ANXIETY, DEPRESSION, MACRONUTRIENT INTAKE AND NUTRITIONAL STATUS OF CANCER SURVIVORS LIVING IN SHELTER HOUSES AFTER CHEMOTHERAPY: A CROSS-SECTIONAL STUDY

Nadya Ika Indryani[1], Rachma Purwanti[1], Ani Margawati[1], Choirun Nissa[1*]
[1]Departement of Nutrition Science, Faculty of Medicine, Diponegoro University, Semarang 50275, Jawa Tengah, Indonesia

ABSTRACT

Depression and anxiety are common in cancer patients due to metabolism alteration and the side effects of chemotherapy. These mental health problems could be even worse in patients with low economy status and living in shelter houses. The aim of the research was to analyze the relationship of anxiety, depression, and macronutrient intake with nutritional status in cancer survivors undergoing chemotherapy at shelter houses. A total of 42 cancer patients aged 40–60 years old at shelter houses was recruited using consecutive sampling under a cross-sectional study design. Anxiety and depression data were taken using the Hospital Anxiety and Depression Scale (HADS) questionnaire, while energy, protein, fat, and carbohydrate data intakes were using Semi-Quantitative Food Frequency Questionnaire (SQ-FFQ). The nutritional status data was examined based on Mid Upper Arm Circumference (MUAC). The data were analyzed using Pearson and Rank Spearman tests. Results of the study indicate that there were significant relationships between energy (p=0.040; r=0.318) and fat (p=0.001; r=0.490) with nutritional status. However, there was no relationship between anxiety and depression with macro-nutrient adequacy; also protein and carbohydrate intake with nutritional status. Anxiety and depression with nutritional also did not relate as evidenced by the value (p>0.05). To sum up, although there were no correlations between anxiety and depression with nutritional status, correlations occurred between energy and fat with nutritional status. Further research is suggested to analyze variables underlying anxiety and depression such as family support, stage, duration of diagnosis and frequency of chemotherapy so that these variables can be controlled.

Keywords: anxiety, chemotherapy, depression, food intake, nutritional status.

INTRODUCTION

Cancer is a condition where cells grow abnormally at uncontrollable rate and at the same time suppress the normal cells (National Cancer Institute, 2021). These abnormal cells can form lumps that can develop in any part of the body. Basic Health Research conducted in Indonesia showed an upward trend of cancer prevalence, from 1.4 in 2013 to 1.79 in 2018 out of 1000 population.

The most common cancers in Indonesia are lung cancer, followed by breast cancer, colorectal cancer, cervical cancer, liver cancer, and oral cancer. Several treatments to cure cancer are being introduced such as surgery, radiotherapy, hormone therapy, and chemotherapy. Chemotherapy is the most common procedure for cancer among all.

Chemotherapy has been a highly recommended treatment for cancer as it effectively kills cancer cells using drugs (Boucher et al., 2015). On the other hand, chemotherapy also brings some side effects such as changes in body appearance, hair loss and difficulty in performing certain activities (Bardwell and Fiorentino, 2012). During such condition, patients often feel lacking of self-confidence and start to worry about their future, which trigger stress and even depression. Anxiety and depression are commonly experienced by people who suffer from illness due to fear. A study conducted in Egypt showed that cancer survivors usually expect bad things to happen in the future (Aly, ElLatief and Mohamed, 2017).

Anxiety and depression affect patient's appetite at the beginning before declining their nutritional status. A research conducted in Amsterdam involving pancreatic cancer survivors showed that anxiety and depression were factors that reduce patient's appetite (van der Werf et al., 2018). Furthermore, a research done in California stated that low nutritional status is the main cause of death in patients with cancer (Jou et al., 2020).

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Seen from patients' backgrounds, the economic factor is a major risk factor for anxiety and depression. Coleman (2005) found 24% of cancer patients with low average incomes experienced severe depression as they had to deal with financial problems while undergoing cancer treatment. They were concerned with the huge medical costs.

Concerning this problem, non-profit movements have been established to assist cancer survivors with low economic status to complete their cancer treatments and to distribute social aid. Not only for providing the shelter houses as temporary residential while they get their treatments in the near type A hospital, but also equipping with free transportation from their home town to the shelter houses and the hospital. All expenses during their treatment are being helped by these non-profit organizations, while for the treatment itself it is covered by their National Health Insurance. After finishing the therapy session, patients left the shelter house and went back to their home.

The present research was conducted to analyze the prevalence of anxiety and depression among cancer survivors at shelter houses, and examined how anxiety and depression relate to macronutrient adequacy and nutritional status.

