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# Nutritional Status of Selected Gastrointestinal Cancer Patients in Coimbatore, India

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**ABSTRACT**

In India, cancers account for about 3.3% of the disease burden and about 9% of all deaths. Malignant neoplasms of the stomach can lead to malnutrition as a result of excessive blood and protein loss or more commonly due to obstruction and mechanical interference with food intake. The purpose of this study was to assess the nutritional status of hospitalized gastrointestinal cancer patients using Nutrition Risk Screening tool (NRS), Subjective Global Assessment tool (SGA) and Questionnaire. Method: Gastrointestinal cancer patients were selected on the bases of the inclusion & exclusion criteria. The NRS 2002, SGA & FFQ were applied by qualified dietitians. Results: Malnutrition evolves during the course of cancer and is modulated by therapeutic interventions. Among the selected patients 23.4% each had colon & stomach cancer followed by esophageal cancer. According to the NRS scoring 43.3% had a score of four indicating malnutrition and only 6.7% were well nourished according to the SGA scoring. Duncan's Post Hoc tests indicated that as the fruit intake was increased the subjects were nourished and nutritional care plan can be initiated for them; whereas for the group whose intake was less, they were consecutively malnourished and there was a need for nutritional care plan along with care to avoid the associated risk status. Conclusion: Malnutrition in cancer patients should be considered and treated as an additional disease, as it has been shown to worsen clinical outcomes and increase morbidity, mortality, and complication rates, thus causing additional costs.

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## Introduction

Cancers refer to a group of diseases associated with uncontrolled cell growth that can affect normal body functions, often with fatal outcomes. Worldwide, cancers account for about 5.1% of the disease burden and 12.5% of all deaths. In India, cancers account for about 3.3% of the disease burden and about 9% of all deaths. These estimates will, however, change as many of the common risk factors for cancers, such as tobacco and alcohol consumption; continue to become more prevalent in India. Fairly conservative assumptions show that the number of people living with cancers will rise by nearly one-quarter from 2001 to 2016. Nearly 10 lakh new cases of cancer will be diagnosed in 2016, compared to about 800,000 in 2001. The incidence of cancers common to both men and women will also see a sharp increase during this period; nearly 670,000 people are expected to die of cancer in India in 2016[1] (NCMH, 2015).

Gastro-Intestinal (GI) cancer is a term for the group of cancers that affect the digestive system. This includes cancers of the oesophagus, gallbladder, liver, pancreas, stomach, small intestine, bowel (large intestine or colon and rectum), and anus. Malignant neoplasms of the stomach can lead to malnutrition as a result of excessive blood and protein loss or more commonly due to obstruction and mechanical interference with food intake.

As a group, gastrointestinal (GI) cancer is not only one of the most common cancers but also one of the most common causes of cancer mortality. A quick look at Globocan data 2012 showed that out of estimated 1.01 million new cases in the year 2012 in India, 227,000 were located in GI tract. Similarly, out of about 682,000 cancer-related deaths, approximately 182,000 deaths were because of GI cancers[2] (WHO, 2018). The six most common GI cancers are colorectal cancer (CRC), stomach, esophagus, liver, gallbladder, and pancreas. In this issue of the journal, authors[3] (Ghadylpatil, *et al*., 2016) have tried to summarize and compile important Indian studies involving GI cancers.

The low rates in India compared with US whites and South Asians in UK and US may be due partially to under-diagnosis but may also be due to lifestyle and environmental factors. In India there exists wide variability in dietary patterns, physical activity levels and environmental exposures[4] (Rastogi, et al., 2004). There are unique aspects of the diet[5] (Sinha, et al., 2003) ranging from high intakes of the spice turmeric, containing curcumin with anti-carcinogenic properties[6] (Weber, et al., 2005) to the common practice of vegetarianism, primarily for religious and not health reasons.

