



# SPECIFIC NUTRITIONAL NEEDS OF CANCER PATIENTS UNDERGOING ADJUVANT CHEMOTHERAPY: AN EXPLORATORY SURVEY

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**Abstract – Objective:** Patients on chemotherapy (CT) experience a multitude of symptoms that affect nutritional intake. Therefore, we aimed to determine the symptoms that reduce food intake among patients and their perceptions towards needs of nutrition support (NS).

**Patients and Methods:** A convenience sample of patients on CT participated in this questionnaire-based study.

**Results:** 336 out of 445 patients on adjuvant CT participated in this survey. Among the symptoms experienced during CT, fatigue (54%) and anorexia (36%) appeared to be main contributors to decreased food intake and it was significantly more prevalent in patients with cachexia ( $p < 0.05$ ). The needs of NS were nutrition intervention and education (78%), recipes to improve food intake (85%), use of ONS (75%) and use of enteral and parenteral nutrition (25%). 82% of the patients wanted the nutritionist to be involved in planning NS and the best time to provide NS was when weight loss became evident (61%) and at the time of diagnosis (51%). 66% of the patients wanted the family to be involved in decisions related to NS and 84% wanted them in follow-up nutrition sessions.

**Conclusions:** Collaborating with patients to understanding their perceptions towards nutritional needs and addressing them can help in the better food intake and manage the nutrition status.

**KEYWORDS:** Nutrition support, Malnutrition, Perceptions, Diet.

## INTRODUCTION

Nutrition support (NS) in cancer patients aims to maintain or improve nutrient intake, mitigate metabolic derangements, maintain skeletal muscle mass and physical performance, decrease the risk of reductions or interruptions of scheduled anticancer treatments, and improve quality of life<sup>1</sup>. Therefore, the recognition of malnutrition and administration of NS are integral parts of the treatment of cancer patients, including patients on CT and in palliative care<sup>2,3</sup>. It has been

recommended that assessment of nutritional status in cancer patients should begin at diagnosis and be repeated at each visit<sup>2,4</sup>. Malnutrition is usually treated by modification of the patient's diet to meet needs of energy, protein and other nutrients. This can be achieved by the use of one or more nutrition therapies including dietary counseling, oral nutrition supplements (ONS) and, when required, enteral and parenteral nutrition therapies<sup>5</sup>.

In India, approximately 1.15 million people are diagnosed with cancer every year<sup>6</sup> and most



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patients diagnosed with cancer receive CT. The biological aggressiveness of CT harms cells in the digestive tract causing early satiety, slower gastric emptying, xerostomia<sup>7</sup>, nausea, and vomiting and taste changes<sup>8</sup>. Due to these symptoms, the individual's relationship with food may change during treatment. Increased weight loss and poorer quality of life is often seen in cancer patients with altered taste, and increased sensitivity to smells<sup>9,10</sup>. The reduced meal appreciation during CT has negative physical, emotional and social consequences<sup>11</sup>.

In this context, there is a need to understand the extent to which these disturbances play a role in dietary behavior among patients receiving CT. We aimed to estimate the patients' perception towards symptoms that reduce their food intake, appropriate time for NS, preferred types of NS, and preferred people to be involved in NS.

## PATIENTS AND METHODS

This study was conducted in a Tertiary Cancer Hospital with 250 beds from July to December 2019. The objective of this study was explained to the patients on adjuvant CT and they were invited to respond to questionnaires. The completion and return of the questionnaire was regarded as consent to participate in this study. The questionnaires were anonymized, given in English and in regional language. The Institutional Review Board approved this study.

### *Eligibility criteria*

Patients had to be age 18 or older, have a diagnosis of a solid tumor, have received at least 6 weeks of chemotherapy and/or targeted/biologic therapy and be on treatment protocol and capable of replying to a self-reported questionnaire with no serious psychological distress recognized by the primary physician. Exclusion criteria included a history of or hematologic malignancy such as leukemia, lymphoma, Hodgkin's disease, or multiple myeloma or myelodysplastic syndrome; having received a bone marrow or stem cell transplant at any time.

