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Adequacy of nutrient intake among pregnant women with chronic energy deficiency in Sukawati I Public Health Center working area

Anak Agung Sagung Mirah Prabandari, Wendy Desyanto, Mardavivian Daud, Made Indra Wijaya, Luh Gede Pradnyawati, Dewa Ayu Putu Ratna Juwita, Komang Triyani Kartinawati

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ABSTRACT

Introduction: Chronic Energy Deficiency (CED) among pregnant women may result in serious health problems for women and children, including low birth weight and stunting. This study aims to analyze nutrient intake adequacy among pregnant women with CED in the Sukawati I Public Health Center working area.

Methods: This descriptive cross-sectional study was conducted at the Sukawati I Public Health Center working area during March 2023. The samples were all pregnant women with chronic energy malnutrition in the Sukawati I Public Health Center Working Area with a total sampling method. Data were collected by interview using 24-hour food recall questionnaire. Data were analyzed with Nutrisurvey software.

Results: There were 15 respondents included. Most of the respondents had total calorie (86.6%), carbohydrate (73.3%), calcium (86.6%), iron (86.6%), and folic acid (86.6%) deficiency. The protein and fat deficiency were 40%. There was a lack of food variety and amount among all respondents.

Conclusion: There was a low adequacy of nutrient intake among pregnant women with CED in the Sukawati I Public Health Center working area, especially regarding total calories, carbohydrates, calcium, iron, and folic acid. The public health center is expected to provide information and counseling to pregnant women and their families about the importance of increasing the variety and amount of food consumed during pregnancy.

INTRODUCTION

Chronic Energy Deficiency (CED) among pregnant women may result in serious health problems for women and children. Pregnant women with CED have reduced muscle strength that assists the delivery process, which may result in prolonged parturition, postpartum hemorrhage, and even maternal death. The risk to the baby includes fetal death (miscarriage), premature birth, congenital disabilities, low birth weight babies (LBW), and even infant death. CED in pregnant women can interfere with the growth and development of the fetus, contributing to stunting. In Indonesia, it was estimated that 17.3% of pregnant women suffered from CED.

Various factors, including nutritional intake, infection, economic status, age, the gap of pregnancies, parity, knowledge, level of education, employment status, and health services, could influence the incidence of CED during pregnancy. Investigative factors are important to develop CED prevention and management programs. This study analyzes nutrient intake adequacy among pregnant women with CED in the Sukawati I Public Health Center working area.

METHOD

This descriptive cross-sectional study was conducted at Sukawati I Public Health Center working area during March-May 2023. The samples were all pregnant women with chronic energy malnutrition in the Sukawati I Public Health Center Working Area with a total sampling method. Data were collected by interview using 24-hour food recall questionnaire. Data were analyzed with Nutrisurvey software. Nutritional intake was categorized as adequate if ≥ 90% of nutritional needs and deficit if less than 90%. The nutritional need was calculated based on gestational age and mother’s weight.

RESULTS

There were 15 pregnant women with CED included. The demographic characteristics of participants are shown in Table 1. The distribution of participants based on the adequacy of nutrient intake is shown in Table 2. Most of the respondents had total calorie (86.6%), carbohydrate (73.3%), calcium (86.6%), iron (86.6%), and folic acid (86.6%) deficiency. The protein and fat deficiency were 40%. There was a lack of food variety and amount among all respondents.

DISCUSSION

The results of this study revealed that the nutritional intake of pregnant women is still below the standard of the mother’s...
needs during pregnancy. This research aligns with Kasrida (2019), who found that the average energy intake of pregnant women with chronic energy deficiency was 1,320, with a minimum intake of 1,226 and a maximum intake of 1,378. The average protein intake was 39.6 grams, with a minimum intake of 38 grams and a maximum of 41.2 grams. Febriyeni’s research (2017) also strengthens this research that 100% of pregnant women experience a severe level of a total nutrient deficit, 91.4% experience a severe protein deficit and 8.6% experience a moderate protein deficit. For protein intake, the highest intake was 121.4 grams, the lowest intake was 29.6 grams, and the average intake was 66.6 grams. The proportion of severe fat deficit was 57.1%, and 20% experienced a mild fat deficit.\(^4\)

A pregnant woman needs to pay attention to their nutrient intake. Each phase of pregnancy is an important stage and greatly influences the baby’s and the mother’s health. This condition makes the nutritional needs of pregnant women different in each phase. The daily nutritional needs of pregnant women must be increased according to their pregnancy age because a fetus is growing and developing in the mother’s womb. Nutritional needs during pregnancy will also differ from those when not pregnant. During pregnancy, a mother needs an additional 300 calories.\(^6\) In the third trimester, the needs of pregnant women will be greater for the growth of the fetus and placenta. Therefore, pregnant women need to change their way of eating, even though pregnant women already feel that they are eating well. If they are on a diet, then the food diet must also follow the food diet for pregnant women.\(^6\) During pregnancy, pregnant women need more intake of protein, calories (for energy), vitamins, and minerals for the development of babies and pregnant women.\(^6\)

**CONCLUSION**

There was a low adequacy of nutrient intake among pregnant women with CED in the Sukawati I Public Health Center working area, especially in total calories, carbohydrates, calcium, iron, and folic acid. The public health center is expected to provide information and counseling to pregnant women and their families about the importance of increasing the variety and amount of food consumed during pregnancy. Further study is needed to investigate the risk factors of low nutritional intake among pregnant women with CED.

