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A study on impact of perioperative nutrition support in surgical gastroenterology patients in era of eras

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Abstract

Background: Preoperative malnutrition is common in surgical patients and has been associated with poor clinical outcomes.

Aim and Objective: This study is undertaken to assess the role of perioperative nutrition on mortality and morbidity in surgical patients who are moderately and severely undernourished in Indian patients.

Methodology: Prospective randomized control study, approved from budget committee and research methodology and ethical committee of Nizam Institute of Medical Science was taken prior to the study. The patients will be interviewed within 24 hours of admission for information on nutritional status and disease severity according to the items in NRS -2002, the total NRS score is 0-7, with NRS >3 means no nutritional risk. All patients in nutrition intervention group in both moderately nourished and severely nourished group will receive enteral nutrition 7 days before surgery.

Results: A total of 1315 consecutive patients admitted in department of surgical gastroenterology ward from January 2014 to July 2015 in Nizam Institute of Medical Science are evaluated in the study for the nutrition status assessment. 100 patients of severely malnourished and moderately malnourished patients were included in the study. Mean age of all the groups were 44.61±13.5. NRS scores of moderately patients are with nutrition are 72% patients are score 3 and in moderately malnourished patients the NRS score of 56% are 3. Only one patient in the moderately malnourished patients received combined nutrition and 24 % of severely malnourished patients received either parenteral only or combined nutrition. Prealbumin levels are higher in moderately malnourished >15 mg/dl about 68% in moderately malnourished without nutrition and 72% in moderately malnourished with nutrition. Prealbumin levels are in lower level in severely malnourished with >15 mg/dl in 52% on severely malnourished without patients and 44% in severely malnourished with nutrition in 44%. The blood loss is higher in the moderately malnourished group without nutrition but when compared between the groups of moderately nourished there is no significant difference in the blood loss.

Conclusion: The present study does not favour the preoperative nutrition support in moderately malnourished group with NRS score 3 or 4 as there is no difference in the mortality and the morbidity and LOS.

Keywords: NRS, malnourished, surgical, prealbumin, preoperative

Introduction

Malnutrition in hospitalized patients is well documented with rates up to 50 percent in certain populations [1]. Nutritional support may be indicated for malnourished individuals requiring surgical intervention, or for healthy individual undergoing major surgery with an anticipated lengthy recovery time to return of normal gastrointestinal function, however, it can be unclear when it is appropriate to intervene. The notion that malnutrition can affect outcomes in surgical patients was first reported in 1936 in a study showing that malnourished patients undergoing ulcer surgery had a 33 percent mortality rate compared with 3.5 percent in well-nourished individuals [2]. A prospective study of 500 patients, including 200 surgical patients, admitted to a teaching hospital in England found that 40 percent of patients were undernourished on presentation, and patients lost an average of 5.4 percent of their body weight during their hospital stay [3].

Preoperative malnutrition is common in surgical patients and has been associated with poor clinical outcomes [4]. A study by the Veterans Affairs administration has shown that preoperative parenteral nutrition decreases the rate of complications in severely malnourished patients but not in borderline or mildly malnourished patients [5]. A meta-analysis was performed of 13 prospective randomized trials in which most subjects were at least moderately Malnourished

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according to weight loss, plasma proteins, or prognostic indices. Five trials found significantly fewer postoperative complications in patients who received preoperative nutritional support, and the pooled results indicated that total parenteral nutrition (TPN) therapy decreased the overall risk of post-operative complications by approximately 10% [6]. Although these studies were criticized for inadequate sample sizes, imprecise definitions of complications, and diverse definitions of malnutrition, there was a consensus that the effectiveness of preoperative nutrition was confined to a limited group of patients with severe malnutrition [7, 15].

The search has continued for more accurate methods of preoperative nutritional assessment and for better identifying the specific subsets of patients who might be best served by preoperative nutritional support. Kondrup *et al.* established the Nutritional Risk Screening Tool 2002 (NRS-2002), which was validated against 128 previous trials of nutritional support and clinical outcomes from the literature. The results from the study showed positive outcomes, such as a lower complication rate in patients at nutritional risk [9].

The controversy remains a still open debate, because the impact of nutritional interventions in surgical patients, despite many years of nutrition research is still unclear. Clinical trials have not been of help as many trial are heterogenous population, or numbers treated were inadequate, and more over previous studies have used other screening modalities for nutrition assessment which cannot be assessed for the better nutrition assessment

This study is undertaken to assess the role of perioperative nutrition on mortality and morbidity in surgical patients who are moderately and severely undernourished in Indian patients

As there are no Indian studies to address the issue of impact of perioperative nutrition this study is undertaken to solve the uncertainty in surgical patients

Aims

The aim of the study is to assess the role of perioperative nutrition in moderately nourished patients

Objectives

Primary objective

Impact of nutrition on moderately malnourished at risk patients, to see the incidence of

- Mortality
- Morbidity (Infectious and non-infectious complications)

Secondary objective

1. Influence of perioperative nutrition in severely nourished surgical patients on mortality and morbidity.
2. Comparison of influence of nutrition in moderately and severely malnourished at risk patients based on mortality and morbidity.

