Original Article

DOI: 10.7860/JCDR/2021/49768.15555

# Effect of Nutritional Therapy on Body Mass Index of Cancer Patients- A Pilot Study

Nursing Section

S SHANTHI[1], SHAMBHAVI[2]



## ABSTRACT

**Introduction:** Nutritional issues are typically encountered throughout the treatment of cancer. Cancer cachexia is usually recognised as not only reduced bodily function and quality of life, but also poor positive outcome in patients. Naturally, Body Mass Index (BMI) is frequently used for determining nutritional status of a patient. Intervening nutritional problems of the patient leads to better prognosis. It is necessary to identify patients at-risk earlier and provide effective nutritional interventions.

**Aim:** To determine the level of BMI and evaluate the effect of nutritional therapy on BMI and find its association with demographic characteristics.

**Materials and Methods:** This was a quasi-experimental interventional trial conducted among 100 patients admitted in the hospital with a diagnosis of head, neck and breast cancers. Parameters assessed were baseline proforma, weight and height which were measured and BMI was calculated (BMI=kg/m$^2$ in which kg is a individuals weight in kilograms and m$^2$ is their height in meters squared) and classified as per World Health Organisation (WHO) guidelines.

**Results:** Before nutritional intervention 20% and 26% of patients were underweight in the experimental and control group respectively, whereas after 21 days 18% in experimental and 32% in control were underweight. Z score for post-test level of BMI in the experimental and control group were 2.125 and 2.34, respectively is greater than the tabulated value (Z=1.96 at p-value=0.05 level of significance), hence there was a significant difference between post-test level of BMI in the experimental and control group. High protein high caloric whole food was significant.

**Conclusion:** Investigators concluded from the present study that nutrition therapy can help to maintain or improve the nutritional status among patients on cancer treatment.

**Keywords:** Cancer treatment, Cancer weight loss, Diet for cancer

## INTRODUCTION

Weight loss is the most common and first clinical sign among patients with cancer [1]. When cancer is diagnosed majority of patients present with clinical manifestations of deficiency of nutrients [2]. Nutritional level declines in patient due to gastrointestinal symptoms related to treatment. The nutritional deficits sometimes leads to cancer cachexia, featured by loss of muscle mass and decreased immune, physical, and mental function [3]. Patients with more risk for nutritional deficit may lead to lowered quality of life in pulmonary, gastrointestinal, head and neck [2,4]. Negative outcomes of malnutrition are longer days of hospital stay, higher incidence of readmission, postponed wound recuperation, weakening of one's immunity, and increased mortality [5,6].

Studies and professionals in the field recommend early nutritional screening and intervention [3,7]. Nutrition intervention involves, educating the patients about nutritious diet and supplementation [8]. It is an urgent need to detect vulnerable patients early and provide prompt intervention which inturn helps the cancer patients to improve treatment tolerance, quality of life and prognosis [8].

Studies reveal that maintaining a good nutritional status improves energy and protein intake, body weight, quality of life, treatment tolerance and reduce treatment-related side effects and readmissions [2,9]. With this regard healthcare workers need to join their hands together to identify malnutrition at the early phase to plan best intervention [10]. So, the study aimed to identify the effect of nutritional therapy on BMI among cancer patients.

## MATERIALS AND METHODS

This was the quasi-experimental interventional trial, conducted in Oncology ward of AJ Institute of Medical Sciences, Mangaluru, Karnataka. Ethical approval was obtained from the institutional Ethics Committee of AJ Institute of Medical Sciences (Ref no: AJEC/REV/209/2018). Data was collected for the period of eight months i.e., from August 2020 to March 2021.

**Inclusion criteria:** Diagnosed head, neck and breast cancer patients who were aged above 18 years admitted in oncology ward and able to tolerate food orally or through nasogastric tube were included.