Malnutrition should be considered and treated as an additional disease, as it has been shown to worsen clinical outcomes and to increase morbidity, mortality, and complication rates, thus causing additional costs[13] (Sungurtekin, et al., 2004). However, malnutrition is preventable and mostly reversible with early adequate

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nutritional therapy. It often remains undetected due to lack of awareness, knowledge, and clinical protocols to identify and treat this problem within hospitals. The identification of malnutrition has typically been based on anthropometric, biochemical, and physical parameters, among others. However, there is currently no universally accepted gold standard (best method) for the assessment of nutritional status[14;15] (Doinin, et al., 2004; Foley, et al., 2009). .

The purpose of this study was to assess the nutritional status of hospitalized gastrointestinal cancer patients using Nutrition Risk Screening tool (NRS), Subjective Global Assessment tool (SGA) and Questionnaire. Malnutrition evolves during the course of cancer and is modulated by therapeutic interventions. It must be seen as a continuum, and be periodically reassessed[16]. (Laviano, et al., 1996). The objective was to determine the presence of malnutrition and cachexia in cancer patients undergoing oncological treatment in the hospital

Coimbatore District is a district in the Kongu Nadu region of the state of Tamil Nadu. Coimbatore is the administrative headquarters of the district. It is one of the most industrialized districts and a major textile, industrial, commercial, educational, information technology, healthcare and manufacturing hub of Tamil Nadu. As of 2011, Coimbatore district had a population of 3,458,045 with a sex-ratio of 1,000 and literacy rate of 84%

**Methods & Materials**

This study was undertaken after the approval by the Institutional Ethical Committee and obtaining consent from the study participants. The study was conducted in the Oncology wards of PSG Institute of Medical Science and Research Hospitals, Coimbatore, TN, India. It is a NABH accredited multi-specialty hospital with a NABL accredited laboratory.

- ❖ Volunteer Patients diagnosed with gastrointestinal cancer confirmed by biopsy and having initiated cancer treatment
- ❖ Gender: Male and Female
- ❖ Age: 20-80 years

**Data Collection Process**

The patients were informed regarding the study, and their consent was obtained. The data regarding Patient Characteristics Identification Form was obtained by the researcher. The time spent for each data collection tool was 20-25 min. Data collection tools used were

- Nutrition risk screening tool 2002
- Subjective global assessment tool
- Food Frequency Questionnaire

**Nutrition Risk Screening Tool**

The NRS-2002 was developed by [17]Kondrup et al., (2003), and is meant to be a generic tool in the hospital setting—that is, useful in detecting most of the patients who would benefit from nutritional therapy

The NRS-2002 is a simple and well-validated tool which incorporates pre-screening with four questions. If one of these is answered positively, a screening follows which includes surrogate measures of nutritional status, with static and dynamic parameters and data on the severity of the disease (stress metabolism). For each parameter, a score from 0 to 3 can result. Age over 70 years is considered as a risk factor, and is included in the screening tool as well, giving 1 point. A total score of $\geq$3 points means that the patient is at risk of malnutrition or already malnourished and therefore a nutritional therapy is indicated[17] (Kondrup et al., (2003[a]).

The Malnutrition Universal Screening Tool (MUST) was developed to identify malnourished individuals in all care settings (hospitals, nursing homes, home care, etc.)[18] (Weekes, 2004). It was the basis for the NRS-2002[19] (Kondrup, 2003[b]). Recent food intake is not included, and calculations of the weight loss percentage may be a barrier for the busy healthcare staff on the wards. It contains the nutritional components of MUST, and in addition, a grading of severity of disease as a reflection of increased nutritional requirements. It includes four questions as a pre-screening for departments with few at risk patients. With the prototypes for severity of disease given, it is meant to cover all possible patient categories in a hospital. A patient with a particular diagnosis does not always belong to the same category. Admitted to intensive care because of a severe infection, should be given a score of 3, rather than 1. The NRS-2002 has been assessed and validated in hundreds of studies, including randomized controlled trials, and has been shown to be very reliable if administered by trained staff[20] (Charney, 2008).

