The Nutritional Status in Patients with Colorectal Cancer Pre and Post Different Modulates of Treatment

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Abstract: Background and Objective: The nutritional status of oncological patients has become a subject of growing scientific interest because of its prognostic significance and the resulting therapeutic possibilities. Colorectal cancer ranks the third highest in cancer incidence and fourth in cancer mortality in both sexes combined worldwide. The role of dietary and other lifestyle factors in colorectal cancer recurrence and survival is largely unknown. The present study aimed to determine the extent of malnutrition in pre and post operative or other treatments of colorectal cancer patients. **Methods:** A cross- sectional descriptive study was carried out among (30) Patients, (17) males (56.7%) while the other (13) females (43.3%) at King Abdul Aziz University Hospital (KAUH) with diagnosed colorectal cancer to be included in the study at their first visit to the outpatient Surgery and Oncology department between October 2011 and April 2012 were included in a retrospective review of the patients' medical record. Patients were enrolled consecutively from outpatients 2–4 weeks prior to surgery for study. Demographics characteristics including performance status (PS), assessments included weight history, body mass index (BMI), and percentage of weight loss. Laboratory investigations includes blood analysis, U&E (urine and electrolyte) and albumin ,also the CEA (Carcinoembryonic Antigen) as a diagnostic tool Cancer staging and hospital length of stay were recorded, nutritional status and assigning the level of risk for malnutrition by, using Simple Screening tool for Malnutrition (SSM), were collected and correlated with different modulates of treatment. **Results**: Majority of patients (83.33%) have the tumor in the colon while only (16.66%) in the rectum. About (43.33%) treated with both Surgery and chemotherapy while (26.66%) surgery only, (13.33%) received only chemotherapy ;(13.33%) received a combination of Chemotherapy and Radiotherapy, and only (3.33%) treated with both Surgery and Radiotherapy. Malnutrition was defined by full nutritional assessment in the participating patients using SSM which revealed that 21 of the 30 patients (70%) were malnourished before treatment and 20 patients (66.6%) after treatment. SSM had high sensitivity and specificity indeticting in patients with colorectal cancer. Declining nutritional status of the patients as seen in serum albumin before and after treatment for all participants which was below reference value of (30.75±0.14 and 29.95±1.93) respectively. The Mean ±SD weight loss (unintentional weight loss) was in male patients (13.61±1.83kg) less than females (15.05±1.75kg). The duration for a unintential weight loss was (50% of participate) had through 3 months; (16. 7 %) after 6 months and (16.7%) had change during one year. **Conclusion:** Colorectal cancer Patients does have a real nutritional problem that surely can influence their disease course and length of hospital stay after surgery and long duration of receiving other treatment. Most patients with malignancies are considered to be at risk for malnutrition, and therefore require further nutritional support. Nutritional screening would be beneficial in this group preoperatively to identify weight-losing patients at an early stage in the care pathway when they initially enter the secondary care system. Screening (SSM) for malnutrition in cancer patients is a valid simple approach to define cancer patients for nutritional care. More patients regard themselves in need for nutritional counseling than the number of patients really achieving any.

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1. Introduction

Colon cancer forms in the tissues of the colon (the longest part of the large intestine). Most colon cancers are adenocarcinoma which begins in cells that make and release mucus and other fluids (**National Cancer Institute, 2011**).

The incidence tends to be low in Asia and intermediate in the southern parts of South America. Although the kingdom of Saudi Arabia (KSA) is considered a low incidence area for CRC, the disease ranks second, after breast cancer (**National Cancer Registry MOH - 2003**).There were 907 cases of colorectal cancer accounting for 9.9% of all newly diagnosed cases in year 2007 (**National Cancer Registry MOH - 2007**).

Geographic differences for CRC are probably explained by dietary and other environmental exposure (**Parkin et al, 2005**).

Eating less red meat and avoiding processed meat altogether can slash colon cancer risk, consuming less alcohol, boosting fiber intake, exercising, and maintaining a healthy body weight could prevent 45% of all colon cancer cases or more than 64,000 cases of colon cancer each year (**Denise, 2011**). Also, central depositions of adiposity (**Gunter, Leitzmann, 2006**) have a major influence on the risk of CRC (**Giovannucci, 2002**).

The three main types of treatment for colorectal cancer are Surgery, Radiation therapy and Chemotherapy .Depending on the stage of cancer, two or more types of treatment may be used at the same time, or used one after the other (**American Cancer Society, 2011**).

While chemo kills cancer cells, it also damages some normal cells and this can cause side effects. These side effects will depend on the type of drugs given, the amount given, and how long treatment lasts. Side effects could include: Hair loss, Mouth sores, Loss of appetite, Nausea and vomiting, increased chance of infection, Easy bleeding or bruising after minor cuts or injuries and severe tiredness. The radiation therapy also causes side effects which include skin soreness, nausea, diarrhea and others (**American Cancer Society, 2012**).

For the surgery there are several factors predispose patients undergoing surgery for upper GI and colorectal cancer to malnutrition. These factors the catabolic effect of cancer as well as the GI side effects of nausea, vomiting, anorexia, diarrhea and, in some cases, dysphagia and malabsorption (**Nitenberg and Raynard, 2000 and Fettes *et al.*, 2002)**

Nutrition plays major (but not always fully understood) roles in many aspects of cancer development and treatment (**Center, 2009**). Good nutrition practices can help cancer patients maintain weight and the body's nutrition stores, offering relief from nutrition impact symptoms and improving quality of life (**Johansson, 2009**). Poor nutrition practices, which can lead to under nutrition, can contribute to the incidence and severity of treatment side effects and increase the risk of infection, thereby reducing chances for survival (**Bozzetti, 2009**). Quality of Life (QoL) is a subjective multidimensional construct that is increasingly being used as a clinical endpoint in oncology (**Lee, and Chi, 2000**).