METHOD

Research Design and Setting

This cross-sectional research was conducted from July to October 2021. An ethical permit was issued by the Commission of Medical/Health Research Bioethics, Medical Faculty, Universitas Islam Sultan Agung Semarang, accession number 203/VII/2021/Bioethics Commission. This research was held at five shelter houses located in Semarang (Central Java), four in Special Region of Yogyakarta, and one from Malang (East Java)

Sampling

A total of forty-two cancer patients was recruited using correlation coefficient formula of 0.489 based on previous study (Alkan, Artaç and Rakıcıoğlu, 2018). Respondents were cancer survivors aged 40-60 years and were in the shelter houses when the data were collected. Several inclusion criteria were set; men or women aged 40–60 years being assisted survivors at the shelter houses, willing to become research subjects by filling out informed consent, undergoing a series of chemotherapy, able to communicate well, and having been diagnosed with cancer. During the study, no respondents were excluded.

Data Collection

Data were collected directly by visiting shelter houses to gain subject's personal data, measure Mid Upper Arm Circumference (MUAC) and interview about their anxiety and depression problem using the Hospital Anxiety and Depression Scale (HADS), as well as their food consumption using the Semi Quantitative Food Frequency Questionnaire (SQ-FFQ) questionnaire. Health protocols were applied during direct measurement by using face mask, face shield, gloves, and gown. Prior the data collection, these two questionnaires had been validated using respondents from shelter houses other than the respondents.

However, due to Small-Scale Social Restrictions during the COVID-19 pandemic, respondents in several locations were not able to be visited. Therefore data were also collected using phone call and then submitted to Google Form, while MUAC measurement was carried out by a trained shelter house administrator officer. HADS and SQ-FFQ questionnaires were filled out by researchers during online interviews via Zoom or WhatsApp Call. These two questionnaires took more or less 25 minutes in total to be finished.

In terms of SQ-FFQ data collection, respondents were also being introduced with household size to emphasize how much food they consumed for the last one month. Additionally, validations were made by engaging cancer patients' relatives or someone who helps them in consuming food on a daily basis.

Anxiety and Depression Scale

HADS consist of 14 questions, which is seven questions regarding anxiety, while the other seven are related to depression. If the score obtained is 0–7, then respondents were categorized as normal, followed by mild (8–10), moderate (11–15), and severe (16–21) (Rudy et al., 2015).

Food Consumption Measurement

SQ-FFQ was used to determine macronutrient intake adequacy (energy, carbohydrate, protein, and fat). In order to obtain the adequacy, total intake was divided by the total need of each macronutrient, and finally multiplied by 100%. Nutrient adequacy was indicated as normal if the percentage was 80 to 110%. Otherwise it is deficit (<80%) or over (>110%) (Handayani et al., 2015).

MUAC Measurement

MUAC was measured to the closest 1 mm using a non-stretchable tape 'Onemed.' A trained enumerator marked subject's midpoint in their upper arm located between the tips of their shoulder and elbow. After a visible sign was given using a non-invasive marker, then wrapped the measuring tape to the skin right in the middle of the dot and recorded the MUAC. Nutritional status according to MUAC was formulated by dividing the actual MUAC with the Harvard standard and multiplying it by 100%. For proportion purposes, nutritional status was divided into five categories, which are obese (>120%), overweight (110-120%), normal (90-110%), underweight (60-90%), and severely underweight (<60%) (Handayani et al., 2015).

Data Analysis

Data analysis was performed using IBM SPSS Version 25 software. Meanwhile, food intake data were analysed using *Nutrisurvey* application. Correlational test was performed using the Pearson's test and Rank Spearman test.

RESULTS AND DISCUSSIONS

Table 1. Subject's Characteristics (N=42)

Characteristics	n	%
Aged		
40–50	24	57.1
51–60	18	42.9
Sex		
Male	5	11.9
Female	37	88.1
Formal Education		
Elementary school	15	35.7
Junior high school	10	23.8
Senior high school	8	19.0
Bachelor	5	11.9
No formal education	4	9.5
Cancer Type		
Breast cancer	18	42.9
Cervical cancer	9	20.5
Nasopharyngeal cancer	7	15.9
Skeletal cancer	1	2.3
Ovarian cancer	2	4.5
Thyroid cancer	1	2.3
Colon cancer	2	4.5
Lung cancer	1	2.3
Pancreatic cancer	1	2.3
Time Diagnosed		
< 1 years	8	19.0
> 1 years	34	81.0
Stage of Cancer		
I	8	19.0
II	7	16.7
III	20	47.6
IV	7	16.7
Marital Status		
Married	42	100.0
Not married yet	0	0.0
Job		
Farmer	7	16.7
Labor	7	16.7
Do not work	18	42.9
Others	10	23.8
Income/Month		
<Rp. 900.000	4	9.5
Rp. 900.000 – Rp.1.500.000	38	90.5
Anxiety Score		
Normal	17	40.5
Low	9	26.2
Moderate	14	33.3
Severe	2	4.8
Depression Score		
Normal	20	47.6
Low	11	26.2
Moderate	10	23.8
Severe	1	2.4

The majority of respondents (88.1%) were female and more than half of these (57.1%)

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were aged 40-50. In addition, nearly half of the respondents (42.9%) were diagnosed with breast cancer, and with stage III (47.6%). All of the respondents have been married (100%). As much as 53.7% of the respondents had elementary school, 42.9% did not work and 90.5% had an income of around IDR 900,000–1,500,000 per month. Based on Table 1, it is known that there were more cancer survivors in the shelter houses with the category of normal anxiety (40.5%). In the depression score, it is known that as many as 20 cancer survivors in the shelter houses are in the normal category (47.6%).

Previous study explained that, at first, anxiety and depression occurred as side effects of chemotherapy and other factors such as economy, family support, cancer stage, duration of diagnosis and frequency of chemotherapy (Suwistianisa, Huda and Ernawaty, 2015). A research conducted in Ethiopia as one of the low income country showed the prevalence of major depression was 16.4%. This study also suggested that severe pain and moderate pain were significantly related with major depression, and almost 70% of respondents with depression had uncontrolled pain (Alemayehu et al., 2018). However in this study, less than 5% were severely anxious and depressed. Despite the fact that they came from a family with low economic status, they used the National Health Insurance to get their disease treated. Financial support can reduce anxiety levels in cancer survivors (Adipo, Jumaini and Rahmalia, 2015).

Moreover, the majority of the respondents had been diagnosed with cancer for over a year (Table 1). This will give enough time for the patients to tackle their anxiety and depression. A person who has been diagnosed with cancer for the first time will experience depression which stimulates the survivors to develop coping strategies such as by getting closer to the God, discussing the situation with a partner or family and sharing with other cancer survivors at shelter houses (Widianti, 2016).

According to Table 2, the food intake of cancer survivors at shelter houses was dominantly lacking in energy (47.7%), protein (69.0%) and carbohydrates (57.1%), while fat adequacy was dominantly good (35.7%). Notably, although fat adequacy reached nearly 100%, the median of energy was only 71.79% (Table 3). In addition, the nutritional status of cancer survivors in shelter houses was also dominantly lacking (71.4%) (Table 2). As also mentioned in Table 3, the average of their MUAC measurement was still in underweight category.

Table 2. Macronutrient Intake Adequacy and Nutritional Status of Respondents

Variables	n	%
Energy Adequacy		
Severe deficit	21	47.7
Moderate deficit	4	9.5
Low deficit	6	13.6
Normal	6	13.6
Over	5	11.9
Fat Adequacy		
Deficient	13	31.0
Normal	15	35.7
Over	14	33.3
Protein Adequacy		
Deficient	29	69.0
Normal	6	14.3
Over	7	16.7
Carbohydrate Adequacy		
Deficient	24	57.1
Normal	3	7.1
Over	15	35.7
Nutritional Status		
Deficient	30	71.4
Normal	10	23.8
Over	2	4.8

Table 3. Median / Average (± Standard Deviation), Minimum and Maximum

Variable	Median/Average (±SD)	Min	Max
Anxiety	8.83(±4.80)	0	19
Depression	7	0	16
Energy Adequacy (%)	71.79	20	150
Fat Adequacy (%)	94.37(±30.64)	29	157
Protein Adequacy (%)	57.67	10	125
Carbohydrate Adequacy (%)	86.26(±43.54)	22	183
Nutritional Status using MUAC (%)	82.54(±16.51)	50	120

* Normal distribution data is presented in average (±SD), while other is presented in median

The Correlation between Anxiety, Depression, Macronutrient Intake Adequacy, and Nutritional Status

No relationship was found between anxiety, macronutrient intake and nutritional status or between depression, macronutrient intake and nutritional status, as shown in Table 4.

Similarly, other researchers also found that factors influencing the food intake of cancer survivors were nausea and vomiting due to chemotherapy (Dewi and Aryawan, 2017; Gebremedhin et al., 2021). It can be inferred that anxiety and depression are not the only factors that affect the food intake among cancer survivors. In addition, most of the respondents in this study did not experience anxiety and depression.

The correlation between macronutrient intake adequacy and nutritional status

As shown in Table 4, there was a weak correlation between energy adequacy and nutritional status, while the correlation between fat adequacy and nutritional status is moderate. This was in line with research conducted in Surabaya with cancer survivors which showed that energy adequacy and fat adequacy were related to nutritional status (Darmawan and Adriani, 2019). Energy is the main fuel for body metabolism. Excessive energy intake will be stored in adipose tissue in the deep layer of the skin. The weight of fat stored in the body can be measured by calculating the percentage of body fat and how it affects the body weight. It is clear that body fat is related to nutritional status (Zaenudin, Dewi and Effendi, 2012).

This study also showed that the energy is mainly contributed from fat as seen in Table 3. It is possible if dietary fat may alter subjects' visceral fat. A study conducted in animal fed high fat diet showed the increase of visceral adiposity compared with isocaloric-low fat diet (Bojková, Winklewski and Wszedybyl-Winklewska, 2020)

In this study, carbohydrate and protein adequacy were not found correlated to nutritional status, similar to what has been found in a study conducted in Lampung involving patients suffering from various types of cancer (Endang, 2020). Carbohydrate adequacy and nutritional status do not correlate because cancer cells take up glucose through the glycolysis pathway, preventing pyruvate from entering the Krebs cycle and preventing the conversion of pyruvate to lactate. This process shows that cancer cells obtain most of their energy from glycolysis, meanwhile *pyruvate hydrogenase* has been inhibited, which decreases the ability of pyruvate to enter oxidative phosphorylation. In such situation, the body lacks of glucose and becomes vulnerable to have low nutritional status (Wu and Zhao, 2013).

Protein adequacy was also not found correlated to nutritional status, because cancer patients are very susceptible to cachexia. Thus, decreased food intake makes the body search for a substitute energy source from total body protein stored as muscle mass. Protein is not the main source of energy, yet it can be converted into energy when food intake is insufficient. However, no direct relationship between protein adequacy and nutritional status is found (Norman et al., 2011).

Several studies showed a distinct level of anxiety and depression in cancer survivors according to their cancer stage, family support, length of diagnosis, and the frequency of

Table 5. The correlation between macronutrient adequacy and nutritional status

Variable	Nutritional Status	
	r	p
Energy adequacy	-0.318	0.040*
Fat adequacy	-0.490	0.001*
Protein adequacy	-0.266	0.088
Carbohydrate adequacy	-0.950	0.548

Pearson; significance level p<0.05 r=correlation value; negative value indicate inverse correlation

Table 4. The correlation between anxiety, depression, macronutrient intake adequacy, and nutritional status

Variable	Energy		Fat		Protein		Carbohydrate		Nutritional Status	
	r	*p*	r	*p*	r	*p*	r	*p*	r	*p*
Anxiety	0.041	0.798	0.176	0.264	-0.55	0.728	0.156	0.325	-0.281	0.072
Depression	-0.117	0.460	-0.31	0.844	-0.162	0.304	-0.003	0.983	-0.193	0.220

chemotherapies. A research conducted among breast cancer survivors in Egypt showed that a higher level of anxiety and depression was experienced in respondents with advanced stage of cancer (stage III and IV) compared to the lower one (stage I and II) (Alagizy et al., 2020). However, in this research showed a different result. Cancer survivors with stage I, II, and III tended to have a normal level of anxiety and depression, while cancer survivors with stadium IV had mild anxiety and normal depression level. This might be due to the time the patients had been diagnosed with cancer. Over 80% of the respondents had been diagnosed more than one year ago, and nearly half of the subjects were in stage III.

Additionally, frequency of chemotherapy was also associated with nutrition status. A research in Denpasar, Bali, Indonesia, among cancer survivors showed that the higher frequency of chemotherapy, the lower level of anxiety and depression experienced in these respondents (Soares, 2013). The overall advantage of this study is knowing how many cancer patients suffer from anxiety and depression, and knowing whether this affects food intake or not. However, those factors had not been controlled in this research due to COVID-19 restriction which limits cancer survivors to visit the shelter houses and have their treatment in hospital.

CONCLUSIONS

More patients in the shelter houses are in the normal category of anxiety and depression. These also did not correlate to either macronutrient adequacy or nutritional status. Furthermore, this study did not find protein and carbohydrate adequacy correlated to nutritional status. However, energy adequacy and nutritional status were found to share weak correlation, while fat adequacy and nutritional status were moderately correlated. Further research is suggested to analyze the variables that underlie anxiety and depression such as family support, stage, duration of diagnosis and frequency of chemotherapy so that these variables can be controlled.

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DECLARATION OF INTEREST

The authors declare no conflict of interest with other person or institution.

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