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Original Article

NUTRITIONAL INDICATORS FOR POSTOPERATIVE MORBIDITY IN ELECTIVE ONCOLOGICAL SURGERY

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Abstract

Objective: This study was to establish the nutritional risk factors for morbidity following cancer surgery to reduce the incidence of related postoperative complications. Therefore this study was undertaken to assess the morbidity and to identify nutritional risk factors following cancer surgery in Bangladeshi population.

Method: This cross-sectional observational study included 312 patients with malignancy who were waiting for surgery or within 60 days of postoperative period were enrolled for the study from indoor of surgical oncology department, NICR&H. Then the patients were submitted for further study to evaluate the preoperative fitness in terms of nutrition assessment – both clinical and biological. All the clinical (pre & post-operative including complication, if any), investigation findings were recorded accordingly.

Results: Statistical correlation was discovered between BMI and morbidity but no statistical correlation was found between WL >10% and major surgical complications of either infectious or noninfectious origin (p = NS). No statistically significant correlation was found between nutritional condition or oedema and surgical morbidity. Conversely, a substantial statistical correlation was found between skin thickness or Hb% or albumin <30 g/l and major surgical complications (either infectious or noninfectious) (p= S).

Conclusion: The best nutritional factor for detecting the risk of MC is albumin levels below 30 g/l.

Introduction

Cancer is becoming a prevalent disease in all age group especially in our aging population. Surgery is the treatment of choice for most of the solid tumours, it is frequently delivered in a suboptimal way in different subsetting (Riccardo et al).

Knowledge of the true frequency of both mortality and morbidity is crucial in planning health care and research and identifying risk factors (Arnaud et al, 2005). Change in nutrition status is associated with reduced organ function and deterioration of immune status. The presence of a chronic, inflammatory, as observed in cancer for instance, increase catabolism and greatly alters immune defenses. Various studies have highlighted a correlation between malnutrition and morbidity and/or mortality rates in cancer patients, particularly in the specific context of surgery where an altered nutritional status is associated with increased surgical morbidity and mortality. Nutritional assessment is currently recommended, particularly in situations where malnutrition is associated with an increased risk of complications, as in the case of major oncologic surgery. Any screening system must be able to detect situations where a protein, micronutrient, and/or energy deficiency is associated with a higher frequency of complications, possibly alleviated by appropriate nutritional support. Various markers, scores, and indices have been used to detect the risk of malnutrition-related complications. Some systems consider simply anthropometric data such as weight loss (WL) or the body mass index (BMI) (weight/height2). Some are based essentially on clinical data like the subjective global assessment (SGA) or its variant, the patient-generated SGA (PG-SGA, Ottery score), developed specifically for cancer patients. Other scores, such as the nutritional risk

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index (NRI) [NRI = (1.519 × albumin g/ l + 0.417 (actual weight ÷ usual weight ×9 100)], take into account biological parameters (Sami et al,2009). Various studies have highlighted a correlation between malnutrition and morbidity and/or mortality rates in cancer patients, particularly in the specific context of surgery when an altered nutritional status is associated with increased surgical morbidity and mortality In surgical clinical studies, the parameters used to assess nutritional risk vary. Some studies use only a percentage of WL, while others use the NRI. Usually WL>10% of the weight recorded 6 months previously is used , but many authors consider that a higher level of weight loss (15–20%) is required to influence alone a patient's prognosis after surgery. A more recent recommendation from the French Society of Digestive Surgery (SFCD) has identified a 20% WL as the cutoff value for providing preoperative artificial nutrition. The SGA is proposed as an alternative to assess a patient's status, but use of this tool would probably require more training.

The different parameters do not always produce consistent results. For example, in the Veterans' study, the NRI, but not the SGA, was found to significantly predict anenhanced risk of surgical complications associated with

malnutrition (Sami et al,2009). Six independent risk factors of morbidity were found: age more than 70 years, neurologic comorbidity, hypoalbuminemia, cardiorespiratory comorbidity, long duration of operation and peritoneal contamination (Arnaud et al, 2005). Other study shows factors for morbidity are: age 75 versus 55, black race, congestive heart failure, coronary artery disease, peripheral vascular disease, hypertension, insulin-dependent diabetes, ASA rating, smoking status, and steroid use (Cameron et al,2009).