Materials and Methods

Study site - Department of gastroenterology, Nizam Institute of Medical Science, Panjagutta, Hyderabad

Study population

Consecutive patients admitted for major surgery in surgical gastroenterology ward

Inclusive criteria

- At Risk of moderately and severely malnourished patients

in SGE scheduled for major surgery (surgery time more than 4 hours).

- 18-80 years.
- Karnofsky performance status >80
- Adequate organ function.

Exclusion criteria

- Minor surgery (Surgery time less than -4 hours)
- Karnofsky performance status <80
- Mild risk nutrition patients
- <18 years
- Pregnant women

Study period: January 2014 – July - 2015

Study design: Prospective randomized control study, open blind Approved from budget committee and research methodology and ethical committee of Nizam Institute of Medical Science was taken prior to the study. Informed written consent from the each participant will be taken prior to the study.

Intervention

The patients will be interview within 24 hours of admission for information on nutritional status and disease severity according to the items in NRS -2002, the total NRS score is 0-7, with NRS >3 means no nutritional risk. All patients in nutrition intervention group in both moderately nourished and severely nourished group will receive enteral nutrition 7 days before surgery, protein and energy requirements are calculated using the nitrogen to body mass ratio (0.15g N/Kg bw) and Q quotient (Q=1650Kcal/g N), the 10% amino acid 10-40% glucose and 10-20% lipid emulsions and trace elements (celecil, Claris) and TNA PERI, TNA CENTRAL (Claris) and OLICLINOMEL (Baxter) were used the study. Most of them are triple chamber, all in one preformulated mixtures were used. Only patients not tolerating enteral nutrition were given parenteral nutrition.

There are 4 groups 2 groups in moderate nourished and 2 groups in severe malnutrition. The group in severe malnutrition will be from historical controls (if data not obtained retrospectively, then control cases will be taken prospectively) as it is unethical to withhold nutrition in severely malnutrition. The other group in the severe malnutrition will be given calculated nutrition requirement mostly enteral if patients not tolerating enteral then parenteral nutrition will be given. The randomization will be done using the randomization software and open labelled according to the randomized computer generated software numbers.

Then group in the enteral feeding also will be randomized using the randomization software and open labelled according to the randomized computer generated software numbers. The group in with nutrition intervention will receive calculated energy required calories.

Post-operatively from day one will receive supportive intravenous supplements, on day 2 patient started oral liquid diet or if patient on feeding tube started feeding starting with 5% dextrose 20 ml/hr then 50 ml/hr after 12 hours later 100 ml/hr after 24 hours elemental diet and prepared diet will be given. The various type of nutrition supplementation (Elemental and polymeric feeds) given below in table 1 and table 2 depending on the availability of products.

Table 1: Elemental and polymeric feeds

	Nourish Plus 100GM	Ensure 100GM	Prosure 100GM
Energy	511	430	600
Carbohydrate	32g	60g	
Fat	31g	14g	10g
MCT	9.6g	5g	
Protein	24g	16g	30g
Fiber	3g		
Sodium	565mg	306	
Potassium	618mg	578	

Outcome measures

During the postoperative period, all patients will be observed for surgical and non-surgical complications using the definitions. Additionally, operating time, intraoperative blood loss and blood transfusions will be recorded. Prior to the operation and on day 1 and day 8 afterward the following tests will be performed: blood count with total lymphocyte count (TLC), albumin and prealbumin concentration, SGOT, SGPT, GGT, alkaline phosphatase, creatinine and blood urea. Postoperative mortality is defined as any fatal outcome during the hospital stay after surgery. The length of the postoperative hospital stay is defined as the number of days from the operation until the discharge. The rate of infectious complications and overall mortality and morbidity will be selected as the primary outcome. Secondary outcomes include overall morbidity and mortality rates in severely malnourished patients and postoperative hospital stay.

Infectious complications—pneumonia, wound infection, intraabdominal infection, sepsis/bactremia, urinary tract infections, gastrointestinal infections, catheter related infected

Non-infectious infections—post op bleeding, anastomotic leak, wound dehiscence, pleural effusion, deepvenous thrombosis, cardiac respiratory or renal dysfunction, multiorgan failure.

