

Optimizing Total Parenteral Nutrition For NBM Patients In Pre And Postoperative Phases: A Clinical Approach

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ABSTRACT

A total of 124 participants were enrolled in the study, they have been categorized based on their age groups. The distribution is as follows 18 to 29 age group has 8 patients, the 30 to 39 age group has 20 patients, the 40 to 49 age group has 28 patients, the 50 to 59 age group has 26 patients, the 60 to 69 age group has 32 patients, 70 to 80 age group has 10 patients and their percentages are as follows 6.45%, 16.12%, 22.58%, 20.96%, 25.80%, 8.06% respectively. 62 were males with 50%, and 62 were females with 50%. The percentage of male patients and female patients was maintained equal. Out Of the total number of subjects, 69 members have comorbidities with a percentage of 56% and 55 members do not have comorbidities denoting 44% of the total population. 36 patients got 5 TPNs administered, 22 patients got 4 TPNs administered, 30 patients got 3 TPNs administered, 27 patients got 2 TPNs administered and 9 patients got 1 TPN administered.

In the present clinical study, the most affected age group was 60–69 years (25.8%), followed by 40–49 years (22.58%). The lowest representation was in the 18–29 years age group (6.45%). This suggests that older patients are more likely to require TPN support, possibly due to comorbidities and age-related metabolic challenges. Equal representation of male and female patients (50% each). This highlights that TPN is required irrespective of gender, emphasizing its role in surgical and critical care. 56% of patients had comorbidities, while 44% did not. Diabetes Mellitus (34.78%) and Hypertension (30.43%) were the most common comorbidities. Asthma, Thyroid Disorders, and Vitamin Deficiencies were also noted. Patients with diabetes and hypertension are at higher risk of post-surgical complications, making proper nutritional support crucial. Gastrointestinal (20.16%) and Gynecology (19.35%) had the highest number of patients. General Surgery (18.54%) and Cardiology (17.74%) also had significant representation. Nephrology and Orthopedics (12.09% each) had fewer patients. Gastrointestinal patients require nutritional support due to gut surgeries, making TPN essential. High-Calorie Diet (56.77%) was the most common, followed by Low-Calorie Diet (26.61%). This indicates that most patients require higher energy intake, likely due to metabolic stress after surgery. 35.48% were NBM for 3 days, and 25.8% for 4 days. Longer NBM periods increase the risk of malnutrition, justifying the need for TPN. 29% of patients received 5 TPN doses, while 24.4% received 3 TPN doses.

Keywords: Nill by mouth, NPO, electrolyte deprivation, enteral nutrition, comorbidities, recovery time, malnutrition.

I.INTRODUCTION

During surgery, the body undergoes significant physiological stress, which can result in the loss of key nutrients and increased metabolic demands. Understanding these losses is critical for appropriate perioperative nutritional management to support recovery.

Types of Nutrient Loss During Surgery

1. Protein Loss

- It is caused by Tissue trauma and surgical wounds increase protein breakdown to supply amino acids for repair and immune response. Blood loss during surgery may result in albumin depletion.
- It impacts in reduced muscle mass and impaired wound healing if not replenished.
- It can be managed through providing high-protein diets (1.5–2.5 g/kg/day) postoperatively to restore protein balance.

2. Blood Loss (Iron and Micronutrient Depletion)

- Blood loss during surgery depletes hemoglobin, iron, and other trace minerals (e.g., zinc and copper).
- It results in anemia, reduced oxygen transport, and delayed healing.
- It can be replenished with iron-rich foods or supplements and focus on vitamin C to enhance absorption.

3. Electrolyte Imbalance

- Loss of fluids and electrolytes due to blood loss, tissue injury, and prolonged fasting or surgical drains which commonly affects electrolytes like sodium, potassium, calcium, magnesium, and chloride.
- It causes muscle weakness, arrhythmias, and delayed recovery.
- It can be managed by administering electrolyte-rich fluids intravenously or orally, depending on severity.

4. Vitamin Loss

- Surgical stress increases metabolic demand for certain vitamins, especially those involved in healing, such as:
 - Vitamin C (used in collagen synthesis).
 - Vitamin A (supports epithelial repair).
 - B-vitamins (metabolic energy support and red blood cell production).
- This loss can cause poor wound healing and compromised immunity.
- This can be overcome by including a variety of vitamin-rich foods or supplements.

5. Fat-Soluble Vitamin Depletion

- In surgeries involving the gastrointestinal system (e.g., bowel resection), fat absorption may be impaired, leading to losses of vitamins A, D, E, and K.
- It can cause impaired wound healing, bone health, and coagulation.
- It can be managed by monitoring and supplementing as necessary, especially for vitamin D and K.

6. Glycogen and Energy Stores

- Stress-induced catabolism depletes glycogen stores as the body shifts to using amino acids and fatty acids for energy.
- It can cause fatigue and muscle wasting.
- Providing adequate carbohydrates (45–65% of total energy) can restore glycogen stores.

7. Fluid Loss

- Blood loss, surgical drains, and evaporation during long procedures contribute to dehydration.

- This causes reduced tissue perfusion, delayed recovery, and increased risk of complications.
- This can be managed by monitoring fluid balance and providing adequate hydration postoperatively.
- In Gastrointestinal Surgery, loss of digestive enzymes and nutrients may occur and special diets or enteral nutrition are needed.
- In Major Burns or Trauma dramatic protein and nutrient losses require aggressive nutritional support.
- Infection or sepsis post-surgery increases metabolic demands and nutrient losses, requiring targeted nutritional therapy.

Nil By Mouth (NBM) is a medical instruction for patients to abstain from consuming food, liquids, or oral medications. This practice is used to prepare patients for certain medical procedures or to manage specific conditions.

NBM is implemented when oral intake poses a risk or interferes with treatment.

Common reasons include:

1. **Pre-Operative Preparation:** To prevent aspiration during anesthesia, where stomach contents could enter the lungs. Patients are typically NBM for 6–8 hours before surgery for solids and 2–3 hours for clear fluids.
2. **Post-Operative Care:** After surgeries involving the gastrointestinal tract, NBM allows the gut to heal or regain function. Examples include bowel resections, oesophageal surgeries, or surgeries involving the stomach.
3. **Gastrointestinal Dysfunction:** Conditions like bowel obstruction, paralytic ileus, or severe Pancreatitis where oral intake could worsen symptoms.
4. **Neurological Impairments:** In patients with swallowing difficulties (dysphagia) due to a stroke or neurological disorders, NBM prevents aspiration pneumonia.
5. **Investigative Procedures:** Certain diagnostic procedures (e.g., endoscopy, imaging requiring sedation) require an empty stomach for better visualization or safety.
6. **Severe Nausea or Vomiting:** To minimize exacerbation of symptoms or complications like aspiration.

IMPLEMENTATION OF NBM:

1. **Patient Instructions:** Clear communication to the patient or caregiver about the duration and purpose of NBM. Patients are often allowed to drink water or clear fluids up to 2–3 hours before a procedure (specific to individual cases).
2. **Nutritional Management:**
 - ☐ **Short-term NBM (<5–7 days):** No significant risk of malnutrition; hydration is the primary focus, often via IV fluids.
 - ☐ **Long-term NBM (>7 days):** Nutrition must be provided via non-oral routes:
 - ☐ **Enteral Nutrition (EN):** Feeding tubes (e.g., nasogastric, PEG) if the gut is functional.
 - ☐ **Parenteral Nutrition (PN):** Intravenous feeding (TPN) if the gut is non-functional.

