Original Research Paper | Surgery

THE ROLE OF PROGNOSTIC NUTRITIONAL INDEX FOR SURGICAL WOUND COMPLICATIONS AFTER LAPAROTOMY IN COLORECTAL CANCER IN H. ADAM MALIK MEDAN GENERAL HOSPITAL

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ABSTRACT

Background: Colorectal cancer is the fourth leading cause of death in the world. Surgery is a definitive treatment for colorectal cancer. However, postoperative complications are still a major problem in colorectal cancer patients. The prognosis of colorectal cancer is determined by several factors, such as tumor stage, biological factors, patients factors, and nutritional status that have an important role. Evaluation of nutritional status is known by calculating the Nutritional Risk Index, Nutrition Risk Screening 2002, Subjective Global Assessment, and Prognostic Nutritional Index (PNI) as the examinations that is simple and easy-to-use. The purpose of this study is to determine the role of PNI to predict the occurrence of post laparotomy surgical wound complications in colorectal cancer patients in H. Adam Malik Medan General Hospital.

Methods: This study is an analytical study with a retrospective design. The sample obtained was 141 cases. Data were collected through medical record at H. Adam Malik Medan General Hospital for 5 years from January 2013 to December 2017. Data were then analyzed using a cross tabulation and Chi-Square test.

Results: From the 141 colorectal cancer patients, we found the average age of patients was 52.17 years old. The PNI ≥ 45 was found in 73 cases. Surgical wound complications occurred in 81 cases. Analysis of PNI's correlation to surgical wounds using Chi-Square test found the p-value 0.001 (p <0.005).

Conclusion: Prognostic nutritional index (PNI) ≥ 45 plays a role in short-term complications after colorectal cancer surgery.

KEYWORDS : PNI, colorectal cancer, complications

BACKGROUND

Colorectal cancer is a malignancy derived from colon and rectal epithelial cells. Colorectal cancer is the third most cancer and is the fourth leading cause of death in the world. In 2017 there were around 95,520 new cases of colon cancer and 39,910 cases of rectal cancer.[1] The incidence of colorectal cancer will continue to increase by 60% to 2,2 million new cases and 1.1 million deaths by 2030.[2] According to the World Health Organization (WHO) in the Global Action Against Cancer, colorectal cancer is more common to occur in developed countries compared to developing countries.[3] In Indonesia, the number of cases of colorectal cancer is 12.8 per 100,000 adults with mortality rate 9.5% of all cancer cases. This number is increasing along with the lifestyle changing of the Indonesian population.[4]

Surgery is a definitive treatment of colorectal cancer.[5] However, postoperative complications are still a major problem in colorectal cancer patients.[6] Complications that can occur after surgery are bleeding, nonspecific infections, or infections associated with anastomotic, dehiscence. Abdominal complications consist of postoperative ileus, fascia dehiscence, and leakage of anastomosis.[7] The prognosis of colorectal cancer is determined by several factors such as tumor stage, biological and patients factors.[8] One of the most important factors is nutritional and immunology status.[9] Evaluation of nutritional status is known by calculating the Nutritional Risk Index, 2002 Nutrition Risk Screening, Global Assessment Subjective, and Prognostic Nutritional Index (PNI). PNI was first put forward by Onodera et al[10] (1984) in a study of prognostic nutritional index in gastrointestinal surgery of malnourished cancer patients and showed that PNI was a significant indicator of postoperative outcomes. PNI is calculated by serum albumin concentration and peripheral blood lymphocyte count.[11] PNI is more often used because it is easier to apply.[12] According to Mohri (2013) preoperative PNI score is a useful predictor of postoperative complications and survival in patients with cancer colorectal.[11]

At H. Adam Malik Medan General Hospital, the PNI has never been applied in cases of colorectal cancer. Based on the description above, the authors was interested to discover the role of Prognostic Nutritional Index towards the occurrence of post laparotomy surgical wound complications in colorectal cancer patients in H. Adam Malik Medan General Hospital