**ACKNOWLEDGMENT**

The authors thank Sukawati I Public Health Center for cooperating in performing this research.

**CONFLICT OF INTEREST**

This study has no conflict of interest.

**FUNDING**

The researcher bore all costs required in this study.

**ETHICS**

This research was conducted after obtaining approval and a research permit from the Head of Sukawati I Public Health Center.

**AUTHOR CONTRIBUTIONS**

All authors contributed equally to the writing of this article.

**REFERENCE**

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Correlation of low protein diet on nitrogen balance in chronic kidney disease patients

Nur Rachmat Adi Sawe1*, Suryani As’ad1, Raden Satriono1

INTRODUCTION

The prevalence of chronic kidney disease (CKD) patients who had protein-energy malnutrition is high enough to increase morbidity and mortality.1 Many CKD patients will experience protein energy malnutrition (PEM).2-4 A low protein diet (LPD) in CKD patients will cause PEM, which is associated with increased morbidity and mortality.2 Many studies have concluded that long-term protein restriction before dialysis causes protein malnutrition and poor prognosis during dialysis.5,6

The recommended protein quantity in the early to moderate stage of renal failure is controversial and varies from 0.55 to 0.8 g/kg/day.7 Agreement regarding how much GFR levels and protein adequacy estimates in pre-dialysis CKD patients is still controversial. Based on this, this study aimed to determine the nitrogen balance in pre-dialysis CKD patients with protein recommendations of 0.6–0.75 g/kgBW/day. This research has never been conducted in Indonesia.

METHOD

This study used cross-sectional analytics conducted at the Kidney Hypertension Sub-Section of the Wahidin Sudirohusodo General Hospital from July 2012 until September 2012. The inclusion criteria for this study were age 40-60 years, pre-dialysis CKD patients, and willingness to participate by providing informed consent. Exclusion criteria were subjects experiencing complications from liver disease, heart disease, respiratory disease, gastrointestinal disease or malignancy known from medical records. Subjects who met the research criteria were counted for 24-hour food recall and 24-hour food record. Suppose the 24-hour food recall and 24-hour food record have reached the total energy requirements. In that case, a 24-hour urine collection is carried out to examine Urine Urea Nitrogen (UUN).

The research was a cross sectional analytic study conducted at the Wahidin Soedirohusodo Hospital, Makassar, Indonesia. Subjects who met the research criteria were counted for 24-hour food recall and 24-hour food record. A 24-hour urine collection is carried out to examine Urine Urea Nitrogen (UUN).

Results: This study found the intake of protein/kg/d, and serum albumin level was significantly positively correlated to the nitrogen balance, whereas Urine Urea Nitrogen (UUN) was significantly negatively related to the nitrogen balance.

Conclusion: In conclusion, pre-dialysis CKD patients with a protein intake <0.75 g/kg/d showed a negative nitrogen balance, more than those with a protein intake >0.75 g/kg/d. There is still considerable scope to provide more protein than the amount that had been recommended for patients with CKD.

RESULTS

The characteristics of the patients in this study were not much different from those of pre-dialysis CKD patients in general, except that the results for nitrogen balance in this study were more variable. Nitrogen balance in pre-dialysis CKD patients had a significant positive correlation with protein intake (r = 0.325; p=0.046) and albumin levels (r = 0.372; p = 0.036) and a significant negative correlation with UUN (r = -0.347; p = 0.052). This study had no significant correlation between GFR and albumin levels. A significant positive correlation was found between GFR and UUN for protein catabolism (r=0.413; p=0.01), and albumin levels tended to be negatively correlated (r = -0.347; p = 0.052) with the level of catabolism. This study found a significantly negative nitrogen balance in the CKD patients who had protein-energy malnutrition.
patients who received an intake of ≤ 0.75 g/kgBW/day. This study found that the group with GFR<15 ml/minute (18) had a significantly higher negative nitrogen balance than those with GFR 15-60 ml/minute.

This study found no significant relationship between GFR and albumin levels for inflammation. A significant positive correlation was found between GFR and UUN as a protein catabolism marker, but UUN describes a person’s protein intake more. So, the greater the person’s protein intake, the greater the UUN. Negative nitrogen balance in patients with a GFR <15 ml/min is due to low protein intake below 0.6 g/kg/day. This aligns with research conducted by Ikizler et al., which implies that LPD should be used cautiously in CKD patients with GFR below 25 ml/minute because malnutrition can occur. This study recommends early initiation of dialysis if a CKD patient’s needs are below 0.7 g/kgBW/day.