Challenges and Risks of NBM

1. **Dehydration:** Inadequate fluid intake can lead to electrolyte imbalances and hemodynamic instability. Managed with IV fluids tailored to individual needs.
2. **Malnutrition:** Prolonged NBM without adequate nutritional support can lead to muscle wasting, weakened immunity, and delayed wound healing.
3. **Patient Compliance:** NBM can cause discomfort, hunger, and frustration, especially in prolonged cases.
4. **Refeeding Syndrome:** Occurs when nutritional support is resumed after a prolonged NBM period, leading to rapid shifts in electrolytes (e.g., hypophosphatemia).

Guidelines and Best Practices:

1. **Individualized Plans:** The duration of NBM and nutritional support should be tailored based on the patient's condition and procedure.
2. **Early Nutritional Intervention:** Enteral feeding should be initiated as soon as it is safe to reduce complications of NBM. TPN should be used judiciously when enteral feeding is not possible.
3. **Monitoring:** Regular assessments of hydration, nutritional status, and electrolyte levels during the NBM period.
4. **Clear Communication:** Ensure the patient and care team understand the rationale and expected timeline for NBM.

Nil By Mouth (NBM) patients during the pre-operative and post-operative phases are critical to ensuring their nutritional needs are met, promoting healing, and reducing complications.

1. Pre-Operative Phase

The goal of this phase is to optimize the patient's nutritional status and reduce the risk of surgical complications.

Key Considerations:

- **Assess Baseline Nutritional Status:** Perform a thorough nutritional assessment (weight, BMI, serum albumin/prealbumin, electrolytes). Identify deficiencies (e.g., vitamin D, zinc, iron) and correct them if possible.
- **Indications for TPN:** Start TPN if the patient has been NBM for more than 5–7 days or is unlikely to resume adequate oral/enteral intake in the short term. Avoid unnecessary TPN if oral or enteral feeding is feasible.
- **Composition of TPN:**
 - ☐ **Calories:** Aim for 25–30 kcal/kg/day based on the patient's ideal body weight.
 - ☐ **Protein:** Provide 1.2–2 g/kg/day to support wound healing and maintain muscle mass.
 - ☐ **Electrolytes and Micronutrients:** Adjust based on lab results and underlying conditions.
 - ☐ **Fluids:** Tailor to hydration status and comorbidities (e.g., heart or renal failure).
- **Special Preparations:** Supplement specific nutrients essential for surgery (e.g., arginine, omega-3 fatty acids) that enhance immune response and wound healing.

Monitor for refeeding syndrome in malnourished patients.

2. Post-Operative Phase

The focus here is on recovery, preventing infection, and supporting tissue repair.

Key Considerations:

- Early Nutritional Intervention: Resume TPN or continue if NBM is prolonged (e.g., Gastrointestinal surgery with delayed motility). Transition to enteral or oral feeding as soon as feasible to reduce the risks associated with TPN (e.g., infections, thrombosis).
- Energy and Protein Requirements: Adjust based on the catabolic state and recovery phase:
 - Early post-op: 25–30 kcal/kg/day.
 - Protein: 1.5–2 g/kg/day, higher in critically ill patients or those with extensive wounds.
- Immune-Enhancing Nutrients: Include glutamine, arginine, and omega-3 fatty acids to support immune function and tissue repair. Avoid overfeeding to minimize the risk of hyperglycemia and other complications.
- Electrolytes and Fluids: Monitor and adjust daily based on lab values, fluid balance, and clinical status. Be vigilant about fluid overload or electrolyte imbalances (e.g., potassium, magnesium).
- Glycemic Control: Maintain blood glucose levels between 140–180 mg/dL to reduce infection risks and improve outcomes.
- Infection Prevention: Follow strict aseptic techniques for catheter care. Monitor for signs of catheter-related bloodstream infections.
- Cancer Cachexia: Cachexia, characterized by weight loss, muscle wasting, and systemic inflammation, requires a multimodal approach including nutritional support, physical activity, and pharmacological interventions. High-protein, energy-dense diets are recommended to counteract muscle loss.

II. REVIEW OF LITERATURE

1. Weimann A, Braga M, Carli F, et al. ESPEN guideline: Clinical nutrition in surgery. *Clin Nutr.* 2017;36(3):623-650. doi:10.1016/j.clnu.2017.02.013.

The study by Weimann et al., titled "ESPEN guideline: Clinical nutrition in surgery," provides comprehensive recommendations for the nutritional management of surgical patients based on current evidence. Published in *Clinical Nutrition* in 2017, this guideline addresses the crucial role of nutrition in perioperative care and its impact on surgical outcomes. Malnourished patients or those at high risk of malnutrition should receive nutritional intervention, such as oral nutritional supplements or enteral feeding, for 7–14 days before surgery if feasible. All surgical patients should be screened for nutritional risk using validated tools like the Nutritional Risk Screening 2002 (NRS-2002). High-risk patients should receive individualized nutrition care plans. Incorporating nutrition into ERAS protocols is strongly recommended, emphasizing minimal fasting, early mobilization, and multimodal analgesia. The use of immune-modulating diets (e.g., containing arginine, and omega-3 fatty acids) is recommended in major cancer surgeries to reduce infection rates and hospital length of stay. Specific recommendations are provided for various surgical populations, including gastrointestinal, oncological, and bariatric surgeries. Nutritional interventions should be tailored to the patient's metabolic state, comorbidities, and surgical risk. The guideline emphasizes that proper nutritional support is

integral to optimizing surgical outcomes, reducing complications, and enhancing recovery. It highlights the importance of timely, tailored interventions and aligns with the principles of enhanced recovery pathways.

2. Singer P, Blaser AR, Berger MM, et al. ESPEN guideline on clinical nutrition in the intensive care unit. *Clin Nutr.* 2019;38(1):48-79. doi:10.1016/j.clnu.2018.08.037.

The study by Singer et al., titled "ESPEN guideline on clinical nutrition in the intensive care unit (ICU)," published in *Clinical Nutrition* in 2019, presents evidence-based recommendations for the nutritional management of critically ill patients in the ICU. The guideline provides detailed strategies to optimize nutrition therapy, addressing energy, protein, micronutrient requirements, and timing and modes of feeding. Nutritional risk should be assessed within 48 hours of ICU admission using validated tools, such as the NUTRIC score or Nutritional Risk Screening (NRS-2002). Individualized nutrition plans should be created based on the patient's risk level, clinical status, and metabolic needs. Energy requirements should be calculated using indirect calorimetry when available; predictive equations (e.g., 20–25 kcal/kg/day) may be used when calorimetry is unavailable. Protein

intake of 1.3 g/kg/day is recommended for most critically ill patients, with adjustments for specific conditions (e.g., renal or liver failure). Early enteral nutrition (EN) should be initiated within 48 hours of ICU admission for patients unable to eat orally, provided there are no contraindications. Parenteral nutrition (PN) is recommended only when EN is not feasible or sufficient after 3–7 days, depending on the patient's condition. Routine use of immunomodulating nutrients (e.g., arginine, omega-3 fatty acids) is not recommended, except in specific subgroups, such as trauma or major surgery patients. Standard ICU feeding should include adequate vitamins and trace elements; supplementation may be required in deficiencies. Target blood glucose levels of 6–10 mmol/L (110–180 mg/dL) to avoid hypo- or hyperglycemia. The guideline emphasizes the critical role of personalized nutrition in improving clinical outcomes for ICU patients. It promotes early, enteral- based feeding strategies, careful monitoring, and adjustments tailored to individual patient needs to enhance recovery and reduce complications.

3. Arends J, Baracos V, Bertz H, et al. ESPEN guidelines on nutrition in cancer patients. *Clin Nutr.* 2017;36(1):11-48. doi:10.1016/j.clnu.2016.07.015.

The study by Arends et al., titled "ESPEN guidelines on nutrition in cancer patients," published in *Clinical Nutrition* in 2017, provides comprehensive recommendations for the nutritional management of patients with cancer. The guideline addresses the challenges of malnutrition, cancer cachexia, and the role of nutrition in improving treatment outcomes and quality of life. All cancer patients should be screened for malnutrition at diagnosis and throughout treatment using validated tools like the Nutritional Risk Screening (NRS-2002) or the Patient-Generated Subjective Global Assessment (PG- SGA). A detailed assessment of nutritional status, body composition, and metabolic changes is essential for those at risk. Oral nutritional supplements (ONS) should be offered to patients who cannot meet their needs through diet alone. **Enteral Nutrition (EN):** If oral intake is insufficient, EN is preferred as the first-line intervention. **Parenteral Nutrition (PN):** PN should be used only when oral or enteral routes are not feasible, such as in patients with severe gastrointestinal dysfunction.

These evidence-based recommendations advocate for nutrition as a critical component of comprehensive cancer management.

4. August DA, Huhmann MB. A.S.P.E.N. clinical guidelines: Nutrition support therapy during adult anticancer treatment and in hematopoietic cell transplantation. *JPEN J Parenter Enteral Nutr.* 2009;33(5):472-500. doi:10.1177/0148607109341804.

The study by August and Huhmann, titled "A.S.P.E.N. Clinical Guidelines: Nutrition Support Therapy During Adult Anticancer Treatment and in Hematopoietic Cell Transplantation," published in *JPEN Journal of Parenteral and Enteral Nutrition* in 2009, provides evidence-based guidelines for managing nutrition support in adults undergoing cancer treatment or hematopoietic cell transplantation (HCT). The guidelines underscore the critical role of

individualized nutrition support in improving outcomes and quality of life for cancer patients and HCT recipients. They advocate for the appropriate use of EN or PN based on clinical indications while highlighting the importance of multidisciplinary care to optimize nutrition during treatment.

5. Braga M, Ljungqvist O, Soeters P, Fearon K, Weimann A, Bozzetti F. ESPEN guidelines on parenteral nutrition: Surgery. Clin Nutr. 2009;28(4):378-386. doi:10.1016/j.clnu.2009.04.002.

The study by Braga et al., titled "ESPEN Guidelines on Parenteral Nutrition: Surgery," published in *Clinical Nutrition* in 2009, provides evidence-based guidelines on the use of parenteral nutrition (PN) in surgical patients. The guidelines aim to help clinicians decide when and how to implement PN, particularly in patients who are unable to meet their nutritional needs via oral or enteral routes, with the goal of improving surgical outcomes and reducing complications. PN solutions should contain an appropriate balance of macronutrients (carbohydrates, proteins, fats) and micronutrients (vitamins, trace elements) to support metabolic needs and prevent deficiencies. Lipid emulsions used in PN should be carefully selected, considering the patient's clinical condition, to avoid complications such as hypertriglyceridemia or immune suppression. Regularly monitoring nutritional intake, weight, electrolytes, liver and renal function, and glucose levels is essential to avoid complications such as refeeding syndrome, hyperglycemia, and liver dysfunction. Adjustments to the PN regimen may be required based on ongoing clinical assessments, including the patient's ability to tolerate feeding and response to treatment.

III. AIMS AND OBJECTIVES

AIM: To optimize total parenteral nutrition for NBM patients in pre and postoperative phases in a tertiary care hospital, Secunderabad.

OBJECTIVES:

PRIMARY OBJECTIVE: To give the clearest option to choose for TPN in NBM patients based on the nutritional requirements of the patient in the pre and post-operative phases. A robust comparative study also informs guidelines and best practices, ensuring improved patient outcomes, and resource utilization in selecting the most appropriate and effective treatment strategies.

SECONDARY OBJECTIVE:

- To reduce the duration of hospital stays.
- To decrease complications and associated costs due to malnutrition
- To increase the shortened recovery periods in post-surgical patients
- To provide better nutritional support to improve post-surgical quality of life.

IV. METHODOLOGY

Study design and study period:

- It is a prospective, observational study in KIMS, Secunderabad.
- The study is proposed to be conducted for 6 months.

Source of data:

Data would be collected by keenly observing patient treatment charts, case sheets, and laboratory data of the subjects included in the study.

Sample size:

The estimated sample size is about 120 patients including both male and female patients.

Inclusion criteria:

The study includes whether the subject satisfies the following criteria:

- Patients who have undergone surgeries
- Age (above 18 years).
- Gender (all)
- Inpatients

Exclusion criteria:

- Pediatrics.
- Patients who are not willing to give consent.
- Patients with more than 2 comorbidities.
- Emergency cases.
- Pregnant women.
- Lactating women.

Method of collection of data:

Informed consent will be obtained from the study participants after the study details are explained. Data collection was achieved using the following:

- = = Annexure – I (Patient Data Collection form) Annexure –II (informed consent form)

STUDY PROCEDURE:

The study's methodology has been approved by KIMS Hospital's ethics committee. 124 cases of sample size have been taken into consideration for our research. Forms for collecting patient data were used to gather all the information needed for our investigation. For the first two months of the research period data collecting was conducted. The data-collecting procedure included speaking with the patients who met the inclusion criteria of our research and they understood the briefings before obtaining their consent. Analyzing information was done for the next two months following data gathering. Excel was the program used to create graphs, tables, and other visual representations. The thesis was prepared during the last two months of the research period.

Statistical analysis:

This study uses descriptive statistics. The patient data will be analyzed using a Microsoft Office Excel spreadsheet.

PLAN OF THE STUDY

This study was conducted over 6 months.

To measure outcomes this study be divided into 4 phases.

PHASE - I:

- Review of Literature.
- Preparation of protocol.
- Approval obtainment from the ethical committee.

PHASE - II:

- Creating a consent form for the patient.
- Creating a data collection form.
- Obtaining information.
- Documentation of the collected data.

PHASE - III:

- Patients receiving surgery in various departments and receiving TPN in NBM were inquired closely.
- The data on the number of patients receiving formulated TPN were obtained and analyzed statistically.
- The data is analyzed and represented in tables and analytical representations like bar diagrams, pie charts, etc.
- Interpretation of data.

PHASE - IV:

- Thesis regulation of project.

V. RESULTS

Over six months, 124 cases were collected from various departments in the KIMS Hospital, Secunderabad to make the following assessment.

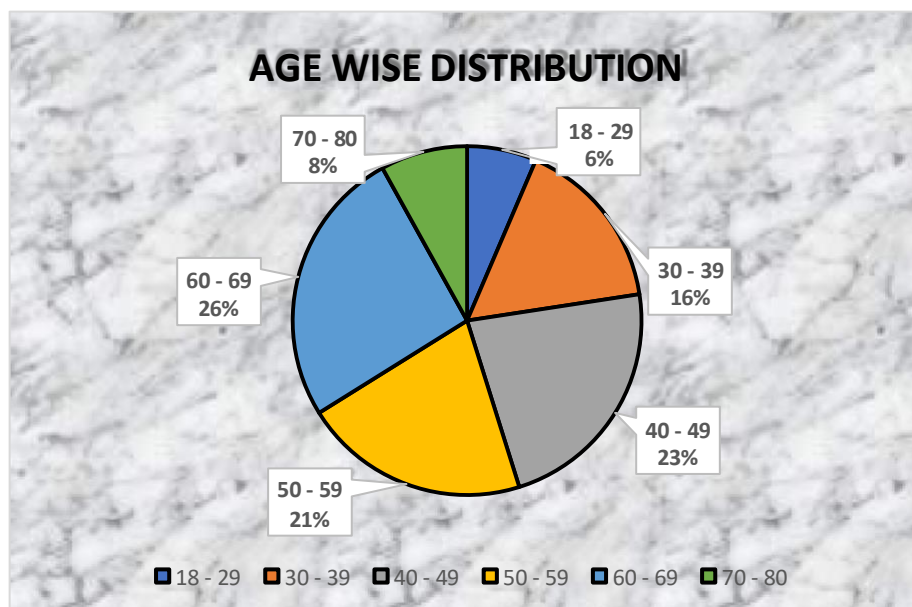
Table 1: AGE - WISE DISTRIBUTION

AGE-WISE DISTRIBUTION

Age in years	No of subjects	Percentage
18 – 29	8	6.45%
30 – 39	20	16.12%
40 – 49	28	22.58%
50 – 59	26	20.96%
60 – 69	32	25.80%

70 – 80	10	8.06%
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Figure 1: AGE-WISE DISTRIBUTION



A total of 124 participants were enrolled in the study, they have been categorized based on their age groups. The distribution is as follows 18 to 29 age group has 8 patients, the 30 to 39 age group has 20 patients, the 40 to 49 age group has 28 patients, the 50 to 59 age group has 26 patients, the 60 to 69 age group has 32 patients, 70 to 80 age group has 10 patients and their percentages are as follows 6.45%, 16.12%, 22.58%, 20.96%, 25.80%, 8.06% respectively.

Table 2: GENDER - WISE DISTRIBUTION

GENDER WISE DISTRIBUTION

GENDER		NO OF SUBJECTS	PERCENTAGE
MALE		62	50.00%
FEMALE		62	50.00%

Figure 2: GENDER-WISE DISTRIBUTION

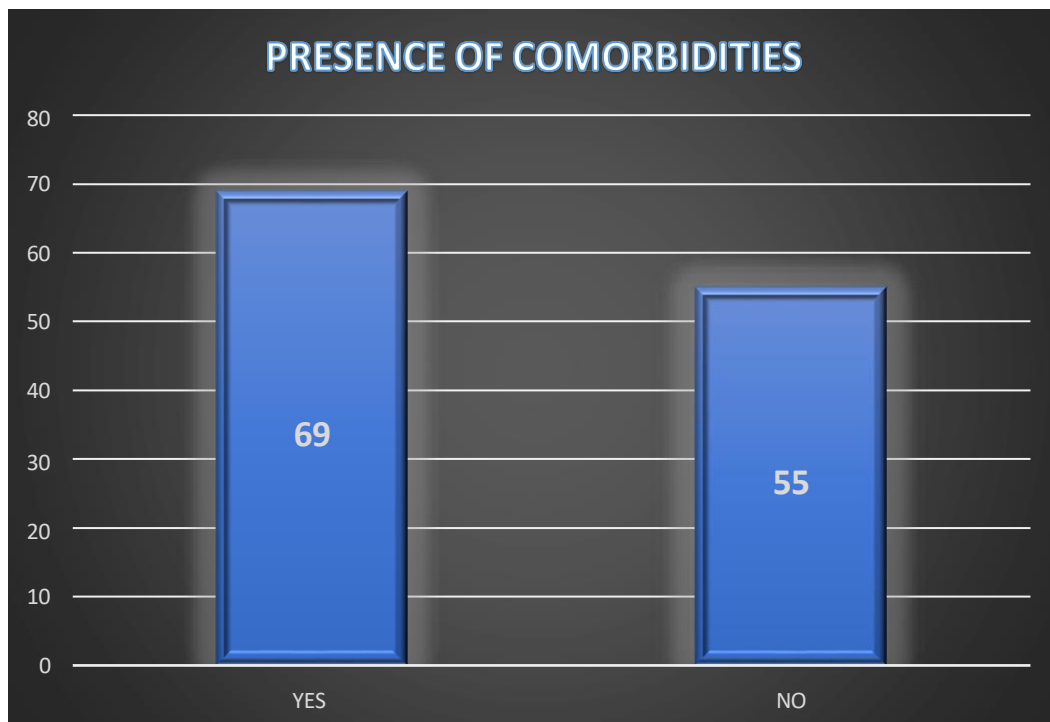


Of 124 total population considered in this study, 62 were males with 50%, and 62 were females with 50%. The percentage of male patients and female patients were maintained equal.

Table 3: PRESENCE OF COMORBIDITIES
PRESENCE OF COMORBIDITIES

COMORBIDITIES	NO OF SUBJECTS	PERCENTAGE
YES	69	56%
NO	55	44%

Figure 3: PRESENCE OF COMORBIDITIES



Of the total number of subjects, 69 members have comorbidities with a percentage of 56% and 55 members do not have comorbidities denoting 44% of the total population.

Table 4: COMORBIDITIES WISE DISTRIBUTION

COMORBIDITIES WISE DISTRIBUTION

COMORBIDITY	NO OF SUBJECTS	PERCENTAGE
HYPERTENSION	21	30.43%
DIABETES MELLITUS	24	34.78%
ASTHMA	8	11.59%
VITAMIN DEFICIENCIES	3	4.34%
THYROID	13	18.84%

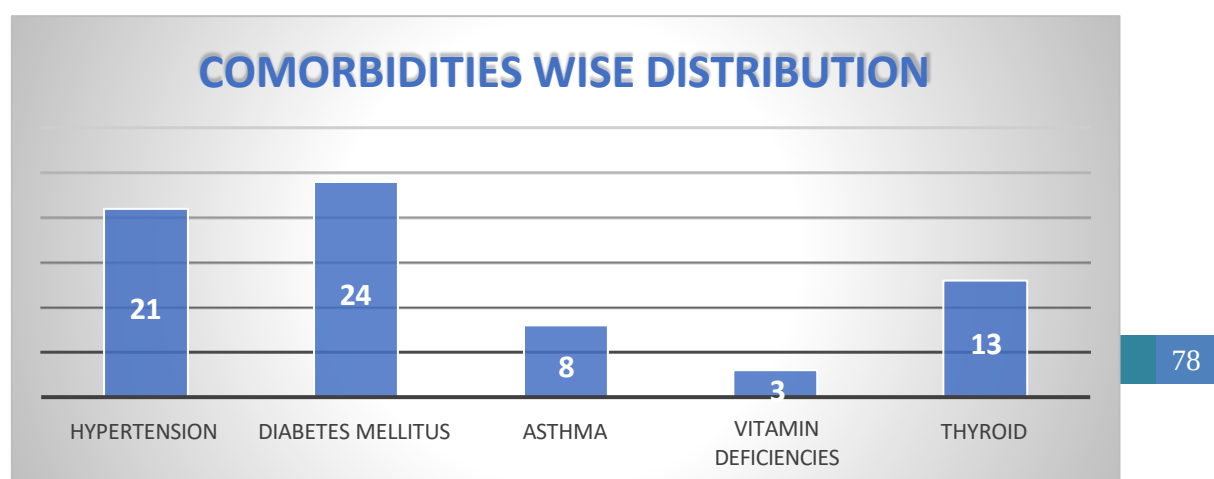


Figure 4: COMORBIDITIES WISE DISTRIBUTION

Comorbidities in the total population were seen as 21 patients have hypertension which accounts for 30.43%, 24 patients have diabetes mellitus which accounts for 34.78%, 8 patients have asthma which accounts for 11.59%, 3 patients have vitamin deficiencies which accounts for 4.34% and 13 patients have thyroid which accounts for 18.84% of the population.

Table 5: DEPARTMENT WISE DISTRIBUTION

DEPARTMENT WISE DISTRIBUTION

Name of the department	No of patients	Percentage
GASTROINTESTINAL	25	20.16%
GENERAL SURGERY	23	18.54%
CARDIOLOGY	22	17.74%
GYNAECOLOGY	24	19.35%
NEPHROLOGY	15	12.09%
ORTHOPAEDICS	15	12.09%

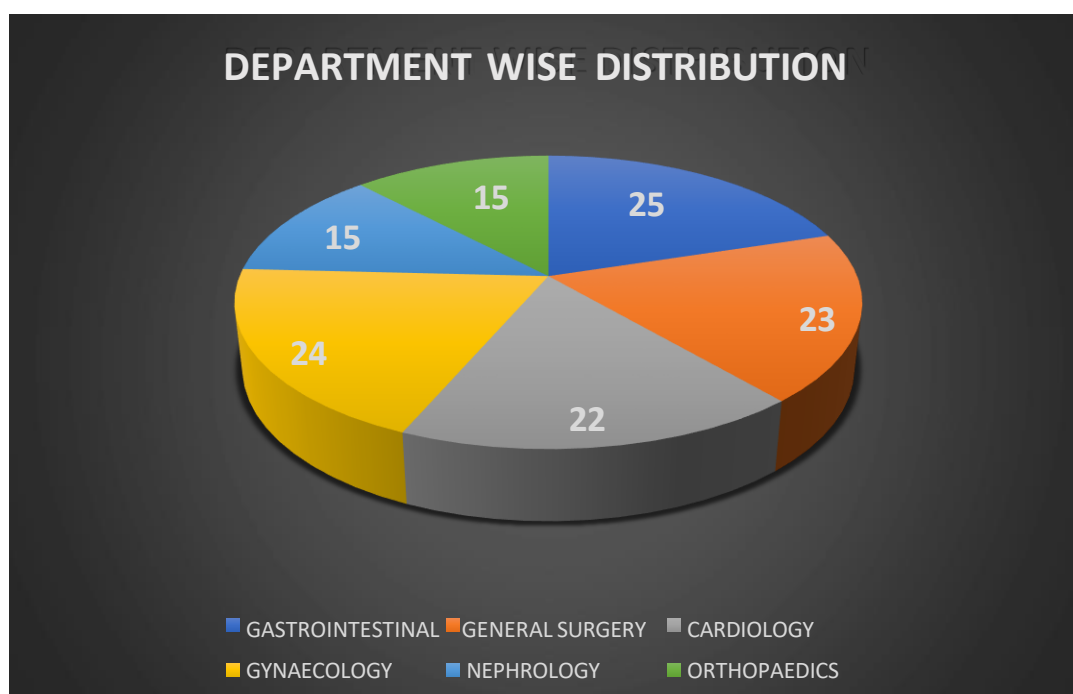


Figure 5: DEPARTMENT WISE DISTRIBUTION

Overall distribution according to the cases collected from each department is as follows:
Gastrointestinal department – 20.16%, General surgery – 18.54%, Cardiology – 17.74%,

Gynaecology – 19.35%, Nephrology – 12.09% and Orthopaedics – 12.09%.

Table 6: DIET WISE DISTRIBUTION

DIET WISE DISTRIBUTION

DIET	NO OF PATIENTS	PERCENTAGE
LOW-CALORIE DIET	33	26.61%
ADEQUATE CALORIE DIET	24	18.64%
HIGH-CALORIE DIET	67	56.77%

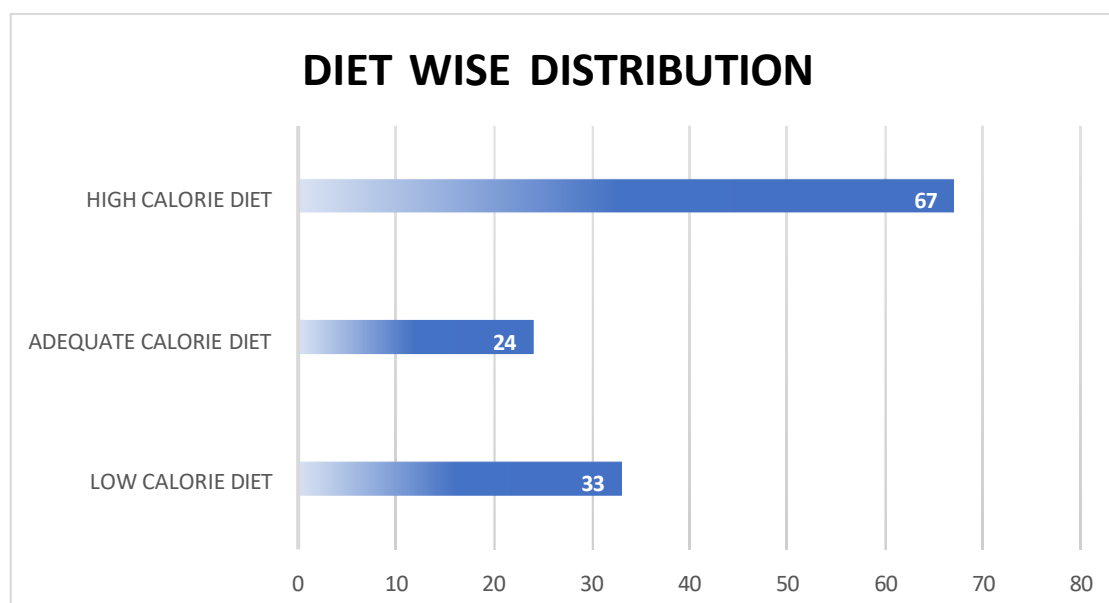


Figure 6: DIET WISE DISTRIBUTION

Based on their eating habits, the subjects are classified as following a high-calorie diet (67 calories), an adequate-calorie diet (24 calories), and a low-calorie diet (33 calories).

Table 7: DEPRIVATION OF ELECTROLYTES IN AGE GROUP (18 - 29)

DEPRIVATION OF ELECTROLYTES IN AGE GROUP (18 - 29)

ELECTROLYTES	No of subjects	Percentage
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SODIUM	7	87.50%
MAGNESIUM	4	50.00%
CALCIUM	8	100.00%
POTTASium	3	37.50%
PHOSPHORUS	2	25.00%

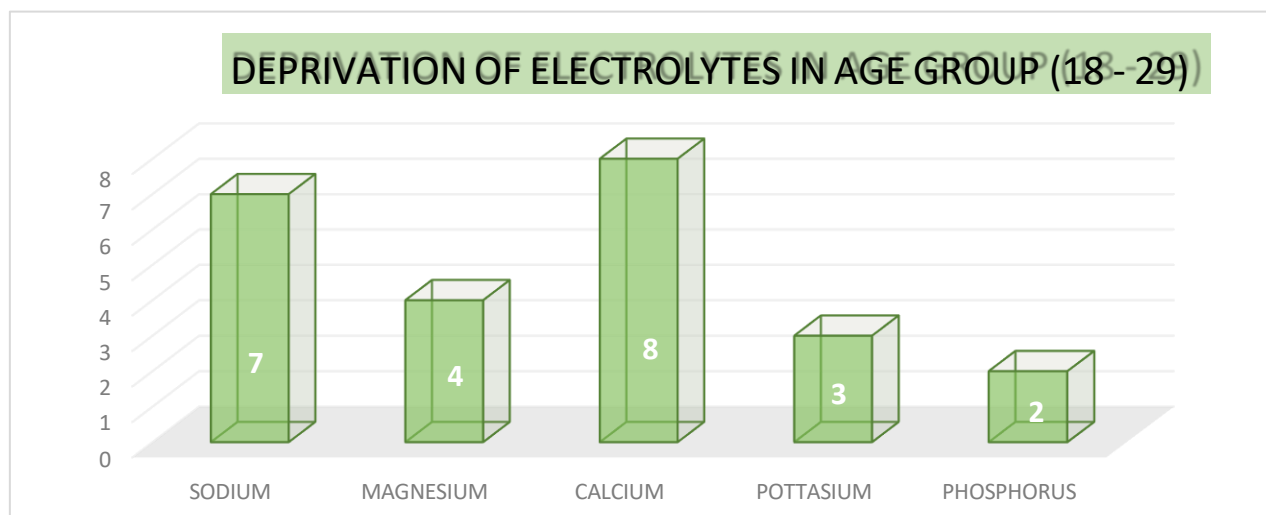


Figure 7: DEPRIVATION OF ELECTROLYTES IN AGE GROUP (18 - 29)

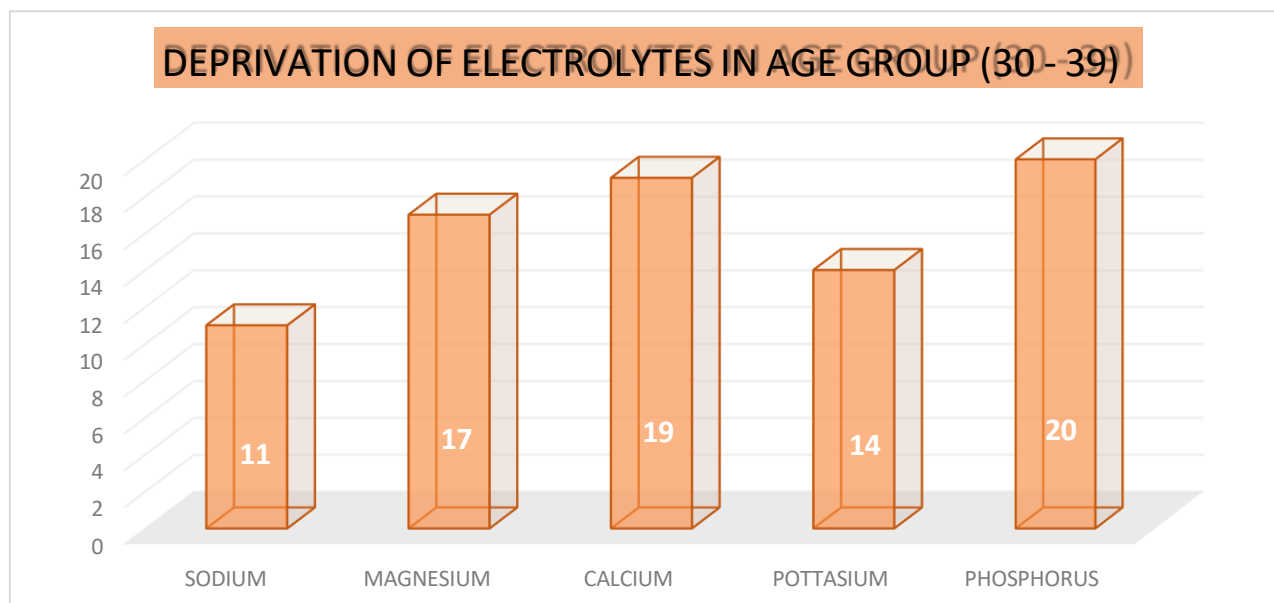
Deprivation of electrolytes is seen in all age groups, in the above graph of age group (18 - 29) 7 subjects have a decrease in sodium levels, 4 have a reduction in magnesium levels, 8 have a reduction in calcium levels, 3 have a reduction in potassium levels and 2 have a reduction in phosphorus levels.

Table 8: DEPRIVATION OF ELECTROLYTES IN AGE GROUP (30 - 39)

DEPRIVATION OF ELECTROLYTES IN AGE GROUP (30 - 39)

ELECTROLYTES	No of subjects	Percentage
SODIUM	11	55.00%
MAGNESIUM	17	85.00%
CALCIUM	19	95.00%
POTTASium	14	70.00%
PHOSPHORUS	20	100.00%

Figure 8: DEPRIVATION OF ELECTROLYTES IN AGE GROUP (30 - 39)



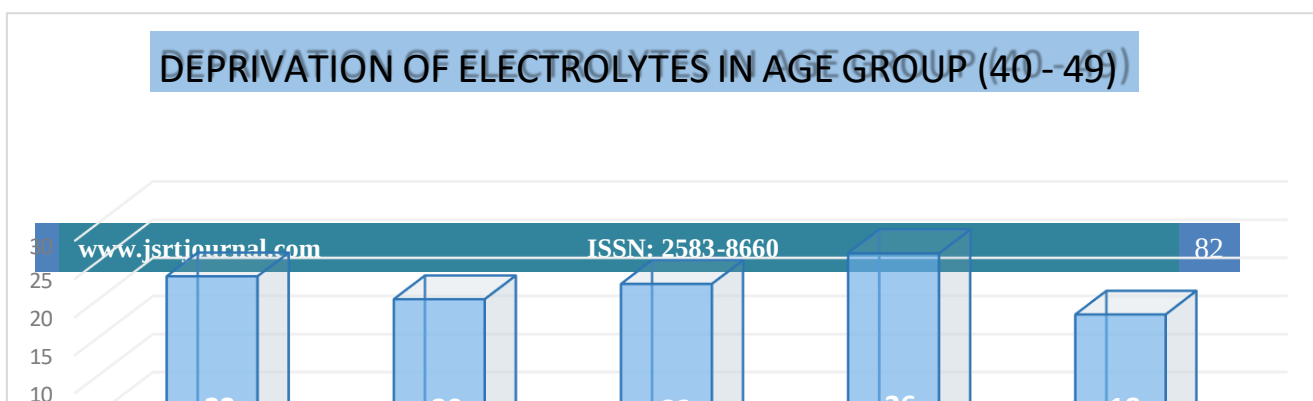
Deprivation of electrolytes is seen in all age groups, in the above graph of age groups (30 - 39), 11 subjects have a decrease in sodium levels, 17 have a reduction in magnesium levels, 19 have a reduction in calcium levels, 14 have a reduction in potassium levels and 20 have a reduction in phosphorus levels.

Table 9: DEPRIVATION OF ELECTROLYTES IN AGE GROUP (40 - 49)

DEPRIVATION OF ELECTROLYTES IN AGE GROUP (40 - 49)

ELECTROLYTES	No of subjects	Percentage
SODIUM	23	82.10%
MAGNESIUM	20	71.40%
CALCIUM	22	78.50%
POTASSIUM	26	92.80%
PHOSPHORUS	18	64.20%

Figure 9: DEPRIVATION OF ELECTROLYTES IN AGE GROUP (40 - 49)



DEPRIVATION OF ELECTROLYTES IN AGE GROUP (70 - 80)

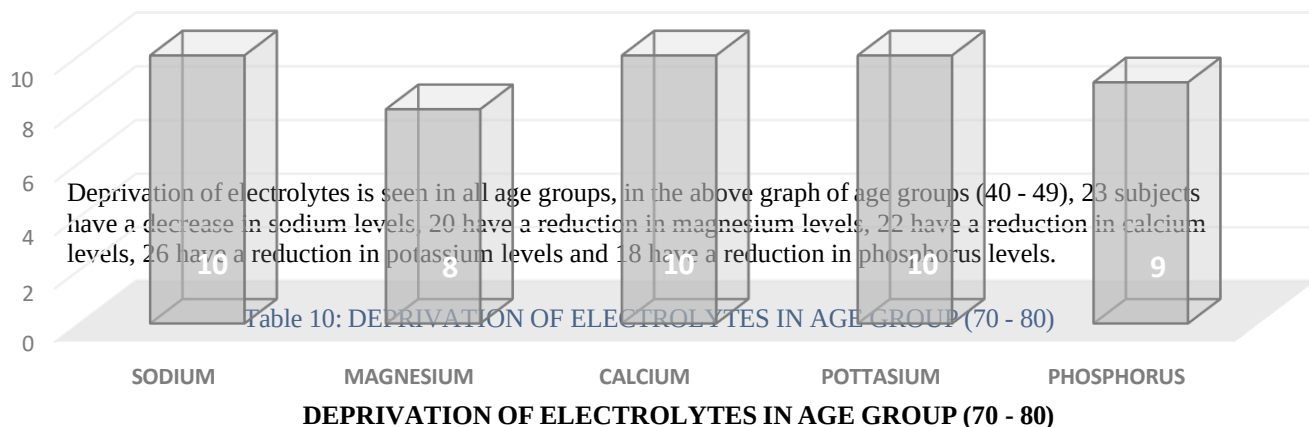


Figure 10: DEPRIVATION OF ELECTROLYTES IN AGE GROUP (70 - 80)

Deprivation of electrolytes is seen in all age groups, in the above graph of age groups (70 - 80), 10 subjects have a decrease in sodium levels, 8 have a reduction in magnesium levels, 10 have a reduction in calcium levels, 10 have a reduction in potassium levels and 9 have a reduction in phosphorus levels.

Table 11: No. of days on NBM

NO. OF DAYS ON NILL BY MOUTH

NO. OF DAYS	NO OF PATIENTS	PERCENTAGE
1	13	10.48%
2	35	28.22%
3	44	35.48%
4	32	25.80%

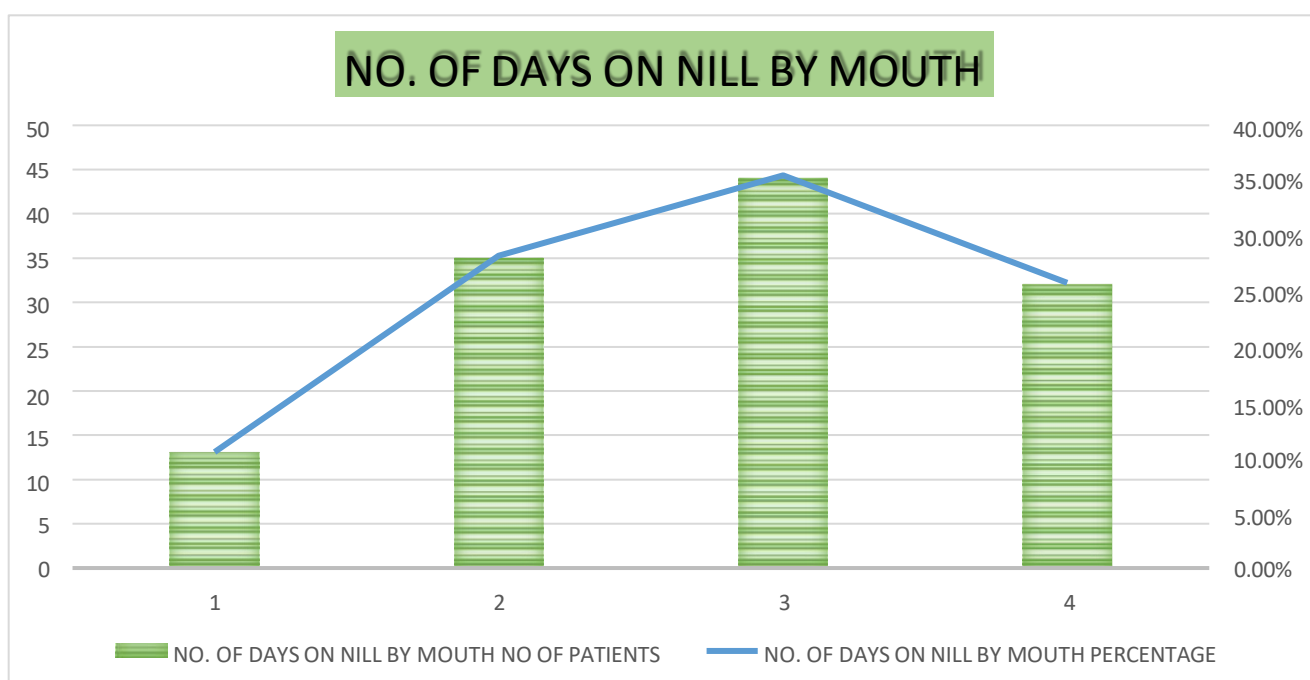


Figure 11: No. of days on NBM

In the total subject population, 25.8% is on NBM for 4 days, 35.48% is on NBM for 3 days, 28.22% is on NBM for 2 days and 10.48% is on NBM for 1 day.

DISCUSSION:

- The study focuses on the role of Total Parenteral Nutrition (TPN) in managing the nutritional needs of Nil By Mouth (NBM) patients during the preoperative and postoperative phases.
- The study included 124 patients from KIMS Hospital, Secunderabad.
- The most affected age group was 60–69 years (25.8%), followed by 40–49 years (22.58%).
- The lowest representation was in the 18–29 years age group (6.45%).

- This suggests that older patients are more likely to require TPN support, possibly due to comorbidities and age-related metabolic challenges.
- Equal representation of male and female patients (50% each).
- This highlights that TPN is required irrespective of gender, emphasizing its role in surgical and critical care.
- 56% of patients had comorbidities, while 44% did not.
- Diabetes Mellitus (34.78%) and Hypertension (30.43%) were the most common comorbidities.
- Asthma, Thyroid Disorders, and Vitamin Deficiencies were also noted.
- Patients with diabetes and hypertension are at higher risk of post-surgical complications, making proper nutritional support crucial.
- Gastrointestinal (20.16%) and Gynecology (19.35%) had the highest number of patients.
- General Surgery (18.54%) and Cardiology (17.74%) also had significant representation.
- Nephrology and Orthopedics (12.09% each) had fewer patients.
- Gastrointestinal patients require nutritional support due to gut surgeries, making TPN essential.
- High-Calorie Diet (56.77%) was the most common, followed by Low-Calorie Diet (26.61%).
- This indicates that most patients require higher energy intake, likely due to metabolic stress after surgery.
- 35.48% were NBM for 3 days, and 25.8% for 4 days.
- Longer NBM periods increase the risk of malnutrition, justifying the need for TPN.
- 29% of patients received 5 TPN doses, while 24.4% received 3 TPN doses.
- Suggests that most patients require multiple rounds of TPN, reinforcing its importance in recovery.
- The study found electrolyte imbalances across different age groups: Sodium, Potassium, Magnesium, and Phosphorus deficiencies were common.
- Older patients (50–80 years) had higher rates of electrolyte depletion, reinforcing the need for careful monitoring and adjusted TPN formulations.
- Older patients (>60 years) are at higher risk of malnutrition and electrolyte imbalance post-surgery.
- Diabetes and hypertension significantly impact recovery, requiring tailored TPN formulations.
- Gastrointestinal and gynecological surgeries were the most common cases needing TPN.
- Longer NBM periods (3+ days) require aggressive nutritional intervention to prevent complications.
- Electrolyte monitoring is crucial to prevent deficiencies that could delay recovery.
- This study highlights the importance of optimized TPN in surgical NBM patients.
- By customizing TPN formulations based on age, comorbidities, and surgery type, healthcare providers can reduce complications, improve recovery times, and enhance patient outcomes.
- Patients with diabetes and hypertension require tailored TPN to prevent metabolic complications.
- Daily monitoring of electrolytes, glucose, and fluid balance is essential.
- Regular assessment of caloric intake to ensure patients receive adequate energy without overfeeding.
- Develop hospital-wide guidelines for optimal TPN formulations based on patient age, surgery type, and comorbidities.
- Educate healthcare providers on recognizing early signs of malnutrition and electrolyte

imbalance.

CONCLUSION

- The study emphasizes that surgical patients, especially those undergoing major or gastrointestinal surgeries, often experience malnutrition, which can lead to complications such as delayed healing, weakened immunity, and longer hospital stays.
- It aims to optimize Total Parenteral Nutrition (TPN) for these patients, ensuring they receive the right balance of macronutrients and micronutrients tailored to their specific surgical and metabolic needs.
- By enhancing nutritional strategies, the study seeks to reduce complications, shorten hospital stays, and improve post-surgical recovery.