METHODS

This study is an analytical study with a retrospective design. The study was conducted in the Digestive Surgery Division, Department of Surgery H. Adam Malik Medan General Hospital, by collecting data from medical records during the period of January 2013 to December 2017. The samples in this study were all patients diagnosed with colorectal cancer who underwent elective and definitive surgery. Patient aged more than 18 years old and have never received prior treatment were included in this study. Patients with incomplete medical record data, underwent preoperative albumin substitution, intraoperative complications, intestinal leakage, comorbidities such as DM, anemia and sepsis were excluded in this study. PNI score is carried out preoperatively using the formula: $10 \times$ albumin (g/dl) + 0,005 x total lymphocytes count (per mm^3). Interpretation of PNI: Normal ≥ 50; Mild malnutrition < 50; Moderate malnutrition < 45; and Severe malnutrition < 40. In this study, PNI were categorized into 2 groups, namely < 45 and ≥ 45. Evaluation of surgical wound complications was carried out on the 6th day postoperative. Surgical wound complications observed were wet wounds (seroma), hematoma, and infection. Data processing was performed using SPSS ver 21. The relationship between PNI and surgical wound complications was assessed by bivariate analysis with chi-square test. The p-value < 0.05 is considered statistically significant.

RESULTS

Characteristics of Study Samples

From January 2013 to December 2017, 141 samples were included in this study. It was found that the average age of patients was 52.17 ± 9.8 years old, with the most of sample's sex were men as many as 100 samples (70.9%). In this study the most common tumor sites were in the medial third of rectum by 47 samples and the least were

in the splenic flexure transverse colon by 4 samples. Based on the histopathological results, there were 69 samples (49%) with well differentiated adenocarcinoma. In this study there were 73 samples (51.8%) with PNI ≥ 45, and surgical wound complications occurred in 81 cases (57.5%). This can be seen in table 1.

Table 1. Characteristics of Study Samples

Characteristics	Frequency (n)	Percentage (%)
Average age (standard deviation)	**52.17 ± 9.8**	
Age		
≥ 50 y.o	78	55.3
< 50 y.o	63	44.7
Sex		
Male	100	70.9
Female	41	29.1
Tumor Site		
Colon	52	36.8
Caecum-Ascendens colon	25	
Hepatic flexure transverse colon	14	
Splenic flexure transverse colon	4	
Descendens Colon	6	
Sigmoid Colon	3	
Rectum	89	63.2
Rectosigmoid	6	
Proximal Rectum	6	
Middle Rectum	47	
Distal Rectum	30	
Histopathology		
Well Differentiated Adenocarcinoma	69	49.0
Moderate Differentiated Adenocarcinoma	32	22.7
Poorly Differentiated Adenocarcinoma	14	9.9
Mucinous Adenocarcinoma	22	15.7
Albumin level		
Normal	99	70.2
Abnormal	42	29.8
Total Lymphocyte count		
Normal	86	61
Abnormal	55	39
PNI score		
< 45	68	48.2
≥45	73	51.8
Surgical Wound Complication		
No Complication	60	42.5
Complication	81	57.5
Wet Wounds	28	19.8
Hematoma	20	14.3
Infected Wounds	33	23.4

The Role of PNI For Complications of Surgical Wounds
In this study, we assessed the role of Prognostic Nutritional Index towards the occurrence of post laparotomy surgical wound complications in colorectal cancer patients. Samples with PNI < 45 with no surgical wound complication were 19 samples (31.7%), whereas sample with PNI ≥ 45 were 41 samples (68.3%). From this data, the odds ratio (OR) was 3,3 with a 95% of confidence interval (CI) 1.63-6.68. The OR 3,3 indicates that the PNI < 45 has a risk for the occurrence of surgical wounds complications (wet wounds, hematom or infected wounds) by 3.3 times more than the PNI ≥ 45. This can be seen in Table 2

Table 2 The Role of PNI Towards the Occurrence of Post Laparotomy Surgical Wound Complications

		Complication		Total	p-valuea	OR, 95% CI
		Yes	No			
PNI	< 45	49	19	68	0.001	3.3 (1.63-6.68)
	≥ 45	32	41	73		
Total		81	60	141		

p-value was analyzed using Chi-square test; p-value <0.05 is considered significant.

