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ASSESSING THE RELATIONSHIP BETWEEN CLINICAL OUTCOMES AND EARLY ENTERAL FEEDING IN CRITICALLY SICK OBESE INDIVIDUALS FROM INDIA

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ABSTRACT

Background: Existing recommendations recommend starting nutritional assistance for critically sick patients within 24-48 hours after admission to the ICU. However, there is limited information on the usefulness of early nutrition in these conditions.

Aim: The current study sought to investigate the relationship between clinical outcomes and early enteral feeding (within 12 hours of admission to the ICU) in critically sick obese participants from India.

Methods: The current study evaluated 280 severely obese and intubated participants based on the WHO-Asian obese BMI categorization, with a minimum ICU stay of three days. individuals getting EN within 12 hours were compared to those receiving EN beyond 12 hours (late EN), with 142 and 138 individuals respectively. The outcomes evaluated were target calorie percentage, target protein attained on the third day, total protein and calories supplied, length of stay (LOS) hospital, LOS ICU, mechanical ventilation days, and death.

Results: The study found that the early EN group received considerably more target calories and proteins than the late EN group, with 84%, 78%, and 79% versus 72%, respectively ($p=0.05$). Early enteral feeding was associated with considerably fewer mechanical ventilation days (6.3±3.3 versus 8.99±5.9 days, $p=0.02$). LOS hospital and LOS-ICU were considerably greater in late EN compared to early EN groups ($p<0.001$ and 0.009, respectively). Mortality rates were similar in the early and late EN groups ($p=0.69$).

Conclusion: The current study suggests that in critically sick and obese Indian participants, initiating early enteral feeding within 12 hours of admission to the ICU reduces the duration of mechanical ventilation days, length of stay in the hospital, and length of stay at the ICU.

Keywords: clinical outcomes, critically unwell obesity, early enteral feeding, hospital stay

INTRODUCTION

CIO (critically ill obese) people have distinct endogenous macronutrient metabolism and pathophysiological abnormalities than non-obese ones. The acute phase of critical illness is distinguished by high catabolic stress, which results in the loss of skeletal muscle proteins and fat breakdown. Furthermore, starvation-induced extreme stress causes protein catabolism, which results in lean body mass due to metabolic maladaptation. Furthermore, dietary assistance during the acute phase of critical illness is essential in obese patients to maintain nutritional status, reduce comorbidities such as organ malfunction and infections, and avoid lean body mass loss.1

Early enteral nutrition (EN) is preferred over parenteral nourishment because it helps to maintain gut integrity by decreasing bacterial translocation and gut barrier disruption. The ASPEN (American Society of Parenteral and Enteral Nutrition), ESPEN (European Society of Parenteral and Enteral Nutrition), and SCCM (Society of Critical Care Medicine)

recommendations indicate that nutritional therapy for CIO should be initiated within 24-48 hours after admission to the ICU. Despite these guidelines, there is still uncertainty about the actual applicability and safety of early enteral feeding in CIO patients. The existing research provides considerable evidence that EN is not begun early in overweight and obese patients.2

Any delay in initiation of EN can be attributed to a variety of factors, including increased intra-abdominal pressure, gastrointestinal complications such as a higher risk of aspiration pneumonia due to reduced gastric motility, delayed gastric emptying and ileus, and the risk of decreased gut perfusion and ischemia caused by hemodynamic instability.

Obesity-related concerns include a lack of proper feeding equipment for obese patients, pre- and post-operative care considerations, metabolic disorders such as hyperglycemia, fluid and electrolyte imbalances, and challenges with airway management and intubation. It has also been shown that initiating enteral feeding within three days of mechanical breathing is associated with shorter hospital and ICU stays, as well as lower mortality in surgical and medical ICU participants.3

Despite growing data supporting early enteral feeding in varied ICU patients, there is a considerable study vacuum regarding its application and effects, notably in critically sick obese Indian people. The majority of research have focused on the overall ICU population or specific subsets such as non-obese patients and those from various geographic locations.

Furthermore, there is a dearth of specialized study on how early enteral feeding impacts clinical outcomes in CIO Indian patients, which may provide significant obstacles and costs because to regional disparities in healthcare systems, nutritional demands, and obesity-related issues.4 As a result, the current study sought to examine the relationship between clinical outcomes and early enteral feeding (within 12 hours of ICU admission) in critically sick obese participants from India.

MATERIALS AND METHODS

The current prospective observational study aims to investigate the relationship between clinical outcomes and early enteral feeding (within 12 hours of ICU admission) in critically unwell obese participants from India. The subjects for the research came from the Institute's Outpatient Department. All individuals provided verbal and written informed consent before to participation.

The current investigation evaluated critically sick participants who were diagnosed as obese using the WHO-Asian classification5 (Table 1), required mechanical ventilation within 48 hours of admission to the ICU, and had a minimum ICU stay of 3 days. The research excluded non-obese people with a BMI <25kg/m2, pregnant women, burn patients, and those under 18 years old.