CONCLUSION
There is still room to provide more protein than is currently recommended in patients with CKD. However, because this study did not assess the amount of protein and its impact on kidney function, the amount of protein that can be given cannot be determined. In this regard, further in-depth research is still needed.

CONFLICT OF INTEREST
This study has no conflict of interest.

FUNDING
The researcher bore all costs required in this study.

ETHICS
This research was conducted after obtaining approval and a permit from the Head of Wahidin Soedirohusodo Hospital, Makassar, Indonesia.

AUTHOR CONTRIBUTIONS
All authors contributed equally to the writing of this article.

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INTRODUCTION

Nasopharyngeal carcinoma (NPC) invades the base cranial, causing paralysis of the glossopharyngeal nerve, which causes dysphagia. Radiation therapy in NPC can cause cells on the surface of the digestive tract to be damaged. In addition, after radiotherapy, sore throat, dysphagia, xerostomia, anorexia and dysgeusia will occur. Chemotherapy, often done with radiation, often causes severe side effects on the digestive tract, such as anorexia, nausea, and vomiting. This will reduce nutrient intake and result in weight loss and malnutrition. Supplementation of omega-3 fatty acids containing 1-2 g/day of EPA increases appetite, body weight, and quality of life in cancer patients. This case report will observe the provision of omega-3 fatty acid supplementation 1050 mg/day for 18 days on the increase in body weight and muscle mass in female patients with NPC.

CASE PRESENTATION

A 51 woman with NPC acute kidney injury (AKI) with clinically severe malnutrition with cachexia and sarcopenia underwent chemotherapy. The composition study showed a very high fat mass, low muscle mass, and a low fat-free mass index. By way of fish oil capsules and ONS (oral nutritional supplements), patients receive calories between 22 and 29 kcal/kg BW, protein between 1.1 and 1.2 g/kg BW, and EPA 1050 mg/day. The supplementation of omega-3 fatty acids impacts appetite, food intake, lean body mass, and body weight. Omega-3 fatty acid supplements to cancer patients can improve appetite, food intake, lean body mass, and body weight. Omega-3 can increase the formation of specialized pro-resolving mediators (SPM), which increase anti-inflammatory mediators, protect the blood-brain barrier, reduce pro-inflammatory cytokines, and reduce neuronal apoptosis, thus having a protective effect on nerve cells. Freitas and Campos suggest EPA supplementation of 1-2 g/day to increase body weight and muscle mass in cancer patients by modulating inflammatory markers, such as tumor necrosis factor (TNF), interleukin-1 β (IL-1β), interleukin-6 (IL-6), and interferon-γ (IFN-γ) have shown inhibitory effects on inflammation associated with muscle atrophy and lipolysis. Additionally, EPA supplementation positively stabilizes lean body mass by reducing levels of C-reactive protein, IL-6, and TNF. However, there is insufficient evidence to support giving omega-3 fatty acid supplements to cancer patients. In this case, giving omega-3 fatty acid supplementation can increase body weight and muscle mass (pictured). In addition, providing adequate nutrition accompanied by supplementation of omega-3 fatty acids can improve patients’ clinical condition and functional capacity without interruption of chemoradiation.

Effect of omega-3 fatty acid supplementation on body weight and muscle mass in nasopharyngeal carcinoma patients in chemoradiation: A case report

Ismi Kusumawati¹, Lily Indriani Octovia¹,², Nurul Ratna Mutu Manikam¹,²

ABSTRACT

Introduction: Anorexia, nausea, and vomiting are common severe side effects of chemotherapy, frequently administered in conjunction with radiation. As a result, nutrient intake will be decreased, which may cause weight loss and malnutrition. Case Report: A 51-year-old lady with nasopharyngeal carcinoma (NPC), acute kidney damage (AKI), clinically severe malnutrition, cachexia, and sarcopenia underwent chemotherapy. The body composition study showed a very high fat mass, low muscle mass, and a low fat-free mass index. By way of fish oil capsules and ONS (oral nutritional supplements), patients receive calories between 22 and 29 kcal/kg BW, protein between 1.1 and 1.2 g/kg BW, and EPA 1050 mg/day. The supplementation of omega-3 fatty acids impacts appetite, food intake, lean body mass, and body weight. Conclusion: Providing omega-3 fatty acid supplementation in NPC patients with AKI in conditions of malnutrition, cachexia and sarcopenia can help improve clinical conditions, increase body weight, muscle mass, and functional capacity.

Keywords: body weight, muscle mass, nasopharyngeal carcinoma, omega-3.
Omega-3 fatty acid supplementation in NPC patients with AKI was well tolerated. No side effects were found using omega-3 fatty acid supplementation in patients during monitoring.\textsuperscript{6,7}

**CONCLUSION**

Providing omega-3 fatty acid supplementation 1050 one hundred and fifty mg/day for 18 days in patients with NPC, AKI with clinically severe malnutrition, cachexia, sarcopenia, who are undergoing chemoradiation can help improve clinical conditions, increase body weight, muscle mass, and functional capacity. Further research with sufficient subjects is needed to see the effect of omega-3 fatty acid supplementation in NPC patients with AKI in chemoradiation conditions of malnutrition, cachexia and sarcopenia.