DISCUSSION

Colorectal cancer is a malignancy derived from colon and rectal epithelial cells. Surgery is a definitive treatment of colorectal cancer.[6] However, postoperative complications are still a major problem in colorectal cancer patients.[6] The prognosis of colorectal cancer is determined by several factors, namely tumor stage, biological and patients factors.[8] One of the most important factors is nutritional and immunology status.[9]

In this study, authors collected samples by 141 patients that included the criteria from medical record for 5 years from January 2013 to December 2017. Data collected were age, sex, diagnosis, tumor site, surgery, serum albumin level, total lymphocyte count, the Prognostic Nutritional Index (PNI) score and surgical wound complications. Characteristics of patients based on age indicated that most subjects in the age above 50 years old (55.3%). The incidence of colorectal cancer began to increase after the age of 35 and increased rapidly after the age of 50, the peak was in the seventh decade. More than 90% of colon cancer occurs after the age of 50.[13] However, the incidence of colorectal cancer in younger people has increased too. In the age of 40 to 54, the incident have increased by 2.3% annually since the 1990s. Today, adults those born around 1990 have a risk fourfold of having rectal cancer compared to those born around 1950.[14]

Based on sex, most samples were men (70,9%). Colon and rectal cancer is the third most common cancer in women and men. According to the ACS survey, in 2018, 25.920 cases of rectal cancer were estimated to occur in men and 17.110 cases in women. This may be related to the habits of most men who smoke and consume alcohol, which are the factors that can increased the risk of colorectal cancer.[13,15] Then, it can also be seen the most diagnosis is rectal cancer (58,9%). Proximal colon cancer is known to be one of the most common malignant neoplasms in human and the most common cancer in the large intestine, followed by rectal cancer (42%).[16] In other hand, Cheng (2011) found the incidence of colorectal cancer most often occurred in the distal colon by 37,79% followed by rectum cancer by 28,83%.[17] The American Cancer Society (ACS) estimates that 43.030 new cases of rectal cancer will occur in 2018.

According to some literature, the incidence of postoperative complications ranges from 11-25% of all patients, even based on the research of Healey et al in 2002 that complications can occur up to 46-52%, where around 49% are preventable complications.[18] Frequent complications include fever, pus in surgical wounds, wet wounds, hematoma, to septic shock. An observational study stated that there was a tendency of correlation between low albumin level and PNI. The same was stated by Dequanter (2011), that the patients with postoperative complications have low albumin level (<3,5 g/dL) (p = 0.001).[19] Other studies found that low preoperative albumin serum was directly related to a risk of postoperative mortality and a higher incidence of morbidity. In addition to preoperative albumin serum level, postoperative albumin level also play an important role in the process of wound healing after surgery. The mechanism of this condition is stated by Labgaa et al (2017) those are changes in body metabolism, blood loss or blood dilution processes, and fluid distribution to the interstitial due to capillary leakage.[20] The latter affects was the decreased of albumin level more than 75% in the early postoperative phase and showed an increased in the systemic inflammatory response. It concluded that albumin levels are influenced by perioperative fluid management, but mainly reflect postoperative stress response. The systemic inflammatory response that occurs is inseparable from the role of proinflammatory cytokines such as IL-1, IL-6, and TNF-α which will increase proteins such as CRP to protect the body from trauma. At the same time, this increased of proinflammatory cytokines will reduce the synthesis of other proteins, such as serum albumin. In addition, this cytokine will also increase capillary permeability and cause albumin leakage to the extravascular cavity. On the other hand, wound healing requires sufficient levels of protein and vitamins so that the wound healing process can happen properly.

Decreased protein level, including albumin, can also increase the risk of infection, so that it can increase the risk of complications, especially in surgical wounds such as direct infection of the wound, leakage of anastomosis, and will further reduce the albumin level. So that a decreased in albumin level can increase morbidity and mortality in postoperative patients.

Based on the results of the statistical analysis, in this study the PNI < 45 proved to be significantly plays role in the incidence of surgical wounds complications 3.3 times more than the PNI ≥ 45. This is consistent with the study of Mohri (2013) stated that preoperative PNI score is predictor for surgical complication in colorectal cancer (p= 0,004).[11] A number of prospective perioperative nutrition studies has failed to explain the importance of this result in improving the patient's postoperative condition, so many of them can only conclude that perioperative nutrition is only useful in patients with malnutrition. So it is necessary to do further research by involving preoperative nutritional factors in patients who are followed in a certain period of time before undergone surgery.

CONCLUSION

Prognostic Nutritional Index (PNI) play a role towards the occurrence of short term complications of post colorectal cancer surgery. If PNI score ≥ 45 then there is possibility of surgical wound 3,3 times better than PNI score < 45.

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