Study Of Correlation Between Preoperative Nutritional Risk Factors And Post Operative Complications With Early Outcome In Patients Undergoing Elective Gastointestinal Surgery

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Abstract

Background:-Malnutrition are more prevalent in patients who suffering from major gastrointestinal tract pathology. Preoperative malnutrition are responsible for post operative morbidity like wound infection, wound dehiscence, anastomosis leak and prolonged hospital stay. [1]Nutrition screening tools like Anthropometric method include Body mass index(BMI), WHO weight status, Nutritional risk index(NRI)-Buzby index, serum albumin level are widely used screening tools to assess preoperative malnutrition.[2] Hypoalbuminemia is single best parameter in preoperative period to assess malnutrition and predictor of postoperative morbidity. Total parenteral nutrition(TPN) in severly malnourished patients during perioperative period significantly decrease postoperative morbidity and mortality and improved operative outcome.

Methods:- This study is retrospective study of 100 patients. Study group underwent nutrition screening during preoperative period and identify potential group of patients who were malnourished and provide perioperative nutritional support in the form of total parenteral nutrition(TPN) to improve postoperative outcome.

Results:- Approx 18% of participants having <2.8 gm/dl albumin ,28 % having 2.8-3.5 gm/dl and 54 % having >3.5 gm/dl albumin in preoperative period. Average duration of preoperative nutritional support was 8.55±5.73 days and postoperative support was 8.9±4.95 days. Majority of postoperative complication observed in <2.8 gm/gl (high risk)albumin level include wound infection(55.56%), wound dehiscence(11.11%) ,anastomosis leak(22.22%), reexploration(16.67%) which was high in compared with moderate and low risk group of albumin.

Conclusion:-Preoperative hypoalbuminemia is inversely associated with postoperative rate of complication, length of hospital stay and mortality. Identify malnourishment in patients by application of nutritional risk assessment tools and application of perioperative nutritional support for better post operative outcome.

Keywords: Malnutrition, postoperative morbidity and mortality, nutrition screening tools, Hypoalbuminemia, TPN

Introduction

Gastrointestinal surgery was commonly performed operative procedure in daily surgical practice on routine as well as emergency procedure. In emergency gastrointestinal operative procedure we didn't have enough time to assess nutritional status of patients to know the nutrition risk and gave nutrition supplements for better postoperative outcome. But in elective setting, if patient's general condition permit, we need to assess patient's overall general health, nutrition status, try to identify nutrition risk patients

and build the patients preoperatively by giving nutritional support in the form of protein-energy riched enteral feeding, immunonutrient or via intravenous route in the form of total parenteral nutrition(TPN) if patient's GI tract couldn't tolerate enteral nutrition for better post operative outcome.[3]

Malnutrition:-

Documented prevalence of malnutrition in patients who underwent elective major gastrointestinal surgery ranges from 20% to 70%. Metabolic stress response, catabolic response to surgery and activation of inflammatory pathway causes the depletion of essential nutrients due to increased metabolic demand ,resulting in an increased postoperative complications, particularly infectious complications. Metabolic response to trauma is characterized by negative nitrogene balance and changes in extracellular and intracellular free amino acid patterns.[4]

Hypoalbuminemia and nutrition support:-

Serum albumin is a good and simple predictor of surgical risk and had close correlation with the severity of malnutrition. Hypoalbuminemia-marker of malnutrition is a powerful predictor of delayed recovery of bowel function, postoperative morbidity in patients who undergoing elective major gastrointestinal tract surgery. Although albumin is regard as acute phase reactant protein.[5]

The European society for parenteral and enteral nutrition(ESPEN) and the Enhanced recovery After Surgery(ERAS) society guidelines recommend that enteral nutrition(EN) should be implemented for patients after surgery as soon as possible if GI tracts work. Enteral nutrition supplements were superior to parenteral nutrition supplements in view of lower rate of post operative infectious complication, mortality and length of hospital stay.[4]