In surgical clinical studies, the parameters used to assess nutritional risk vary. Some studies use only a percentage of WL, while others use the NRI. Usually WL>10% of the weight recorded 6 months previously is used , but many authors consider that a higher level of weight loss (15–20%) is required to influence alone a patient's prognosis after surgery. A more recent recommendation from the French Society of Digestive Surgery (SFCD) has identified a 20% WL as the cutoff value for providing preoperative artificial nutrition. The SGA is proposed as an alternative to assess a patient's status, but use of this tool would probably require more training. The different parameters do not always produce consistent results. For example, in the Veterans' study, the NRI, but not the SGA, was found to significantly predict an enhanced risk of surgical complications associated with malnutrition.

The aim of the present study was to determine the most relevant nutritional parameters not only in terms of an association with surgical morbidity but also of practical routine feasibility for cancer patients undergoing planned major surgery of any type.

Materials and Methods

This study involved cross-sectional observational study conducted at the department of Surgical Oncology, National Institute of Cancer Research and Hospital (NICR&H), Dhaka, Bangladesh during the period of january 2010 to december 2011.The study population comprised all admitted patients burdening with malignancy in the department of surgical Oncology of NICR&H, Dhaka, Bangladesh who were underwent operative treatment during the period of the study. Inclusion criteria were- Cytologically and/or histologically diagnosed all case of malignancy admitted in the indoor of Surgical Oncology department underwent operative treatment & all operated surgical patients within 60 days of postoperative period. Exclusion criteria were - Indoor admitted cancer bearing patients not underwent operative treatment due to any reason, all operated surgical patients beyond 60 days of postoperative period & all surgical patients had neo-adjuvant radiotherapy. Study Variable were - nutritional risk factor like – weight loss, BMI, serum Albumin level, Hb%, ascites etc.& other factors like - emergency surgery, age >70 years, long duration of surgery & peritoneal contamination, duration of operation, hospital stay etc. Total Sample size was 312. Patients with any type of malignancy admitted under the department of surgical oncology in NICR&H waiting for or underwent surgery within 60 days who had proven cytological or histological evidence of malignancy were enrolled in the study. Then the patients were submitted for further study to evaluate the preoperative fitness in terms of nutrition assessment – both clinical and biological. Data collection was done by direct interviewing of the cases. All the clinical (pre & post-operative), investigation findings were recorded accordingly from the patients' admission file by the principal investigator himself. Standard statistical method was used. Data from the study were compiled & analyzed using SPSS version 13, SAS (statistical Analysis System) and EPI (Epidemiological Information) especially for analysis of risk factors for post-operative morbidity and mortality

by logistic regression. For testing significance chi-square test, odd ratio (OR) with 95% confidence interval and simple percentage were used. Informed written consent was taken before starting any procedure.

Observation and Results

Two hundred seventy-five (312) patients were enrolled during anesthesia consultation. The mean age was 42 years (range = 4–92 years). Highest decade of cancer patients was of 5th (78 patients, 25%).

Male patients were 124 (39.7%) & female patients were 188 (60.3%). So male and female ratio was 1:1.51. Highest number of patients were housewife (173, 55.4%) followed by farmer (63, 20.2%). Most of the patient was muslim (95.5%). Height number of patients came from Dhaka (11.2%) followed by Noakhali & Mymensingh (8.7%), Comilla (6.4%), Jessor (5.4), Tangail (5.1%) and so on. Nineteen patients (6.1%) had history of recent steroid use and 81 patients (26%) had one or more comorbidity like DM, hypertension,ISD etc.

