COVID patients, out of which 762 patients were males and 179 patients were females [Fig 2].

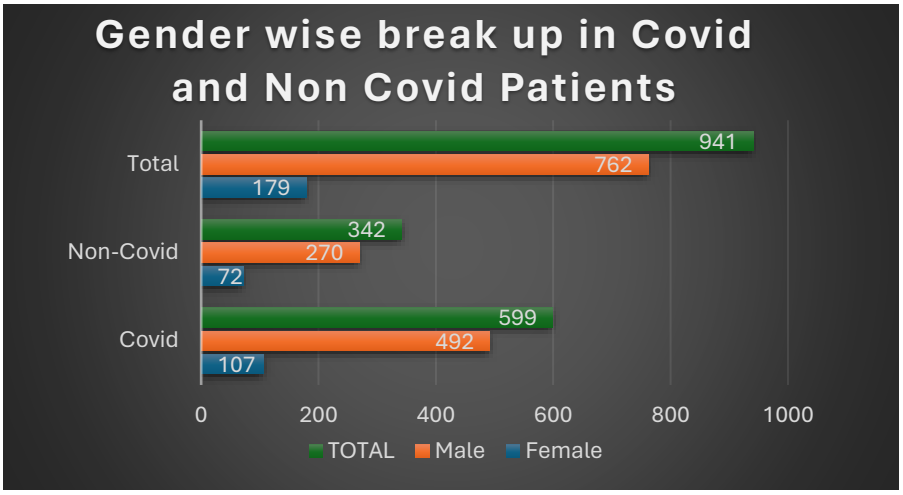


Figure 2 shows the total number of patients included in the study. The total number of patients was 941, out of which male patients were 762 and females 179. Non-COVID patients were 342, males 270, and females 72, versus COVID patients, 599, out of which males were 492 and females were 107.

GRAPHICAL REPRESENTATION OF STUDY POPULATION

As expected patient affected and admitted to the ICU stayed longer than the non-COVID patients. For COVID patients, the duration was 9.31 days whereas, for non-COVID patients, it was 6.8 days. Only 3% of the total COVID patients did not receive supplemental nutrition, compared to 42.4% of non-COVID patients. Among the scientific feeding formulae, the use of Peptamen®(Nestle)®was highest, 85% in COVID patients compared to 75% of non-COVID patients who did not receive Peptamen®.

Furthermore, the results of our study revealed that compared to non -COVID patients, COVID patients had a 60% increment in TPN usage [Fig 3 and 4 show that 9% of covid patients in the ICU required TPN versus only 1% of non-covid patients required TPN]. A cost analysis revealed the daily nutritional expense for COVID patients admitted to the ICU was Rs. 786.04 compared to Rs. 463.54 in non-COVID patients. [Fig 5.]