ERAS in pancreatoduodenectomy

1. Preoperative counselling
2. Pre-operative biliary drainage in serum bilirubin >15mg/dl
3. 1 month of abstinence of alcohol and smoking
4. Preoperative nutrition optimization
5. Intake of clear liquids 2 hours before surgery, intake of solids 6 hours before surgery
6. Antithrombotic prophylaxis and continued for 10 days post operatively
7. Antimicrobial prophylaxis single dose 30 min before incision, repeat dose depending on the duration of surgery and the half-life of the drug
8. Epidural analgesia post operatively for 72 hours for superior pain relief
9. Intraoperative prevention of hypothermia by using forced air garments
10. Post-operative glycemic control <200mg/dl
11. Near zero fluid balance
12. Early removal of drains after 72 hours in low risk (drains fluid amylase <3times, amount less than 100ml)
13. No somatostatin analogues routinely
14. Foleys catheter removed on day 3
15. Feeding jejunostomy started within 24 hours, first 24 hours trial and after 24 hours started with 50ml/hour, later increased to 100-150ml/hour as tolerated.
16. Early mobilization from day 2

ERAS in colon and pelvic surgery

1. Preoperative counselling

2. Pre-operative biliary drainage in serum bilirubin >15mg/dl
3. 1 month of abstinence of alcohol and smoking
4. Preoperative nutrition optimization, no mechanical bowel preparation
5. Intake of clear liquids 2 hours before surgery, intake of solids 6 hours before surgery,
6. Antithrombotic prophylaxis and continued for 10 days post operatively
7. Antimicrobial prophylaxis single dose 30 min before incision, repeat dose depending on the duration of surgery and the half-life of the drug, SKIN PREPARATION – chlorhexidine-alcohol
8. Epidural analgesia post operatively for 72 hours for superior pain relief
9. Intraoperative prevention of hypothermia by using forced air garments,
10. Fluid control therapy, analgesia and management intraoperatively by anesthetist to prevent or reduce metabolic stress response
11. Post-operative glycemic control <200mg/dl
12. Near zero fluid balance
13. Early removal of ryles tube on post op day 2
14. No drains routinely
15. Foleys catheter removed on day 3.
16. EARLY mobilization from day 2

Assessment of complications

A standard complication classification system published by Dindo *et al.* was used to monitor the complications.

Statistical methods

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean \pm SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5% level of significance.

Results

A total of 1315 consecutive patients admitted in department of surgical gastroenterology ward from January 2014 to July 2015 in Nizam institute of medical science are evaluated in the study for the nutrition status assessment. 100 patients of severely malnourished and moderately malnourished patients were included in the study who have given consent.

Results**Analysis of preoperative variables**

Mean age of all the groups were 44.61 \pm 13.5

Table 2: Age distribution of patients studied

Age in years	Moderately malnourished without nutrition	Moderately malnourished with nutrition	Severely malnourished without nutrition	Severely malnourished with nutrition	Total
<20	1(4%)	1(4%)	1(4%)	1(4%)	4(4%)
20-30	2(8%)	1(4%)	5(20%)	6(24%)	14(14%)
31-40	5(20%)	6(24%)	4(16%)	8(32%)	23(23%)
41-50	9(36%)	8(32%)	5(20%)	4(16%)	26(26%)
51-60	7(28%)	6(24%)	6(24%)	3(12%)	21(21%)
61-70	1(4%)	3(12%)	4(16%)	3(12%)	11(11%)
Total	25(100%)	25(100%)	25(100%)	25(100%)	100(100%)
Mean \pm SD	44.60 \pm 11.33	47.88 \pm 12.05	45.28 \pm 15.40	40.68 \pm 14.65	44.61 \pm 13.51

Male to female ratio

Most of the patients in the group are male with average ratio M:F=1.4:1

BMI distribution

Average BMI of moderately malnourished are 21kg/m² whereas the average BMI of severely malnourished is 17-18 kg/m².

Table 3: BMI (kg/m²) distribution of patients studied

BMI (kg/m ²)	Moderately malnourished without nutrition	Moderately malnourished with nutrition	Severely malnourished without nutrition	Severely malnourished with nutrition	Total
<18.5	2(8%)	3(12%)	18(72%)	18(72%)	41(41%)
18.5-25	22(88%)	22(88%)	7(28%)	7(28%)	58(58%)
25-30	1(4%)	0(0%)	0(0%)	0(0%)	1(1%)
>30	0(0%)	0(0%)	0(0%)	0(0%)	0(0%)
Total	25(100%)	25(100%)	25(100%)	25(100%)	100(100%)
Mean \pm SD	21.30 \pm 2.38	21.24 \pm 2.20	17.62 \pm 2.38	16.98 \pm 3.07	19.29 \pm 3.19

NRS scores

NRS scores of moderately patients are with nutrition are 72%

patients are score 3 and in moderately malnourished patients the NRS score of 56% are 3.