**CONFLICT OF INTEREST**

This study has no conflict of interest.

**FUNDING**

The researcher bore all costs required in this study.

**ETHICS**

This study was conducted after obtaining approval from the patient.

**REFERENCES**

Medical nutritional therapy on severe protein-calorie malnourished HIV-infected patients with lung tuberculosis and COVID-19

Ni Ketut Sumartini*

ABSTRACT

Introduction: Human immunodeficiency virus (HIV) infection gives rise to complex nutritional problems due to chronic inflammation and present superinfections. Ultimately, these events cause a decrease in food intake, a decrease in digestive ability, and a decrease in both nutrition absorption and utilization. This case report documented a patient with HIV, tuberculosis, and COVID-19 with severe protein-calorie deficiency whose clinical manifestations improved after receiving medical and nutritional intervention.

Case description: A 50-year-old female was admitted to the isolation ward following a positive COVID-19 test result. The patient was later diagnosed with stage 4 HIV and lung tuberculosis. The patient initially exhibited symptoms such as coughing, breathlessness, nausea, pain when swallowing, difficulty smelling, and mouth ulcers. Lab results indicated that the patient suffers from hyponatremia, hypoalbuminemia, transaminitis, anemia, and heightened inflammation. To avoid refeeding syndrome, the patient’s caloric and protein intake was gradually increased in terms of amount and consistency. In addition, to counter inflammation, the patient was supplemented with vitamin D, vitamin C, zinc, and omega-3 fatty acids. On day 12 of treatment, the patient was discharged after correction of lab results and clinical manifestations.

Conclusion: The patient improved gradually by providing adequate macronutrients and reducing inflammations with specific nutrients.

Keywords: Keywords: Omega-3, Refeeding Syndrome, Vitamin C, Vitamin D, Zinc.

INTRODUCTION

Southeast Asia holds the record for the second-highest human immunodeficiency virus (HIV) infection cases worldwide. In 2018, 3.8 million people in Southeast Asia were reported to have HIV. Per July 2019, 349,882 are reportedly living in Indonesia. Upon analyzing the Indonesian HIV incidence graph from 2009 to 2018, an upward trend can be observed, indicating a notable increase in HIV incidence over the specified period. Patients with HIV can suffer from a range of symptoms depending on the stage they are currently at, varying from asymptomatic infection to HIV wasting syndrome. Alongside this progression, individuals living with HIV suffer a gradual deterioration of their immune system. This deterioration causes patients to become more susceptible to infections. Furthermore, these secondary infections manifest with heightened severity, exacerbating the patient’s clinical picture.

Secondary infections include tuberculosis (TB) and the coronavirus disease of 2019 (COVID-19). In HIV patients, malnourishment results from several biological and psychosocial events. Ultimately, these events cause a decrease in food intake, a decrease in digestive ability, and a decrease in both nutrition absorption and utilization. The presence of tuberculosis introduces the new challenge of increasing resting energy expenditure and decreasing protein synthesis due to inflammation. In addition, COVID-19 superinfection introduces the risk of nutritional inadequacy as patients suffer from diarrhea and vomiting, aside from the increase of anorexia due to anosmia. Due to the complexity of the etiopathology of malnutrition in HIV patients with TB and COVID-19, a proper combination of guidelines and concepts of nutritional treatment is needed to treat the patient effectively. This case report will describe a case of a malnourished HIV patient with TB and COVID-19 who showed clinical improvement after 13 days of treatment, which included nutritional therapy.

CASE PRESENTATION

A 50-year-old female was admitted to the isolation ward following a positive COVID-19 polymerase chain reaction (PCR) test result. One month before admission, the patient complained of night precipitation, 3 weeks of diarrhea, and decreased appetite. Three weeks before admission, she complained of a high fever reaching 39°C, which developed from a dry cough to a productive cough with yellowy purulent sputum, mouth ulcer, nausea, occasional vomiting, and decreased food intake. One week before admission, the patient complained of difficulty swallowing and smelling. Three days before admission, the patient complained of breathlessness that comes and goes, which worsens during physical activity.

During the nutritional assessment, the patient exhibited symptoms such as coughing, breathlessness, nausea, swallowing pain, difficulty smelling, and mouth ulcers. The patient had yet to defecate that day but had defeated the...
in charge of the patient diagnosed the patient with severe COVID-19-associated pneumonia, WHO pre-HAART stage IV HIV infection, lung TB, and candidiasis. Based on the mentioned diagnoses, the patient was given 2 lpm O₂, IVFD NaCl 0.9% 20 dpm, remdesivir 200 mg/24 hour in 100 mL NaCl 0.9%, followed by remdesivir 100 mg/30 minutes in 10 mL NaCl 0.9%, 400 mg acetylcysteine every 8 hours orally, 0.4 cc every 24 hours enoxaparin subcutaneously, 500 mg paracetamol every 8 hours orally, 1000 mg of vitamin C every 24 hours orally, 1000 IU of vitamin D3 (calciferol) every 24 hours orally, 10 drops of nystatin every 8 hours orally, 200 mg of fluconazole every 24 hours intravenously, 960 mg of cotrimoxazole every 8 hours orally, and 40 mg of prednisone every 12 hours orally.