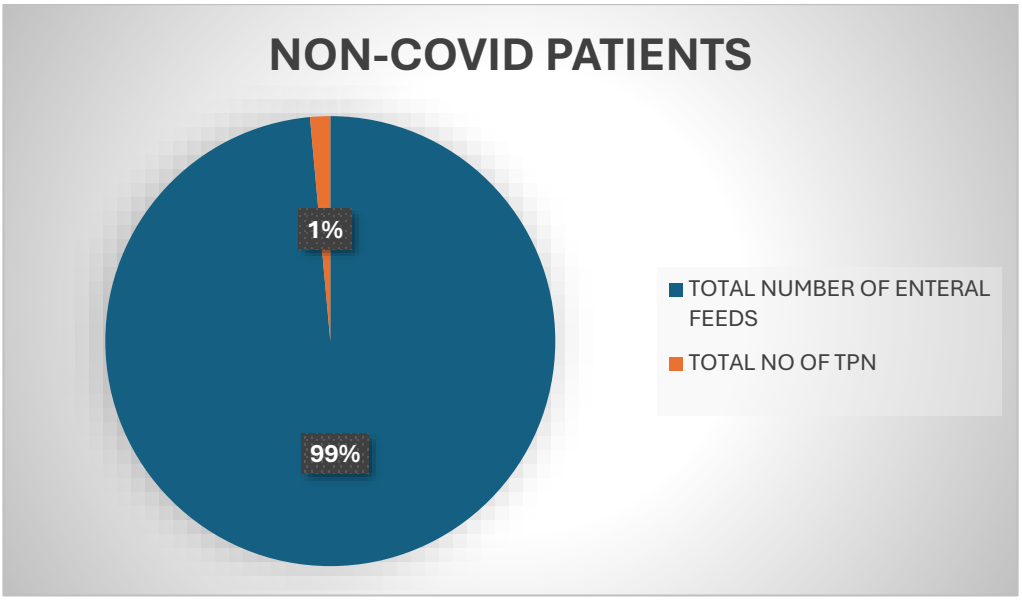


Figure 3. In Non-Covid patients' total number of enteral feeds was 99% and total number of TPN feeds was 1%.

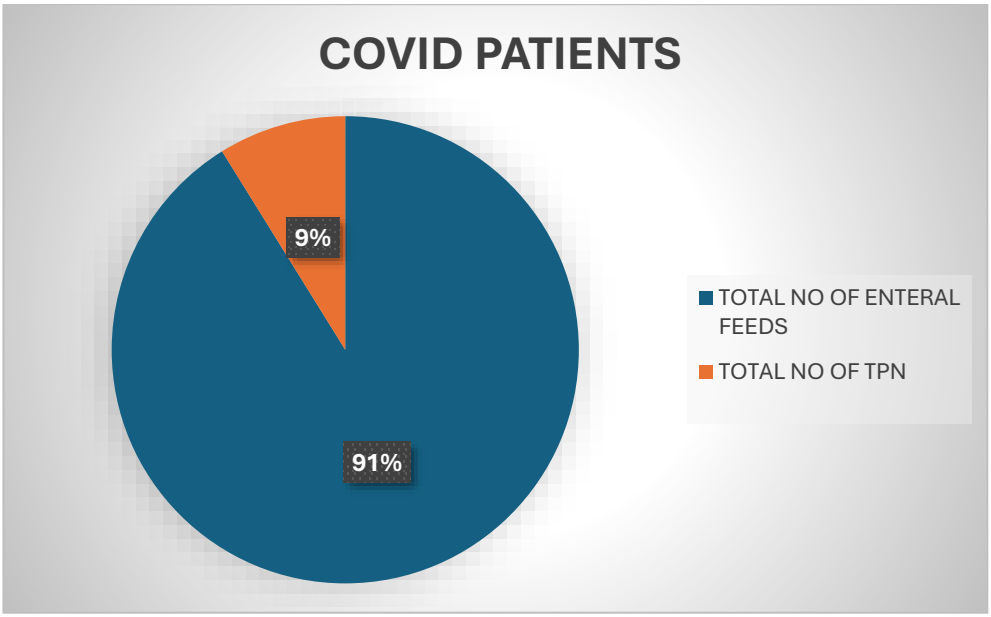


Figure 4. In COVID patients' the total number of enteral feeds was 91% and the total number of TPN feeds was 9%