The ESPEN guideline recommend that surgeon consider initiating parenteral nutrition if the energy requirement of the patients have not been met by enteral nutrition for more than 7 days. The American society for parenteral and enteral nutrition guideline recommend that parenteral nutrition should be initiated within 3-5 days for patients who are at nutritional risk and unlikely to achieve a desired oral intake or with insufficient enteral nutrition (<60% of energy requirement) .[4]

Total parenteral nutrition(TPN) prevent the effect of starvation in patients with a nonfunctioning gastrointestinal tract, modulate the catabolic response to surgical stress and reduced complications associated with hypercatabolism. Administration of TPN resulting in improvement in weight, nitrogene balance, prealbumin level and other nutritional end points.[6,7]

Assessment of nutritional risk factors:-

Nutrition screening aims to detect the presence and the risk of developing undernutrition. Numerous nutrition screening tools have been developed to detect the nutritional status of patients like weight, height, BMI, anthropometric data, serum albumin level and many others. These objective parameters are not powerful enough to detect malnourished patients at high risk. The absence of a single gold standard objective measure has led investigators to develop various nutritional indices that can be used to stratify patients at increased risk for poor outcomes. These prognostic indices include the Nutritional Risk Index(NRI) which is based on mathematical equations.

Materials And Methods

An retrospective study was conducted among 100 patients those who underwent elective gastrointestinal surgery in the Department of General Surgery, New civil hospital Surat, over a period of 32 months (December 2020-July 2023).

Participants:-

Inclusion criteria

Age (20-60)years

All patients who were undergoing elective gastrointestinal surgery

Exclusion Criteria:

Age <20 or >60 years.

Emergency abdominal surgery

Socio-demographic details like age, gender, full history, clinical examination, laboratory-blood tests, as well as radiological investigations and, management was done for all these patients. Anthropometric parameters like weight, height, BMI

collected from record data. Nutritional risk index calculated from available information and comparision was done in relation with BMI and preoperative serum albumin level to classify the patients risk category into no risk , mild risk, moderate risk, severe risk category. Calculate correlation between serum albumin level in relation with postoperative complication.

Results

TABLE 1- SOCIO-DEMOGRAPHIC CHARACTERISTICS

FACTOR	FREQUENCY
AGE(IN YEAR)(n=100)	
20-30	18
31-40	23
41-50	19
51-60	40
Mean age 45.1 ±13.08	
SEX(n=100)	
Male	68
Female	32
DIETARY HABBIT(n=100)	
Vegetarian	60
Non-vegetarian	40
DIAGNOSIS (n=100)	
Upper GI tract pathology	27
Lower GI tract pathology	34
Hepatobiliary pancreatic splenic system pathology	25
Retroperitoneal system pathology	06
Genitourinary system pathology	08
CHIEF COMPLAINT OF PARTICIPANTS(n=100)	
Abdominal pain	69
Abdominal distention	9
Vomiting	24
Constipation/diarrhoea	6
Anorexia	14
Weakness	15
Others	67

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Table 2-Nutrition Risk Distribution Among Study Participants:-

NUTRITION DEFICIENCY(n=100)	
Skin changes of nutrition deficiency	46
BMI DISTRIBUTION - kg/m^2 (n=100)	
<18.5(under weight)	19
18.5-24.9(normal range)	76
25-29.9(over weight)	04
30-34.9(obese class 1)	01
35-39.9(obese class 2)	00
Mean BMI 21.32 ±2.86	
PERIOPERATIVE NUTRITIONAL SUPPORT(n=60)	
Preoperative period	20
Postoperative period	40
PREOPERATIVE NUTRITION SUPPORT IN RELATION WITH BMI STATUS(n=20)	
<18.5(under weight)	06
18.5-24.9(normal range)	14
25-29.9(over weight)	00
30-34.9(obese class 1)	00
POSTOPERATIVE NUTRITION SUPPORT IN RELATION WITH BMI STATUS(n=40)	
<18.5(under weight)	10
18.5-24.9(normal range)	27
25-29.9(over weight)	02
30-34.9(obese class 1)	01
AVERAGE DAYS(MEAN) OF NUTRITION SUPPORT	
Preoperative period(n=20)	8.55±5.73
Postoperative period(n=40)	8.9±4.95
DISTRIBUTION OF ALBUMIN LEVEL(n=100)	
High risk(<2.8 g/dl)	18
Moderate risk(2.8-3.5 g/dl)	28
Low risk(>3.5 g/dl)	54
Mean Albumin 3.56±0.77	
NUTRITIONAL RISK INDEX(NRI-BUZBY INDEX)(n=100)	