The present study has been carried out to evaluate nutritional status among colorectal cancer patients pre and post different treatment modulates.

1. Study sample

A cross- sectional descriptive study was carried out among (30) Patients at King Abdul Aziz University Hospital (KAUH).All patients with diagnosed colorectal cancer were invited to participate in the study at their first visit to the outpatient Surgery and Oncology department between October 2011 and April 2012 which included in a retrospective review of the patients' medical record. The most common explanation for not participating was that 'people were too sick 'or 'the burden of the study was too heavy'. All participates were asked about their usual physical activity. They were all sedentary or had a low physical activity level (PAL). Inclusion criteria for participate patients include aged above the age of 18 years old involving any location from the cecum to the rectum; received any type of treatment. Study participants, 17 (56.7%) males and 13 (43.3%) females were conducted. The mean age for both women and men was 51.96±1.02 years (range from 21-80 years). Patients with other comorbedity were excluded. The aim of the study was explained to the subjects.

2. Methods:

2.1. Study Instruments:

This study carried out to identify the nutritional status of patients with colorectal cancer pre and post operative and other treatments from the data which was collected by an English questionnaire was developed for the purpose of data collection, which was pilot, tested and modified accordingly. A face to-face interview with each participating patients with diagnosed Colorectal cancer. The interview was of 20 to 30 minutes duration (**Karlsson *et al.*, 2009). The questionnaire contains several sections**

2.1.1. Socio-demographic data

This includes questions on basic socio-economic characteristics of the households. It also collects data on individual characteristics as the : age, nationality, marital status, educational status of the patient and the wife / husband (if married), occupational and employment status, working hours, income source, average of household income, place of residence, type of dwelling, number of rooms, number of family members.

2.1.2. Medical history data

This is divided into two divisions: pre and post treatment. Questions in this section includes the location of the primary tumor, signs and symptoms, evidence of metastasis, area affected (if metastatic), family history of the disease, surgical history, medical history, medications, types of treatment, and finally the doses and sessions (if chemo or radiotherapy).

2.1.3. Nutritional assessment

A full nutritional assessment by measurements of BMI, triceps skinfold thickness (TST), mid-arm muscle circumference(MAMC), serum albumin (alb), serum prealbumin (palb), total lymphocyte count (TLC) and unintentional weight loss of more than 5% within the preceding month or 10% or more within the previous 6 months (**Thorsdottir *et al.* , 2001**).

Malnutrition was defined as present when three or more of these seven parameters were subnormal. In addition, weight change from patients' self-reported earlier healthy weight was evaluated (**Thorsdottir *et al.* , 2001)**

2.1.4. **Laboratory data**

Laboratory investigations which was divided to two divisions: pre and post treatment, it includes blood analysis, U&E (urine and electrolyte) and blood glucose and albumin to measure the malnutrition level (if malnourished), also the CEA (Carcinoembryonic Antigen) as a diagnostic tool this was collected from the patient's medical records.

2.1.5. Nutritional Screening

The SSM sheet (Fig.1) **Thorsdottir *et al.*, 2001** is made up of seven questions covering BMI, weight loss, anorexia, surgery and other variables that may influence nutritional status. No measurements other than weight and height were needed for answering the questions. Each question gave a score according to the answers. The criterion set for malnutrition was a total score four or more points for cancer patient.

2.2 Biochemical measurements:

Blood tests that are commonly used in diagnosing and staging the disease were obtained from the hospital records and compared with reference standards.

2.2.1. Complete blood count (CBC) (**Derrick et al, 2004**).

2.2.2. Carcinoembryonic antigen (CEA) assay (**National cancer institute, 2011).**

2.2.3. The blood test that were used to determine the nutritional status and detect malnutrition:

A. Serum Albumin. (**Mahan and Escott-Stump; 2008**).

B. Hematocrit. (**Bistrian *et al.*, 1976**).

C. U&E (Urea and Electrolyte). (**Liaison, 2012**).

The results were taken from patient's records of KAAUH and Surgery and Oncology Clinic files.

NATIONAL UNIVERSITY HOSPITAL Nutritional status of cancer patients
Department of Clinical Nutrition SCREENING FOR MALNUTRITION
This screening sheet should be used to assess the need for nutritional therapy among adult patients. Answer the following questions and give score Accordingly

PATIENT'S I.D.

QUESTION	ANSWER	ASSESSMENT SCORES	
1. Height :_____m BMI: Kg/m2 _____		>20 0 scores 18-20: 2 scores < 18: 4 score	
Weight: _____kg	_____		
2. Recent unintentional weight loss?	Yes No	Unintentional weight loss: >5% past month or > 10 % previous 6 mo 4 scores 5-10% "1-6 mo. 2 score Doesn´t know 2 scores Other 0 scores	know Weight loss % _____ _____ _____
If yes, how much? _____kg	Doesn´t		
In what time period? _____months			
3. Age over 65 years?	Yes No		
4. Problems last weeks or months?			
A. Vomiting lasting more than 3 days?			Yes No _____
B. Daily diarrhea (more than 3 liquid stools per day)?			Yes No _____
C. Continuous loss of appetite or nausea?			Yes No _____
D. Difficulty in chewing or swallowing?		Question 3 to 8: Yes: 1 scores No: 0 scores	Yes No _____
5. Hospitalized for 5 days or more during previous 2 months?	Yes No		_____ If yes, list type
6. Major surgery in the past month?	Yes No		_____
7. Diseases – 5 points Burn >15 % Malnutrition Multiple traumas	Yes No		_____
Completed by_____ Signature		Date_____	Sum Scores _____

If a patient gets 5 or more scores, a referral should be sent to the department of clinical nutrition. For cancer patients and patients with pulmonary diseases use 4 or more scores.