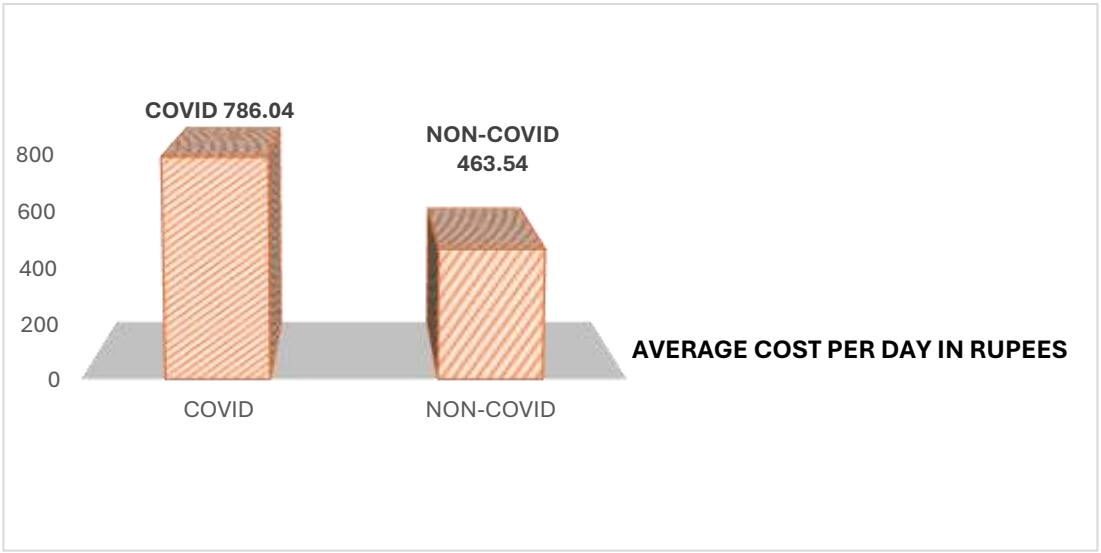


Figure 5. showing the per day cost of nutrition in COVID versus non-COVID ICU patients.

DISCUSSION

COVID-19 disease had many treatment-related implications in view of the airborne isolation protocols. Nutrition stood out as one of the many neglected fields during the treatment of these individuals. Until COVID, the utilization of parenteral nutrition was less in medical intensive care patients as most of the patients tolerated enteral feed wells and matched at least 70 percent of their macronutrient requirements. This, however, was not the case with Covid patients. Most Covid patients were managed using non-invasive ventilation with a mask and helmet interface. Most of them required very high oxygen requirements and had very high respiratory rates. A nasogastric tube was generally avoided as these tubes created leaks in the non-invasive ventilator circuit, creating problems in optimal ventilation. It was often almost impossible to secure the nasogastric tube due to desaturation and unstable vital signs. There was a lack of invasive ventilators and trained staff during the pandemic, making invasive ventilation a last resort. Also, the absence of taste, in addition to the respiratory distress in a good majority of patients, precluded difficulties in consuming oral nutrition. During the pandemic, a common protocol for nutrition was created for all intensive care unit admissions, regardless of whether they were or were not affected by COVID-19. Our study showed an increased use of parenteral nutrition in COVID patients compared to patients admitted to the

intensive care unit without covid 19 being the immediate diagnosis. This increased use of parenteral nutrition would have also been why the cost of nutrition in COVID patients was much higher than in non-Covid patients. What was also clear was that if kitchen feeds were being prescribed, the macronutrient requirements were generally unmet (for reasons mentioned earlier), and hence the majority of patients needed to be transitioned to scientific feeding powder-based formula feeds. This was also because the patient needed easily assimilable, high protein and high-calorie supplements with reduced volume, which could be consumed quickly. This study points out the difference in the pattern of nutrition in Covid versus non-Covid patients. However, due to the small sample size and a single-center study, future investigators are urged to conduct more studies to conclude these results firmly. The results of our study pave a path for future researchers to investigate the role of nutrition in the recovery of Covid patients after ICU discharge.

CONCLUSION

On comparison between COVID patients and non-COVID patients, it was seen that in COVID patients the use of scientific feeding formulas increased by 168% and that of TPN by 60%. 99% of non-Covid patients were managed without TPN in comparison to 91% of Covid patients [Fig 3 and 4]. This increased use of TPN may have resulted in the increased cost of nutrition for Covid patients. The intolerance to enteral nutrition appears to be suggested by the increased use of TPN. The increased use of scientific feeding powder-based feeds and increased use of TPN seems to suggest that kitchen feeds were probably inadequate to meet macronutrient requirements

LIMITATIONS

- Single-center observational study
- Small sample size

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