The primary tumour sites were: (1) carcinoma breast in 129 cases; (2) gastrointestinal cancer in 73 cases: stomach (n = 31), colon (n = 13), rectum (n = 21), gastro-oesophagus junction(n = 3), anal canal (n = 4), GIST involving small & large gut (n= 1), gall bladder (n = 1); (3) soft tissue sarcoma in 43 cases; (4) bone sarcoma in 20 cases; (5) squamous cell carcinoma in 19 cases & malignant melanoma in 10 cases (6) other origins in 17 cases: lymphoma (n = 4), 0ral malignancy (n = 3), testis (n = 2) and other sites (n = 8). Histologic investigation revealed mostly duct cell carcinoma (n = 109), adenocarcinoma (n = 78), sarcoma(n=61), squamous cell carcinoma(n=28) and malignant melanoma(n=10). The tumors detected in the remaining patients were malignant and of varied histology (Table.-I).

Table-I

Preoperative diagnosis of the study patients

	Frequency	Percent	Valid Percent	Cumulative	Percent
Valid	Ca breast	129	41.3	41.3	41.3
	Ca Stomach	31	9.9	9.9	51.3
	Ca Gastro-oesophageal junction	3	1.0	1.0	52.2
	Soft tissu sarcoma	43	13.8	13.8	66.0
	Bone sarcoma	20	6.4	6.4	72.4
	SCC	19	6.1	6.1	78.5
	Melanoma	10	3.2	3.2	81.7
	BCC	2	.6	.6	82.4
	Ca colon	13	4.2	4.2	86.5
	Ca rectum	21	6.7	6.7	93.3
	Ca anal canal	4	1.3	1.3	94.6
	Ca thyroid	1	.3	.3	94.9
	Testicular tumour	2	.6	.6	95.5
	Ca parotid	2	.6	.6	96.2
	Ca adranal gland	1	.3	.3	96.5
	GIST	1	.3	.3	96.8
	Oral malignancy	3	1.0	1.0	97.8
	Lymph node dissection	1	.3	.3	98.1
	Lymphoma	4	1.3	1.3	99.4
	Malignant unknown primary	1	.3	.3	99.7
	Ca GB	1	.3	.3	100.0
	Total	312	100.0	100.0	

Before surgery, 115 (36.9%) patients had anticancer chemotherapy and 22 (7.1%) had radiotherapy.

The duration of the surgical procedure was <3 hours (65.4%) & >3 hours (34.6%) and 22.1% of patients had moderate to severe peroperative blood loss required a blood transfusion. 45.5% patients had given peroperative blood transfusion. At the anesthesia consultation, weight was recorded for 100% of patients. Most patients (83.7%) had lost weight >10% (Table-II).

In clinical parameter BMI, skin thickness, nutritional condition & oedema were seen in all the patients. As per BMI concerned patients with severe malnutrition were 6.7% (21), moderate malnutrition 23.4% (73), normal nutrition 53.5% (167) & overweight 16.3% (51) (Table-III).

Table-II

Wt. loss>10% of the patients

	Frequency	Percent	Valid Percent	Cumulative Percent	P
Valid	present	261	83.7	83.7	
	absennt	51	16.3	16.3	.001
	Total	312	100.0	100.0	

Table-III

Basal Meta Rate of the patients

	Frequency	Percent	Valid Percent	Cumulative Percent	p
Valid	severe malnutrition	21	6.7	6.7	
	moderate malnutrition	73	23.4	23.4	
	normal	167	53.5	53.5	.250
	overweight	51	16.3	16.3	
	Total	312	100.0	100.0	

Skin thickness was normal in 40 (12.8%) & decreased in 272 (87.2%) patients (Table 4).

Table-IV

Skin thikness of the patients

	Frequency	Percent	Valid Percent	Cumulative Percent	p
Valid	normal	40	12.8	12.8	
	decrease	272	87.2	87.2	.518
	Total	312	100.0	100.0	

Oedema was found in 34(10.9%) patients (Table 6). Nutritional condition was found underweight in 144 (46.2), average in 158(50.6%) & overweight in 10(3.2%) patients(Table-V).