Fig (1): Simple screening tool for malnutrition (SSM).

3. **Ethical Considerations**:
Permission was attained from the head of department of Surgery and Oncology Clinic in King Abdul-Aziz university hospital (KAAUH).Patient was given consent before the interview.
4. **Statistical analysis**:
The statistical analysis included:

A) Descriptive Statistics: arithmetic mean or average and standard deviation.
B) The results were analyzed by SPSS statistical package version **15 (1994)** and the results were tabulated and used the Harvard graphics packages version 4 for representing the results graphically **(Harvard, 1998).**
C) Qualitative variables were expressed as percentages and numbers association measures available **(Armitage et al. 2002 and Betty, and Jonathan, 2003).**
D) Pearson's Correlation Coefficient (r) has been also applied in this study between two quantitive variables. It measures the nature and strength between two variables of the quantitative type. The value of r ranges between -1 and +1(**Thomas Dietz&Linda Kalof,** *2000*)

3. Results:

Table (1) shows the socioeconomic status of the patients participated in the study. The total numbers of the participants were 30 patients 17 males and 13 females. Thirty percent of patients were Illiterate and 20% have elementary and intermediate degree; 23.3 % have high school degree, 26.7 % for the Bachelor's degree and above. The main source of financial was 50% depend on their job, while the type of dwelling where 56.66 % and 43.33 % live in shared house and separate house respectively. The average household income of participant was 10% have a low income of less than 1000 RS / month, 43.33% of the participants have an income between 1000 to 3000RS and 46.66 % between 2000 to 6000 RS and more per month.

Table (2) shows the anthropometric measurements of studied sample of colorectal cancer patients. The mean ±SD of age was 54, 49.30 for males and females respectively.

Before treatment, the mean ±SD of weight (kg), and body mass index (BMI) were 72.11, 24.25 and 86.53 and 32.93, for males and females respectively. However, after treatment the mean ± SD of weight (kg), body mass index (BMI), weight change and weight loss were 69.54, 23.76±0.14, 12.17 , 13.61,and 76.07, 29.3, 13.23 and 15.05, for males and females respectively. Regarding to unintentional weight loss duration, the majority of the patients (50%) had weight change during 3 months followed (16.7%) during 6 months and (16.7%) during 1 year but only (13.3%) had weight change during 1 month.

Table (3) shows the location of the primary tumor and types of cancer treatment of patients participated in the study. About (83.33%) have the tumor in the colon and (16.66 %) in the rectum. The different type of cancer treatment including surgery, chemotherapy and radiotherapy. The majority of the patients (43.33%) treated with both Surgery and chemotherapy while (26.66%) treated by surgery only, (13.33%) received only chemotherapy and other (13.33%) of them received a combination of chemotherapy and radiotherapy, and only (3.33%) treated with both surgery and radiotherapy.

Table (4) demonstrates the statistical evaluation of biochemical analysis for male and female before and after treatment. Through the interpretation the previous data statistically there was significant difference between before and after treatment ($P < 0.05$) in CEA, HB and albumin in male before and after treatments. Regard to biochemical analysis for female we notice that a significant difference between before and after treatment ($P < 0.05$) in CEA, HB and albumin; but there was a high significant difference in albumin after treatments by ($P < 0.0$)

The evaluation of SSM as single nutritional parameters used in the full nutritional assessment to indicate malnutrition among cancer patients is shown in Table (5) The SSM identified 9 of the 30 patients (30%) as malnourished before treatment and 10 patients (33.34%) after treatment (The criterion set for malnutrition was a total score of 4 or more points). The same table show 23.53% (n= 4) and 38.47% (n= 5) as malnourished before treatment for male and females respectively. However, after treatment (47.06%) (n=8) and (15.39%) (n=2) as malnourished for male and females respectively.

Table (6) verify statistical evaluation of indicators for malnutrition parameters (SSM, BMI, Alb and Unintentional Weight Loss) for male and female colorectal cancer patients before and after treatments, the difference of Mean± SD of SSM as indicator for malnutrition for male before and after treatment was significant ($P< 0.05$). However the difference of Mean± SD for albumin demonstrates highly significant correlations by ($P < 0.01$) but still low (33.67±1.2). Regarding to female colorectal cancer patients the difference of mean of SSM before and after treatment was highly significant ($P < 0.01$). However the change of Mean ± SD of BMI was significant ($P < 0.05$) between before and after treatment. Regarding to the difference of Mean± SD before and after treatment decrease (from 25.07±1.12 to 25.07±1.12) for albumin which demonstrate highly significant correlations by ($P < 0.01$).

Table (7) demonstrate the Correlation between SSMB and SSMA with anthropometric measurements variables as we can see there was significant correlation between weight before and after treatment

by ($P < 0.01$**) and ($P < 0.05$*) respectively; regard to the correlation of weight loss before and after was significant similar at ($P < 0.05$*). The same table and figures (2) showed that BMI change before and after was highly significant ($P < 0.01$**). While figure (3) shows negative correlation between SSMB and SSMA with Body Mass Index and Weight change. Weight change correlation was ($P < 0.05$*) before and ($P < 0.01$**) after as presented in table (7).

Table (8) represented Sensitivity and specificity of anthropometric measurements and Albumin in relation to SSM-pre and SSM-post treatment. Through the interpretation of the previous data the SSM had sensitivity and specificity for BMI, Ab, and UWL pre-treatment which improved post- treatment.