The implemented nutritional therapy employed a gradual and controlled increase in the patient’s intake to prevent the occurrence of refeeding syndrome. Resting energy expenditure was calculated using the Harris-Benedict formula and added with activity and stress factors, resulting in 2,100 kcal of target caloric intake per day. Protein intake was calculated by multiplying the patient’s ideal

Table 1. Monitoring of the patient’s abnormal laboratory assessments

<table>
<thead>
<tr>
<th>Checkup</th>
<th>Day 1</th>
<th>Day 3</th>
<th>Day 6</th>
<th>Day 7</th>
<th>Day 12</th>
<th>10 days post-Hospitalization</th>
<th>Normal Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>SGOT</td>
<td>106.3</td>
<td>58.2</td>
<td>-</td>
<td>63.4</td>
<td>-</td>
<td>26.9</td>
<td>5 – 34 u/L</td>
</tr>
<tr>
<td>SGPT</td>
<td>57.8</td>
<td>53.2</td>
<td>-</td>
<td>99.4</td>
<td>-</td>
<td>22.9</td>
<td>11 – 34 u/L</td>
</tr>
<tr>
<td>Albumin</td>
<td>2.56</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3.4 – 4.8 g/dL</td>
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<tr>
<td>CRP</td>
<td>10.8</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6.40</td>
<td>&lt; 5 mg/dL</td>
</tr>
<tr>
<td>D-dimer</td>
<td>0.9</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>&lt; 0.5 ug/mL</td>
</tr>
<tr>
<td>Hb</td>
<td>9.4</td>
<td>-</td>
<td>9.7</td>
<td>-</td>
<td>11.1</td>
<td>-</td>
<td>12.0 – 16.0 g/dL</td>
</tr>
<tr>
<td>Lymphocyte</td>
<td>0.43</td>
<td>-</td>
<td>0.23</td>
<td>-</td>
<td>0.32</td>
<td>-</td>
<td>1.0 – 4.0 x10⁶/uL</td>
</tr>
<tr>
<td>NLR</td>
<td>11.38</td>
<td>-</td>
<td>23.97</td>
<td>-</td>
<td>10.74</td>
<td>-</td>
<td>≤ 3.13</td>
</tr>
<tr>
<td>CD4</td>
<td>6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>404 – 1.612/uL</td>
</tr>
<tr>
<td>Natrium</td>
<td>132</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>136 – 145 mmol/L</td>
</tr>
</tbody>
</table>

Abbreviations: Hb, hemoglobin; CRP, C-reactive protein; NLR, neutrophil-lymphocyte ratio.
body weight by 1.5, which results in 81 g of daily protein requirement. This accounted for 15% of the patient's total caloric need. The rest will be filled with carbohydrates (50 – 55% [263 – 288 grams]) and fat (30 – 35% [70 – 81 grams]). Vitamin B1 was administered intravenously in the first 3 days every 8 hours with a dose of 100 mg. On the first day, the patient was given a smooth diet. Rice porridge with minced chicken was the primary source of carbohydrates and protein. The patient received three servings of PULMOSOL® and half of snakehead fish extract daily. Daily and consistent of nutrient intake will be gradually increased. On day 12, the final day of hospitalization, the patient was given steamed chicken rice as the main source of carbohydrates and protein. Administered PULMOSOL® and snakehead fish extract were increased to 3 servings and 3 half servings per day, respectively. Daily administered calories and protein can be seen in Figure 1 and Figure 2, respectively. Following treatment, the patient's condition gradually improved, which is reflected in the laboratory assessment results that can be seen in Table 1. The patient was discharged on day 12.

DISCUSSION

Several factors can cause hyponatremia in HIV patients. Diarrhea and vomiting decrease the amount of natrium effectively absorbed. Furthermore, opportunistic infections such as TB and COVID-19 might trigger elevated release of the antidiuretic hormone, which causes water retention, increasing the dilution of natrium. \(^8\) This condition might cause mild symptoms but will quickly develop into severe symptoms, such as muscle cramps, a decrease of consciousness, epilepsy, and more when the natrium level drops further. \(^9\)

Hypoalbuminemia is more an inflammatory marker than a malnutrition marker in this case. \(^10\) Chronic infection, caused by and including HIV infection, causes chronic inflammation, which causes hypoalbuminemia. This finding is valuable in predicting mortality that is not explainable by decreasing CD4 cell count. \(^10\) The inclusion of TB in this case may also continue to the decrease in albumin levels. Systemic inflammation present in TB patients causes an increase in vascular permeability and albumin degradation rate while inhibiting the production of albumin. \(^11\)

Poor control of HIV can cause chronic infection and inflammation, chronically increasing transaminase levels. The GP120 receptors found in hepatic cells can be activated by HIV, activating its respective signaling pathway and causing apoptosis. \(^12\)