**Exclusion criteria:** Cancer patients, who were critically ill and not willing to participate in the study.

Written consent was obtained from the cancer patients. Purposive sampling technique was used to select total of 100 cancer patients. It was a pilot study, so estimated sample size was 50 in each group. and randomly assigned 50 as an experimental group and 50 as a control group. Baseline proforma was administered, which included age, gender, educational status, family income, type of diet, type of cancer, stage of cancer and measured weight in kilogram and height in meter of cancer patients using with calibrated weighing scale and inch tape. Then BMI was computed and categorised [11] as below 18.5 kg/m$^2$- underweight, 18.5-24.9 kg/m$^2$- normal weight, 25-29.9 kg/m$^2$- preobesity, >30 kg/m$^2$- obesity.

In the experimental group, nutritional therapy (supplementation of regular diet with extra serving of pulses, eggs and milk) was given by the nutritionist after obtaining 24 hours recall of individual patient and in the control group routine diet was served. Postassessment was conducted after 15 days and 21 days. Patient who got discharged before the time, they were provided with handout to follow-up nutritional therapy and reminded every day with short message system. In the experimental group, one subject was expired and five subjects did not continued the nutritional therapy. The analysis was done from 15$^{th}$-25$^{th}$ March 2021. The allocation bias was minimised by randomly assigned the subjects as an experimental and control group.

## STATISTICAL ANALYSIS

The collected data was coded, organised, and analysed using Statistical Package for the Social Sciences (SPSS) version 21.0. Demographic characteristics of the sample, level of BMI of cancer

patients were analysed using frequency and percentage. Z test was used to find the significant difference in the post-tests BMI scores of experimental and control group. Chi-square test was used to determine the association of level of BMI with demographic variables.

## RESULTS

**Distribution of the sample according to their demographic characteristics:** Out of 50 subjects in the experimental group highest 24 (48%) were in the age above 50 years, highest 30 (60%) were females. Maximum 20 (40%) of them were educated upto primary school, and in control group majority 19 (38%) were in the age group between 41 to 50 years. Maximum 17 (34%) of them were educated upto secondary education. Majority 23 (46%) of them were with breast cancer [Table/Fig-1].

| Demographic characteristics | | Experimental group | | Control group | |
|---|---|---|---|---|---|
| | | n | % | n | % |
| Age (years) | 18-30 | 2 | 4 | 4 | 8 |
| | 31-40 | 11 | 22 | 10 | 20 |
| | 41-50 | 13 | 26 | 19 | 38 |
| | >50 | 24 | 48 | 17 | 34 |
| Sex | Male | 20 | 40 | 19 | 38 |
| | Female | 30 | 60 | 31 | 62 |
| Educational status | No formal education | 7 | 14 | 0 | 0 |
| | Primary | 20 | 40 | 10 | 20 |
| | Secondary | 11 | 22 | 17 | 34 |
| | Pre-University | 5 | 10 | 9 | 18 |
| | Graduate/Diploma | 3 | 6 | 12 | 24 |
| | Postgraduate | 4 | 8 | 2 | 4 |
| Family income (Rs/month) | <10,000 | 8 | 16 | 1 | 2 |
| | 10,001 to 20,000 | 16 | 32 | 10 | 20 |
| | 20,001 to 30,000 | 12 | 24 | 20 | 40 |
| | 30,001 to 40,000 | 7 | 14 | 15 | 30 |
| | ≥40,001 | 7 | 14 | 4 | 8 |
| Type of diet | Vegetarian | 9 | 18 | 6 | 12 |
| | Mixed | 41 | 82 | 44 | 88 |
| Type of cancer | Head | 18 | 36 | 18 | 36 |
| | Neck | 6 | 12 | 9 | 18 |
| | Breast | 26 | 52 | 23 | 46 |
| Stage of cancer | I | 2 | 4 | 4 | 8 |
| | II | 23 | 46 | 23 | 46 |
| | III | 18 | 36 | 18 | 36 |
| | IV | 7 | 14 | 5 | 10 |

**[Table/Fig-1]:** Distribution of sample according to their demographic characteristics.

Mean±standard deviation of BMI in experimental and in control group is shown in [Table/Fig-2]. Mean±standard deviation of weight in experimental and in control group is shown in [Table/Fig-3].