The SSM had a sensitivity of 0.38 and the specificity was 0. 65. Few individual nutritional parameters had sensitivity above 0.5, and no parameter reached the quality of the SSM. If the patients' earlier self-reported usual healthy weight was used as the reference for unintentional weight loss, this was the single best parameter with high sensitivity

Table (1): Distribution of Socioeconomic characteristic of studied sample of colorectal cancer patients (N= 30).

Parameters	Male (n=17)	%	Female (N=13)	%	All (N=30)	%
Nationality						
Saudi	5	29.4	5	38.5	10	**33.3**
Non Saudi	12	70.6	8	61.5	20	**66.7**
Type of certificate degree						
Illiterate	5	29.4	4	30.76	9	**30**
Elementary	2	11.8	3	23.1	5	**16.7**
Intermediate	1	5.9	-	-	1	**3.3**
High School	4	23.5	3	23.1	7	**23.3**
Bachelor's degree	4	23.5	1	7.7	5	**16.7**
Diploma	1	5.9	2	15.4	3	**10**
source of financial Support						
Job	11	64.7	4	30.8	15	**50**
Husband/ wife	1	5.9	6	46.2	7	**23.33**
Parents	1	5.9	-	-	1	**3.33**
Other relatives	1	5.9	2	15.4	3	**10**
Other	3	17.6	1	7.7	4	**13.33**
Average household income /RS						
<1000	2	11.8	1	7.7	3	**10**
1000 to 3000	8	47.1	5	38.5	13	**43.33**
3000 to 6000	2	11.8	2	15.4	4	**13.33**
> 6000	5	29.4	5	38.5	10	**33.33**
Type of dwelling						
Separate	6	35.3	7	53.8	13	**43.33**
Shared	**11**	**64.7**	**6**	**46.2**	**17**	**56.66**

Table (2): Anthropometric Measurements of Studied sample of colorectal cancer patients (M±SD).

Variables	Male (n=17) M±SD		Female (n=13) M±SD		All	
Age	54±1.93		49.30±1.11		51.96±1.02	
Before Treatment						
Weight (kg)	72.11±1.65		86.53±2.44		78.36±1.12	
Height (cm)	170.76±7.64		161.61±6.15		166.8±8.31	
Body Mass index	24.25±0.21		32.93±0.55		28.01±0.25	
After Treatment						
Weight (kg)	69.54±1.66		76.07±2.01		72.37±1.66	
Height (cm)	170.76±7.64		161.61±6.15		166.8±8.31	
BMI	23.76±0.14		29.3±0.36		26.16±0.16	
Weight change	12.17±0.2		13.23±0.51		12.63±0.18	
Weight Loss	13.61±1.83		15.05±1.75		14.24±1.06	
Weight change duration						
	No	%	No	%	No	%
Non	-	-	1	7.7	1	3.3
1 month	4	23.5	-	-	4	13.3
3 months	9	52.9	6	46.2	15	50.0
6 Months	3	17.6	2	15.4	5	16.7
1 year	1	5.9	4	30.8	5	16.7
Total	17	100	13	100	30	100

Table (3): Distribution of location of the tumor and type of treatment for studied sample (Male &female) of colorectal cancer patients

Parameters	Male (n=17)	%	Female (N=13)	%	All (N=30)	%
Location of the tumor						
Colon	13	76.5	12	92.3	25	**83.33**
Rectum	4	23.5	1	7.7	5	**16.66**
Which type of treatment did you receive						
Surgery	4	23.5	4	30.8	8	**26.66**
Chemotherapy	1	5.9	3	23.1	4	**13.33**
Surgery + chemotherapy	8	47.1	5	38.5	13	**43.33**
Surgery + Radiotherapy	1	5.9	-	-	1	**3.33**
Chemotherapy + Radiotherapy	**3**	**17.7**	**1**	**7.7**	**4**	**13.33**

Table (4): Mean±SD Biochemical Analysis for Male and Female of colorectal cancer patients before and after treatment.

Variables	Male (N=17)				Female (N=13)			
	Before Mean ± SD	After Mean ± SD	T. value	*P*	**Before** Mean ± SD	**After** Mean ± SD	**T. value**	*P*
CEA	4.8±0.01	5.81±0.04	2.68	**P<0.05***	2.92±0.11	3.22±0.21	2.29	*
WBC	6.72± 0.96	6.92±0.73	0.21	**NS**	7.61±0.03	9.15±0.39	1.94	*
RBC	4.39±0.77	4.25±0.58	0.78	**NS**	4.2±0.43	3.97±0.54	2.31	*
HB	15.83±1.6	12.08±1.11	2.41	*	10.7±1.53	10.66±1.10	1.61	**NS**
HCT	35.86±1.74	36.14±1.45	0.95	**NS**	31.93±1.32	38.06±1.73	2.83	**
MCV	82.25±2.35	85.54±4.51	0.17	**NS**	74.02±1.56	82.89±4.5	3.16	**
MCH	27.05±0.15	28.71±1.49	1.64	**NS**	25.5±0.11	27.04±1.2	1.34	**NS**
Platelet count	280.52±10.33	257.35±6.58	2.37	*	298.61±10.76	255.84±9.7	4.15	***
Albumin	29.55±0.06	33.67±1.2	2.18	*	32.3±0.79	25.07±1.12	2.64	**
Urea	5.09±0.77	4.62±1.82	3.01	*	3.86±0.12	4.14±3.47	1.17	**NS**
Na	136.05±3.28	137.35±2.95	0.65	**NS**	135.55±3.24	137.23±4.81	1.5	**NS**
Crea	82.64±2.83	80±19.55	1.59	**NS**	69.23±2.07	55.23±22.84	2.44	*
K	4.61±0.25	3.78±0.42	1.91	*	3.64±0.38	3.86±0.34	1.34	**NS**
Cl	**99.05±4.22**	**101.58±3.75**	**0.46**	**NS**	**99.11±3.12**	**99.46±4.92**	**0.23**	**NS**