Aside from that, COVID-19 can bind to ACE-2 receptors on cholangiocytes and hepatocytes, causing further damage to liver cells while simultaneously inducing systemic inflammation. \(^13\) Furthermore, 5 – 28% of anti-tuberculosis drugs are hepatotoxic, which can cause an increase in transaminase, further exacerbating the patient's transaminitis. \(^14\)

The patient suffers from anemia of chronic disease (ACD) caused by chronic infection of HIV and TB. Chronic infections cause a continuous release of pro-inflammatory cytokines, such as IL-6, which then causes an increase in CRP and hepcidin. A decrease in transferrin level and an increase in ferritin level may also be observed in ACD patients. \(^15\)

Administration of a high-omega-3 fatty acid diet serves as antiinflammation, antioxidant, and antithrombotic therapy. On cell membranes, docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) can produce eicosanoid and resolvin while competitively inhibiting arachidonic acid, which can cause inflammation. \(^16\) By competitively inhibiting the binding of arachidonic acid, the production of thromboxane B\(_2\), a potent platelet activator, was halted and replaced by thromboxane B\(_3\) which has few physiologic effects. \(^17\) Omega 3 fatty acids can also inhibit the production of F2-isoprostan, effectively acting as an antioxidant. \(^18\)

Vitamin D acts as an immunomodulator and anticoagulant agent. Macrophages, T lymphocytes, and dendritic cells have vitamin D receptors and CYP27B1. Hence, active immune cells can help convert calcidiol into calcitriol. Vitamin D can activate antiinflammation mediators (IL-4 & IL-10) and inhibit proinflammation mediators (IL-2, IL-6, and TNF - a). It also promotes the activation of T helper (Th) 2 and regulatory T cells while decreasing the activation of Th\(_{1}\) cells. Vitamin D can induce the production of cathelicidin and defensin, increasing the antimicrobial ability of macrophages and monocytes. Furthermore, cathelicidin can bind into protein S of Sars-Cov-2, impairing its ability to bind into ACE\(_2\), receptors, thus blocking the virus’ viral entry and replication process. Vitamin D can alleviate hypercoagulability by influencing arterial stiffness and upregulating anticoagulants. \(^6\)

Vitamin C therapy benefits respiratory infection patients, depending on the dose. A dose of 1 – 2 grams/day can prevent respiratory tract infections and, to some extent, reduce their severity, such as in the case of COVID-19. The upper limit for daily intake is 2 grams, and administration below 200 mg is hardly beneficial. \(^19\)

Zinc supplementation can prove to be beneficial in COVID-19 patients. Zinc can enhance barrier function by improving ciliary function, stabilizing the membrane and cytoskeletal, enhancing the expression of tight junction proteins and antioxidants, and suppressing apoptosis caspase activation in respiratory epithelia. It also serves as an antiviral by blocking viral entry and replication and upregulating antiviral proteins. Zinc decreases the expression of inducible nitric oxide synthase, decreasing reactive nitrogen species. Zinc can also act as an immunomodulator by increasing the activity of natural killer cells and cytotoxic T cells, boosting the signaling of B cell receptors and antibody synthesis, and balancing the immune response, preventing hyperimmune response by modulating cytokines. \(^20,21\)

CONCLUSION

Implementing medicine and nutritional therapy has been shown to improve the patient's clinical condition. The patient gradually enhanced by providing the patient with an adequate supply of macronutrients and by reducing inflammations with specific nutrients.

CONFLICT OF INTEREST

This study has no conflict of interest.

FUNDING

The researcher bore all costs required in this study.
ETHICS
The patient in this study has agreed to use personal data related to writing scientific articles. The patient has also given informed consent consciously for data collecting and publication in scientific journals.

AUTHOR CONTRIBUTIONS
All authors contributed equally to the writing of this article.

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EDITORIAL

Effect of omega 3 (eicosapentaenoic acid) administration on improvement of muscle mass and handgrip strength in cervical carcinoma patients with cancer cachexia: A case report

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ABSTRACT

Cancer cachexia is a type of disease-related malnutrition (DRM) that develops as a side effect of the disease. It results in progressive dysfunction, an accelerated systemic inflammatory response, a negative protein balance, and a loss of fat-free mass, with or without reducing fat tissue. With a significant nutritional deficiency, the 68-year-old female patient is being treated for radiation-induced cervical cancer type IIB. Eicosapenta (EPA) at a dose of 1-2 g/day was administered orally to patients for 30 days. Cancer cachexia individuals with cervical carcinoma can benefit from the treatment by increasing their muscle map strength. Thus in this case report will report the effect of omega 3 (eicosapentaenoic acid) administration on improvement of muscle mass and handgrip strength in cervical carcinoma patients with cancer cachexia.

Keywords: cachexia, cervical cancer, EPA, handgrip, muscle mass.