**Subjective Global Assessment Score**

There are a limited number of tools used for the assessment of nutritional status. The most-used tool is the Subjective Global Assessment (SGA), which includes information on a medical history (weight loss; dietary intake change; gastrointestinal and functional impairment) and physical examination(loss of subcutaneous fat; muscle wasting; ankle edema, sacral edema, and ascites). A limitation of using SGA is that it only classifies subjects into three general groups, and it does not reflect subtle changes in nutritional status. Furthermore, it is subjective, does not account for biochemical values (e.g., visceral protein levels), and its sensitivity, precision, and reproducibility over time have not been extensively studied in some patient populations[21;22] (Koom, et al., 2012; NKF, 2000).

The SGA scores were assessed by a dietitian and included 2 other major components: 1) a history of weight loss, changes in dietary intake, GI symptoms, functional capacity, and metabolic demand associated with the underlying disease and 2) a physical examination focusing on the detection of muscle wasting, a loss of subcutaneous fat and the presence of edema. The nutritional status of a patient was classified as (A) well-nourished, (B) mildly / moderately (or suspected of being) malnourished, and (C) severely malnourished[23;24] (Guigoz , et al., 1994; Detsky, et al., 2008)

**Results & Discussion**

[25]Isenring, et al., (2006), determined the relative validity of the Malnutrition Screening Tool (MST) compared with a full nutrition assessment by the scored Patient Generated-Subjective Global Assessment (PG-SGA) and assessed MST inter-rater reliability in patients receiving chemotherapy. It was an observational, cross-sectional study conducted at an Australian public hospital in 50 oncology outpatients receiving chemotherapy. Inter-rater reliability was assessed in a subsample of 20 patients. They report the main results that according to PG-SGA global rating, the prevalence of malnutrition was 26%. The MST was a strong predictor of nutritional risk relative to the PG-SGA (100% sensitivity, 92% specificity, 0.8 positive predictive values, 1.0 negative predictive value). MST inter-rater reliability was acceptable with agreement by administration staff/nursing staff/patient and the dietitian in 18/20 cases (kappa=0.83; p0.001). They conclude that the MST had acceptable relative validity, inter-rater reliability, sensitivity, and specificity to identify

chemotherapy outpatients at risk of malnutrition and, hence, are an acceptable nutrition screening tool in this patient population.

A prospective case-control study by [26]Mathew, et al., (2000) was conducted in Trivandrum, India, to evaluate the dietary risk factors for stomach cancer. The multivariate analysis showed a high consumption of rice, high consumption of chilli and consumption of high-temperature food to be independent risk factors.

**Table 1 . Types of Cancer among the Selected Subjects.**

| Diagnosis | Frequency | Percent |
|---|---|---|
| Colon Cancer | 7 | 23.4 |
| Hepato cellular cancer | 1 | 3.3 |
| Stomach cancer | 7 | 23.4 |
| Anal cancer | 1 | 3.3 |
| Esophagus cancer | 5 | 16.6 |
| Head of pancreas cancer | 1 | 3.3 |
| Gall bladder cancer | 1 | 3.3 |
| Tongue cancer | 1 | 3.3 |
| Rectal cancer | 3 | 10.0 |
| Cecum cancer | 3 | 10.0. |
| Total | 30 | 100 |

In 2012, there were ∼140 000 new cases of gastric cancer diagnosed across all European countries, making it the sixth commonest cancer diagnosis. Perhaps more importantly, it remains the fourth commonest cause of cancer-related death, being responsible for ∼107 000 deaths annually. Despite a gradual decline in the worldwide incidence of gastric cancer, there has been a relative increase in the incidence of tumours of the Oesophago-Gastric Junction (OGJ) and gastric cardia. The peak incidence is in the seventh decade, and the disease is approximately twice as common in men as in women[32] (Waddell et al., 2013).