* $P < 0.05$ ** $P < 0.01$ *** $P < 0.001$ NS: No significant

Table (5): Statistical evaluation of (SSM) for colorectal cancer patients before and after treatment

Parameters	Male (n=17)	%	Female (N=13)	%	All (N=30)	%
Before Treatment						
<4	13	76.47	8	61.53	21	**70**
≥ 4	4	23.53	5	38.47	9	**30**
After treatment						
<4	9	52.94	11	84.61	20	**66.66**
≥ 4	**8**	**47.06**	**2**	**15.39**	**10**	**33.34**

Simple screening tool for malnutrition **(SSM)**

Table (6): Statistical evaluation of indicators of malnutrition parameters for colorectal cancer (male&female) patients before and after treatment

Variables	Male (N=17)				Female (N=13)			
	Before	**After**	**T. Value**	*P*	**Before**	**After**	**T. Value**	*P*
SSM	4.47±0.8	3.47±0.37	1.98	*	3.07±0.11	5.81±0.35	3.11	**
BMI	24.25±0.21	23.76±0.14	1.05	NS	32.93±0.55	29.3±0.36	2.16	*
Alb	29.55±0.66	33.67±1.2	2.31	**	32.3±0.79	25.07±1.12	3.25	**
UWL (kg)	-	**13.61±1.83**	-	-	-	**15.05±1.75**	-	-

* $P < 0.05$ ** $P < 0.01$ *** $P < 0.001$ NS: No significant

SSM_ screening sheet; BMI_ body mass index; alb_ serum albumin; UWL_unintentional weight loss.

Table (7): **Correlation between SSM-Pre and SSM-Post with anthropometric measurements variables**

Measurements	SSM-Pre		SSM-Post	
	R	*P* –value	R	***P* -value**
WEIGHT	-0.59	*P* < 0.01**	-0.44	***P* < 0.05***
HEIGHT	-0.15	*P* > 0.05(NS)	-0.22	***P* > 0.05(NS)**
BMI	-0.48	*P* < 0.01**	-0.56	***P* < 0.01****
W.CHANG	-0.39	*P* < 0.05*	-0.56	***P* < 0.01****
W.LOSS	-0.39	*P* < 0.05*	-0.39	***P* <0.05***
DURATION(months)	**-0.17**	***P* > 0.05(NS)**	**-0.23**	***P* > 0.05(NS)**

* $P < 0.05$ ** $P < 0.01$ SSMB – Simple Screening for malnutrition before treatment SSMA- Simple Screening for malnutrition after treatment.

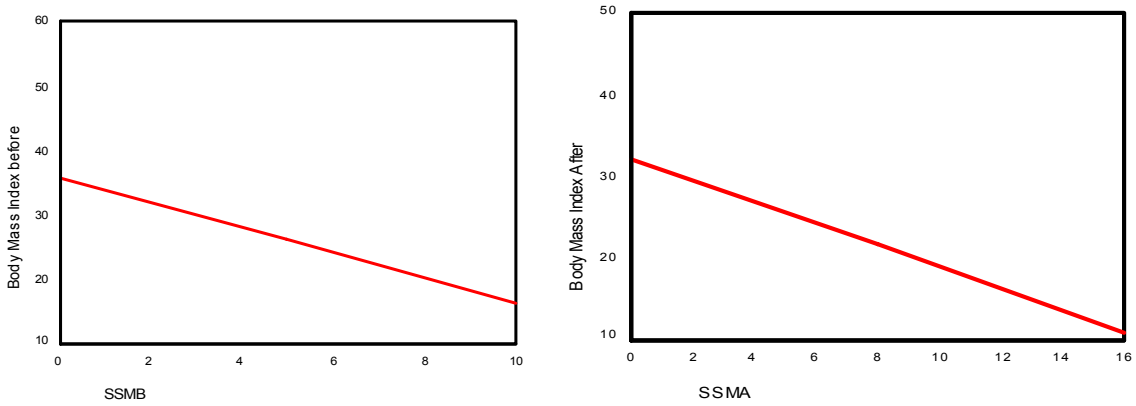

Figure (2): Correlation between SSMB&SSMA and Body Mass Index before

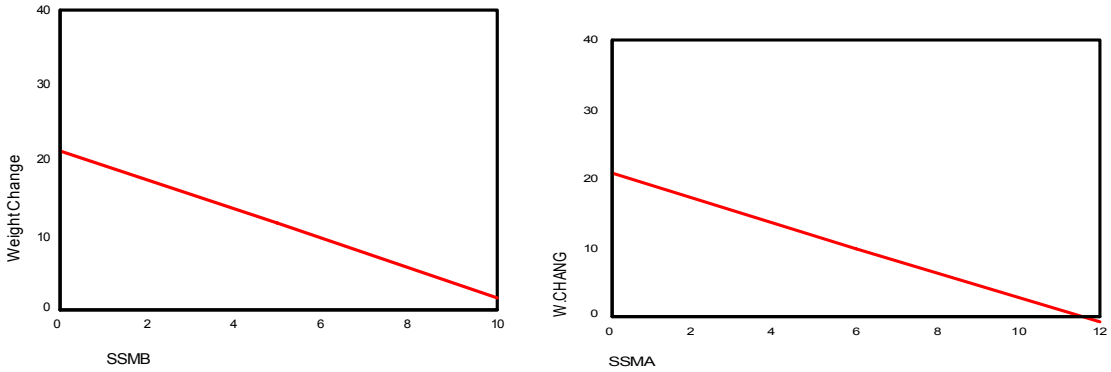

Figure (3): Correlation between SSMB&SSMA and Weight Change

Table (8): **Sensitivity and specificity of anthropometric measurements and Albumin in relation to SSM-pre and SSM- post treatment**