Table 4: NRS score distribution of patients studied

NRS score	Moderately malnourished without nutrition	Moderately malnourished with nutrition	P value	Severely malnourished without nutrition	Severely malnourished with nutrition	P value
3	18(72%)	14(56%)	0.239	0(0%)	0(0%)	1.000
4	7(28%)	11(44%)		0(0%)	0(0%)	
5	0(0%)	0(0%)		25(100%)	25(100%)	
Total	25(100%)	25(100%)		25(100%)	25(100%)	

Preoperative nutrition intervention distribution

Only one patient in the moderately malnourished patients

received combined nutrition and 24 % of severely malnourished patients received either parental only or combined nutrition.

Table 5: Pre-operative nutrition distribution of patients studied

Pre-operative nutrition	Moderately malnourished without nutrition (n=25)	Moderately malnourished with nutrition (n=25)	P value	Severely malnourished without nutrition (n=25)	Severely malnourished with nutrition (n=25)	P value
Enteral	25(100%)	24(96%)	1.000	25(100%)	19(76%)	0.022*
Parental	0(0%)	0(0%)		0(0%)	2(8%)	
Combined	0(0%)	1(4%)		0(0%)	4(16%)	

Preoperative investigations**Table 6:** Investigations of patients studied: Pre-op

Investigations pre-op	Moderately malnourished without nutrition (n=25)	Moderately malnourished with nutrition (n=25)	P value	Severely malnourished without nutrition (n=25)	Severely malnourished with nutrition (n=25)	P value
TLC						
<4000	2(8%)	2(8%)	1.000	2(8%)	1(4%)	0.553
4000-11000	19(76%)	20(80%)		19(76%)	22(88%)	
>11000	4(16%)	3(12%)		4(16%)	2(8%)	
Albumin						
<2.5	1(4%)	2(8%)	1.000	6(24%)	3(12%)	0.428
2.5-3.5	14(56%)	14(56%)		9(36%)	13(52%)	
>3.5	10(40%)	9(36%)		10(40%)	9(36%)	
Pre Alb						
<5.5	0(0%)	0(0%)	0.754	0(0%)	0(0%)	0.572
5.5-10.9	0(0%)	1(4%)		1(4%)	0(0%)	
11-15	8(32%)	6(24%)		11(44%)	14(56%)	
15-35	17(68%)	18(72%)		13(52%)	11(44%)	

SGOT (U/L)						
0	0(0%)	0(0%)	1.000	0(0%)	0(0%)	0.269
0-42	20(80%)	20(80%)		19(76%)	22(88%)	
>42	5(20%)	5(20%)		6(24%)	3(12%)	
SGPT (U/L)						
0	1(4%)	0(0%)	0.463	0(0%)	0(0%)	1.000
0-48	21(84%)	19(76%)		22(88%)	22(88%)	
>48	3(12%)	6(24%)		3(12%)	3(12%)	
Alkaline Phosphatase (U/L)						
<20	0(0%)	0(0%)	0.771	0(0%)	0(0%)	0.508
20-125	16(64%)	15(60%)		20(80%)	18(72%)	
>125	9(36%)	10(40%)		5(20%)	7(28%)	
Creatinine (mg/dl)						
<1.1	20(80%)	24(96%)	0.082+	19(76%)	22(88%)	0.269
>1.1	5(20%)	1(4%)		6(24%)	3(12%)	
Urea						
<20	8(32%)	9(36%)	0.203	9(36%)	4(16%)	0.074+
20-40	14(56%)	16(64%)		10(40%)	18(72%)	
>40	3(12%)	0(0%)		6(24%)	3(12%)	

Hypoalbuminemia <3.5 gm/dl in 60% of moderately malnourished and severely malnourished patients Prealbumin levels are higher in moderately malnourished >15 mg/dl about 68% in moderately malnourished without nutrition and 72% in

moderately malnourished with nutrition Prealbumin levels are in lower level in severely malnourished with >15 mg/dl in 52% on severely malnourished without patients and 44% in severely malnourished with nutrition in 44%.