The document details the physiological stress and nutrient loss that occurs during surgery:

- Protein Loss: Due to tissue trauma, protein breakdown increases, affecting muscle mass and wound healing.
- Blood Loss: Leads to depletion of iron, hemoglobin, and micronutrients like zinc and copper.
- Electrolyte Imbalance: Loss of sodium, potassium, and magnesium, which impacts muscle function and recovery.
- Vitamin Depletion: Increased demand for vitamins like C, A, and B-complex for immune function and healing.
- Glycogen Depletion & Energy Loss: The body's shift towards using fatty acids and amino acids for energy can cause muscle wasting.
- The need for individualized nutritional plans is emphasized, balancing early enteral feeding versus prolonged TPN use.
- Optimizing TPN is expected to reduce hospital stays, decrease infection rates, and improve recovery.
- The study contributes to developing standardized and cost-effective TPN protocols for better resource utilization in clinical settings.
- This document provides a detailed and structured approach to perioperative nutrition, particularly for NBM patients.
- Focus on individualized nutritional strategies, evidence-based guidelines, and clinical case studies, offers valuable insights into improving surgical outcomes through optimized TPN administration.
- Patients with diabetes and hypertension are at higher risk of post-surgical complications, making proper nutritional support crucial.
- Gastrointestinal patients require nutritional support due to gut surgeries, making TPN essential.
- This indicates that most patients require higher energy intake, likely due to metabolic stress after surgery.
- Longer NBM periods increase the risk of malnutrition justifies the need for TPN.
- Older patients (50–80 years) had higher rates of electrolyte depletion, reinforcing the need for careful monitoring and adjusted TPN formulations.

SUMMARY

- Older patients (>60 years) are at higher risk of malnutrition and electrolyte imbalance post-surgery. Diabetes and hypertension significantly impact recovery, requiring tailored TPN formulations.
- Gastrointestinal and gynecological surgeries were the most common cases needing TPN.
- Longer NBM periods (3+ days) require aggressive nutritional intervention to prevent complications.
- Electrolyte monitoring is crucial to prevent deficiencies that could delay recovery.
- This study highlights the importance of optimized TPN in surgical NBM patients.
- By customizing TPN formulations based on age, comorbidities, and surgery type, healthcare providers can reduce complications, improve recovery times, and enhance patient outcomes.
- Most affected age group is 60–69 years (25.8%). Equal gender distribution is seen as 62 males (50%) and 62 females (50%).
- 56% of patients had comorbidities, with the most common being Diabetes Mellitus (34.78%), Hypertension (30.43%), Thyroid Disorders (18.84%)
- Highest cases in: Gastrointestinal (20.16%), Gynecology (19.35%), and General Surgery (18.54%), Suggesting a high need for TPN in gastrointestinal surgeries where oral feeding is restricted.
- 56.77% of patients required a high-calorie diet, 26.61% followed a low-calorie diet, 35.48% of patients were NBM for 3 days, and 25.8% were NBM for 4 days, increasing the risk of malnutrition. 29% of patients required 5 TPNs, indicating prolonged dependency on parenteral nutrition. Sodium, potassium, magnesium, and phosphorus depletion was observed across all age groups.
- Older patients (>50 years) had the highest rates of electrolyte depletion, requiring careful supplementation. Patients with diabetes and hypertension require tailored TPN to prevent metabolic complications.
- Older patients (>60 years) need increased electrolyte monitoring to avoid deficiencies.
- Start TPN early in patients expected to be NBM for more than 3 days.
- Use enteral nutrition as soon as feasible to transition away from TPN and reduce infection risks.
- Daily monitoring of electrolytes, glucose, and fluid balance is essential.
- Regular assessment of caloric intake to ensure patients receive adequate energy without overfeeding.

REFERENCES

1. Weimann A, Braga M, Carli F, et al. ESPEN guideline: Clinical nutrition in surgery. *Clin Nutr.* 2017;36(3):623-650. doi:10.1016/j.clnu.2017.02.013.
2. Singer P, Blaser AR, Berger MM, et al. ESPEN guideline on clinical nutrition in the intensive care unit. *Clin Nutr.* 2019;38(1):48-79. doi:10.1016/j.clnu.2018.08.037.
3. Arends J, Baracos V, Bertz H, et al. ESPEN guidelines on nutrition in cancer patients. *Clin Nutr.* 2017;36(1):11-48. doi:10.1016/j.clnu.2016.07.015.
4. August DA, Huhmann MB. A.S.P.E.N. clinical guidelines: Nutrition support therapy during adult anticancer treatment and in hematopoietic cell transplantation. *JPEN J Parenter Enteral Nutr.* 2009;33(5):472-500. doi:10.1177/0148607109341804.
5. Braga M, Ljungqvist O, Soeters P, Fearon K, Weimann A, Bozzetti F. ESPEN guidelines on parenteral nutrition: Surgery. *Clin Nutr.* 2009;28(4):378-386. doi:10.1016/j.clnu.2009.04.002.
6. Goossens C, Weijs PJ, Driessen A, et al. Effect of early oral feeding compared with total parenteral nutrition on postoperative recovery after esophagectomy: A retrospective cohort study. *Clin Nutr.* 2014;33(4):683-688. doi:10.1016/j.clnu.2013.09.005.
7. Heyland DK, Stephens KE, Day AG, McClave SA. The success of enteral nutrition and the role of gastric residual volume: A multicenter, observational study. *JPEN J Parenter Enteral Nutr.* 2011;35(3):337-344. doi:10.1177/0148607110379834.
8. Marik PE, Hooper MH. Normocaloric versus hypocaloric feeding on the outcomes of ICU

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- patients: A systematic review and meta-analysis. *Crit Care Med.* 2016;44(2):317-323. doi:10.1097/CCM.0000000000001385.
9. Bozzetti F, Forbes A. The ESPEN clinical practice guidelines on parenteral nutrition: Present status and perspectives for future research. *Clin Nutr.* 2009;28(4):359-364. doi:10.1016/j.clnu.2009.05.010.
 10. Wischmeyer PE, Dhaliwal R, McCall M, Ziegler TR, Heyland DK. Parenteral glutamine supplementation in critical illness: A systematic review. *Crit Care Med.* 2014;42(2):415-424. doi:10.1097/CCM.0b013e3182a272c3.
 11. Correia MI, Waitzberg DL. The impact of malnutrition on morbidity, mortality, length of hospital stay, and costs was evaluated through a multivariate model analysis. *Clin Nutr.* 2003;22(3):235-239. doi:10.1016/S0261-5614(02)00215-7.
 12. Elke G, Wang M, Weiler N, Day AG, Heyland DK. The effect of parenteral nutrition on mortality in critically ill patients receiving nutrition therapy: A systematic review and meta-analysis. *Crit Care.* 2014;18(6):R147. doi:10.1186/cc13975.
 13. Allard JP, Keller H, Jeejeebhoy KN, et al. Malnutrition at hospital admission—contributors and effect on length of stay: A prospective cohort study from the Canadian Malnutrition Task Force. *JPEN J Parenter Enteral Nutr.* 2016;40(4):487-497. doi:10.1177/0148607114567902.
 14. Casaer MP, Mesotten D, Hermans G, et al. Early versus late parenteral nutrition in critically ill adults. *N Engl J Med.* 2011;365(6):506-517. doi:10.1056/NEJMoa1102662.
 15. Shenkin A, Cederholm T. Muscle function and protein energy metabolism in the elderly: Role of TPN. *Clin Nutr.* 2008;27(1):5-8. doi:10.1016/j.clnu.2007.10.011.