### *Measures*

Participants completed a 15-min self-administered questionnaire. The variables in the questionnaire included age, gender, cancer type, current body weight, body weight loss over last 6

months. Questionnaire also included questions on specific needs of NS, best person to plan NS, best time to receive NS and needs of family involvement in the decisions and sessions of NS which had to be answered as 'Yes' and 'No' to capture the perceptions of the patients. The terminologies that the patient found difficult to understand were explained by the chemotherapy nurse. Performance status of the patient was measured by Eastern Cooperative Oncology Group Performance Status (ECOG PS) and body mass index (BMI) was calculated as weight in kilograms divided by height in meter square. Nutrition status was measured by patient-generated subjective global assessment (PG-SGA) and classified as well-nourished, moderately malnourished and severely malnourished. Cachexia was defined as body weight loss rate (BWLR) in 6 months  $\geq 5\%$  or body mass index (BMI)  $< 20 \text{ kg/m}^2 + \text{BWLR in 6 months} \geq 2\%$ . Patients below or above these cutoff values were grouped as non-cachexia and cachexia.

### *Statistical Analysis*

This was an estimation study with no formal hypothesis testing planned. Proportions of patients' perceptions were estimated using descriptive statistics for prevalence of symptoms that reduced food intake and needs of NS. Comparison between groups of patients was made using the chi-square test. All results were considered to be significant if the *p*-value was less than 0.05. All analyses were performed using SPSS v. 22.0 (SPSS Inc., Armonk, NY, USA).

## RESULTS

### *Patient Baseline Characteristics*

336 of 445 (76%) eligible patients completed the survey. Of these, 143 (43%) were men, 193 (57%) were women; median (minimum, maximum) age was 54 (20-79) years; 112 (33%) patients were  $\geq 65$  years of age; mean baseline weight was 62.7 (SD 13.5) kg; and mean BMI was 24.9 (SD 5.1)  $\text{kg/m}^2$  and 113 (34%) were cachexic. The proportions of ECOG-PS 0-1, 2, and 3 were 81%, 16%, and 3%, respectively. Nutrition status as assessed by patient-generated subjective global assessment (PG-SGA) were well-nourished (42%;  $n=141$ ), moderately malnourished (47%;  $n=158$ ) and severely malnourished (11%;  $n=37$ ), respectively. Table 1 comprises of the baseline characteristics of patients.

**TABLE 1.** Baseline characteristics of patients on chemotherapy who participated in the study.

| Demographics                 | Study Participants<br>(n = 336) |
|------------------------------|---------------------------------|
| <b>Age, years</b>            |                                 |
| Median (SD)                  | 54 (13.6)                       |
| Min, Max                     | 20, 79                          |
| <b>Gender</b>                |                                 |
| Male, n (%)                  | 143 (43)                        |
| Women, n (%)                 | 193 (57)                        |
| <b>Weight, kg</b>            |                                 |
| Mean (SD)                    | 62.7 (13.5)                     |
| <b>ECOG-PS</b>               |                                 |
| 0-1, n (%)                   | 272 (81)                        |
| 2, n (%)                     | 54 (16)                         |
| 3, n (%)                     | 10 (3)                          |
| <b>Cachexia status</b>       |                                 |
| Cachexic                     | 113 (33.6)                      |
| Non cachexic                 | 223 (66.4)                      |
| <b>BMI, kg/m<sup>2</sup></b> |                                 |
| Median (SD)                  | 24.9 (5.1)                      |
| <18.5, n (%)                 | 26 (7.7)                        |
| 18.5-24.9, n (%)             | 143 (42.5)                      |
| 25-29.9, n (%)               | 111 (33)                        |
| >30, n (%)                   | 47                              |
| <b>PG-SGA, n %</b>           |                                 |
| Well nourished               | 133 (44)                        |
| Moderately malnourished      | 137 (46)                        |
| Severely malnourished        | 30 (10)                         |
| <b>Cancer Type, n (%)</b>    |                                 |
| Gastrointestinal             | 81 (24)                         |
| Breast                       | 69 (21)                         |
| Head and Neck                | 50 (15)                         |
| Lung                         | 18 (5)                          |
| Gynecological                | 52 (15)                         |
| Sarcomas                     | 27 (8)                          |
| Neurological and other       | 39 (12)                         |