Table 7: Investigations: Pre-op

Investigations	Moderately malnourished without nutrition	Moderately malnourished with nutrition	P value	Severely malnourished without nutrition	Severely malnourished with nutrition	P value
TLC	8192.00±4133.59	8004.00±2858.39	0.852	8004.00±3294.75	8128.00±3131.9	0.892
Albumin	3.47±0.53	3.42±0.70	0.787	3.23±0.98	3.20±0.73	0.896
Pre Alb	15.16±3.87	15.08±5.31	0.952	15.84±5.14	13.28±4.77	0.074+
SGOT (U/L)	31.00±22.06	41.92±56.05	0.369	32.56±23.30	27.20±12.98	0.320
SGPT (U/L)	30.96±17.80	44.40±55.31	0.253	27.24±22.53	28.36±19.48	0.852
Alkaline Phosphatase (U/L)	135.48±79.46	181.52±144.03	0.169	115.16±86.27	169.44±189.08	0.198
Creatinine (mg/dl)	0.96±0.49	0.79±0.15	0.110	0.86±0.29	0.78±0.27	0.275
Urea	22.84±12.14	18.84±4.48	0.129	27.08±13.95	24.16±7.17	0.357

There is no difference in the preoperative groups in moderately nourished with or without nutrition. All have the similar characters in the study.

in the moderately nourished group and the severely malnourished group.

Pre albumin statue also increased in the malnourished group and the severely malnourished group.

Post-operative investigations (Day 8)

There is an increase in the albumin status but it is not significant

Table 8: Post-operative day 8 investigations

Investigations: POD8	Moderately malnourished without nutrition (n=25)	Moderately malnourished with nutrition (n=25)	P value	Severely malnourished without nutrition (n=25)	Severely malnourished with nutrition (n=25)	P value
TLC						
<4000	1(4%)	0(0%)	1.000	0(0%)	0(0%)	1.000
4000-11000	23(92%)	24(96%)		23(92%)	24(96%)	
>11000	1(4%)	1(4%)		2(8%)	1(4%)	
Albumin						
<2.5	1(4%)	0(0%)	1.000	2(8%)	1(4%)	1.000
2.5-3.5	18(72%)	18(72%)		18(72%)	19(76%)	
>3.5	6(24%)	7(28%)		5(20%)	5(20%)	
Pre Alb						
<12	1(4%)	1(4%)	0.050*	2(8%)	0(0%)	0.615
12-22	24(96%)	19(76%)		19(76%)	21(84%)	
>22	0(0%)	5(20%)		4(16%)	4(16%)	
SGOT (U/L)						
0	0(0%)	0(0%)	0.684	0(0%)	0(0%)	0.297
0-42	22(88%)	21(84%)		24(96%)	22(88%)	
>42	3(12%)	4(16%)		1(4%)	3(12%)	

SGPT (U/L)						
0	0(0%)	0(0%)	0.713	0(0%)	0(0%)	1.000
0-48	21(84%)	20(80%)		22(88%)	22(88%)	
>48	4(16%)	5(20%)		3(12%)	3(12%)	
Alkaline Phosphatase (U/L)						
<20	0(0%)	0(0%)	0.552	0(0%)	0(0%)	0.637
20-125	23(92%)	24(96%)		23(92%)	22(88%)	
>125	2(8%)	1(4%)		2(8%)	3(12%)	
Creatinine (mg/dl)						
<1.1	21(84%)	23(92%)	0.384	19(76%)	23(92%)	0.123
>1.1	4(16.0%)	2(8.0%)		6(24.0%)	2(8.0%)	
Urea						
<20	5(20%)	1(4%)	0.189	6(24%)	3(12%)	0.463
20-40	19(76%)	23(92%)		19(76%)	22(88%)	
>40	1(4%)	1(4%)		0(0%)	0(0%)	

Table 9: Post-operative day 8 investigations

Investigations POD8	Moderately malnourished without nutrition	Moderately malnourished with nutrition	P value	Severely malnourished without nutrition	Severely malnourished with nutrition	P value
TLC	7176.00±2797.66	7540.00±1678.04	0.580	7524.00±1852.09	7220.00±1899.56	0.569
Albumin	3.26±0.48	3.41±0.37	0.227	3.19±0.50	3.18±0.40	0.902
Pre Alb	17.68±2.84	18.56±4.65	0.423	17.08±4.92	16.92±4.26	0.903
SGOT (U/L)	36.52±37.59	35.48±23.72	0.907	26.40±10.5	29.84±13.64	0.323
SGPT (U/L)	35.76±16.02	39.00±20.03	0.531	30.6±17.81	32.40±13.71	0.691
Alkaline Phosphatase (U/L)	130.40±160.97	101.84±15.33	0.382	99.84±19.17	102.96±22.33	0.598
Creatinine (mg/dl)	0.93±0.73	0.76±0.37	0.302	0.84±0.27	0.75±0.20	0.213
Urea	27.16±12.75	28.16±11.33	0.771	27.88±7.83	26.04±6.75	0.378

Comparison of preoperative albumin and prealbumin with post-operative albumin status

There is an increase in the albumin status but it is not significant in the moderately nourished group and the severely

malnourished group.

