ORIGINAL RESEARCH ARTICLE

An Evaluation of the Prognostic Nutrition Index as a Predictor of Post-Operative Mortality and Morbidity in Patients Undergoing Abdominal Surgery

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DOI: http://dx.doi.org/10.21276/ijcmsr.2019.4.2.19

How to cite this article: Pankaj Agrawal, Om Prakash Gupta. An evaluation of the prognostic nutrition index as a predictor of post-operative mortality and morbidity in patients undergoing abdominal surgery. International Journal of Contemporary Medicine Surgery and Radiology. 2019;4(2):B83-B86.

ABSTRACT

Introduction: Malnutrition and following weight loss is the primary cause of morbidity and mortality among the patients undergoing surgery. Study aimed to evaluate the prognostic nutrition index as a predictor of post-operative mortality and morbidity in patients undergoing abdominal surgery.

Material and Methods: This was a cross-sectional observational study. The patients of age above 12 years either sex were recruited for the study. Details of cases were recorded including history, clinical examination and surgical procedures. All routine investigations including serum albumin, serum transferring level and total lymphocyte count were done. PNI was calculated as follows: PNI = 10 X serum Alb (g/dl) + 0.005 X (TLC); where: Alb= Serum albumin concentration (g/dL), TLC= total lymphocyte count. The PNI was considered Low if PNI<45 and high if PNI≥45. Follow up was done till discharge.

Results: About one fourth of patients were between 30-40 years (28%). The percentage of male patients was 42.7%. Stricturoplasty type of surgery was among about one fourth of patients (24.4%). The low PNI was in 67.1% patients and high PNI was in 32.9%. The mean PNI was 43.68±4.28. The commonest post-op complication wound infection (37.8%). The overall mortality was 7.3%. The mortality was lower among low PNI (16.7%) than high PNI (83.3%). The association between mortality and PNI was statistically significant (p=0.006).

Conclusion: The present study showed that PNI can be used in predicting patients who are at increased risk of postoperative morbidity and mortality. The pre-operative PNI was found to be an independent predictor for the occurrence of post-operative complications and mortality in elective abdominal surgeries.

Key words: Prognostic Nutrition Index, Abdominal Surgery, Mortality

INTRODUCTION

Malnutrition has been defined in terms of the energy, protein and other specific nutrient deficiencies.[1,2] Patients who have gastrointestinal malignancy and undergoing elective procedures will have the greater risk of post-operative surgical complications as well as alterations. This comes from their pre as well as post-admission nutritional status; particularly, related to surgical stress, immune destruction brought by cancer or blood transfusion. Among all these factors, malnutrition is the most important factor. This is because of its higher incidence as well as negative impact on clinical outcomes like longer hospital stay and mortality. The mortality is much more associated to the malnutrition compared to cancer alone and may occur in 20% cases.[2]

The estimation of serum albumin level provides an indirect estimate of instinctual protein stores. Pre-albumin level is more suggestive of acute changes in the nutritional status. Transferrin is the chief plasma protein for transport of iron. Its concentration well associated with the total iron-binding capacity of serum. The determination of transferrin levels in serum and other body fluids aids in the differential diagnosis of malnutrition, acute inflammation, infection and assessment of renal function and red blood cell disorders.[3]

As a predictive tool, a combination of measurements (albumin and total lymphocyte count) is used to determine the nutritional status of patients. The Prognostic Nutrition Index (PNI) was originally planned to determine the perioperative immune nutritional status and surgical risk in patients undergoing gastrointestinal surgery.[4]

The preoperative nutritional status has been proved to be correlated not only with the incidence of postoperative complications but also with the long-term outcomes of patients with malignant tumors. In regard to gastric cancer, however, only few studies have been conducted. The clinical significance and prognostic value of this marker remains unclear.[5]

The present study was planned to evaluate the prognostic

ISSN (Online): 2565-4810; (Print): 2565-4802 | ICV 2018: 86.41 |

nutrition index as a predictor of post-operative mortality and morbidity in patients undergoing abdominal surgery.

	No. (n=82)	%
Age in years		
<30	12	14.6
30-40	23	28.0
41-50	19	23.2
51-60	20	24.4
>60	8	9.8
Mean±SD	44.05±12.53	
Gender		
Male	47	57.3
Female	35	42.7

Table-1: Age and gender distribution of patients

PNI	No. (n=82)	%
<45 (Low)	55	67.1
≥45 (High)	27	32.9
Mean±SD (Range)	43.68±4.28	

Table-2: Distribution of pre-op PNI

MATERIAL AND METHODS

This was a cross-sectional observational study conducted among the patients undergoing abdominal surgery. The patients of age above 12 years either sex were recruited for the study. Patients with icterus, severe anemia (Hb<7 gm/dl) diabetes mellitus, chronic renal disease and chronic liver disease were excluded from the study.

Details of cases were recorded including history, clinical examination and surgical procedures. All routine investigations including serum albumin, serum transferring level and total lymphocyte count were done. PNI was calculated as follows:

PNI = 10 X serum Alb (g/dl) + 0.005 X (TLC)

Where: Alb = Serum albumin concentration (g/dL), TLC= total lymphocyte count

The PNI was considered Low if PNI<45 and high if PNI≥45. Follow up was done till discharge.

STATISTICAL ANALYSIS

The results are presented in frequencies, percentages and mean±SD. The Chi-square test was used to compare the

Parameters	No. of patients		PNI				p-value[1]
			Low (<45)		High (≥45)		
	No.	%	No.	%	No.	%	
Wound infection							
Yes	31	37.8	24	77.4	7	22.6	0.12
No	51	62.2	31	60.8	20	39.2	
Wound dehiscence							
Yes	6	7.3	5	83.3	1	16.7	0.37
No	76	92.7	50	65.8	26	34.2	
Acute kidney injury							
Yes	8	9.8	8	100.0	0	0.0	0.03*
No	74	90.2	47	63.5	27	36.5	
ARDS							
Yes	10	12.2	8	80.0	2	20.0	0.35
No	72	87.8	47	65.3	25	34.7	
Cadiac arrest							
Yes	2	2.4	1	50.0	1	50.0	0.60
No	80	97.6	54	67.5	26	32.5	
Deep vein thrombosis							
Yes	1	1.2	1	100.0	0	0.0	0.48
No	81	98.8	54	66.7	27	33.3	
Prolonged ileus							
Yes	14	17.1	11	78.6	3	21.4	0.31
No	68	82.9	44	64.7	24	35.3	
Urinary infection							
Yes	7	8.5	6	85.7	1	14.3	0.27
No	75	91.5	49	65.3	26	34.7	
SIRS							
Yes	7	8.5	6	85.7	1	14.3	0.27
No	75	91.5	49	65.3	26	34.7	
Reintubation							
Yes	3	3.7	2	66.7	1	33.3	0.98
No	79	96.3	53	67.1	26	32.9	

1Chi-square test, *Significant

Table-3: Association of PNI with post-op complications

Mortality	No. of patients		PNI				p-value[1]
			Low (<45)		High (≥45)		
	No.	%	No.	%	No.	%	
Death	6	7.3	1	16.7	5	83.3	0.006*
Alive	76	92.7	54	71.1	22	28.9	
1Chi-square test, *Significant							

Table-4: Association of PNI with mortality

categorical variables. The p-value<0.05 was considered significant. All the analysis was carried out on SPSS 16.0 version (Chicago, Inc., USA).

RESULTS

About one fourth of patients were between 30-40 years (28%) followed by 51-60 (24.4%), 41-50 (23.2%), <30 (14.6%) and >60 (9.8%). The percentage of male patients was 42.7% (Table-1).

Stricturoplasty type of surgery was among about one fourth of patients (24.4%) followed by anterior resection and open cholecystectomy (22%), open appendicectomy (20.7%) and hysterectomy (11%) (Fig.1).

The low PNI was in 67.1% patients and high PNI was in 32.9%. The mean PNI was 43.68±4.28 (Table-2).

Table-3 presents the association of PNI with post-op complications. The commonest post-op complication wound infection (37.8%). Prolonged ileus was the second most common post-op complication (17.1%) and ARDS was the third most common post-op complication (12.2%). Deep vein thrombosis was the least common post-op complication (1.2%). Low PNI was among all the patients whom post-op complication was acute kidney injury with significant (p=0.03) association. Low PNI was also among all the patients whom post-op complication was deep vein thrombosis, however, association was statistically insignificant (p>0.05). None of the other post-op complications were significantly (p>0.05) associated with PNI.

The overall mortality was 7.3%. The mortality was lower among low PNI (16.7%) than high PNI (83.3%). The association between mortality and PNI was statistically

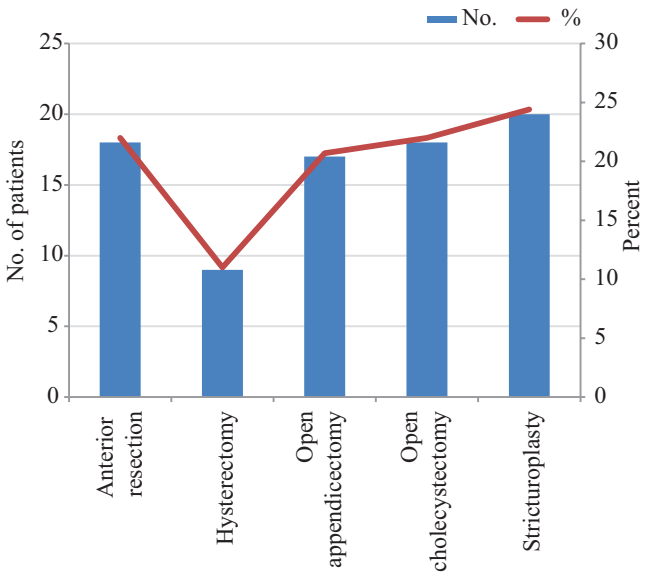

Figure-1: Distribution of type of surgery

significant (p=0.006) (Table-4).

DISCUSSION

In the present study, about one fourth of patients were between 51-60 years (24.4%). However, Jee et al[6] reported that 46.6% were 60 years (46.6%). Females constituted 54.3%. This was consistent with the study by Jee et al[6] in 66.2% patients were males.

In this study, stricturoplasty type of surgery was among about one fourth of patients (24.4%) followed by anterior resection and open cholecystectomy (22%), open appendicectomy (20.7%) and hysterectomy (11%). Bogdan et al[7] performed radical resections among 81 patients of which 34 were total gastrectomies and 47 were subtotal gastrectomies. Palliative procedures included 17 gastroenterostomy, 13 feeding jejunostomy and 25 exploratory laparoscopies.

This study showed that low PNI was in 67.1% patients and high PNI was in 32.9%. The mean PNI was 43.68±4.28. The mean PNI in this study was found to be lower than the study by Jee et al[6] in which the mean PNI was 54.2 ± 5.9. This difference might be due to different socio-economic status and dietary habits between the two studies. Rubia et al investigated the methods of evaluation of nutritional status that better correlated with postoperative complications and duration of hospital stay in patients undergone to gastrointestinal or abdominal wall surgeries. They observed that severe malnutrition was seen among 17.6% patients considering subjective global assessment and 42% considering the nutritional risk index.[8]

Surgical site infections (SSIs) are the commonest postoperative complications in patients undergoing elective abdominal surgeries. It contributes increased postoperative morbidity, longer hospital stay and health care burden[9]. Therefore, pre-operative determination of PNI may help to identify patients at high risk in developing SSIs post-operatively.

In this study, wound infection was the most common post-op complication (37.8%). Prolonged ileus was the second most common post-op complication (17.1%) and ARDS was the third most common post-op complication (12.2%). Deep vein thrombosis was the least common post-op complication (1.2%). Low PNI was among all the patients whom post-op complication was acute kidney injury with significant (p=0.03) association. Low PNI was also among all the patients whom post-op complication was deep vein thrombosis. In a study, SSIs were diagnosed in 34.1% patients with incisional infection identified in 18.6%, deep incisional in 4.5%, and organ/space infection in 11.0%[10]. In another study, the oncologic patients had a very poor nutritional status as per this index. There was a significant

ISSN (Online): 2565-4810; (Print): 2565-4802 | ICV 2018: 86.41 |

negative correlation between occurrence of the non-infectious postoperative complications with the nutritional risk index (p=0.001).[8] Nan Jiang et al (2014) found that low PNI was an independent predictor of incidence of postoperative complications. Fukuda et al reported that the prevalence of SSIs was significantly higher among patients of malnourished compared to well-nourished patients (35.5 vs. 14.0%; $p < 0.0001$).[11] Mohri and Inoue also showed that low PNI significantly associated with the prevalence of post-operative complications, especially serious ones in colorectal cancer.[12]

In this study, the overall mortality was 7.3%. The mortality was lower among low PNI (16.7%) than high PNI (83.3%). The association between mortality and PNI was statistically significant (p=0.006). Kumar et al found that there was no mortality in their study which was conducted among 60 patients who underwent for major elective abdominal surgery.[13] Nan Jiang et al found that 5-year survival rates were 54.1% and 21.1% for patients with PNI ≥ 46 and PNI < 46 respectively.[5]

Numerous prospective studies of perioperative nutritional support have failed to show improvements in short-term surgical outcomes.[14] Thus, it is expected that only severely malnourished patients may get benefit from preoperative nutritional support.[15]

The index demonstrates predictive ability for the stratification of patients who are at increased risk of postoperative morbidity and mortality. Moreover, this index can be of used to identify patients who would be benefited from peri-operative nutritional support in improving surgical outcomes.

CONCULSION

The present study showed that PNI can be used in predicting patients who are at increased risk of postoperative morbidity and mortality. The pre-operative PNI was found to be an independent predictor for the occurrence of post-operative complications and mortality in elective abdominal surgeries.

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Source of Support: Nil; **Conflict of Interest:** None

Submitted: 05-03-2019; **Accepted:** 01-04-2019; **Published online**: 03-06-2019