INTRODUCTION

Global Cancer Statistics data for 2020 shows that cervical cancer is the fourth most common cancer in women and is the second cause of cancer mortality, at 18.8 per 100,000 women.1 Cervical cancer in Indonesia occurs in 24.5 out of 100,000 women per year and will rank second among all cancer cases in Indonesia in 2020 after breast cancer cases.2 In cancer patients, metabolic disorders occur, so the risk of malnutrition increases due to the cancer itself and the effects of cancer treatment, which impact nutritional status and the risk of malnutrition.3 Cancer cachexia is a specific form of disease-related malnutrition (DRM). It occurs secondary to cancer, causing progressive dysfunction and increased systemic inflammatory response, negative protein balance, and loss of fat-free mass, with or without a decrease in fat tissue.4 Nutritional interventions do not focus on macronutrients alone but need to involve micronutrients. Other specific nutrients that benefit cervical cancer patients include omega-3, branched-chain amino acids, probiotics, and prebiotics.5 Thus in this case report will report the effect of omega 3 (eicosapentaenoic acid) administration on improvement of muscle mass and handgrip strength in cervical carcinoma patients with cancer cachexia.

CASE PRESENTATION

Female patient, 68 years old, cervical carcinoma IIB, currently undergoing radiation, with moderate malnutrition nutritional status based on malnutrition criteria based on American Society for Parenteral and Enteral Nutrition (ASPEN) and cancer cachexia based on Fearon criteria.6-8 Patients were given enteral nutrition containing eicosapentaenoic acid (EPA) 1-2g/day for 30 days as part of nutritional therapy. Patients are monitored for muscle mass and hand grip strength every week.

DISCUSSION

EPA is a derivate that has anti-inflammatory and anti-cachexia effects and can decrease inflammation by inhibiting nuclear factor kappa B (NF-kB) and production of pro-resolution mediators such as...
resolvins and protectins and decrease lipolysis and catabolism by modulating tumor necrosis factor alpha (TNF-α) and interleukin-6 (IL-6) EPA will compete with arachidonic acid, on omega-6 derivative, to produce eicosanoic products that are anti-inflammatory. EPA’s anti-cachexia effect prevents muscle protein degradation by inhibiting inflammatory pathways and proteolysis-inducing factor (PIF) signaling pathways caused by cancer. EPA has a direct inhibitory effect on TNF-production lines and PIF signaling pathways, which in turn inhibit the NF-κB system and downregulate the ubiquitin-proteosome system, which plays a role in muscle protein degradation in the mechanism of cancer cachexia.9,10

CONCLUSION

Administration of omega 3 (eicosapentaenoic acid) at a 1-2 g/day dose increases muscle mass and grip strength in cervical carcinoma patients with cancer cachexia.

CONFLICT OF INTEREST

This study has no conflict of interest.

FUNDING

The researcher bore all costs required in this study.

ETHICS

The patient in this study has agreed to use personal data related to writing scientific articles. The patient has also given informed consent consciously for data collecting and publication in scientific journals.

AUTHOR CONTRIBUTIONS

All authors contributed equally to the writing of this article.

REFERENCES

Hypoalbuminemia upon admission as biomarker predictor related to mild ischemic stroke at Prof. Dr. I.G.N.G Ngoerah General Hospital

Agustinus I Wayan Harimawan¹, Chiquita Putri Vania Rau²

INTRODUCTION

Ischemic stroke occurs due to either arterial embolism or the occlusion of a blood vessel through thrombosis or cerebral hypoperfusion.¹ Albumin can impede the process of platelet aggregation, regulate systemic inflammation, and demonstrate antioxidant properties. A negative correlation exists between decreased albumin levels and ischemic stroke severity. The findings obtained from an experimental investigation provide more evidence to support the neuroprotective properties of albumin.¹,²

The study by Riaz Ahmed Javid et al. observed hypoalbuminemia in 42% of individuals diagnosed with ischemic stroke. In a study conducted by Dziedzi et al., it was observed that hypoalbuminemia occurred at a frequency of 45.5%.¹,² The study conducted by Gao et al. revealed a significant correlation between decreased serum albumin levels and an elevated risk of poor functional outcome at the 90-day mark. Additionally, the researchers observed a negative linear dose-response connection between these variables. The objective of this study is to establish if the occurrence of hypoalbuminemia at admission can serve as an indicator for the development of cognitive dysfunction after mild to moderate ischemic stroke.¹