Test	SSM-pre			SSM-post		
	BMI	Alb (g/L)	UWL (kg)	BMI	Alb (g/L)	**UWL (kg)**
Sensitivity	0.09	0.55	1.0	0.15	0.54	**0.85**
Specificity	0.84	0.53	0.21	0.76	0.65	**0.12**
Positive predictive value	0.25	0.40	0.42	0.33	0.54	**0.42**
Negative predictive value	0.62	0.67	1.0	0.54	0.65	**0.50**
False positive	0.75	0.6	0.58	0.67	0.46	**0.58**
False negative	0.38	0.33	0.0	0.46	0.35	**0.5**
Misclassification rate	**0.04**	**0.03**	**0.02**	**0.03**	**0.03**	**0.04**

Table (9): Statistical evaluation of some indicators of malnutrition in cancer patients

Tests	SSM	BMI	Alb (g/L)
Sensitivity	0.38	0.17	0.54
Specificity	0.65	0.88	0.53
Positive predictive value	0.45	0.25	0.47
Negative predictive value	0.58	0.81	0.60
False positive	0.55	0.75	0.53
False negative	0.42	0.19	0.40
Misclassification rate	**0.03**	**0.03**	**0.03**

4. Discussion

Colorectal cancer ranks the third highest in cancer incidence and fourth in cancer mortality in both sexes combined worldwide (**Jinfu Hu *et al.*, 2010**). Hyper metabolism-associated malnutrition, known as protein-calorie malnutrition, is common in cancer patients and is clearly associated with cytokine production and the systemic inflammatory response **(Falconer *et al.*, 1994 and Staal-van den Brekel, *et al.*, 1995).** Malnutrition is common among hospitalized patients. However, the nutritional aspect of medical management has not always been given first priority. Cancer patients suffer

from protein energy malnutrition throughout the evolution of their disease with elevated basal energy requirements due to their inherent illness and decreased oral intake due to reduced gustatory senses with elevated basal energy requirements due to their inherent illness and decreased oral intake due to reduced gustatory senses (**Sanz et al 2008**).

This is the first study that examined the nutritional status for colorectal cancer patient's pre and post different modulates of treatment at the king Abdul-Aziz University Hospital. A cross- sectional descriptive study was carried out among (*30*) Patients at King Abdul Aziz Hospital (KAAUH) Kingdom Saudi Arabia after an informed consent agreement, with diagnosed colorectal cancer to be included in the study at their first visit to the outpatient surgery and oncology department between October 2011 and April 2012 were included in a retrospective review of the patients' medical record. Inclusion criteria for those Patients aged over the age of 18 years old with colorectal cancer; proven adenocarcinoma of the colon involving any location from the cecum to the rectum; received any type of treatment. Patients with other diagnoses were excluded. The mean age for both women and men was 51.96±1.02 (range 21 – 84 year).The aim of the study was explained to the subjects. Our study likewise the study by **Olof and Inga.2008** the participants (n_30).The mean age was 55 years (range 29_72year).

An English questionnaire was developed for the purpose of data collection, which was pilot, tested and modified accordingly. A face- to- face interview with each participating Patients with diagnosed Colorectal cancer. The interview was of 20 to 30 minutes duration (**Karlsson *et al.*, 2009**). The questionnaire was includes information about Socio-economic status demographic data including; age, sex, social status, housing, educational level, anthropometric measurements (height, weight, calculate BMI, hip, waist circumference and calculate hip/waist ratio) by direct contact face to face or by telephone. In addition to the required laboratory investigations which was collected from the patient's medical records.

Socioeconomic Characteristics

The country of Saudi Arabia is among the richest and highest per caption income countries of the world. This high income combined with food affluence and lack of nutritional awareness has led to a state of over-nutrition of macronutrients and malnutrition of micronutrients among the population (**Madani *et al.*, 2000**). Our result table (1) revealed that about 30% of patient were had more than 6000 RS/ month, however 13.33 had 3000- 6000RS/month and 43% were had 1000 to 3000 RS/month .About 57% from our participate were living in shared dwelling but remain (43%) had separate house. This result verified that most of our sample in high Socioeconomic status (H-SES).

Nutritional screening

The purpose of nutritional screening is to identify those patients who are at nutritional risk and at higher risk for complications. Early detection of nutritional risk would allow for early intervention and this may prevent later complications. The validity of a screening tool is dependent on its ability to predict outcome. Our study found that there was a significant association between high nutritional risk by the SSM sheet (Fig. 1), (**Thorsdottir *et al.*, 2001**) The evaluation of SSM as single nutritional parameters used in the full nutritional assessment to indicate malnutrition among cancer patients is made up of seven questions covering BMI, weight loss, anorexia, surgery and other variables that may influence nutritional status. The criterion set for malnutrition was a total score of four score or more for cancer patient**.** This study by SSM identified (30%) as malnourished before treatment and (33.34%) after treatments as shown in table (5). Another study by **Olof and Inga, 2008 which used** the SSM sheet showed that 20% of cancer patients in an outpatient clinic with a clinical diagnosis of colon cancer were malnourished. Weight loss and malnutrition are common in patients with advanced malignant diseases that adversely influence patient survival and QoL **(Laviano and Meguid, 1996; Delmore, 1997; and Noursissat *et al.*, 2008).**

Unintentional weight loss has often been reported in cancer patients (**Watson, and Tang, 1980**) and regarded as a stronger variable for detection of malnutrition than BMI **(Lipkin and Bell, 1993 and Orr *et al.*, 1984**). In the present study, unintentional weight loss as indicator for malnutrition in cancer patients showed in table (2) for all participated **(14.24±1.06kg)**, however unintentional weight loss value (13.61±1.83kg) and (15.05±1.75kg) for males and females respectively. In the study by **Olof and Inga, 2008** report that the general unintentional weight loss from patients' self-reported earlier usual healthy weight was found to be the best single parameter for detecting malnutrition. However, it did not reach the quality of the SSM in terms of specificity and misclassification.