The study included 280 CIO participants who were hospitalized to the Institute's ICU. The subjects were separated into two groups depending on the commencement time of EN. The early EN (EEN) group includes participants who started EN within 12 hours of admission. It included 142 participants, as well as 138 subjects in the late EN (LEN) group, in which EN was began after 12 hours after ICU admission. In EN, a high-protein, low-calorie diet was followed. Subjects with a BMI between 25-29.9 kg/m2 were given 20-25 calories per kg of real body weight, whereas those with a BMI ≥30 were given 15-20 calories per kg of actual body weight.

Every day, all individuals received 1.5 grams of protein per kilogram of ideal body weight. The dietician evaluated the individuals' nutritional status using the mSGA (modified Subjective Global Assessment) technique.6 Dietician estimated the calories and proteins required using the EN procedure, chose the appropriate EN, and prescribed appropriately. The nurses commenced EN and noted each subject's feed tolerance, interruptions, and feed initiation data. The participants were monitored daily until they were discharged or died, whichever occurred first.

Data collected for each participant included basic parameters such as diagnosis at admission, BMI, gender, and age. The severity of the disease was determined using the Acute Physiology and Chronic Health Evaluation II (APACHE II), the Sequential Organ Failure Assessment (SOFA) Score, and the Nutrition Risk in the Critically Ill (NUTRIC) score.9 The nutritional data collected included the time of EN commencement (within or after 12 hours), the percentage of target calories and proteins met on days three and five, and the target calories and proteins prescribed. In addition, total proteins and calories supplied were recorded, as well as any feeding pauses.

The study's key outcomes were length of stay in the hospital (LOS-Hospital), length of stay in the intensive care unit (LOS-ICU), and mechanical ventilation (MV) days. Secondary outcomes included in-hospital mortality. Details on outcomes were taken from the individuals' medical records.

The collected data were statistically analyzed using SPSS (Statistical Package for the Social Sciences) software version 24.0 (IBM Corp., Armonk, NY, USA) for descriptive measures, Student t-test, ANOVA (analysis of variance), and Chi-

square test. The data were presented in the form of mean and standard deviation, as well as frequency and percentage. A p-value of <0.05 was considered.

RESULTS

The current prospective observational study aims to investigate the relationship between clinical outcomes and early enteral feeding (within 12 hours of ICU admission) in critically unwell obese participants from India. The current study evaluated 280 severely obese and intubated participants using the WHO-Asian obese BMI categorization, with a minimum ICU stay of three days. The research individuals had an average age of 67.2±14.3 years, with mean BMI and NUTRIC scores of 28.0±3.4 and 4.4±1.7, respectively. The research included 66% men and 345 females.

After analysing the demographic data in the research participants, it was shown that the mean age was considerably greater in the early EN group compared to the late EN group (p=0.001). BMI was statistically insignificant in both groups (p=0.241). There were considerably more men in late EN compared to early EN (p=0.01). Early EN start occurred substantially earlier than late EN (p<0.0001). Tracheostomy rates were considerably greater in late EN compared to early EN (p=0.0003). There was no significant change in polymorbidity, NUTRIC score, mean SOFA, or mean APACHE II between the late and early EN groups (p=0.616, 0.09, 0.276, and 0.07, respectively) (Table 2).

For nutritional information in early and late EN study subjects, the percentage of total targeted proteins delivered, the percentage of total target calories delivered, the percentage of total target proteins delivered on day 5, and the percentage of total target calories delivered on day 5 were statistically comparable in the early EN and late EN groups (p=0.711, 0.373, 0.873, and 0.862). Early EN participants supplied considerably more target proteins and calories on day 3 than late EN subjects (p=0.05 and 0.05, respectively) (Table 3).

The study found that when comparing outcomes in early and late EN study patients, the discharge rate and death rate were statistically equal (p=0.708 and 0.712, respectively). Early EN was associated with a greater rate of hospital stays of ≤15 days and ICU stays of ≤10 days compared to late EN, with p-values <0.001 and 0.03, respectively.

Late EN had considerably greater mean LOS in hospitals and ICUs compared to early EN (p<0.001 and 0.008, respectively). Mean mechanical ventilation days were also considerably greater in late EN compared to early EN individuals (p=0.02) (Table 4).

DISCUSSION

The current study evaluated 280 severely obese and intubated participants using the WHO-Asian obese BMI categorization, with a minimum ICU stay of three days. The research individuals had a mean age of 67.2±14.3 years, a BMI of 28.0±3.4, and a NUTRIC score of 4.4±1.7. The research included 66% men and 345 females. These findings were consistent with earlier investigations by Reignier J et al10 in 2018 and Pardo E et al11 in 2023, in which authors evaluated patients for comparisons of early and later enteral nutrition, as shown in the current study.