In a study conducted by [33]do-Prado & Campos, (2015) on malnutrition in patients with gastrointestinal cancer, the effectiveness of different diagnostic methods for identifying the risk and/or presence of malnutrition in individuals with gastrointestinal neoplasia was investigated. Of the 143 patients, 74.1% presented an advanced stage of the disease, and 83.2% were undergoing chemotherapy treatment. All the methods of nutritional assessment showed adequate discriminatory capacity for detecting the risk of malnutrition and presence of malnutrition. The BMI was significantly better for detecting malnutrition than for the risk of malnutrition.

**Table 2 . NRS & SGA Score.**

| NRS Score | Frequency | Percent | SGA Score | Frequency | Percent |
|---|---|---|---|---|---|
| 1 | 3 | 10.0 | A | 2 | 6.7 |
| 2 | 4 | 13.3 | B | 17 | 56.6 |
| 3 | 10 | 33.4 | C | 11 | 36.7 |
| 4 | 13 | 43.3 | | | |
| Total | 30 | 100 | Total | 30 | 100 |

The above table gives the score based on the nutrition screening tool 2002. Accordingly majority of the patients (43.3%) were under the category of score 4, and the lowest number of patients get the least risk (Score 1 ) of 10%, comparatively 33.4% of the patients recorded the score 3.

On assessing the patients using the SGA tool, it was evident that the majority of the patient i.e, 56.6% was under the category of moderately malnourished conditions; only 6.7% of the patients were well nourished, while the rest of 36.7% of the patients were severely malnourished.

In a study by [34]Gómez, et al., (2010), 40-80% of cancer patients suffered from diverse degrees of malnutrition, depending on tumor subtype, location and staging and treatment strategy. Malnutrition was associated with increased morbidity and mortality in cancer patients. Both the high prevalence and prognostic significance of malnutrition imply the need for accurate malnutrition screening in cancer patients, which could select those patients at risk of nutritional derangements who would benefit from nutritional therapy. Patient-generated subjective global screening (VSG-GP) remains the reference malnutrition screening method, but its complexity and training requirements prevent wider applicability by oncologists. Thus, easier, more clinic-based malnutrition screening tools are required for cancer patients. They proposed a basic screening tool based on three items: weight loss, changes in physical activity and decrease in food intake. Two affirmative responses out of the three questions were considered as a positive response, and would prompt expert nutritional assessment. Their screening interview showed positive correlation with VSG-GP (ROC 0.85, $p<0.001$) and allowed for a rapid and accurate identification of patients with cancer-related malnutrition.

**Table 3. Mean Difference on Frequency of Food Intake among NRS Groups.**

| Post Hoc test on Frequency of Food Intake | | | | |
|---|---|---|---|---|
| Statistical test | NRS Score | N | Subset for alpha = 0.05 | |
| | | | 1 | 2 |
| Duncan[a] | 3 | 10 | 33.0000 | |
| | 4 | 14 | 33.0714 | |
| | 2 | 4 | | 36.2500 |
| | 1 | 3 | | 38.3333 |
| | Sig. | | .962 | .168 |
| Increased frequency indicates high mean score | | | | |

Tukey's test revealed that there was a significant difference on frequency of food of food intake of group 1 was found to be significantly differing from Group 3 and 4. However Post Hoc tests indicated that as the intake was increased the subjects were nourished and nutritional care plan can be initiated for them; whereas for the group whose intake was less, they were consecutively malnourished and there was a need for nutritional care plan along with care to avoid the associated risk status.