The present study as shown in table (4) of biochemical analysis which revealed that a majority of the patients had serum albumin (73.2% before treatment and 71.3% after treatment) below the reference value. This result supported by the data in the table (6) which demonstrated that the difference of Mean± SD for albumin as malnutrition indicators in our study was highly significant correlations by ($P< 0.01$) for male and female patients before and after treatments but still low than reference rang (34 – 50 g/l). Another Similar study by **Olof and Inga, 2008** found that a majority of the patients had serum albumin

(70%) below the reference value. Previous studies have implicated that pro-inflammatory tumor derived mechanisms influence the hepatic acute phase protein response, which makes measurements of serum albumin and immunocompetence such as TLC of limited value. Serum albumin is the most widely used clinical index of nutrition, but because of its long half-life and affection by stress and illness **(Wong *et al.*, 2001)** it can be regarded as a poor parameter of nutritional status. Also many cancer therapy drugs cause low TLC and serum albumin **(Forse *et al.*, 1985).** This underlines that nutritional status cannot be evaluated from one or two single parameters and supports the need for several measurements as used in the present study.

Medical information and the different types of treatment

The present study as present in table (3) revealed that the majority of the patients (43.33%) treated with both Surgery and chemotherapy while (26.66%) treated by surgery only followed by (13.33%) of the patients received only chemotherapy also other (13.33%) of patients were received a combination of Chemotherapy and Radiotherapy, and only (3.33%) treated with both Surgery and Radiotherapy. Another study by **Olof and Inga, 2008** reported that data from one month screening with SSM indicated that 41% of all cancer patients in chemotherapy were malnourished or in nutritional risk. The majority of the screened patients are regarded themselves in need of nutritional counseling, but only few had received nutritional counseling. Likewise our study showed that (70 %) participated were received chemotherapy or with other treatments (surgery or Radiation) and our date from screening with SSM indicated that (50%) of all cancer patients in chemotherapy were malnourished or in nutritional risk. These studies supported by other reports that nutritional issues are underestimated in diagnostic and therapeutic procedures (**Nitenberg, and Raynard, 2000, Delmore, 1997; and Laviano, and Meguid, 1996).** It has been concluded from the results of other studies that early nutritional support is necessary to improve patient's nutrient status and controlling complications related to food intake which influence patients' QoL (**Ravasco *et al.*, 2007**).

Chemotherapy and radiotherapy are the two important treatment modalities for cancer and can tumor cells and prolong survival time of cancer patients. Patients receiving high-dose chemotherapy need to be supported with parenteral nutrition (**Tartarone *et al.*, 2005)** Nutrition therapy can help cancer patients get the nutrients to maintain body weight and performance status, prevent body tissue from breaking down and rebuild tissues (**Johansen *et al.*, 2004**). Malnutrition can make the patients have more severe chemotherapy-induced toxicity and complications (**Van Cutsem, and Arends, 2005**). High energy/protein diets help patients tolerate the treatment with fewer side-effects (**Read, 2004 and Khan et al., 2006)** patients with tumors of the gastrointestinal tract have difficulty eating due to side effects of surgery. These patients are weak, tired, and unable to withstand cancer therapies because of malnutrition. The treatment outcome and prognosis of the diseases are associated with the nutritional status of the patients (**Sanford, 2005, Lummen et al, 2006 and Peng et al., 2006**). If the patients get enough calories and protein from their diet when they are not on chemotherapy or radiation therapy, they may have a better prognosis and are able to tolerate higher doses of chemotherapy or radiation therapy (**Bozzetti et al, 1998 and Capra et al, 2001**).

Nutritional assessment

Many researchers have suggested that good nutrition in the patient with cancer may improve quality of life, and the nutrition status of the patient after diagnosis is associated with cancer recurrence and survival rates **(Tian *et al.*, 2008).** The present study as we can see in the table (2) revealed that unintential weight loss in male patients was more than female. Regard to duration for a unintential weight loss; the half (50%) for all patient however (52.5% in male & 46.2% in female) had lost weight through 3 months. As we can see after 6 months and1 year unintential weight loss was (17.6% and 5.9 respectively for male) and (15.4% and 30.8% respectively for female). We concluded from these results that 3monthes don't enough for improvement and patients need 6 months - 1 year under treatment to decrease the percent of unintential weight loss. Unfortunately that the female were less improvement than male may be due to another factors related gender. Our study in agreement with other studies who's reported that unintentional weight loss has often been reported in cancer patients (**Watson, and Tang, 1980**) and regarded as a stronger variable for detection of malnutrition than BMI (**Orr and Shingleton, 1984 Lipkin &Bell, 1993)**. Other study in the Unit of Nutrition Research, National University Hospital, Reykjavik, Iceland by **Olof and Inga, 2008**, found that the unintentional weight change was not significant due to this wide range of patient's weight changes. However, if the patients' self-reported earlier usual healthy weight was found to be the best single parameter for detecting malnutrition. However, it did not reach the quality of the SSM in terms of specificity and misclassification.

The present study as shown in tables (**8**) there was relation between the sensitivity and specificity of SSM-pre and post treatment with the sensitivity and specificity of BMI, Alb, and UWL before treatment and this relation improved after treatment. The SSM had a sensitivity of 0.38 and the specificity was 0.65 as presented in table (**9**). Other study by **Olof and Inga, 2008** found that the SSM had high sensitivity (0.87)

and specificity (0.88), and 13% misclassification and few individual nutritional parameters had sensitivity above 0.5 and no parameter reached the quality of the SSM. If the patients' earlier self-reported usual healthy weight was used as the reference for unintentional weight loss, this was the single best parameter with high sensitivity. The SSM have been validated with high sensitivity and are used in routine clinical screening in other departments at Landspitali-University Hospital **(Thorsdottir *et al.*, 2005).** Sensitivity in nutritional screening is very important for realization of the goal of finding malnourished patients, and specificity for preventing well-nourished patients being classified as malnourished. The sensitivity of the SSM was higher in the study by **Olof and Inga, 2008** of cancer patients than found in earlier studies for other patient groups (**Thorsdottir I *et al.*, 2001 and Bauer J *et al.*, 2002**). Likewise our study verifies that the sensitivity of the SSM was higher as show in table (8).

Anthropometric Data:

According to the National Cancer Institute's ''Nutrition in Cancer Care'' guidelines, timely identification and treatment of nutrition problems may improve cancer patients' prognosis by helping the patient gain or maintain weight, improving the patient's response to therapy, and reducing the complications of treatment (**Gupta *et al.*, 2006).**

A review **Alina Vrieling and Ellen Kampman, 2010** shows that there is a paucity of published studies on BMI, physical activity, and dietary factors in relation to colorectal cancer recurrence and survival. Because of these small numbers and the large heterogeneity in the type of exposure, timing of exposure assessment, and disease outcomes investigated, summarizing the results and drawing firm conclusions is difficult. Higher BMI or body fatness before or at time of diagnosis may be associated with higher all-cause mortality, colorectal cancer–specific mortality, or recurrence, although results appeared to differ according to sex, tumor location, and the molecular subtype of the tumor. There is suggestive evidence that a higher post diagnosis leisure-time physical activity is associated with lower all-cause and colorectal cancer–specific mortality.

Our results as we can see in table (2) verify that mean of BMI for all colorectal patients was (28.01) before treatments and decrease to (26.16) after treatments. Likewise the results revealed that unintentional weight loss in male patients was more than female. Regard to duration for a unintential weight loss; the half (50%) of our sample had through 3 months. As we can see in the same table after 6 months and1 year unintential weight loss occurs in (17.6%) and (5.9%) from our participated patients respectively. Another study by **Burden *et al.*, 2010** showed that one in five of patients were malnourished (weight loss >10%) when they first entered the secondary health care system; however, BMI categorized over half of the patients as being overweight or obese. If BMI alone were used as a measure of nutritional status, many CRC patients with malnutrition and weight loss would go unidentified.

Prevalence of malnutrition:

There is a definite interplay between the nutritional status and disease in cancer patients. The altered host metabolism associated with cancer commonly leads to protein calorie malnutrition. In turn, protein calorie malnutrition produces a vicious cycle by interfering with the response to oncological therapy and enhancing morbidity. Protein calorie malnutrition is a common secondary diagnosis in cancer patients. It has an insidious evolution and its detection and treatment is important to the success of oncological therapy and improvement in quality of life. It thus becomes mandatory to develop objective criteria to recognize malnutrition. Anthropometric parameters have long been used in nutrition surveys as markers of malnutrition owing to the ease and simplicity of measurement. Loss of body weight is an important indicator of the presence, severity, and progress of the disease process. Weight is unique in that it is a measurement that many people determine themselves; therefore they can give some estimate of what their weight was when they were well (**Gurpreet Singh and Khanna, 1985).**

Malnutrition is observed in up to 80 % of patients with advanced colorectal cancer (**Karthaus and Frieler, 2004**) and is associated with longer hospital stay, reduced response, and increased overall cost of care, and poor survival. A retrospective analysis study was accomplished in USA on 58 stage III–IV colorectal cancer patients treated at cancer treatment Centers of America concluded that the prevalence of malnutrition, as determined by SGA, was 41% (24 of 58)(**Gupta *et al.*, 2006**).

Another study that was conducted to evaluate a short screening sheet (SSM) for malnutrition and to investigate the nutritional status of patients receiving chemotherapy for cancer of the lungs, colon or breast at an outpatient clinic. The test of SSM in clinical routine showed that 40% of the patients were malnourished (**Olof Gudny and Inga, 2008).** And the prevalence and risk factors of malnutrition among cancer patients according to tumor location and stage in the National Cancer Center in Korea is 61% (**Gyung-Ah *et al.*, 2009**). The present study mentioned that (30%) as malnourished before treatment and (33.34%) after treatment (The criterion set for malnutrition was a total score of 4 or more points by SSM screening) as shows in table (5).

Also our study in table (6) which verify the statistical evaluation of indicators for malnutrition (SSM,BMI , Alb and Unintential Weight Loss) for

male cancer patients before and after treatments, as we can see the Mean± SD of SSM was 3.47±0.37 and 4.47±0.8, there was significant difference between before and after treatment at * $P< 0.05$. However Mean of second parameters BMI was 24.25±0.21 and 23.76±0.14 but the change was not significant difference between before and after treatment. Regarding to Mean± SD for albumin was 29.55±0.66 and 33.67±1.2 before and after treatment respectively and the difference was highly significant by ** $P< 0.01$.

Unintentional weight loss has often been reported in cancer patients (**Watson, 1980**) and regarded as a stronger variable for detection of malnutrition than BMI (**Lipkin, Bell 1993; Orr *et al.*, 1984**). In the present study, general unintentional weight loss was 13.83 for males and 15.05 for females as we can see in table (6).

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