In the experimental group, before intervention 10 (20%) patients were in underweight and 35 (70%) were in normal weight, whereas after nutritional therapy 9 (18%) of cancer patients were in underweight and 36 (72%) were in normal weight [Table/Fig-4].

In the control group, before intervention 13 (26%) of patients were in underweight and 35 (70%) were in normal weight, whereas after 21 days observation noticed 16 (32%) of cancer patients were in underweight and 32 (64%) were in normal weight [Table/Fig-4].

| Group | Mean BMI | Standard deviation | Range |
|---|---|---|---|
| Experimental group | 20.9 | 3.44 | 33.1-16.1 |
| Control group | 19.6 | 2.35 | 26.7-13.2 |

**[Table/Fig-2]:** Pre test BMI scores in experimental and control groups.

| Group | Mean weight (kg) | Standard deviation | Range |
|---|---|---|---|
| Experimental group | 53.73 | 9.25 | 73.2-42 |
| Control group | 52.2 | 9.87 | 80-27 |

**[Table/Fig-3]:** Pre test weight scores in experimental and control groups.

| Categories | Experimental group (n=50) | | | | | | Control group (n=50) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pre test | | Post test 1 | | Post test 2 | | Pre test | | Post test 1 | | Post test 2 | |
| | n | % | n | % | n | % | n | % | n | % | n | % |
| <18.5 (underweight) | 10 | 20 | 9 | 18 | 9 | 18 | 13 | 26 | 14 | 28 | 16 | 32 |
| 18.5-24.9 (normal weight) | 35 | 70 | 36 | 72 | 36 | 72 | 35 | 70 | 34 | 68 | 32 | 64 |
| 25-29.9 (pre obesity) | 4 | 8 | 4 | 8 | 4 | 8 | 2 | 4 | 2 | 4 | 2 | 4 |
| >30 (obesity) | 1 | 2 | 1 | 2 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |

**[Table/Fig-4]:** Frequency and percentage distribution of cancer patients based on pre test and post test BMI scores in the experimental and control group.

### Effect of nutrition therapy on BMI:

$H_1$: There is a significant difference in post test BMI scores of cancer patients between experimental and control group.

$H_{01}$: There is no significant difference in post test BMI scores of cancer patients between experimental and control group

The data in [Table/Fig-5] depicts mean and standard deviation of BMI scores in post test-1 and 2 in the experimental and control group and also shows calculated Z score for post test-1 and 2 is 2.125 and 2.34 respectively is greater than the tabulated value (Z=1.96 at p-value = 0.05 level of significance), hence the data shows that there is a statistical significant difference in post test BMI scores of cancer patients in experimental and control group.

| Group | Post test-1 | | | Post test-2 | | |
|---|---|---|---|---|---|---|
| | Mean | SD | Z score | Mean | SD | Z score |
| Experimental group | 21.1 | 3.48 | 2.125# | 21.2 | 3.53 | 2.34# |
| Control group | 19.4 | 2.25 | | 19.3 | 2.26 | |

**[Table/Fig-5]:** Z test showing the significant difference in post test BMI in experimental and control group.
Z=1.96 at #p<0.05, SD: Standard deviation

Association of level of BMI of cancer patients with demographic variables: In an experimental group, there was a significant association of level of BMI with type of diet (p-value=0.002) [Table/Fig-6].

| Variables | Experimental group | | | Control group | | |
|---|---|---|---|---|---|---|
| | $\chi^2$ | df | p-value | $\chi^2$ | df | p-value |
| Age | 7.35 | 9 | 0.59 | 5.83 | 6 | 0.44 |
| Sex | 2.97 | 3 | 0.39 | 3.82 | 2 | 0.14 |
| Education | 7.29 | 15 | 0.94 | 4 | 8 | 0.85 |
| Family income | 8.05 | 12 | 0.78 | 6.46 | 8 | 0.59 |
| Type of diet | 14.18 | 3 | 0.002* | 0.30 | 2 | 0.85 |
| Type of cancer | 6.39 | 6 | 0.38 | 2.43 | 4 | 0.65 |
| Stage of cancer | 10.79 | 9 | 0.29 | 5.23 | 6 | 0.51 |