n, number of participants; SD, standard deviation; Min, minimum; Max, maximum; kg, kilogram; ECOG-PS, Eastern Cooperative Oncology Group Performance Status; BMI, body mass index; kg/m<sup>2</sup>, kilogram/meter square; PG-SGA, patient generated subjective global assessment.

### Impact of Chemotherapy on Food Intake

54% (n=183) and 36% (n=120) of patients reported that fatigue and anorexia reduced their food respectively. Other contributors to reduced food intake included pain (29.7%; n=110), nausea and/or vomiting (29.7%; n=100), diarrhea (22.4%; n=82), dry mouth (7.7%; n=26) and difficulty in swallowing (14.5%; n=49). The symptoms that reduced food intake are given in Table 2. It was seen that the prevalence of fatigue and anorexia was significantly different based on cancer sites with greater prevalence among head and neck (fatigue: 65%;

anorexia: 52%;  $p<0.05$ ) and GI cancers (fatigue: 63%; anorexia: 54%;  $p<0.05$ ). Subgroup analysis also showed that patients with cachexia reported significantly more fatigue and anorexia (fatigue: 84%; anorexia: 62%;  $p<0.01$ ) compared to non-cachexic patients (Figure 1).

### Needs of Nutrition Support

The specific needs of NS that were included in the questionnaire were: 1. Nutrition intervention and education, 2. Recipes to increase food intake, 3. Use of ONS, 4. Tube feeding and IV nutrition (enteral and parenteral nutrition). 85% (n=285) wanted recipes to increase food intake, 78% (n=263) wanted nutrition intervention and education, 75% (n= 252) wanted to use ONS to complement their food intake and 25% (n=84) wanted to use enteral and parenteral nutrition (Table 3). Subgroup analysis revealed that the need for nutrition intervention and education significantly varied with the cancer site, with 95% of patients with breast cancers, 96% of patients with GI cancers and 76% of patients with head and neck cancers expressing significantly greater need for nutrition intervention than other cancers ( $p<0.05$ ); however, we did not see any significant difference in the needs of nutrition support with cachexia (cachexia: 82%; non-cachexia: 76%;  $p=0.89$ ).

### Timing and People Involved in NS

82% (n=276) of patients felt that the best person to be involved in planning NS is the nutritionist, 61% (n=206) of patients felt that the best time to provide NS is when weight loss and loss of appetite became evident and 51.5% (n=173) of the patients preferred NS to be initiated at the time of diagnosis of cancer. On the questions related

**TABLE 2.** Symptoms that reduced food intake among patients on chemotherapy.

| Symptoms that reduced food intake | Patients<br>(n=336) |
|-----------------------------------|---------------------|
| Fatigue, n (%)                    | 183 (54)            |
| Anorexia, n (%)                   | 120 (36)            |
| Pain, n (%)                       | 100 (29.7)          |
| Nausea/Vomiting, n (%)            | 100 (29.7)          |
| Diarrhea, n (%)                   | 82 (22.4)           |
| Dry Mouth, n (%)                  | 26 (7.7)            |
| Swallowing Difficulty, n (%)      | 49 (14.5)           |

n, number of participants; %, percentage.