METHOD

The present investigation employed a prospective cohort design. It was carried out inside the Emergency Room, Inpatient Room, and Neurology Polyclinic at teaching hospital Dr. I.G.N.G Ngoerah Hospital over the period spanning from March to April 2023. Only patients who met the specified inclusion and exclusion criteria were included in the study until the minimum required sample size was achieved. The criteria for inclusion are as follows: 1. This study aims to include individuals who have experienced mild to moderate acute ischemic stroke within less than 48 hours from onset. 2. The target age range for participants is between 45 and 65 years. 3. Prospective participants will be required to provide informed permission by signing a letter after receiving a detailed explanation regarding the goal and procedures of the research. The criteria for exclusion are as follows: 1. documented medical record of prior stroke events, including both ischemic and bleeding types. 2. The presence of a recent infection, either localized or systemic, may have impacted the initial serum albumin concentration. 3. The existence of chronic systemic conditions that have the potential to influence serum albumin levels, such as chronic kidney disease, liver disease, autoimmune disorders, Human Immunodeficiency Virus (HIV) infection, documented medical record of prior stroke events, including both ischemic and bleeding types. 2. The presence of a recent infection, either localized or systemic, may have impacted the initial serum albumin concentration. 3. The existence of chronic systemic conditions that have the potential to influence serum albumin levels, such as chronic kidney disease, liver disease, autoimmune disorders, Human Immunodeficiency Virus (HIV) infection,
and malignancy. The assessment of serum albumin levels is conducted within a 48-hour timeframe, and a number below 34 g/L indicates low levels. This study evaluated cognitive function using the Montreal Cognitive Assessment - Indonesia (MoCA-Ina) tool, specifically administered 14 days after an ischemic stroke.

RESULT

From March to April 2023, 86 individuals diagnosed with acute ischemic stroke received medical treatment. A total of twenty patients were excluded from the study. A total of 66 participants who satisfied the inclusion criteria were identified; however, 10 individuals (15.2%) were classified as dropouts due to their unavailability for further engagement in the study. The study encompassed a total of 56 participants who were evaluated. Table 1 displays the fundamental attributes of the research participants.

Based on the data presented in the table, it is evident that a significant proportion of patients exhibit cognitive impairment after experiencing a mild to moderate stroke, with a higher number of individuals affected in comparison to those who do not experience cognitive impairment (32 against 24, respectively). Individuals who exhibit cognitive impairment tend to have a higher average age (59.38 ± 5.8) than those who do not. More men (78.1%) exhibit mild to moderate cognitive impairment following a stroke than women (21.9%).

The average serum albumin level in patients without cognitive impairment was 37.4 ± 4.1 g/L. In contrast, patients with cognitive impairment had a lower mean serum albumin level of 34.2 ± 4.8 g/L. This disparity was determined to be statistically significant (p = 0.01).

The present study examined the association between hypoalbuminemia, considered an independent variable, and cognitive function following an ischemic stroke, which was treated as the dependent variable. The statistical significance level was established at p < 0.05, with a 95% confidence interval (CI). Based on the bivariate analysis, it has been determined that hypoalbuminemia, characterized by low serum albumin levels, is associated with a 1.63-fold increase in the likelihood of decreased cognitive function following an ischemic stroke. This association has been established as statistically significant, with a p-value of 0.034.

DISCUSSION

The prevalence of cognitive impairment was much higher among males, accounting for 78.1% of the overall sample population. The ILSA study revealed a notable disparity in most vascular dementia between men and women, with men exhibiting a significantly higher risk (RR = 2.23). A comprehensive meta-analysis of multiple European research revealed that the prevalence of vascular conditions showed a reversal trend with increasing age, particularly concerning sex differences. Before reaching the age of 79, the incidence of vascular diseases exhibited a higher prevalence among males. However, beyond the age of 85, the prevalence of such conditions shifted to a higher occurrence among females. The observed phenomenon may be attributed to the gradual decrease in ovarian sex hormone production in females as they age.

The occurrence of ischemic stroke leads to the demise of neuronal cells and the subsequent release of molecules, such as damage-associated molecular patterns (DAMPs), which provoke a localized inflammatory response within the affected brain area. In addition to the occluded inflammation inside the wounded brain region, existing research indicates that inflammatory responses following a stroke manifest and last across the entirety of the brain. The significance of global brain inflammation in the survival of nerve cells and the repair of neural tissue following ischemia is of significant importance.

Hypoalbuminemia is a commonly recognized disorder among patients admitted to care facilities. A multitude of factors exert an effect on the quantity of serum albumin. The serum albumin levels are affected by acute and chronic inflammatory situations due to the regulation of protein metabolism in the liver and the occurrence of capillary leaks. This study has demonstrated that hypoalbuminemia, which serves as an indicator of inflammatory status, is correlated with unfavorable outcomes in cases of acute ischemic stroke. Those who exhibited poor cognitive function had significantly lower serum albumin levels than those who did not exhibit impaired cognitive function (34.2 ± 4.8 g/L vs. 37.4 ± 4.1 g/L), as evidenced by a statistically significant difference (p = 0.01). Furthermore, it should be noted that reduced serum albumin levels, referred to as hypoalbuminemia, are also associated with an elevated likelihood of encountering compromised cognitive function following an ischemic stroke. This relationship is supported by a relative risk (RR) value of 1.63 and a p-value of 0.034.

The potential impact of albumin on stroke outcome, particularly cognitive function, can be elucidated through three distinct pathophysiological processes. The extended circulatory half-life of serum albumin renders it a potential diagnostic for malnutrition, a condition significantly impacting prognosis. Additionally, the presence of hypoalbuminemia can potentially disrupt the equilibrium between coagulation and anticoagulation mechanisms. