

A perspective observational study on Nutritional Status of Oncosurgery Patients

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Abstract

Present study was initiated to study nutritional status of 30 patients between the age of 35-65 years from Department of Oncosurgery at Mahatma Gandhi Medical College & Hospital, Jaipur.

The incidence rate was found higher in patients above 40 years of age. Men were affected more than women and were less likely to survive.

Most of the patients showed clinical sign and symptoms of weakness, fatigue, nausea, anorexia, weight loss, anemia and wasting. Some patients experienced symptoms of oral ulcer, mucositis, xerostomia, chronic cough and blood in sputum and vomiting.

Problem of weight loss was associated with poor diet compliance. It was also related to the symptoms of anemia, wasting and weakness as many patients were not able to have proper diet due to poor physical condition as well as ignorance regarding right food choices.

Introduction

Cancer is caused by multiple interactions between genes and the environment. Cancer is one of the well-known factor for global morbidity and mortality. Prevalence for new cancer cases may be 70% in coming 20 years as per report of World Health Organization. Cancer is characterized by uncontrolled cell growth. Growth of cancer cells occurs in three phases:-

- Initiation phase,
- Promotion phase and
- Progression phase.

In the initiation phase, the cell is not able to repair itself due to exposure to oxidative stress or exposure to carcinogens. In promotion phase, the initiated cell replicates and grow to the extent of irreparable DNA damage also known as cellular proliferation which was stimulated by cell signaling. In progression phase, the tumor may increase in size or may translocate to other parts of the body.

The common cancer sites in Indian men are lung, colon, rectum, stomach, head, neck and liver. Indian women are mostly affected with cancers of breast, lungs, ovary, cervix, lip and oral cavity.

Incidence of cancer in India was found 679,421 (94.1 per 100,000) in males, while 712,758 (103.6 per 100,000) among females in 2020. As per report of National Cancer Registry Programme, India (2020), stigma of cancer can be seen in 1 in 68 patients (lung), 1 in 29 patients (breast) and 1 in 9 Indian population.

Cancer and Malnutrition

Malnutrition may be precipitated due to disease itself or due to antineoplastic therapy or from both. Oncological therapies like chemotherapy, radiation, immunotherapy and surgery are major leading factors for poor nutritional status.

Body is in the state of inflammation when malnutrition occurs that further promotes anorexia and results in loss of body weight. Problem of malnutrition is quite predominant in cancer patients. Prevalence of malnutrition has been reported to 40% to 80% during treatment of cancer. Malnutrition can lead to poor tolerance to treatment and cause longer duration in hospital and poor survival rates (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6723589/>, Paula Ravasco, 2019).

Sarcopenia

Sarcopenia is a condition of reduced muscle mass and muscle strength that affects quality of life adversely. It is often left undiagnosed in obese cancer patients (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6723589/>, by Paula Ravasco, 2019).

Cancer Cachexia

A secondary problem during cancer treatment, known as cancer cachexia is characterized by tissue wasting and progressive impairment of body functions. Systemic inflammation, protein and energy deficiency and involuntary muscle reduction are common signs of cancer cachexia. Cancer cachexia is allied with fat mass loss irrespective of skeletal muscle mass loss (Paula Ravasco, 2019).

Some other common treatment related risk factors for poor nutritional status -

Spleen was used to be removed in patients with Hodgkin lymphoma that may lead to poor immunity and increased risk of infections.

Limb amputation is usually done in case of bone and soft-tissue cancers that affects overall quality of life.

Lymphedema is very common after radiation therapy or surgery of lymph nodes that is again a risk factor for decreased immunity and higher infection rate. Besides this lymphedema is a quite painful situation that makes swallowing difficult ([food.https://www.cancer.net/survivorship/long-side-effect-cancer-treatment](https://www.cancer.net/survivorship/long-side-effect-cancer-treatment))

Types of tumours

- **Carcinoma:** Tumours of skin or covering membranes of internal organs.
- **Sarcoma:** Tumours of connective or supportive tissues e.g., bones, cartilage etc.
- **Leukemia:** Starts from bone marrow or blood producing organs & rapidly spread to all over body through blood

- **Lymphoma and myeloma:** Tumours of lymph nodes that spread all over body through lymph
- **Glioma:** Tumours in brain and spinal cord

Causes of cancer

Cancer may occur both due to endogenous or exogenous factors. Exogenous factors include tobacco use, infectious agents (e.g. bacteria, parasites, viruses), Medications like radiation, chemical exposure (e.g. polychlorinated biphenyls, organic compounds used in plastics, paints, adhesives), carcinogenic components found in foods and beverages (e.g. aflatoxins, heterocyclic amines, polycyclic aromatic and N-nitroso variants). germ-line mutations, oxidative stress, inflammation and hormones are some endogenous causes of malignancy (Clinical Dietetics Manual, 2018).

Treatment of cancer

Surgery: Tumors that can be removed by surgery, in those cases it is a preferred choice for complete eradication of cancerous tumors. It can be done alone or in combination of other therapies. Surgeries, especially where GI tract is involved, nutrient digestion and absorption may be reduced significantly, while requirements of nutrients become high for wound healing and recovery. Some symptoms of fatigue, pain, decreased appetite may be faced following a surgery

Chemotherapy: In this, anti-cancer drugs are used for treatment of cancer, where surgery is not possible like in leukemia or post surgery also it can be given as an adjunct treatment for complete cure of the disease.

Radiation: In this type of treatment, ionizing radiation are applied to cancer treatment to control or diminish cancerous cells. It involves high energy radiography targeted on the cancer site to kill or shrink cancerous cells. It can be administered externally into the body from a linear accelerator or a cobalt unit or internally by placing a radioactive source directly inside the body or next to the tumor to deliver a highly localized dose. Radiation is needed to be given in a very controlled manner to avoid destruction of healthy cell with cancerous cell. The severity of the nutritional problems depends on the site and intensity of the radiation treatment. There are many painful side effects associated including severe skin irritations, mouth ulcers, nausea, vomiting, diarrhea, temporary hair loss and loss of energy. But with new development and symptom suppressing medications, the above mentioned side-effect are being minimized. Linear accelerator or a cobalt unit or a localized dose placed internally is used to apply radiation to the affected part.

Cytotoxin: These substances aid in preventing growth of cancer cells in number and size, which helps in shrink of tumors size.

Immunotherapy: Cancer immunotherapy is the spur of the immune system to treat cancer, improving on the immune system's natural ability to fight the disease. It is an application of the fundamental research of cancer immunology and a growing subspecialty of oncology.

Impact of therapies on nutritional status of cancer patients

Treatment	Potential nutritional impact
Surgery	Surgery impose higher need of nutrients for recovery and wound healing, It may also lead to poor nutrient absorption, early satiety, dehydration, abdominal cramping.
Chemotherapy	It may cause abdominal discomfort, hyperglycemia, fluid/electrolyte imbalance, lactose intolerance, constipation, food aversion, taste change
Cytotoxic	These agents may cause symptoms of decreased immunity, fatigue, anorexia, nausea, vomiting, diarrhea, mucositis, neuropathy, dyspepsia, metallic taste etc. that alter or decrease food intake
Radiation	Abdomen discomfort are some common symptoms
Immunotherapy	Anorexia nausea vomiting diarrhoea fatigue immuno suppression
Hormonal treatment	It may cause problems of hyperglycemia, hypercalcemia, edema, osteoporosis, bone pain, hot flashes etc.

Table 1 Type of treatment for cancer (Khanna et al., 2016)

Cancer and Nutritional Status

Malnutrition is a common feature of cancer and its treatment. Therefore, nutrition screening and the nutrition care process including nutrition assessment, ongoing monitoring and follow-up are crucial for preventing or minimizing the development of malnutrition at all stages of treatment. The plan of care should allow appropriate intervention to target problem areas as warranted. Long term follow-up upon completion of therapy is also recommended, as nutrition-impact symptoms may be experienced even as long as 12 months following commencement of therapy and have been associated with reduction in quality of life. The plan of appropriate intervention to target problem areas is warranted. Long term follow-up upon completion of therapy is also recommended, as nutrition-impact symptoms may be experienced even as long as 12 months following commencement of therapy and have been associated with reduction in quality of life. Therefore present research work was planned with a view to assess nutritional status of all cancer patients who were admitted to Mahatma Gandhi Medical College, Jaipur. As timely assessment of nutritional status may help to save quality of a life.

Research Methodology

Present research work was a perspective observational study in which 30 samples were selected with purposive sampling method, who were fulfilling inclusion criteria as below-

Inclusion criteria

- Patients between 35 -65 years
- Patients undergone oncosurgery
- Cooperative patients

Exclusion criteria

- Patients < 35 and >65 years of age
- Who have not undergone oncosurgery

- Non-Cooperative patients
- Patients suffering from some other serious illness
- Duration of study: 3 months

Data collection: For ease of understanding, data collection was divided under following headings:

Phase 1: Collection of review of literature

Phase 2: Data collection

Phase 3: Interpretation of data through statistical analysis

Phase 1: Collection of review of literature: Research studies were collected from pubmed, google scholar, infibnet and other online sources as well as from libraries of Mahatma Gandhi medical College and library of College of community and applied Sciences in MPUAT, Udaipur. It was done for 1 month.

Phase 2: Data collection: It was done in the duration of 2 months. This phase is divided into following subheadings -

2.1 Collection of general information: Information was gathered for patient's name, age /sex, place, education, working status, type of activity, economic status and marital status with the help of a well structured questionnaire. Data was collected from in patient record or by interview of attendant.

2.2 Assessment of nutritional status

2.2a Anthropometric measurement

In this part, patient's different anthropometric parameters like height, weight, waist circumference, hip circumference, mid upper arm circumference, body mass index and waist to hip ratio were noted. Height was noted using heightometer. Body weight was recorded using digital weighing machine.

Body mass index was calculated using the formula: weight (kg)/ Height (m²).

Waist circumference, hip circumference and mid upper arm circumference were recorded using non stretchable measuring tape. Waist to hip ratio was noted by dividing waist circumference with hip circumference.

2.2b Collection of biochemical reports

Data was recorded from patient's in patient records for following biochemical parameters.

RBC($10^6/\mu\text{L}$)	WBC($10^3/\mu\text{L}$)	HB(g/dL)	SGOT (U/L)	Na(mmol/L)	K(mmol/L)	RBS(mg/dL)
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Table 2. Format to collect data on biochemical profile

2.2c Data collection for presence or absence of clinical signs and symptoms

Patients were observed for following clinical signs and symptoms:-

Oral ulcer, weakness, pain in waist/shoulder/back, mucositis, xerostomia, sputum with blood, anorexia, wasting, anemia, loss of appetite and taste change, shortness of breath,

recurrent bronchitis /pneumonia, fatigue, headache, nausea /vomiting, diarrhoea and constipation

2.2d Diet recall and nutrient intake

To know whether patient's nutrient intake was normal or compromised, a 24 hours home diet recall was noted on a preset questionnaire. With this, 24 hour empty calorie intake was also noted using a food frequency questionnaire as shown below:

S.No.	Food items consumed	Quantity	Energy	Carbohydrates	Fat	Protein	Iron
1	Cereals						
2	Pulses						
3	Vegetable						
4	Fruits						
5	Fats						
6	Sugar						
7	Milk						

Table 3 Sample table for calculation of nutrient intake from home diet recall

Empty calorie intake through food frequency

Food item	Daily	Weekly	Fortnight	Monthly	Total empty calories intake
Oil					
Cold drink /sharbat / juice					
Pickles /fried foods /junk food					
Alcohol					
Total					

Table 4 Sample table to record empty calorie intake

2.3 Nutritional diagnosis: Patients were categorized under the category of well nourished/ malnourished or at risk of malnutrition on the basis of nutritional assessment. After diagnosis, patients were given diet charts and diet counseling was done.

Sample diet charts are as below -

Diet chart 1: RT feed

Patient nameAge/ Sex.....Diagnosis.....Date.....

Height (cm).....Weight (kg).....BMI (kg/m²).....Energy (Kcal).....Protein (g).....

Time	Name of Feed (Volume)	Ingredients	Quantity

Table 5 Sample table for RT feed diet chart

Diet Chart 2: High Protein Diet

Patient nameAge/ Sex.....Diagnosis.....Date.....

Height (cm).....Weight (kg).....BMI (kg/m²).....Energy (Kcal).....Protein (g).....

Timing	Meal	Menu	Quantity
7:00 am	Early morning	Milk Biscuits	1 glass 2 no.
9:00 am	Breakfast	Milk Sandwich	½ Glass 1
11:00 am	Mid morning	Veg soup	1 glass
1:00 pm	Lunch	Chapati Dal Vegetable Salad Curd	4 1 katori 1 katori 1 plate 1 katori
4:00 pm	Evening	Paneer	50 gm
5:00		Roasted chana Apple	30 gm 1
7:00 pm	Dinner	Chapati Dal Vegetable Salad	4 1 katori 1 katori 1 plate
9:00 pm	Bed time	Milk Banana	½ Glass 1

Table 6. Sample table for high protein diet chart

Phase 3 Statistical analysis and data interpretation

In this part of the study all data collected was tabulated and presented in form of graphs after relevant statistical analysis. Mean, standard deviation and ANOVA was applied to find out any significant difference among various subjects.

Results and discussion

After data collection on different aspects of patients profile, it was analyzed by statistical tests and presented in the form of tables and graphs under following headings:

1. General Information of the patients

Patient no.	Age/s ex	Place	Education	Working status	Types of activity	Economic status	Marital status
1	48/M	Bhilwara	Metric	Working	Moderate	MIG	Married
2	59/M	Hanumangarh	Illiterate	Working	Moderate	HIG	Married
3	55/F	Sri Ganganagar	Metric	Working	Moderate	MIG	Married
4	44/M	Kothputali Jaipur	Matric	Working	Moderate	MIG	Married
5	41/M	Jobner, Jaipur	Primary	Working	Moderate	LIG	Married
6	36/M	Dholpur	Matric	Working	Moderate	MIG	Married
7	46/F	Jaipur	Graduate	Working	Moderate	MIG	Married
8	39/F	Jhunjhnu	Illiterate	Working	Moderate	LIG	Married
9	24/F	Bharatpur	Illiterate	Working	Moderate	LIG	Married
10	68/F	Bhilwara	Illiterate	Non working	Sedentary	MIG	Married
11	58/F	Tonk	Illiterate	Working	Moderate	MIG	Married

12	65/M	Jaipur	Matric	Non working	Sedentary	MIG	Widower
13	39/F	Jhunjhunu	Post graduate (Ph.D.)	Working	Moderate	MIG	Married
14	61/M	Ajmer	Matric	Non working	Sedentary	MIG	Married
15	47/M	Bharatpur	Primary	Working	Moderate	MIG	Married
16	43/F	Alwar	Illiterate	Working	Moderate	MIG	Married
17	39/F	Karauli	Primary	Working	Moderate	MIG	Married
18	45/F	Jaipur	Illiterate	Working	Moderate	MIG	Married
19	61/F	Alwar	Illiterate	Working	Moderate	MIG	Married
20	47/F	Pali	Illiterate	Working	Moderate	MIG	Married
21	46/M	Jhalawar	Metric	Working	Moderate	MIG	Married
22	44/M	Alwar	Primary	Working	Moderate	MIG	Married
23	43/M	Alwar	Metric	Working	Moderate	MIG	Unmarried
24	69/M	Dholpur	Graduate	Non working	Sedentary	MIG	Married
25	60/M	Sirohi	Metric	Working	Moderate	MIG	Married
26	32/M	Jhunjhunu	Senior secondary	Working	Moderate	MIG	Married
27	58/M	Jaipur	Graduate	Working	Moderate	HIG	Married
28	46/F	Jaipur	Graduate	Working	Moderate	HIG	Married
29	59/M	Kothputli Jaipur	Metric	Non working	Sedentary	MIG	Married
30	42/F	Kaman Bharatpur	Illiterate	Working	Moderate	MIG	Married

Table 7 General information of cancer patients

Above table 7 is showing the raw data of general information of all 30 cancer patients, in which patients information related to education, occupation, activity pattern, economic status and marital status. Out of 30, 14 patients were female and 16 patients were male, so occurrence in both sexes was almost equal.

Data interpretation of general information

Parameters		Total number of patients (N= 30)	Percentage
Age	20-30 years	1	3.33
	30-40 years	5	16.66
	40-50 years	13	43.33
	50-60 years	6	20
	60 years above	5	16.66
Place	Jaipur	8	26.66
	Tonk	1	3.33
	Bhilwara	2	6.6
	Alwar	4	13.33
	Hanumangarh	1	3.33
	Ganganagar	1	3.33

	Bharatpur	3	10
	Sirohi	1	3.33
	Dholpur	2	6.6
	Jhalawar	1	3.33
	Pali	1	3.33
	Karauli	1	3.33
	Ajmer	1	3.33
	Jhunjhunu	3	10
Educational status	Graduate	4	13.33
	Illiterate	10	33.33
	Metric	10	33.33
	Primary	4	13.33
	Post graduate	1	3.33
	Senior secondary	1	3.33
Working status	Working	25	83.33
	Non working	5	16.66
Type of activity	Sedentary	5	16.66
	Moderate	25	83.33
	Heavy	0	0
Economic status	LIG	3	10
	MIG	24	80
	HIG	3	10
Marital status	Married	28	93.33
	Unmarried	1	3.33
	Widow/widower	1	3.33

Table 8 Data interpretation of general information

Above table 8 is presenting that majority of the patients were in the age group of 40-50 years (43.33%), while 16.66% patients were found in the category of 30-40 years and above 60 years in each category respectively. Percentage of patients in lower age group was statistically not significant. Ninety three percent patients were married. Significantly high ($p < 0.01$) number of patients were from middle income group (80%). Twenty five out of thirty patients (83.33%) were having moderate activity. 83% patients were engaged in some or other occupation. 66% patients were educated while 33% were illiterate. Majority of patients were found from Jaipur due to vicinity to the hospital but occurrence was found all over the Rajasthan.

2 Anthropometric measurement of cancer patients: In this part of study, patients height, weight, waist circumference, hip circumference & mid upper arm circumference were measured and body mass index (BMI) was calculated and tabulated as below-

Patient No.	Height (cm)	Weight (Kg)	BMI (kg/m ²)	WC (cm)	HP (cm)	WHR	MUAC (cm)
1	153	55	23.50	66	84	0.78	26
2	176	57	18.14	107	105	1.02	30.5
3	167	50	17.98	76	87	0.87	28
4	172	56	19.17	71	64	1.10	26
5	171	69	23.63	76	81	0.93	25.5
6	171	60	20.54	81	99	1.2	25
7	169	50	17.54	97	103	0.94	35.5
8	158	49	19.6	87	100	0.87	23.2
9	160	30	11.71	66	74	0.89	13
10	152	53.9	23.33	90	102	0.88	22
11	153	65	27.7	82	99	0.82	28
12	174	66	21.8	66	74	0.89	21
13	168	68	24.11	87	101	0.86	32
14	177.8	65	20.7	86	90	0.95	27
15	171	60	20.5	92	97	0.94	24
16	148	45	20.5	71	77	0.92	20
17	149	40	18	73	79	0.92	25
18	144	60	28.9	94	100	0.94	33
19	152	47	20.3	69	78	0.88	20
20	160	30	11.7	66	68	0.97	16
21	170	60	20.76	87	94	0.92	28
22	182	60	18.11	82	87	0.94	27
23	157	65	26.37	97	102	0.95	33
24	170	80	28.57	95	110	1.15	40
25	171	50	17.09	81	87	0.93	26
26	167.6	75	26.9	80	106	0.75	33
27	173	62	20.71	82	88	0.93	30
28	156	64	26.33	90	99	0.90	33.3
29	182	86	25.98	87	97	1.11	34
30	137	56	29.94	91	110	1.20	35

Table 9 Anthropometric measurements of cancer patients

Above table 9 is showing that mean height for male and female patients was 171 cm and 155 cm respectively while mean weight was 73 kg and 50.6 kg for these categories. Mean BMI was 22.03 kg/m² for males while it was 21.26 kg/m² for females. It is showing that most of the patients having normal BMI. Parameter of waist circumference showed 81.35 cm for female and 83.5 cm for male patients. Hip circumference was recorded as 91.31 cm for female and 91.56 cm for male counterparts. Mean waist to hip ration was calculated as 0.89 for females and 0.91 for males. Which was also found in the normal range only. Mean MUAC was noted as 26 cm for females and 28.5 cm for males. This data is depicting that nutritional status of the cancer patients in terms of anthropometry was almost normal as these patients were diagnosed timely and had taken proper treatment and diet advice.

3. Biochemical profile of cancer patients

Patient No.	RBC (10 ⁶ /μL)	WBC (10 ³ /μL)	HB (g/dL)	SGO T (U/L)	Na (mmol/L)	K (mmol/L)	RBS (mg/dL)
1	3.55	9.2	9.9	20.0	136	4.0	123
2	3.45	8.86	11.5	19.6	130	3.59	112
3	5.22	10.59	12.1	13.8	142	4.0	145
4	6.19	7.69	8.8	126	132	2.5	111
5	5.97	37.49	7.9	21.4	159	5.2	165
6	4.20	6.21	13.4	24.1	137	4.1	99.9
7	7.01	6.45	10.5	36	129	4	105
8	6.63	8.6	7.4	18.6	133	2.1	120
9	3.74	8.1	9.1	12.6	149	5.6	91.5
10	4.9	3.5	9.8	20.9	138	3.9	161
11	6.19	8.2	7.5	21.5	140	4.20	92.30
12	4.07	5.95	11.6	256	133.6	4.80	101
13	3.17	4.0	8.1	31.0	151	3	120
14	2.95	10.30	8.2	192	127	3.3	144
15	2.75	4.73	8.8	22	137	4.4	160
16	2.96	7.5	8.9	20.1	135	3.6	132
17	4.40	12.6	12.7	23.0	150	2.7	88.5
18	5.22	6.72	7.15	189	136	4.6	129
19	4.5	8.0	6.1	23.9	139	4.1	156
20	3.68	6.12	7.5	26.9	133	3.2	120
21	6.84	7.09	11.1	26.8	131	3.7	142
22	7.43	4.83	8.0	31.8	136	4.7	120
23	8.3	5.59	10.6	12.9	119	5.6	272
24	5.5	6.78	12.1	35.9	132	3.6	224
25	4.58	8.15	9.8	22.6	119	2.1	154
26	6.67	7.6	7.09	10.89	130	3.6	123
27	2.86	6.6	8.8	28.9	133	3.8	101
28	2.0	5.8	7.86	23.8	128	3.1	136
29	3.08	11.7	11.3	29.6	149	3.24	272
30	3.85	5.78	7.1	343	134	4.24	140

Table 10 Biochemical data of cancer patients

Above table 10 is showing the biochemical profile of cancer patients for blood cells, hemoglobin, SGOT, sodium, potassium and random blood sugar.

Data interpretation

Parameters	Variables	Total number of patients (N=30)	Percentage
HAEMOGLOBIN (11.5 to16.5g /dl)	Normal	8	26.66
	Low	22	73.33
	High	0	0
RBC (4.50-5.50 10 ⁶ /μL)	Normal	8	26.66
	Low	14	46.66
	High	8	26.66

WBC (4-10 10 ³ /μL)	Normal	23	76.66
	Low	2	6.66
	High	5	16.66
SODIUM (137-145 mmol/L)	Normal	7	23.33
	Low	18	60
	High	5	16.66
BLOOD SUGAR (60 to 140mg/dl)	Normal	0	0
	Low	10	10
	High	20	66.66
POTASSIUM (3.5-5.1 mmol /L)	Normal	20	66.66
	Low	7	23.33
	High	3	10
SGOT (15-46 U/L)	Normal	21	70
	Low	4	13.33
	High	5	16.66

Table 11 Interpretation of data obtained for biochemical reports

When data was analyzed for biochemical profile, 73.33% patients were observed anemic, while 26.66% patients showed normal hemoglobin levels. RBC levels were found low in 46.66% patients. Majority of the patients (76.66%) showed normal counts for WBCs. Sixty percent patients showed low sodium levels, while 23.33% patients showed low potassium levels. Although potassium levels were found near normal in majority of patients (66.66%). Blood sugar was found on a higher side in 66.66% patients while SGOT levels were found normal.

4. Clinical Signs & Symptoms

Clinical signs and symptoms of patients were recorded for common symptoms associated with cancer and its therapies. These were oral ulcer, weakness, mucositis, xerostomia, chronic cough, blood in sputum, anorexia, wasting, loss of appetite, pneumonia, fatigue, vomiting and diarrhea. With this, diagnosis of the patients was also recorded to co-relate the symptoms with type of cancer.

S. N.	Oral ulcer	Weakness	Mucositis	Xerostomia	Chronic Cough	Sputum With Blood	Anorexia	Wasting	Anemia	Loss of appetite	Pneumonia	Fatigue	Vomiting	Diarrhea	Diagnosis
1	Y	Y	Y	N	Y	N	Y	Y	Y	Y	N	Y	N	N	Cancer of tongue
2	N	Y	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Cancer of Oesophagus
3	Y	Y	Y	N	N	N	Y	Y	Y	Y	N	Y	N	N	Cancer

															maxilla
4	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Y	N	N	Ca BM (RMT)
5	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Y	N	N	Ca buccal mucosa
6	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Y	N	N	Ca tongue
7	N	Y	N	N	N	N	Y	Y	Y	Y	Y	N	N	N	Ca Breast
8	N	Y	N	N	N	N	Y	Y	Y	Y	N	Y	Y	N	B/L adrenal mass
9	N	Y	N	N	N	N	Y	Y	Y	Y	N	Y	Y	N	Adrenal mass
10	N	Y	N	N	N	N	Y	Y	Y	Y	N	Y	N	N	Ca ovary
11	N	Y	N	N	N	N	Y	Y	Y	Y	N	Y	N	N	Ca cervix
12	N	Y	N	N	N	N	Y	Y	Y	Y	N	Y	Y	Y	Ca gall bladder
13	N	Y	N	N	N	N	Y	Y	Y	Y	N	Y	N	N	Ca ovary
14	N	Y	N	N	N	N	Y	Y	Y	Y	N	Y	N	N	Ca pancreas
15	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	N	CA right buccal mucosa
16	N	Y	N	N	N	N	Y	Y	Y	Y	N	Y	N	N	Ca ovary
17	N	Y	N	N	N	N	Y	Y	Y	Y	N	Y	Y	Y	Ca stomach
18	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Y	Y	Y	Ca parotid
19	N	Y	N	N	N	N	Y	N	Y	Y	N	Y	N	N	Basal cell cancer
20	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	N	Ca esophagus
21	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Y	N	N	Ca alveolus
22	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	N	Ca centra arch
23	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	N	Ca BM T ₂ DM
24	N	Y	Y	N	N	N	Y	Y	Y	Y	N	Y	Y	N	Ca GB HTN T ² DM
25	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Ca lung
26	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	N	Ca thyroid

27	N	Y	N	N	N	N	Y	Y	Y	Y	N	Y	N	Y	Ca anal canal
28	N	Y	N	N	N	N	Y	Y	Y	Y	N	Y	N	N	Ca breast
29	N	Y	N	N	N	N	Y	Y	Y	Y	N	Y	N	Y	Ca colon
30	N	Y	N	N	N	N	Y	Y	Y	Y	N	Y	N	N	Ca cervix

Table 12 Clinical signs and symptoms

Data interpretation of clinical sign and symptoms

Clinical sign/Symptoms	Total number of patients (N=30)	Percentage
Oral ulcer	10	33.33
Weakness	30	100
Fatigue	30	100
Recurrent bronchitis and pneumonia	2	6.66
Anemia	30	100
Loss of appetite	30	100
Vomiting	8	26.66
Mucositis	14	46.66
Nausea and anorexia	30	100
Diarrhoea	6	20
Chronic cough	12	40
Sputum With blood	8	26.66
Xerostomia	11	36.66
Type os cancer		
Oral cavity cancer	12	40
Lungs cancer	2	6.6
Breast / ovary cancer	4	13.33
GI tract cancer	5	16.66
Others	7	23.33

Table 13 Interpretation of data for clinical Signs & Symptoms

Above table 13 is depicting that out of 30, 11 patients were suffering from head & neck cancer. Thirty three percent patients showed symptoms of oral ulcers. Hundred percent patients showed signs of weakness, fatigue and loss of appetite, while 26.66% patients suffered from vomiting and sputum with blood. Forty percent patients faced the problem of chronic cough. Forty six percent patients showed symptoms of mucositis. Data showed the maximum occurrence being for oral cavity cancer followed by GI tract and breast and

ovary cancer. Problems of xerostomia, mucositis and nausea, vomiting was observed in majority of patients with cancer of oral cavity.

5. DIETARY HISTORY

Patient No.	Energy (kcal)	Protein (g)	CHO (g)	Fat (g)
1	1114.32 (58.4)	43.4 (68)	167.4 (128)	33.8 (112)
2	1176.4 (42)	49.77 (55)	172.2 (132)	36.8 (122)
3	1520.86 (58.4)	56.31 (75)	242.7 (186)	34.4 (137)
4	1392.35 (69)	44.25 (66)	185.82 (142)	54.3 (181)
5	1482.7 (68)	57.48 (67)	239.1 (183)	30.8 (102)
6	1073.58 (42)	40.01 (47)	161.8 (124)	28.6 (195)
7	1618.44 (60)	50.31 (66)	281.3 (167)	56.8 (127)
8	1225.66 (64)	46.38 (73)	185.6 (127)	32 (128)
9	1222.84 (57)	51.34 (95)	214.1 (164)	30.6 (122)
10	1312.01 (78)	45.37 (80)	166.05 (127)	32.2 (167)
11	1163.36 (81)	46.18 (80)	172.5 (132)	31.4 (125)
12	1488.9 (56)	59.74 (67)	234.2 (180)	36.9 (147)
13	1618.68 (86)	65.91 (87)	235.9 (181)	39.7 (158)
14	1091.39 (39)	41.21 (45)	193 (148)	41.2 (164)
15	1483.7 (50)	57.48 (67)	239.1 (183)	31.8 (106)
16	921.5 (60)	33.64 (65)	138 (106)	25.6 (102)
17	749.75 (47)	29.62 (56)	92.4 (171)	28.88 (115)
18	730.19 (52s)	29.92 (64)	87.65 (167)	29.6 (118)
19	1344.92 (79)	50.35 (89)	208.8 (160)	33 (132)
20	1985 (90)	72.5 (94)	237.5 (182)	82.5 (130)
21	1306.84 (52)	42.21 (50)	219.1 (168)	31.6 (105)
22	1310 (44)	57.68 (59)	253.2 (194)	37.4 (124)
23	1663.8 (97)	59.94 (88)	250.2 (192)	42.1 (140)
24	1328.94 (79)	52.38 (62)	196.1 (150)	21.4 (185)
25	1487.4 (50)	55.12 (65)	236 (181)	34.6 (115)
26	1493 (74)	51.95 (65)	233.2 (179)	38.6 (128)
27	1381.04 (52)	42.25 (48)	218 (167)	37.2 (124)
28	1597.84 (104)	57.04 (93)	228.1 (175)	48.7 (194)
29	1093.33 (44)	33.63 (34)	165.5 (127)	26.6 (106)
30	902.98 (59)	30.48 (60)	130.9 (100)	32.6 (130)

Table 14 Dietary recall

Above table 14 is showing nutrient intake of patients from their home diet. Three consecutive day's diet recall was noted including two working days and one holiday. Then these foods were converted into nutrients to interpret the nutrient intake of patients when they were at home. Their intake was compared to their individual requirements and percentage intake in comparison to the requirements has been mentioned in the parentheses. It is evident from above table that calorie intake of majority of subjects (56.66%) was between 40-60% of their requirements. While only 16% patients showed normal energy intake as per their requirements. It is showing that a greater number of patient had poor dietary intake. Protein intake was found in the range of 60 -80% of requirements in 40% patients, while it was between 40 -60% of the requirements in 26.66% patients. Only 26.66% patients showed normal protein intake. Carbohydrate and fat intake was seen above normal levels in nearly all patients.

6. Nutritional Diagnosis

Parameters	Total number of patients (N = 30)	Percentage (%)
At risk of malnutrition	11	36.66
Well nourished normal	14	46.66
Malnourished	5	16.66

Table 15 Nutritional Diagnosis of the cancer patients

On the basis of data collected, 46.66% patients were found in the range of well nourished or near normal nutritional state. 36% patients were found at risk of malnutrition while 16.66% patients showed status of malnourished after data analysis based on anthropometry, biochemical profile, clinical signs and symptoms and dietary recall. Majority of patients in this category were suffering from mouth cancer . Most of the patients suffered from loss of appetite, oral ulcers, weakness that led to decreased food intake.

Conclusion

It can be concluded from the present study that cancer and treatment of cancer both put patients at nutritional risk by causing increased nutritional needs and decreased food intake. It can be prevented or treated by early detection of nutritional status, so that timely decision can be taken for right nutritional intervention for them.

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