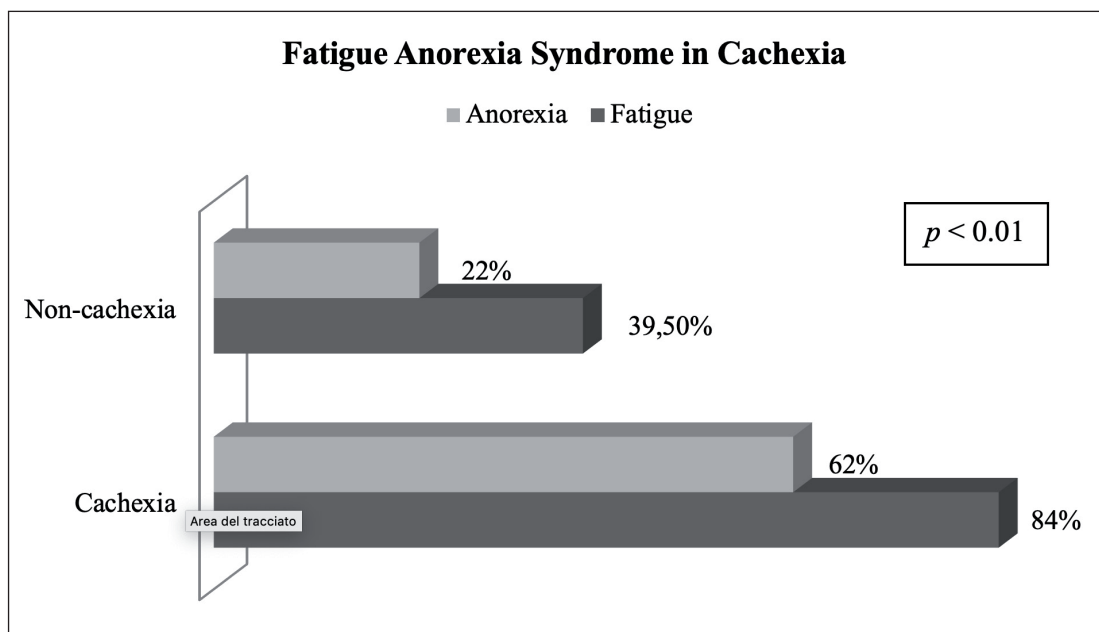


Fig. 1. Significantly High Prevalence of Fatigue and Anorexia among Cachexic Patients. ( $p$ , level of significance  $<0.05$ ).

to family involvement in NS, 66% ( $n=225$ ) of the patients wanted the family/caregiver to be involved in the decisions of NS and 84% ( $n=282$ ) of patients wanted to the family in the follow-up nutrition sessions. The perceptions related to the needs, timing and people involved in NS are given in Table 3.

## DISCUSSION

This study emphasizes the importance of collaborating with patients to understand their nutrition needs during CT and to the best of our knowledge this study is the one of the few studies done among Indian patients on nutritional needs. Chronic inflammation contributes to cancer initiation, progression, alters the cellular microenvironment and alters the glucose and lipid metabolic pathways<sup>12</sup> that may lead to malnutrition. We found that fatigue and anorexia were the most common causes for reduced food intake and patients with cachexia reported significantly more of these symptoms than non-cachexic patients. Micro-nutrient deficiencies are common in patients on adjuvant CT especially deficiency of magnesium, potassium and a few other electrolytes. These deficiencies can present as symptoms of fatigue and loss of appetite<sup>12</sup>. Studies have shown that the cycle of cachexia syndrome begins with anorexia and fatigue, leading to poor nutrition intake and decreased physical activity and ultimately results in loss of muscle mass and poor performance, which directly impacts a cancer patient's surviv-

al<sup>13,14</sup>. This warrants more efforts to educate the patients on the importance of fatigue and anorexia associated with CT that could lead to better nutrition intake.

Our study also revealed that about 80% of the patients wanted nutrition intervention and education and wanted recipes to increase food intake, which suggests an important role of a nutritionist in planning and monitoring NS. A recent study<sup>15</sup> demonstrated that metastatic colorectal patients undergoing CT receiving individualized nutritional counseling by a dietitian had improved body weight, progression free survival and overall survival compared to usual care. Studies have validated that individualized nutrition counseling and education during cancer treatment is valuable for patients<sup>16,17</sup>. A high proportion of patients (75%) preferred taking ONS to complement their food intake, though only 25% wanted to use enteral and parenteral nutrition. Several studies have found that use of ONS is associated with improved body weight, improved nutrition status, decreased fatigue symptoms and improved quality of life<sup>18-20</sup> and using ONS to complement their food intake can help in meeting their nutritional goals.

It was also seen that patients preferred to receive NS at the time of diagnosis and when weight loss and poor appetite became evident. The timing of nutrition intervention is very important in the management and prevention of malnutrition and few studies have emphasized the importance of establishing multimodal nutrition teams to effectively and timely screen and educate patients for adequate nutrition<sup>1,21</sup>.



**TABLE 3.** Perception on Specific Needs of Nutrition Support.

| Questions  | Patients (n=336) |
|--|------------------|
| <b>Needs of Nutrition Support</b>                        |                  |
| Nutritional Intervention and education, n (%)            | 263 (78)         |
| Recipes to Increase food intake, n (%)                   | 285 (85)         |
| ONS, n (%)   | 252 (75)         |
| Tube feeding and IV nutrition, n (%)                     | 84 (25)          |
| <b>Best Person to plan Nutrition Support</b>             |                  |
| Nutritionist, n (%)                                      | 247 (82)         |
| Treating doctor, n (%)                                   | 113 (38)         |
| Nurses, n (%)  | 6 (2)            |
| Other paramedical staff, n (%)                           | 4 (1)            |
| <b>Best Time to receive Nutrition Support</b>            |                  |
| When weight loss and poor appetite become evident, n (%) | 206 (61)         |
| At the time of diagnosis, n (%)                          | 173 (51.5)       |
| During hospital admissions, n (%)                        | 45 (13.4)        |
| At the time of recurrence, n (%)                         | 45 (13.4)        |
| <b>Family Involvement in Nutrition Support</b>           |                  |
| Family involvement in decision making, n (%)             | 225 (66)         |
| Family involvement in follow up nutrition session, n (%) | 282 (84)         |

n, number of participants; %, percentage; ONS, oral nutrition supplements; IV, intravenous.

Family members are important companions and an irreplaceable source of support for cancer patients<sup>22-24</sup>. Having a patient- and family-centric nutrition support can decrease distress from eating difficulties and possibly can improve nutritional clinical outcomes<sup>25,26</sup>. Our study results showed that above 65% of the patients wanted the family to be involved in decisions related to NS and to participate in the nutrition sessions.

There are several limitations in this study. One of the potential limitations of this study was the random convenient sampling and selection bias. It was not possible to enroll all consecutive patients who have received at least 6 weeks of adjuvant CT since their consent to participate in the study was vital. Since this study was a one-time questionnaire, the symptoms leading to reduced food intake might have changed over the various timelines of adjuvant CT which was not captured. Errors could have occurred from the questions being misunderstood and being answered differently which could result in information bias. However, to prevent recall bias, the questionnaires were administered to the patients who were on treatment protocol.

### **Implications for Nutrition Practice during Chemotherapy**

In this study, we have identified some practical advice for nutritionists and healthcare profession-

als in order to improve food intake and to prevent significant weight loss during CT:

- Food intake is reduced in most patients during adjuvant CT. Therefore, a systematic nutritional assessment and monitoring is required to prevent malnutrition.
- Nutritionists should be involved in nutrition interventions and education with focus on providing ideas to improve food intake and using ONS to complement intake.
- Best time to initiate nutrition support is at the time of diagnosis and modifying the nutrition when loss of appetite / weight loss becomes evident.
- Nutrition counseling and sessions should involve patients' caregivers and family. A family-centric nutrition therapy may help in improved food intake.

### **CONCLUSIONS**

The results of this study show that food intake is reduced in patients undergoing adjuvant CT and fatigue anorexia syndrome was associated with cachexia. These findings can help to understand the perceptions related to food intake and may serve as a basis for health professionals, presenting strategies for reducing these symptoms in order to improve the nutrition of patients and individualized nutrition support.



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## CONFLICT OF INTEREST:

The authors declare that they have no conflict of interest.

## REFERENCES

1. Ravasco P. Nutrition in Cancer Patients. *J Clin Med* 2019; 8:1211.
2. Bozzetti F. Nutritional support in oncologic patients: where we are and where we are going. *Clin Nutr* 2011; 30: 714-717.
3. Amano K, Morita T, Miyamoto J, Uno T, Katayama H, Tatara R. Perception of need for nutritional support in advanced cancer patients with cachexia: a survey in palliative care settings. *Support Care Cancer* 2018; 26: 2793-2799.
4. Arends J, Bodoky G, Bozzetti F, Fearon K, Muscaritoli M, Selga G. ESPEN guidelines on enteral nutrition: non-surgical oncology. *Clin Nutr* 2006; 25: 245-259.
5. De Las Peñas R, Majem M, Perez-Altozano J, Virizuela JA, Cancer E, Diz P, Donnay O, Hurtado A, Jimenez-Fonseca P, Ocon MJ. SEOM clinical guidelines on nutrition in cancer patients. *Clin Transl Oncol* 2019; 21: 87-93.
6. Smith RD, Mallath MK. History of the growing burden of cancer in india: from antiquity to the 21st century. *J Glob Oncol* 2019; 5: 1-15.
7. Calixto-Lima L, Martins de Andrade E, Gomes AP, Geller M, Siqueira-Batista R. Dietetic management in gastrointestinal complications from antineoplastic chemotherapy. *Nutr Hosp* 2012; 27: 65-75.
8. Beaver K, Williamson S, Briggs J. Exploring patient experiences of neo-adjuvant chemotherapy for breast cancer. *Eur J Oncol Nurs* 2015; 20: 77-86.
9. Hutton JL, Baracos VE, and Wismer WV. Chemosensory dysfunction is a primary factor in the evolution of declining nutritional status and quality of life in patients with advanced cancer. *J Pain Sympt Manag* 2007; 33: 156.
10. Zabernigg A, Gamper EM, Giesinger JM, Rumpold G, Kemmler G, Gatteringer K, Sperner-Unterwieser B, Holzner B. Taste alterations in cancer patients receiving chemotherapy: a neglected side effect? *Oncol* 2010; 15: 913-920.
11. Boltong A, Keast R, Aranda S. Experiences and consequences of altered taste, flavour and food hedonics during chemotherapy treatment. *Support Care Cancer* 2012; 20: 2765-2774.
12. Quagliarillo V, Rossetti S, Cavaliere C, Palo RDi, Lantania E, Castaldo L, Nocerino F, Ametrano G, Cappuccio F, Malzone G, Montanari M, Vanacore D, Romano FJ, Piscitelli R, Iovane G, Pepe MF, Berretta M, D'Aniello C, Perdonà S, Muto P, Botti G, Ciliberto G, Veneziani BM, De Falco F, Maiolino P, Caraglia M, Montella M, Iaffaioli RV, Facchini G. Metabolic syndrome, endocrine disruptors and prostate cancer associations: biochemical and pathophysiological evidences. *Oncotarget* 2017; 2: 30606-30616.
13. Guerdoux-Ninot E, Kilgour RD, Janiszewski C, Jarlier M, Meuric J, Poirée B, Buzzo S, Ninot G, Courraud J, Wismer W, Thezenas S, Senesse P. Nutritional interventions for cancer-induced cachexia. *Curr Probl Cancer* 2011; 35: 58.
14. Ezeoke CC, Morley JE. Pathophysiology of anorexia in the cancer cachexia syndrome. *J Cachexia Sarcopenia Muscle* 2015; 6: 287-302.
15. van der Werf A, Langius JAE, Beeker A, Ten Tije AJ, Vulink AJ, Haringhuizen A, Berkhof J, van der Vliet HJ, Verheul HMW, de van der Schueren MAE. The effect of individualized nutritional counseling on muscle mass and treatment outcome in patients with metastatic colorectal cancer undergoing chemotherapy: a randomized controlled trial protocol. *BMC Cancer* 2015; 15: 98.
16. Ravasco P, Monteiro-Grillo I, Camilo M. Individualized nutrition intervention is of major benefit to colorectal cancer patients: long-term follow-up of a randomized controlled trial of nutritional therapy. *Am J Clin Nutr* 2012; 96: 1346-1353.
17. Cereda E, Cappello S, Colombo S, Klersy C, Imarisio I, Turri A, Caraccia M, Borioli V, Monaco T, Benazzo M, Pedrazzoli P, Corbella F, Caccialanza R. Nutritional counseling with or without systematic use of oral nutritional supplements in head and neck cancer patients undergoing radiotherapy. *Radiother Oncol* 2018; 126: 81-88.
18. Cotogni P, Pedrazzoli P, De Waele E, Aprile G, Farina G, Stragliotto S, De Lorenzo F, Caccialanza R. Nutritional Therapy in Cancer Patients Receiving Chemoradiotherapy: Should We Need Stronger Recommendations to Act for Improving Outcomes? *J Cancer* 2019; 10: 4318-4325.
19. Kim SH, Lee SM, Jeung HC, Lee JJ, Park JS, Song M, Lee DK, Lee SM. The effect of nutrition intervention with oral nutritional supplements on pancreatic and bile duct cancer patients undergoing chemotherapy. *Nutrients* 2019; 11: 1145.
20. Parsons EL, Stratton RJ. Oral nutritional supplements in a randomized trial are more effective than dietary advice at improving quality of life in malnourished care home residents. *Clin Nutr* 2017; 36: 134-142.
21. Kim JM, Sung MK. The efficacy of oral nutritional intervention in malnourished cancer patients: a systemic review. *Clin Nutr* 2016; 5: 219-236.
22. Orell H, Schwab U, Saarihahti K, Österlund P, Ravasco P, Mäkitie A. Nutritional counseling for head and neck cancer patients undergoing (Chemo) radiotherapy: a prospective randomized trial. *Front Nutr* 2019; 18: 6-22.
23. Hauke D, Reiter-Theil S, Hoster E, Hiddemann W, Winkler EC. The role of relatives in decisions concerning life-prolonging treatment in patients with end-stage malignant disorders: informants, advocates or surrogate decision-makers? *Ann Oncol* 2011; 22: 2667-2674.
24. Kirk PK, Kirk I, Kristjanson LJ. What do patients receiving palliative care for cancer and their families want to be told? A Canadian and Australian qualitative study. *BMJ* 2004; 328: 1343-1350.
25. Pardon K, Deschepper R, Stichele RV, Bernheim JL, Mortier F, Bossuyt N, Schallier D, Germonpré P, Galdermans D, Van Kerckhoven W, Deliens L. Preferences of patients with advanced lung cancer regarding the involvement of family and others in medical decision-making. *J Palliat Med* 2010; 13: 1199-1203.
26. Molassiotis A, Roberts S, Cheng HL, To HKF, Ko PS, Lam W, Lam YF, Abbott J, Kiefer D, Sanmugarajah J, Marshall AP. Partnering with families to promote nutrition in cancer care: feasibility and acceptability of the PlcNIC intervention. *BMC Palliat Care* 2018; 17: 50.