Insufficient intake of total fruits and vegetables is linked to an increased cancer risk. Higher intake of raisins and other dried fruits may be important in the prevention of cancers of the digestive system. It is still possible that there are benefits to be identified: there could be benefits in populations with low average intakes of fruit and vegetables, such that those eating moderate amounts have a lower cancer risk than those eating very low amounts, and there could also be effects of particular nutrients in certain fruits and vegetables, as fruit and vegetables have very varied composition. Nutritional principles indicate that healthy diets should include at least moderate amounts of fruit and vegetables, but the available data suggest that general increases in fruit and vegetable intake would not have much effect on cancer rates, at least in well-nourished populations[35] (Key, 2011).

**Table 4. Mean Difference on Frequency of Fruit Intake among NRS Groups.**

| Post Hoc test on Frequency of Fruits Intake | | | | |
|---|---|---|---|---|
| Statistical Tests | NRS Score | N | Subset for alpha = 0.05 | |
| | | | 1 | 2 |
| Tukey HSD[a] | 3 | 10 | 2.3000 | |
| | 2 | 4 | 3.0000 | 3.0000 |
| | 4 | 14 | 3.4286 | 3.4286 |
| | 1 | 3 | | 5.0000 |
| | Sig. | | .501 | .081 |
| Duncan[a] | 3 | 10 | 2.3000 | |
| | 2 | 4 | 3.0000 | |
| | 4 | 14 | 3.4286 | 3.4286 |
| | 1 | 3 | | 5.0000 |
| | Sig. | | .192 | .059 |
| Increased frequency indicates high mean score | | | | |

Tukey's test revealed that there was a significant difference on fruit intake between Group 1 and 3; whereas Group 1 was found to be significantly differing from Group 2 and 3 on frequency of fruit intake as per Duncan's test. However Duncan's Post Hoc tests indicated that as the fruit intake was increased the subjects were nourished and nutritional care plan can be initiated for them; whereas for the group whose intake was less, they were consecutively malnourished and there was a need for nutritional care plan along with care to avoid the associated risk status.

Early intervention on modifiable risk factors of gastric cancer is very important. Given the tenfold variation in disease incidence between population at the highest and lowest risk[36] (Brenner, et al., 2009), dietary factors have been suggested to play a key role in the aetiology of the disease. The identification of foods and nutrients associated with gastric cancer could give an opportunity for prevention. With regard to dietary factors, dairy products are important source of several nutrients, including animal fat, lactose, vitamins, calcium, and total energy. Results of the meta-analysis support a positive association between dairy consumption and the risk of gastric cancer. However, there was substantial heterogenesity across studies of the associations of dairy consumption with gastric cancer risk. It is reported that estrogen in milk which may contribute to the etiology of prostate cancer[37] (Quin, et al., 2004), may have a protective effect on gastric cancer[38] (Wang, et al., 2017).

**Table 5. Mean Difference on Frequency of Milk Intake among NRS Groups.**

| Post Hoc test on Frequency of Milk Intake | | | | |
|---|---|---|---|---|
| | NRSSCORE | N | Subset for alpha = 0.05 | |
| | | | 1 | 2 |
| Duncan[a] | 1 | 3 | 1.0000 | |
| | 4 | 14 | 1.5714 | 1.5714 |
| | 3 | 10 | 1.9000 | 1.9000 |
| | 2 | 4 | | 2.2500 |
| | Sig. | | .128 | .248 |
| Increased frequency indicates high mean score | | | | |

Duncan's test revealed that there was a significant difference on milk intake between Group 2 and 1. However Post Hoc tests indicated that as the intake was increased the subjects were nourished and nutritional care plan can be initiated for them; whereas for the group whose intake was less, they were consecutively malnourished and there was a need for nutritional care plan along with care to avoid the associated risk status.

Most of the study patients were 50 - 60 years old, and all of them had Squamous Cell Carcinoma. The mean ± SD of PG-SGA score was 9.88±4.41, implying that the patients required a nutrition intervention. The energy and protein intakes of most of the patients were well below the minimum recommended level. Almost all of them experienced weight loss. Both PG-SGA and SGA were strongly correlated with performance scores, but weakly correlated with the GPS. None of the indicators (KPS, ECOG, BMI, MAC, energy and protein intakes, and the weight change in the past one and six months) were correlated with the GPS. A malnutrition status with weight loss and an insufficient dietary intake were the most critical concerns in patients with stage III/IV esophageal cancer. The association between nutritional status and performance scores was strong whereas the association between nutritional status and GPS was weak. Weight change was not correlated with the GPS; nevertheless, the weight change in the past six months was weakly correlated with performance scores[39].

**Conclusion**

Malnutrition is an independent risk factor that negatively influences patients' clinical outcomes, quality of life, body function, and autonomy. Early identification of patients at risk of malnutrition or who are malnourished is crucial in order to start a timely and adequate nutritional support. Nutritional risk screening, a simple and rapid first-line tool to detect patients at risk of malnutrition, should be performed systematically in patients at hospital admission. Patients with nutritional risk should subsequently undergo a more detailed nutritional assessment to identify and quantify specific nutritional problems. Such an assessment includes subjective and objective parameters such as medical history, current and past dietary intake (including energy and protein balance), physical examination and anthropometric measurements, functional and mental assessment, quality of life, medications, and laboratory values. Nutritional care plans should be developed in a multidisciplinary approach, and implemented to maintain and improve patients' nutritional condition. Standardized nutritional management including systematic risk screening and assessment may also contribute to reduced healthcare costs. Adequate and timely implementation of nutritional support has been linked with favorable outcomes such as a decrease in length of hospital stay, reduced mortality, and reductions in the rate of severe complications, as well as improvements in quality of life and functional status. The aim of this review article is to provide a comprehensive overview of nutritional screening and assessment methods that can contribute to an effective and well-structured nutritional management (process cascade) of hospitalized patients[40] (Reber, et al., 2019).

**References**

1. NCMH, (2015), Background Papers—Burden of Disease in India, Disease burden in India Estimations and causal analysis*, An overview based on a paper entitled 'Choosing Investments in Health' prepared by Dr Ajay Mahal, Assistant Professor, Harvard School of Public Health, USA, for the National Commission on Macroeconomics and Health (NCMH). P 4.

2. WHO, (2018), International Agency for Research on Cancer, [Last accessed on 2019 Oct. 12] . Available from: http://www.globocan.iarc.fr/Pages/summary_table_pop_sel.aspx.

3. Ghadyalpatil NS, Chopra S, Patil P, et al. (2016), Gastrointestinal Cancers in India: Treatment perspective. South Asian J Cancer. 2016; 5:126–36. [PMCID: PMC4991133] [PubMed: 27606298].
4. Rastogi T, Hildesheim A, Sinha R., (2004), Opportunities for cancer epidemiology in developing countries. Nat RevCancer2004; 4:909–17.
5. Sinha R, Anderson DE, McDonald SS, Greenwald P., (2003), Cancer risk and diet in India, J Post grad Med 2003;49:222–28.29.
6. Weber WM, Hunsaker LA, Abcouwer SF, Deck LM,Vander Jagt DL., (2005), Anti-oxidant activities of curcumin and related enones.Bioorg Med Chem 2005;13:3811–12.
7. Kamineni A, Williams MA, Schwartz SM, Cook LS,Weiss NS., (1999), The incidence of gastric carcinoma in Asian migrants to the United States and their descendants, Cancer Causes Control1999;10:77–83.
8. Kolonel LN, Nomura AM, Hirohata T, Hankin, JH,Hinds MW., (1981), Association of diet and place of birth with stomach cancer incidence in Hawaii Japanese and Caucasians.Am J Clin Nutr1981;34:2478–85.
9. Tsugane S, Sasazuki S, Kobayashi M, Sasaki S., (2004), Salt and salted food intake and subsequent risk of gastric cancer among middle-aged Japanese men and women.Br JCancer2004;90:128–34.
10. Lee JK, Park BJ, Yoo KY, Ahn YO., (1995), Dietary factors and stomach cancer: a case-control study in Korea., Int JEpidemiol1995;24:33–41.46
11. Ji BT, Chow WH, Yang G et al., (1998), Dietary habits and stomach cancer in Shanghai, China.Int J Cancer1998;76:659–64.
12. Rastogi T., Devesa S., Mangtani P., Mathew A., Cooper N., Kao R. & Sinha R., (2008), Ethnicity and Health - Cancer incidence rates among South Asiansin four geographic regions: India, Singapore, UK and US, International Journal of Epidemiology2008;37:147–160.
13. Sungurtekin, H.; Sungurtekin, U.; Balci, C.; Zencir, M.; Erdem, E., (2004), The influence of nutritional status on complications after major intraabdominal surgery.J. Am. Coll. Nutr.2004, 23, 227–232. [CrossRef
14. Donini, L.M.; Savina, C.; Rosano, A.; Cannella, C., (2007), Systematic review of nutritional status evaluation and screening tools in the elderly. J. Nutr. Health. Aging2007, 11, 421–432.
15. Foley, N.C.; Salter, K.L.; Robertson, J.; Teasell, R.W.; Woodbury, M.G., (2009), Which reported estimate of the prevalence of malnutrition after stroke is valid? Stroke2009, 40, E66–E74.
16. Laviano A, Meguid MM., (1996), Nutritional issues in cancer management. Nutrition 1996; 12(5):358-71.Nair MK., et.al, (2015), Cancer: current scenario, intervention strategies and projections for 2015, NCMH Background Papers· Burden of Disease in India, Pp. 219-225.
17. Kondrup, J.; Allison, S.P.; Elia, M.; Vellas, B.; Plauth, M., (2003[a]), ESPEN guidelines for nutrition screening 2002.Clin.Nutr.2003, 22, 415–421.
18. Weekes, C.E.; Elia, M.; Emery, P.W., (2004), The development, validation and reliability of a nutrition screening tool based on the recommendations of the British, Association for Parenteral and Enteral Nutrition (BAPEN).Clin. Nutr.2004, 23, 1104–1112.
19. Kondrup, J.; Rasmussen, H.H.; Hamberg, O.; Stanga, Z., (2003[b]), Nutritional risk screening (NRS 2002): A new method based on an analysis of controlled clinical trials.Clin. Nutr.2003, 22, 321–336.
20. Charney, P., (2008), Nutrition screening vs. nutrition assessment: How do they differ? Nutr. Clin. Pract.2008, 23,366–372.
21. Koom, W.S.; Ahn, S.D.; Song, S.Y.; Lee, C.G.; Moon, S.H.; Chie, E.K.; et al., (2012), Nutritional status of patientstreated with radiotherapy as determined by subjective global assessment.Radiat. Oncol. J.2012, 30, 132–139.[CrossRef]
22. NKF (National Kidney Foundation), (2000), KDOQI Clinical Practice Guidelines for Nutrition in Chronic Renal Failure 2000. Available online: https://kidneyfoundation.cachefly.net/professionals/KDOQI/guidelines_nutrition/nut_a09.html (accessed on 24 June 2019).
23. Guigoz Y, Vellas B, Garry PJ., (1994), Mini nutritional assessment: a practical assessment tool for grading the nutritional state of elderly patients. In: Vellas B, editor. The mini nutritional Assessmet (MNA), Suppl 2: 15–59. Paris: Serdi Publisher; 1994.
24. Detsky, A.S.; McLaughlin, J.R.; Baker, J.P.; Johnston, N.; Whittaker, S.; Mendelson, R.A.; Jeejeebhoy, K.N., (2008), What is subjective global assessment of nutritional status? 1987, Classical article. Nutr. Hosp.2008, 23,400–407.
25. Isenring, E., Cross, G., Daniels, L. et al., (2006), Validity of the malnutrition screening tool as an effective predictor of nutritional risk in oncology outpatients receiving chemotherapy. Support Care Cancer 14, 1152–1156.
26. Mathew A, Gangadharan P, Verghese C, Nair MK., (2000), Diet and stomach cancer: a case-control study in south India. Eur J Cancer Prev 2000; 9: 89– 97.
27. Rao DN., Ganesh B., Dinshaw KA., Mohandas KM., (2002), A case-control study of stomach cancer in Mumbai, India, Int J Cancer, . 2002 Jun 10; 99(5):727-31.
28. Gajalakshmi CK, Shanta V., (1996), Life style and risk of stomach cancer: a hospital based case-control study. Int J Epidemiol 1996; 25: 1146– 53.
29. Khuroo MS, Zargar SA, Mahajan R, Banday MA., (1992), High incidence of oesophageal and gastric cancer in Kashmir in a population with special personal and dietary habits. Gut 1992; 33: 11– 5.
30. Chow WH, Swanson CA, Lissowska J, Groves FD, Sobin LH, Nasierowska-Guttmejer A, Radziszewski J, Regula J, Hsing AW, Jagannatha S, Zatonski W, Blot WJ., (1999), Risk of stomach cancer in relation to consumption of cigarettes, alcohol, tea and coffee in Warsaw, Poland. Int J Cancer 1999; 81: 871– 6.
31. Inoue M, Tajima K, Yamasura Y, Hamajima N, Hirose K, Nakamura S, Kodera Y, Kito T, Tominaga S., (1999), Influence of habitual smoking on gastric cancer by histologic type. Int J Cancer 1999; 81: 39– 43.
32. Waddell T., Verheij M., Allum W., Cunningham D. Cervantes A. & Arnold D., (2013), Gastric cancer† : ESMO–ESSO–ESTRO Clinical Practice Guidelines for diagnosis, treatment and follow-up, Annals of Oncology 24 (Supplement 6): vi57–vi63
33. Do Prado CD. & Campos ADB., (2015), Malnutrition in patients with gastrointestinal cancer: effectiveness of different diagnostic methods, Nutr Hosp. 2015;32(1):275-282.
34. Gómez Candela C, Olivar Roldán J, García M, Marín M, Madero R, Pérez-Portabella C, Planás M, Mokoroa A, Pereyra F, Martín Palmero A. (2010), Utilidad de un método de cribado de malnutrición en pacientes con cáncer

[Assessment of a malnutrition screening tool in cancer patients]. Nutr Hosp. 2010 May-Jun; 25(3):400-5. Spanish. PMID: 20593122.

35. Key TJ., (2011), Fruit and vegetables and cancer risk, Br J Cancer, 2011 Jan 4; 104(1): 6–11

36. Brenner H, Rothenbacher D, Arndt V., (2009), Epidemiology of stomach cancer. Methods Mol Biol. 2009; 472:467–77.

37. Qin LQ, Wang PY, Kaneko T, Hoshi K, Sato A., (2004), Estrogen: one of the risk factors in milk for prostate cancer. Med Hypotheses. 2004; 62:133–42.

38. Wang S., Zhou M. Ji A., Zhang D. & He J., (2017), Milk/dairy products consumption and gastric cancer: an update meta-analysis of epidemiological studies, www.impactjournals.com/oncotarget 1 Oncotarget, Pp. 1-10.

39. Quyen, TC., Angkatavanich J., Van Thuan T., Van Xuan V., Tuyen L.D. Tu D.A., (2017), Nutrition assessment and its relationship with performance and Glasgow prognostic scores in Vietnamese patients with esophageal cancer, Asia Pac J Clin Nutr 2017;26(1):49-58.

40. Reber E., Gomes F., Vasiloglou MF., Schuetz P. & Stanga Z., (2019), Nutritional Risk Screening and Assessment, J Clin Med 2019 Jul; 8(7): 1065.