**[Table/Fig-6]:** Association of level of BMI with demographic variables using Chi-square test.
p<0.05 *-Significant; df: Degree of freedom

## DISCUSSION

Out of 50 subjects in an experimental group highest 24 (48%) were above 50-year-old; a similar study conducted by Lin T et al., consisted of 51.8% males and 48.2% females with a mean (SD) age of 60.2±9.8years [12]. In present study, majority of them 30 (60%) were females. A study by Edgren G et al., documented the universal nature of the sex disparity in cancer [13]. In contrast the

study conducted by Akst J highlighted that males are more affected with cancer than females and also adds that prognosis is better in females while comparing to males [14]. In present study, maximum 27 (54%) of them were belonged to no formal education/ primary school education. These findings are supported by the study which was conducted by Mathew A et al., in which the result revealed that 27% of the sample was with illiterate/primary education [15]. In present study, majority 26 (52%) were with breast cancer which is similar to article published in Times of India stated that in India one woman gets diagnosed every 4 minutes and one dies with breast cancer in every 13 minutes, making it the main malignancy cancer in women [16].

The European Society for Clinical Nutrition and Metabolism (ESPEN) guideline mentions that one should undergo regular evaluation of nutritional status, at the initial phase and is repeated based on the situation [17]. Present study result revealed that in the experimental group before intervention 10 (20%) of were underweight and 35 (70%) were of normal weight.

A similar was study carried out at Department of Oncology at Landspitali-University Hospital with breast, colon or lung cancer, nutritional screening of all cancer patients (n=93) with the SSM (simple screening tool for malnutrition) indicated that 41% of the patients were malnourished [18]. Another study conducted by Gioulbasanis et al., revealed more than 60% were with either overweight or obese, (49.5%) were at risk and (12.8%) were malnourished [19].

Noteworthy in present study postnutritional therapy 9 (18%) of cancer patients were underweight and 36 (72%) were normal weight. In the control group before intervention 13 (26%) were underweight and 35 (70%) had normal weight, whereas post-test in control group shown 16 (32%) of were underweight and 32 (64%) had normal weight. A finding of the study supported by study conducted Ravasco P et al., showed that nutritional intervention is effective on clinical outcomes in certain cancer types or treatments [20,21].

In present study, mean±standard deviation of weight (in Kg) of cancer patients in the experimental group is 53.73±9, whereas in control group mean±standard deviation of weight of cancer patients is 52.2±9.87. Notably a study by Liu SA et al., indicated that weight loss envisage poor prognosis in recurrent oral cancers [22], and also a previous retrospective analysis reported that preoperative weight loss more than 5% in head and neck cancer show poor outcome [23].

Many studies report that 25-80% of cancer survivors are under dietary supplements [24-27]. In present study, Z score in post test 01 and 02 was 2.125 and 2.34, respectively, is greater than the tabulated value (Z=1.96, p-value=0.05 level of significance). A significant increase in the post-tests level of BMI in the experimental group. Commensurate study conducted by Deutz NEP et al., revealed; high protein diet group showed significant increase in muscle synthesis in intervention group [28]. Another study was conducted by Cawood AL et al., concludes that high protein supplement is associated with good clinical benefits and is economical [29]. Alike meta-analysis showed overall benefit of interventions on BW (Body Weight) during chemo (radio) therapy. A significant effect was observed in intervention group compared with isocaloric controls (+1.89 kg, 95% CI 0.51-3.27, p=0.02; Q=3.1 p=0.37) [30]. Similar study was conducted by Gonçalves Dias MC et al., among three nutritional intervention groups (oral, nasogastric and supplemental group) revealed that the protein ingestion has increased significantly in all three nutritional intervention groups [31]. In contrast, study was conducted by Bossola M revealed that prophylactic feeding does not offer significant benefit compared to reactive feeding [32]. However, considering the limited number of prospective, randomised studies, definitive conclusions cannot be drawn and it is desirable that further investigations will be conducted on this issue in the next future.

In this study, there was a significant association of level of BMI with type of diet at p<0.05 level of significance. Study supported by Zang J et al., revealed that high and moderate dairy intake (>600 and 400–600 g/day, respectively) significantly reduced the risk of breast cancer compared with low dairy intake {<400 g/day; Risk Ratio (RR), 0.90, 95% Confidence Interval (CI), 0.83-0.98, and RR, 0.94, 95% CI, 0.91-0.98, respectively} [33]. Another study supports that risk of premenstrual breast cancer reduces by consuming more of soy foods during adolescence [34]. Alike observational studies show reduction in risk of cancer incidence in people with higher consumption of vegetables [35,36].

Majority of the study participants had readily accepted the diet which was provided as a intervention and followed the same regime as it was easily accessible and tolerable to them. Further studies can be conducted with larger sample and long term follow-up and study can be conducted among the specific type of cancer patient.

### Limitation(s)

Small sample size and no long term follow-up were the limitations of the study. Further studies can be conducted with larger sample and long term follow-up.

## CONCLUSION(S)

Majority of the cancer patients have malnutrition during the process of disease and its treatment. These patients need nutritional supplement to combat with malnutrition. Usually synthetic protein powders are prescribed for cancer patients to manage malnutrition. This study revealed that diet with supplemented protein via locally available whole foods such as egg, milk, sprouted grams, legumes, lean meat, yogurt, nuts (with or without turning into powder form) is also effective in improving nutritional status. Locally available whole foods are with fewer side effects, economical and easily available to cancer patients. Hence, the compliance to the diet is better comparing to the synthetic protein powders. So, the investigators conclude that cancer patient may also be prescribed with locally available whole foods to which patients have better compliance even after discharge from the hospital to improve the nutritional status.

## REFERENCES


[1] Cancer.Net Editorial Board. Weight Loss. https://www.cancer.net/coping-with-cancer/physical-emotional-and-social-effects-cancer/managing-physical-side-effects/weight-loss (accessed 18.05.2021).

[2] Halpern-Silveira D, Susin LR, Borges LR, Paiva SI, Assunção MC, Gonzalez MC. Body weight and fat-free mass changes in a cohort of patients receiving chemotherapy. Support Care Cancer. 2010;18:617-25.

[3] Fearon K, Strasser F, Anker SD, Bosaeus I, Bruera E, Fainsinger RL, et al. Definition and classification of cancer cachexia: An international consensus. Lancet Oncol. 2011;12:489-95.

[4] Li ZQ, Zou L, Liu TR, Yang AK. Prognostic value of body mass index before treatment for laryngeal squamous cell carcinom. Cancer Biology and Medicine. 2015;12(4):394-400.

[5] Pressoir M, Desné S, Berchery D, Rossignol G, Poirée B, Meslier M, et al. Prevalence, risk factors and clinical implications of malnutrition in French Comprehensive Cancer Centres. Br J Cancer. 2010;102:966-71.

[6] Virizuela JA, Camblor-Álvarez M, Luengo-Pérez LM, Grande E, Álvarez-Hernández J, Sendrós-Madroño MJ, et al. Nutritional support and parenteral nutrition in cancer patients: An expert consensus report. Clin Transl Oncol. 2018;20:619629.

[7] August DA, Huhmann MB. American Society for Parenteral and Enteral Nutrition (ASPEN) Board of Directors, ASPEN clinical guidelines: Nutrition support therapy during adult anticancer treatment and in hematopoeitic cell transplantation. JPEN J Parenter Enteral Nutr. 2009;33:472-500.

[8] Bozzetti F. Nutritional support of the oncology patient. Crit Rev Oncol Hematol. 2013;87:172-200.

[9] Baldwin C, Spiro A, Ahern R, Emery PW. Oral nutritional interventions in malnourished patients with cancer: A systematic review and meta-analysis. J Natl Cancer Inst. 2012;104:371-85.

[10] Santarpia L, Contaldo F, Pasanisi F. Nutritional screening and early treatment of malnutrition in cancer patients. J Cachexia Sarcopenia Muscle. 2011;2:27-35.

[11] Body Mass Index–BMI. World Health Organization. Available at: https://www.euro.who.int/en/health-topics/disease-prevention/nutrition/a-healthy-lifestyle/body-mass-index-bmi( Accessed on 15.05.2021).

[12] Lin T, Yang J, Hong X, Yang ZY, Ge T, Wang M. Nutritional status in patients with advanced lung cancer undergoing chemotherapy: A prospective observational study. Nutrition and cancer Journal. 2020;72(7):1225-30. Available at: https://doi.org/10.1080/01635581.2019.1675720.

[13] Edgren G, Liang L, Adami HO, Chang ET. Enigmatic sex disparities in cancer incidence. Eur J Epidemiol. 2012;27:187-96. [Online]. Available at: https://link.springer.com/article/10.1007%2Fs10654-011-9647-5.

[14] Akst J. Why is cancer more common in men than in women? 2019. Available at: https://www.the-scientist.com/notebook/why-is-cancer-more-common-in-men-than-in-women--65640 (Accessed: 13 May 2021).
[15] Mathew A, George PS, Kunnambath R, Mathew BS, Kumar A, Syampramod R, et al. Educational status, cancer stage, and survival in South India: A population-based study. JCO Global Oncology. 2020;6:1704-11.
[16] Sofi J. 'Breast Cancer in India'. Times of India. 2020; 30th June, Pp. Ist.
[17] Arends J, Bachmann P, Baracos V, Barthelemy N, Bertz H, Bozzetti F, et al. ESPEN guidelines on nutrition in cancer patients. Clinical Nutrition. 2017;36(1):11-48.
[18] Geirdottir O G, Thorsdottir I. Nutritional status of cancer patients in chemotherapy; dietary intake, nitrogen balance and screening. Food Nutr Res. 2008; 52. Doi: 10.3402/fnr.v52i0.1856.
[19] Gioulbasanis, Martin L, Baracos EV, Thézénas S, Koinis F, Senesse P. Nutritional assessment in overweight and obese patients with metastatic cancer: Does it make sense? Annals of Oncology. 2015;26: https://reader.elsevier.com/reader/sd/pii/S0923753419313419?token=F1AB56F865C1EE4814AB85DE29CFBF5EE616F24427C3301EE8C46AA2390C1F6EF0AC6FAB106E3C7D60C97B239372 (accessed 17 May 2021). Doi: 10.1093/annonc/mdu501.
[20] Ravasco P, Monteiro-Grillo I, Vidal PM, Camilo ME. Dietary counseling improves patient outcomes: A prospective, randomised, controlled trial in colorectal cancer patients undergoing radiotherapy. J Clin Oncol. 2005;23:1431e8.
[21] Ravasco P, Monteiro-Grillo I, Marques Vidal P, Camilo ME. Impact of nutrition on outcome: A prospective randomised controlled trial in patients with head and neck cancer undergoing radiotherapy. Head Neck. 2005;27:659-e68.
[22] Liu SA, Tsai WC, Wong YK, Lin JC, Poon CK, Chao SY, et al. Nutritional factors and survival of patients with oral cancer. Head Neck. 2006;28:998-1007.
[23] van Bokhorst-de van der Schuer, van Leeuwen PA, Kuik DJ, Klop WM, Sauerwein HP, Snow GB, et al. The impact of nutritional status on the prognoses of patients with advanced head and neck cancer. Cancer. 1999;86:519-27.
[24] Eisenberg DM, Davis RB, Ettner SL, Appel S, Wilkey S, Van Rompay M, et al. Trends in alternative medicine use in the United States, 1990-1997: Results of a follow-up national survey. JAMA. 1998;280:1569-75.
[25] Newman V, Rock CL, Faerber S, Flatt SW, Wright FA, Pierce JP. Dietary supplement use by women at risk for breast cancer recurrence. The Women's Healthy Eating and Living Study Group. J Am Diet Assoc. 1998;98:285-92.
[26] McDavid K, Breslow RA, Radimer K. Vitamin/mineral supplementation among cancer survivors: 1987 and 1992 National Health Interview Surveys. Nutr Cancer. 2001;41:29-32.
[27] Rock CL, Newman VA, Neuhouser ML, Major J, Barnett MJ. Antioxidant supplement use in cancer survivors and the general population. J Nutr. 2004;134:3194S-95.
[28] Deutz NEP, Safar A, Schutzler S, Memelink R, Ferrando A, Spencer H, et al. Muscle protein synthesis in cancer patients can be stimulated with a specially formulated medical food. Clinical Nutrition. 2011;30(6):759-68. Doi: 10.1016/j.clnu.2011.05.008.
[29] Cawood AL, Elia M, Stratton R. Systematic review and meta-analysis of the effects of high protein oral nutritional supplements. Ageing research review. 2012;11(2):278-96. Doi: 10.1016/j.arr.2011.12.008.
[30] De van der Schueren MAE, Laviano A, Blanchard H, Jourdan M, Arends J, Baracos VE. Systematic review and meta-analysis of the evidence for oral nutritional intervention on nutritional and clinical outcomes during chemo (radio) therapy: Current evidence and guidance for design of future trials. Ann Oncol. 2018;29(5):1141-53.
[31] Gonçalves Dias MC, de FátimaNunesMarucci M, Nadalin W, Waitzberg DL. Nutritional intervention improves the caloric and protein ingestion of head and neck cancer patients under radiotherapy. Nutr Hosp. 2005;20(5):320-25.
[32] Bossola M. Nutritional interventions in head and neck cancer patients undergoing chemoradiotherapy: A narrative review. Nutrients. 2015;7(1):265-76.
[33] Zang J, Shen M, Du S, Chen T, Zou S. The association between dairy intake and breast cancer in western and asian populations: A systematic review and meta-analysis. Journal of Breast Cancer. 2015;18(4):313-22.
[34] Lee SA, Shu XO, Li H, Yang G, Cai H, Wen W, et al. Adolescent and adult soy food intake and breast cancer risk: Results from the Shanghai Women's Health Study. The American Journal of Clinical Nutrition. 2009;89(6):1920-26.
[35] Vieira AR, Abar L, Vingeliene S, Chan DS, Aune D, Navarro-Rosenblatt D, et al. Fruits, vegetables and lung cancer risk: A systematic review and meta-analysis. Ann Oncol. 2016;27(1):81-96. Doi: 10.1093/annonc/mdv381.
[36] Wiseman M. The second World Cancer Research Fund/American Institute for Cancer Research expert report. Food, nutrition, physical activity, and the prevention of cancer: A global perspective. Procnutr Soc. 2008;67(3):253.

**PARTICULARS OF CONTRIBUTORS:**
1. Associate Professor, Department of Paediatric Nursing, Laxmi Memorial College of Nursing, Mangaluru, Karnataka, India.
2. Associate Professor, Department of Medical Surgical Nursing, Laxmi Memorial College of Nursing, Mangaluru, Karnataka, India.

**NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:**
Dr. S Shanthi,
Laxmi Memorial College of Nursing, Mangaluru-575002, Karnataka, India.
E-mail: shantjoe82@gmail.com

**PLAGIARISM CHECKING METHODS:** [Jain H et al.]
- Plagiarism X-checker: Apr 09, 2021
- Manual Googling: May 26, 2021
- iThenticate Software: Jun 05, 2021 (17%)

**ETYMOLOGY:** Author Origin

**AUTHOR DECLARATION:**
- Financial or Other Competing Interests: Rajiv Gandhi University of Health Sciences, Karnataka for providing the grant for the study
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. No

Date of Submission: **Apr 07, 2021**
Date of Peer Review: **May 06, 2021**
Date of Acceptance: **May 29, 2021**
Date of Publishing: **Oct 01, 2021**