Table-V

Nutritional condition of the patient

	Frequency	Percent	Valid Percent	Cumulative Percent	p
Valid	under wt	144	46.2	46.2	
	average	158	50.6	50.6	.074
	over wt	10	3.2	3.2	
	Total	312	100.0	100.0	

Table-VI

Oedema of the patients

	Frequency	Percent	Valid Percent	Cumulative Percent	p
Valid	present	34	10.9	10.9	.569
	absent	278	89.1	89.1	
	Total	312	100.0	100.0	

Table-VII

Hb% of the patients

	Frequency	Percent	Valid Percent	Cumulative Percent	p
Valid	<10%	124	39.7	39.7	.000
	=/>10%	188	60.3	60.3	
	Total	312	100.0	100.0	

Table –VIII

Serum albumin level of the patients

	Frequency	Percent	Valid Percent	Cumulative Percent	p
Valid	<30 g/l	134	42.9	42.9	.000
	=/>30 g/l	178	57.1	57.1	
	Total	312	100.0	100.0	

Regarding biological parameters, albumin was assayed and the Hb% recorded in 100% of patients (Table-VIII). The frequency of malnutrition varied according to the nutritional parameter analyzed, 42.9% with reference to albumin <30 g/l regards as malnourished (Table-VII).

There was no difference in the frequency of WL >10% or in patient nutritional status associated with the type of surgery. The median duration of hospital stay was 31.05 days (range = 10-55 days) (p<0.001).

In total, 11.9% of patients had minor infectious complications (mIC), 9.0% had major infectious complications (MIC), 10.6% had minor noninfectious complications (mNIC), 5.8% had major noninfectious complications (MNIC), and 8.3% had major complications (MNIC and MIC). Therefore, slightly less than one in four patients (23.1%) had a major complication, and slightly less than one in two (45.6%) had a complication, be it minor or major, infectious or noninfectious (Table IX).

Table-IX

Postoperative morbidity in type of the patients

	Frequency	Percent	Valid Percent	Cumulative	Percent
Valid	mIC	37	11.9	11.9	11.9
	MIC	28	9.0	9.0	20.8
	mNIC	33	10.6	10.6	31.4
	MNIC	18	5.8	5.8	37.2
	MIC+MNIC	26	8.3	8.3	45.5
	no complication	170	54.5	54.5	100.0
	Total	312	100.0	100.0	

The correlation between nutritional and surgical parameters and morbidity rates was studied using univariate analysis (Table 10). With respect to clinical parameters, statistical correlation was discovered between BMI and morbidity but no statistical correlation was found between WL >10% and major surgical complications of either infectious or noninfectious origin (p = NS). Although there statistical correlation was found between WL >10% and any surgical complications (p=S).

Table-X

Statistical significance (p) of correlation between nutritional parameters & major complication (by univariate analysis)

Nutritional indicator	Major Complication - p value
BMI	.001
wt loss >10%	.250
nutritional condition of patient	.074
oedema	.569
subcutaneous fat	.518
Hb%	.000
Serum albumin level	.000

With respect to biological parameters, no statistically significant correlation was found between nutritional condition or oedema and surgical morbidity.

Conversely, a substantial statistical correlation was found between skin thickness or Hb% or albumin <30 g/l and major surgical complications (either infectious or noninfectious) (p= S). This is also truth for any sort of complication (major or minor).

Length of hospital stay was not significantly correlated with weight loss and serum albumin level (p=NS). With respect to the three surgical parameters evaluated, statistical correlation was recorded between a duration of the procedure longer than 3h (p>0.05), the amount of red blood cell units transfused (p = 0.03), and the presence of major complications.

The only two persistent variables tested in multivariate analysis (appendix 3) and found statistically linked to major complications were blood albumin <30 g/l and procedures lasting longer than 3 hour.

Discussion

This study aimed to determine the parameter(s) used by most physicians in routine (feasibility) that display the greatest correlation with major surgical complications associated with a wide variety of major cancer surgical procedures in a participating center.

In our study, weight variations, BMI, subcutaneous skin thickness, nutritional condition, oedema could be measured in 100% of the patients. Complete biological assessment was done in 100% of patients for albumin and also 100% for Hb%. In the literature, the collection of simple nutritional data such as a weight variation is often difficult to incorporate in the routine recording of clinical parameters. A survey conducted among healthcare staff has shown that only 53% of nurses and 73% of junior doctors question their patients about a possible involuntary WL (Lennard-Jones). Even then, in this survey, 100% of the patients had been weighed. When nutritional evaluation is part of a survey and included in management procedures, albumin is assayed in 100% of cases. In our study, physicians were strongly encouraged to record albumin levels for usual preoperative and general recommendations.

Involuntary WL was significantly correlated only with certain morbidity items (Ikeda). The WL cutoff value most frequently used in studies is 10% (Bozzetti), & this level was found statistically correlated only with the occurrence of MIC (p = 0.02) and with the length of hospital stay (Sami Antoun). But in our study this level (WL >10%) was found statistically correlated only with the occurrence of major complication (p = S) and not with the length of hospital stay (p=NS). In fact, the predictive role of this index has not been confirmed in all published studies, whether they focused on a specific type of surgery [Karl 0] or considered larger populations and more varied surgical procedures (Collins, Gibbs). In the study by Karl et al. (Karl) that focused on esophagogastrectomies, five variables, including WL[10% (40% of patients), were collected before surgery; only the presence of diabetes was found statistically correlated with increased morbidity. Retrospective studies have analyzed different surgical risk factors in larger populations, such as n = 23919 (Collins) and n = 54215 (Collins) but involuntary WL was not found to be correlated with either increased length of hospital stay (Collins) or complications and mortality at 30 days (Collins) . The prognostic role of weight loss and the cutoff value to

be used require more in-depth evaluation before this factor is recommended for assessing surgical complication risk.

This study confirms the major role of blood albumin levels below 30 g/l as a risk factor for complications (42.9% of patients). In univariate analysis it was found to be statistically correlated with all surgical morbidity markers. It was one of the two parameters associated with MC in multivariate analysis.This finding was also consistent with the study done by Sami Antoun et al(2009), although malnutrition were found in abit lower number of patients (8% of patients). The study conducted on a large number of patients undergoing planned surgery demonstrated that blood albumin level is the best predictive factor for surgical complications (Gibbs). A retrospective analysis of the records of 526 patients who underwent planned gastrointestinal surgery (Kudsk) has shown that albumin levels are correlated with the onset of surgical complications, the length of hospital stay, the length of stay in the intensive care unit, and the rate of surgical mortality. Although in our study length of hospital stay was not satisfactorily correlated with serum albumin level <30 gm/l. Surgical complications are more frequent in patients who underwent esophageal and pancreatic surgery and less frequent following colic surgery, at every blood albumin level. For the entire population of the Kudsk et al. study (Kudsk) , the incidence of complications gradually increased with blood albumin levels, with 29% for albumin levels between 27.6 and 32.5.

Again, the BMI calculated on the basis of weight and height or skin thickness clinically or Hb% has also been found a risk factor for morbidity.

The other usual parameters recommended to detect severe malnutrition before surgery (nutritional condition of patient clinically or oedema) are poorly related to major complications.

In our study, the prediction of not only major infectious but also major noninfectious complications seemed less accurate with anthropometric features and clinical score than with albumin levels <30 g/l. This important finding is satisfactorily consistent with study done by Sami Antoun et al(2009). With albumin level being the only variable found statistically linked to major complications in the multivariable analysis, collecting these data before surgery is mandatory. Anyhow, recognition of severe malnutrition was most often not associated with an implementation of nutrition care or artificial nutrition when required.

Conclusion:

In this study, the best nutritional factor for detecting the risk of MC is albumin levels below 30 g/l. BMI and Hb% also have statistically significant correlation with the existence of MC. So preoperative assessment of these three nutritional risk factor may help in prediction of development of postoperative MC.

Recommendation:

Preoperative assessment of nutritional risk factors such as albumin levels below 30 g/l, BMI and Hb% are highly recommended to decrease morbidity rates following cancer surgery.

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