In terms of demographic data analysis in the research participants, the mean age was considerably greater in the early EN group than in the late EN group (p=0.001). BMI was statistically insignificant in both groups (p=0.241). There were considerably more men in late EN compared to early EN (p=0.01). Early EN start occurred substantially earlier than late EN (p<0.0001). Tracheostomy rates were considerably greater in late EN compared to early EN (p=0.0003). There was no significant difference in polymorbidity, NUTRIC score, mean SOFA, or mean APACHE II between the late and early EN groups (p=0.616, 0.09, 0.276, and 0.07, respectively).

These demographics were comparable to the findings of Reignier J et al12 in 2023 and Moon et al13 in 2023, who evaluated patients with demographic data similar to the current study in their respective investigations. The study results showed that for nutritional information in early and late EN study subjects, the percentage of total targeted proteins delivered, the percentage of total target calories delivered, the percentage of total target proteins delivered on day 5, and the percentage of total target calories delivered on day 5 were statistically comparable in early and late EN groups (p=0.711, 0.373, 0.873, and 0.862, respectively).

Early EN participants provided considerably more target proteins and calories on day 3 than late EN subjects (p=0.05 and 0.05, respectively). These findings were congruent with the findings of Thapa PB et al14 and Heyland DK et al15 in 2011, in which the authors provided nutritional information in early and late EN individuals that was equivalent to the results of the current investigation. When comparing outcomes in early and late EN study patients, the discharge rate and death rate were found to be statistically equal (p=0.708 and 0.712, respectively).

Early EN was associated with a greater rate of hospital stays of ≤15 days and ICU stays of ≤10 days compared to late EN, with p-values <0.001 and 0.03, respectively. Late EN had considerably greater mean LOS in hospitals and ICUs compared to early EN (p<0.001 and 0.008, respectively). Mean mechanical ventilation days were also substantially longer in late

EN compared to early EN participants (p=0.02). These findings were consistent with the findings of Alberda C et al16 in 2009 and Haines KL et al17 in 2023, in which the results for comparing outcomes in early and late EN participants reported in the current study were equivalent to the results of the present investigation.

CONCLUSIONS

The present study, considering its limitations, concludes that in critically ill and obese Indian subjects, initiation of early enteral nutrition within 12 hours of admission to ICU results in shorter duration of mechanical ventilation days, length of hospital, and length of stay at ICU.

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TABLES

Classification	BMI (kg/m2)
Underweight	<18.5
Normal	18.5-22.9
Overweight	23-24.9
Obese I	25-29.9
Obese II	≥30

Table 1: WHO classification of weight by BMI in adult Asian subjects

Characteristics	EN within 12 hours (n=142)	EN after 12 hours (n=138)	p-value
Mean age (years)	61.2±13.2	53.0±14.4	0.001
BMI (kg/m2)	28.3±3.4	27.8±3.4	0.241
Male gender n (%)	80 (56)	124 (66)	0.01
EN initiation (hours)	6.5±3.3	28.2±15.5	<0.0001
Tracheostomy n (%)	50 (35)	90 (65)	0.0003
Polymorbidity n (%)	78 (55)	70 (51)	0.616
NUTRIC score (mean)	4.7±1.6	4.1±1.8	0.09
Mean SOFA	9.1±2.3	8.7±2.3	0.276
Mean APACHE II	23.3±6.2	21.4±6.4	0.07

Table 2: Baseline demographics in the study subjects

Variables	EN within 12 hours (n=142)	EN after 12 hours (n=138)	p-value
% of total target proteins delivered	87.1±11.8	87.7±0.3	0.711
% of total target calories delivered	88.9±7.3	89.9±7.3	0.373
% of target proteins delivered on day 3	78.7±20.5	72.0±22.2	0.05
% of target calories delivered on day 3	83.8±18.3	77.3±21.3	0.05
% of target proteins delivered on day 5	85.3±20.4	85.9±22.9	0.873
% of target calories delivered on day 5	86.7±17.6	87.2±22.6	0.862

Table 3: Nutritional information in early and late EN study subjects

Variables	EN within 12 hours (n=142)	EN after 12 hours (n=138)	p-value
Discharge n (%)	116 (82)	116 (84)	0.708
Mortality n (%)	26 (18)	22 (16)	0.712
LOS hospital ≤15 days	90 (63.4)	38 (27.5)	<0.001
LOS hospital ≤10 days	84 (59.2)	60 (43.5)	0.03
Mean LOS hospital	15.3±7.9	24.7±12.3	<0.001
Mean LOS ICU	10.06±3.3	14.0±9.00	0.008
Mean mechanical ventilation days	6.3±3.3	9.05±5.9	0.02

Table 4: Comparison of outcomes in early and late EN study subjects