Severe malnourishment	24
Moderate malnourishment	35
Mild malnourishment	8
No malnourishment	33
POST OPERATIVE COMPLICATION AMONG STUDY PARTICIPANTS(n=100)	
Episode of fever	45
Primary hemorrhage	08
Collapse of lung	25
Hypotension/ Shock	11
Pneumonia	20
Wound Infection	39
Wound Dehiscence	07
Anastomosis Leakage	11
Re-exploration	09
UTI	28
Paralytic ileus	23
MEAN DURATION OF OPERATIVE PROCEDURE(n=100)	
Operative procedure hours	3.97±1.36
OPERATIVE OUTCOME(n=100)	
Discharge	81
Discharge on request	11
DAMA	01
Death	07

TABLE 3-PATIENT DISTRIBUTION ACCORDING TO BMI IN RELATION WITH SERUM ALBUMIN LEVEL (N=100)

BMI in kg/m^2	Serum albumin level			
	High risk (<2.8g/dL)	Moderate risk (2.8-3.5g/dL)	Low risk (>3.5g/dL)	Total no.
<18.5(under weight)	3	9	7	19
18.5-24.9(normal range)	15	18	43	76
25.0-29.9(over	0	1	3	4

weight)				
30.0-34.9(obese class 1)	0	0	1	1
Total no.	18	28	54	100

TABLE 4- FREQUENCY OF POST OPERATIVE COMPLICATIONS IN RELATION WITH SERUM ALBUMIN LEVEL OBSERVED AMONG CASES(N=100)

Post-op complications	Serum Albumin level		
	High risk (<2.8g/dL)(n=18)	Moderate risk (2.8-3.5g/dL)(n=28)	Low risk (>3.5g/dL)(n=54)
Episode of fever	12(66.67%)	13(46.43%)	20(37.04%)
Primary hemorrhage	1(5.56%)	3(10.71%)	4(7.41%)
Collapse of lung	7(38.89%)	8(28.57%)	10(18.52%)
Hypotension/ Shock	4(22.22%)	3(10.71%)	4(7.41%)
Pneumonia	6(33.33%)	5(17.86%)	9(16.67%)
Wound Infection	10(55.56%)	10(35.71%)	19(35.18%)
Wound Dehiscence	2(11.11%)	1(3.57%)	4(7.41%)
Anastomosis Leakage	4(22.22%)	4(14.28%)	3(5.56%)
Re-exploration	3(16.67%)	4(14.28%)	2(3.7%)
UTI	5(27.78%)	11(39.28%)	12(22.22%)
Paralytic ileus	8(44.44%)	6(21.43%)	9(16.67%)

Majority of postoperative complication observed in <2.8 gm/gl (high risk)albumin level population include fever(66.67%), primary haemorrahge(5.56%)), collapse of lung(38.89%) , Hypotension/shock(22.22%), pneumonia(33.33%), wound infection(55.56%) ,wound dehiscence(11.11%) ,anastomosis leak(22.22%), reexploration(16.67%), paralytic ileus(44.44%) which was high in compared with moderate and low risk group of albumin level populations.

Table 5-Length Of Hospital Stay In Relationship With Nutrition Risk Factors:-

LENGTH OF POSTOPERATIVE HOSPITAL STAY IN RELATION WITH SERUM ALBUMIN LEVEL(n=100)	
High risk (<2.8g/dL)	16.67±4.46
Moderate risk (2.8-3.5g/dL)	15.25±8.76
Low risk (>3.5g/dL)	13.96±10.30
LENGTH OF POSTOPERATIVE HOSPITAL STAY IN RELATION WITH NRI SCORE(n=100)	
Severe malnourishment(<83.5)	15.62±4.60

Moderate malnourishment(83.5-97.4)	15.06±10.32
Mild malnourishment(97.5-100)	14.50±9.91
No malnourishment(>100)	14.03±10.17

Discussion

Protein energy malnutrition are frequently associated in patients who suffering from major gastrointestinal tract pathology. The reason behind malnutrition is due to nutritional depletion from inadequate dietary intake because of chronic ill health, major surgical stress and increase in metabolic demand in perioperative period.[8] Postoperative GI dysfunction occurs due to gut injury, bowel wall edema and dysmotility which lead to GI intolerance and increase risk of malnutrition.[4] Due to this reason, we cannot be nourished adequately via enteral feeding could benefit from additional nutrition via application total parenteral nutrition(TPN). Hypoalbuminemia is single best parameter in preoperative period to assess malnutrition and predictor of postoperative morbidity. Surgical stress induced rapid decrease in serum albumin due to altered metabolism, blood loss/dilution, redistribution in third space due to transcapillary escape rate is elevated at the end of a major surgical procedure due to intense inflammatory response in already malnourished patients leads to hypoalbuminemia.[3] Hypoalbuminemia was associated with poor tissue healing, decreased collagen synthesis in the surgical wounds or at the anastomosis site, and impairement of immune response. So it more prone to developed operative complication like intra abdominal sepsis, wound infection, wound dehiscence, anastomosis leak and therefore need of reexploration and prolonged hospital stay and mortality, remote infection like pneumonitis, delayed in return of bowel function due to bowel wall edema which leads to paralytic ileus. In preoperative period , before proceeding for major gastrointestinal surgery it is necessary to know nutritional status of patients and patients who are at nutritional risk. Nutrition screening tools like Anthropometric method include Body mass index(BMI), WHO weight status, Nutritional risk index(NRI)-Buzby index, serum albumin level are widely used screening tools to assess preoperative malnutrition.[2] If malnourished individuals are adequately provide TPN for atleast 7-10 days preoperatively and continue in postoperative period until patient take adequate oral calories or regain bowel function properly will improved surgical outcome in relation with morbidity and mortality.[8,9] Studies show that, compared with parenteral nutrition, enteral nutrition is well tolerated and is associated with reduced septic morbidity, costs and length of hospital stay.[8] We found longer postoperative hospital stay in participants who found to be malnourished at the time of hospital admission and who got nutrition therapy in perioperative period to improve postoperative surgical outcome.[6,7]

Conclusion

Prevalence of risk of malnutrition was found to be high in patients with gastrointestinal disorders, which remains a frequently unrecognized and untreated risk factor in hospitalized patients, which reflect the importance of application of various nutrition screening tools in early identification of potential candidates of malnutrition who get benefited from application of perioperative nutritional support.[10]

Based on our study observation, we concluded that Majority of postoperative complication observed in <2.8 gm/gl (high risk)albumin level population includes fever(66.67%), primary haemorrahge(5.56%)), collapse of lung(38.89%), Hypotension/shock(22.22%), pneumonia(33.33%), wound infection(55.56%) ,wound dehiscence(11.11%) ,anastomosis leak(22.22%), reexploration(16.67%), paralytic ileus(44.44%) which was high in compared with moderate and low risk group of albumin level populations.

Slightly prolonged hospital stay of 16.67±4.46 days found in high risk (<2.8 gm/dl)albumin level population in compared with 15.25±8.76 days in moderate risk(2.8-3.5 gm/dl) and 13.96±10.30 days in low risk(>3.5 gm/dl)albumin level population.

So Simple serum albumin level effectively define risk in general surgical populations. Preoperative

carbohydrate administration, postoperative early enteral nutrition and also perioperative total parenteral nutrition with immunonutrition in patients who poorly tolerate enteral nutrition are beneficial policies used in association with elective gastrointestinal tract surgery in reduction of postoperative morbidity and mortality.[11]

References

1. Bozzetti F, Gianotti L, Braga M, Di Carlo V, Mariani L. Postoperative complications in gastrointestinal cancer patients: the joint role of the nutritional status and the nutritional support. Clin Nutr. 2007 Dec;26(6):698-709. doi: 10.1016/j.clnu.2007.06.009. Epub 2007 Aug 1. PMID: 17683831.

2. Kuzu MA, Terzioğlu H, Genç V, Erkek AB, Ozban M, Sonyürek P, Elhan AH, Torun N. Preoperative nutritional risk assessment in predicting postoperative outcome in patients undergoing major surgery. World J Surg. 2006 Mar;30(3):378-90. doi: 10.1007/s00268-005-0163-1. PMID: 16479353.

3. Labgaa I, Joliat GR, Kefleyesus A, Mantziari S, Schäfer M, Demartines N, Hübner M. Is postoperative decrease of serum albumin an early predictor of complications after major abdominal surgery? A prospective cohort study in a European centre. BMJ Open. 2017 Apr 8;7(4):e013966. doi: 10.1136/bmjopen-2016-013966. PMID: 28391235; PMCID: PMC5775466.

4. Gao X, Liu Y, Zhang L, Zhou D, Tian F, Gao T, Tian H, Hu H, Gong F, Guo D, Zhou J, Gu Y, Lian B, Xue Z, Jia Z, Chen Z, Wang Y, Jin G, Wang K, Zhou Y, Chi Q, Yang H, Li M, Yu J, Qin H, Tang Y, Wu X, Li G, Li N, Li J, Pichard C, Wang X. Effect of Early vs Late Supplemental Parenteral Nutrition in Patients Undergoing Abdominal Surgery: A Randomized Clinical Trial. JAMA Surg. 2022 May 1;157(5):384-393. doi: 10.1001/jamasurg.2022.0269. PMID: 35293973; PMCID: PMC8928091.

5. Galata C, Busse L, Birgin E, Weiß C, Hardt J, Reißfelder C, Otto M. Role of Albumin as a Nutritional and Prognostic Marker in Elective Intestinal Surgery. Can J Gastroenterol Hepatol. 2020 Apr 13;2020:7028216. doi: 10.1155/2020/7028216. PMID: 32351914; PMCID: PMC7174932.

6. Bozzetti F, Gavazzi C, Miceli R, Rossi N, Mariani L, Cozzaglio L, Bonfanti G, Piacenza S. Perioperative total parenteral nutrition in malnourished, gastrointestinal cancer patients: a randomized, clinical trial. JPEN J Parenter Enteral Nutr. 2000 Jan-Feb;24(1):7-14. doi: 10.1177/014860710002400107. PMID: 10638466.

7. Heyland DK, Montalvo M, MacDonald S, Keefe L, Su XY, Drover JW. Total parenteral nutrition in the surgical patient: a meta-analysis. Can J Surg. 2001 Apr;44(2):102-11. PMID: 11308231.

8. Ward N. Nutrition support to patients undergoing gastrointestinal surgery. Nutr J. 2003 Dec 1;2:18. doi: 10.1186/1475-2891-2-18. PMID: 14641921; PMCID: PMC293477.

9. Starker PM, Lasala PA, Askanazi J, Gump FE, Forse RA, Kinney JM. The response to TPN. A form of nutritional assessment. Ann Surg. 1983 Dec;198(6):720-4. doi: 10.1097/00000658-198312000-00010. PMID: 6416193; PMCID: PMC1353221.

10. Kudsk KA, Tolley EA, DeWitt RC, Janu PG, Blackwell AP, Yeary S, King BK. Preoperative albumin and surgical site identify surgical risk for major postoperative complications. JPEN J Parenter Enteral Nutr. 2003 Jan-Feb;27(1):1-9. doi: 10.1177/014860710302700101. PMID: 12549591.

11. Akbarshahi H, Andersson B, Nordén M, Andersson R. Perioperative nutrition in elective gastrointestinal surgery--potential for improvement? Dig Surg. 2008;25(3):165-74. doi: 10.1159/000136478. Epub 2008 Jun 2. PMID: 18515968.