Pre albumin status also increased in the malnourished group and the severely malnourished group.

Table 10: Comparison of albumin and pre albumin levels

Albumin preop	3.47±0.53	3.42±0.70	3.23±0.98	3.20±0.73
Pre Alb preop	15.16±3.87	15.08±5.31	15.84±5.14	13.28±4.77
Albumin post op day 8	3.26±0.48	3.41±0.37	3.19±0.50	3.18±0.40
Pre Alb post op day 8	17.68±2.84	18.56±4.65	17.08±4.92	16.92±4.26

Intraoperative findings

In moderately malnourished patients the average blood loss is <450 ml in 44% in patients without nutrition and 76% in patients with nutrition.

In severely malnourished patients here is 44% patients with blood loss <450 ml in without nutrition group and 64% patients in with nutrition group.

Table 11: Intra operative findings

Intra operative	Moderately malnourished without nutrition (n=25)	Moderately malnourished with nutrition (n=25)	P value	Severely malnourished without nutrition (n=25)	Severely malnourished with nutrition (n=25)	P value
Blood loss						
<450	11(44%)	19(76%)	1.000	11(44%)	16(64%)	0.747
450-900	1(4%)	1(4%)		2(8%)	1(4%)	
>900	1(4%)	1(4%)		0(0%)	1(4%)	
Transfusions						
Nil	21(84%)	20(80%)	1.000	17(68%)	18(72%)	1.000
1	3(12%)	4(16%)		6(24%)	5(20%)	
2	1(4%)	0(0%)		1(4%)	2(8%)	
3	0(0%)	1(4%)		0(0%)	0(0%)	
6	0(0%)	0(0%)		1(4%)	0(0%)	
Surgery duration						
<5	13(52%)	11(44%)	0.572	7(28%)	10(40%)	0.388
5-8	11(44%)	14(56%)		16(64%)	15(60%)	
>8	1(4%)	0(0%)		2(8%)	0(0%)	

The average transfusion are higher in severely malnourished group >20% with 1 unit of blood received whereas only 16% in moderately malnourished group.

There is no significant difference in intergroup comparison of transfusions requirement.

Surgical procedure

Most of the patients in moderately malnourished without

nutrition underwent Whipples (16%) and Lateral pancreateojejunostomy (12%) (Whereas in moderately malnourished with nutrition underwent Whipples (28%) and D2 gastrectomy (24%).

In severely malnourished group patients without nutrition 56% underwent gastrectomy D2, whereas in patients with nutrition 24% underwent Whipples.

Table 12: Intra operative findings

Intra operative	Moderately malnourished without nutrition (n=25)	Moderately malnourished with nutrition (n=25)	Severely malnourished without nutrition (n=25)	Severely malnourished with nutrition (n=25)
Procedure				
Whipples	4(16%)	7(28%)	2(8%)	6(24%)
D2 distal gastrectomy	1(4%)	3(12%)	7(28%)	3(12%)
Total gastrectomy	0(0%)	3(12%)	7(28%)	4(16%)
Right hemicolectomy	3(12%)	2(8%)	3(12%)	0(0%)
Hepaticojejunostomy	1(4%)	1(4%)	2(8%)	1(4%)
LPJ	3(12%)	2(8%)	0(0%)	0(0%)
Small bowel resection and fistula repair	1(4%)	2(8%)	0(0%)	2(8%)
Colon interposition	0(0%)	0(0%)	1(4%)	3(12%)
LAR	2(8%)	0(0%)	0(0%)	1(4%)
Anterior resection	1(4%)	1(4%)	0(0%)	0(0%)
Enucleation of liver hemangioma	2(8%)	0(0%)	0(0%)	0(0%)
Ileo cecal resection	2(8%)	0(0%)	0(0%)	0(0%)
Left hepatectomy	1(4%)	0(0%)	1(4%)	0(0%)
Open necrosectomy	1(4%)	0(0%)	0(0%)	1(4%)
PSRS	2(8%)	1(4%)	1(4%)	0(0%)
Gastric devascularization	0(0%)	1(4%)	0(0%)	0(0%)
Hemicolectomy	0(0%)	0(0%)	1(4%)	0(0%)
Hj-CDC	1(4%)	0(0%)	0(0%)	0(0%)
Lap rectopexy	0(0%)	1(4%)	0(0%)	0(0%)
Macevans	0(0%)	0(0%)	0(0%)	1(4%)
Palliative GJ	0(0%)	0(0%)	0(0%)	1(4%)
Radical cholecystectomy	0(0%)	1(4%)	0(0%)	0(0%)
Restoration of SB continuity	0(0%)	0(0%)	0(0%)	1(4%)
Ultralow LAR	0(0%)	0(0%)	0(0%)	1(4%)

Intraoperative blood loss and duration of surgery

The surgery duration is average of 5 hours in all the groups. The blood loss is higher in the moderately malnourished group

without nutrition but when compared between the groups of moderately nourished there is no significant difference in the blood loss.

Table 13: Intra operative

Intra operative	Moderately malnourished without nutrition	Moderately malnourished with nutrition	P value	Severely malnourished without nutrition	Severely malnourished with nutrition	P value
Blood loss	307.69±345.11	207.14±233.07	0.317	196.15±145	308.33±678.94	0.564
Surgery duration	5.02±1.67	5.22±1.29	0.645	5.58±1.83	5.02±0.96	0.497

Postoperative nutrition intervention

Only one patient in the moderately nourished with nutrition group received combined nutrition and in severely malnourished

with nutrition 3 patients received combined nutrition. Most of the patients in all the group received enteral nutrition.

Table 14: Post-operative

Post-operative	Moderately malnourished without nutrition (n=25)	Moderately malnourished with nutrition (n=25)	P value	Severely malnourished without nutrition (n=25)	Severely malnourished with nutrition (n=25)	P value
Enteral nutrition	25(100%)	24(96%)	1.000	23(92%)	22(88%)	1.000
Parenteral nutrition	0(0%)	0(0%)		0(0%)	0(0%)	
Combined	0(0%)	1(4%)		2(8%)	3(12%)	

Post-operative complications

There is higher complication rates of grade 4 and 5 of clavin dindo complication in moderately malnourished without nutrition (12% vs 0%). There is no difference in the surgical

complication in between the moderately malnourished group. There is significant increase in Non-surgical complications in moderately malnourished group without nutrition 36% versus 16% in moderately malnourished with nutrition.

The duration of hospital stay is also averages 18+-22.78 in moderately malnourished vs 13.0+-3.13 in moderately malnourished with nutrition.

There is one mortality in moderately risk without nutrition.

There are more common Hepato biliary surgery in moderately malnourished patients (60%).

In severely malnourished patients there are more of upper gastrointestinal surgery (50%).

The average number of cancer cases in malnourished patients with and without nutrition are 64% versus 52% which is not statistically significant.

Post-operative complications

There is no surgical complications in 80% cases. There is no difference in complication rates between moderately risk patients.

In severely malnourished patients there is increase in complication in severely malnourished patients with nutrition 72% versus 80%.

Most common complications of severely malnourished with nutrition is 2% cases had DGE and 2% cases had SAIO.

Table 15: Pre-operative complications

	Moderately malnourished without nutrition (n=25)	Moderately malnourished with nutrition (n=25)	Severely malnourished without nutrition (n=25)	Severely malnourished with nutrition (n=25)	Total (n=100)
Surgical complication					
Nil	20(80%)	20(80%)	21(84%)	18(72%)	79(79%)
DGE	1(4%)	0(0%)	1(4%)	3(12%)	5(5%)
SAIO	1(4%)	1(4%)	0(0%)	3(12%)	5(5%)
GRADE A -PF	0(0%)	2(8%)	1(4%)	0(0%)	3(3%)
PF-A	1(4%)	1(4%)	0(0%)	0(0%)	2(2%)
Acute liver failure	1(4%)	0(0%)	0(0%)	0(0%)	1(1%)
Anastomotic leak	0(0%)	1(4%)	0(0%)	0(0%)	1(1%)
Biliary fistula	0(0%)	0(0%)	1(4%)	0(0%)	1(1%)
ECF	0(0%)	0(0%)	0(0%)	1(4%)	1(1%)
Ileus	1(4%)	0(0%)	0(0%)	0(0%)	1(1%)
Post op bleed	0(0%)	0(0%)	1(4%)	0(0%)	1(1%)
Non-surgical complications					
Nil	16(64%)	21(84%)	20(80%)	18(72%)	75(75%)
Sepsis/ARDS	6(24%)	4(16%)	3(12%)	4(16%)	17(17%)
Pneumonia /PE	1(4%)	0(0%)	1(4%)	2(8%)	4(4%)
ARDS	0(0%)	0(0%)	1(4%)	0(0%)	1(1%)
ARF	1(4%)	0(0%)	0(0%)	0(0%)	1(1%)
Glossitis	0(0%)	0(0%)	0(0%)	1(4%)	1(1%)
Mods.sepsis	1(4%)	0(0%)	0(0%)	0(0%)	1(1%)

Difference in LOS and complications

There is increase in hospital stay of 5 days in moderately malnourished patients without nutrition, but the difference is not statistically significant.

There is no difference in the overall complication rates as per clavin dindo classification between the moderately nourished patients.

Table 16: Clavin dindo/ hospital stay

	Moderately malnourished without nutrition	Moderately malnourished with nutrition	P value	Severely malnourished without nutrition	Severely malnourished with nutrition	P value
Clavin dindo	1.00±1.47	0.44±0.71	0.093+	0.72±1.37	1.40±1.53	0.104
Hospital stay	18.16±22.78	13.04±3.13	0.271	14.20±6.25	17.52±8.13	0.112

Discussion

The association between the perioperative malnutrition and a poor clinical outcome suggest that providing perioperative nutritional support could benefit malnourished patients undergoing surgery, however the implementation of adequate perioperative nutrition support leads to postponed surgery and extra cost for the artificial nutrition. The consensus based on existing studies is toward providing nutritional support for 7 to 10 days before surgery in severely malnourished patients [10, 11].

In a study by Bozzetti *et al.* [12] that demonstrates the effect of preoperative TPN in malnourished patients with gastrointestinal cancers, a subgroup analysis showed that TPN had an advantage in decreasing infectious complications in patients with weight loss of 15% or more and for those 65y or younger, it seems better to use a specifically designed nutritional screening system to evaluate malnutrition.

The NRS is a new screening system using the combinations of under nutrition and the severity of disease to evaluate nutritional

risk. The cut-off point of 3 is based on the analysis of previous interventional trials in nutritional support and clinical outcome. The present study evaluate the nutritional assessment by using the NRS 2002 and also assess the outcome of perioperative nutrition in malnourished patients [13].

In the present study one patient (4%) in moderately malnourished patient received combined nutrition and 6 patients (24%) in severely malnourished group received combined nutrition support which is statically significant ($p < 0.002$). This is similar to the other study published by Bin *et al.* in which 35% of NRS score of 5 received nutrition whereas only 5% of NRS score 3 and 4 received nutrition support.

The base line characteristic, include TLC, albumin, prealbumin, SGOT, SGPT, ALP, Creatinine, urea were similar between the 2 groups between moderately malnourished and between severely malnourished.

The BMI baseline is similar between the control and test group in moderately malnourished and in severely malnourished.

The ability to recover from an illness or surgery is only partly dependent on the nutritional status. The occurrence of complications is strongly influenced by the type of surgery. Therefore we conducted a subgroup analysis for the type of surgery (HPB/UGI/LGI). There is no significant difference in the base line characters between the moderately nourished group and between the groups in severely malnourished.

There is difference in the number of surgery in all the groups which reflects even though they have same group of surgery under HPB/UGI/LGI the individual surgical number are different and cannot be represented in the single group as the number of Whipples in moderately malnourished with nutrition is 28% and only 16% had whipples in control group.

The complication rates based on Calvin dindo are higher in class 4-5 in moderately malnourished without nutrition is 12% whereas it is 0% grade 4-5 complication in moderately malnourished with nutrition. There is no overall significant difference in complication rate ($P < 0.093$). This reflects the preoperative nutrition reduces the complications of severe grade but overall there is not much significant difference.

There is also increase in the non-surgical complication in moderately malnourished patients without nutrition (36% vs 16%) mostly of sepsis and pneumonia. this reflects the increase in sepsis complications and pulmonary complications in the patients of moderately nourished without nutrition but it did not reach statically significant. This is similar to the study by bin jie *et al.* where there is lower complication rates across groups in nutrition support in subgroup analysis, but did not reach the clinical significant value.

There is difference of mean of 5 days more in moderately malnourished patients without nutrition. But the overall out difference in the hospital stay is not significant.

Of the patients with a NRS score of 3 or 4, no difference in complication rates and LOS in the hospital was found between the perioperative nutrition group and the control group

In summary the present study does not favour the preoperative nutrition support in moderately malnourished group with NRS score 3 or 4.

In severely malnourished group there no difference in the overall complication rates, mortality and the LOS in the hospital, In this reports a conflicting contradicting statement, this can be explained by the heterogeneous study group in the study and the high risk surgery performed in these patients tend to have higher complication. There is also higher catheter related complications and the over feeding were the two major factors responsible for the inferiority of the parental nutrition to enteral nutrition in earlier trials such as Busby and VA ^[13, 14].

Conclusion

To our knowledge this is the first study to evaluate the effect of perioperative nutrition support and the outcome in patients at risk defined by NRS 2002 from India. The present study does not favour the preoperative nutrition support in moderately malnourished group with NRS score 3 or 4 as there is no difference in the mortality and the morbidity and LOS. In patients with NRS score-5 there is overall no difference in the mortality or the morbidity with perioperative nutrition but based on the result comment cannot be made as the group are heterogeneous. But further research need to bring homogenous group of patients for further studied by block randomization of subjects of taking only homogenous group of patients under study.

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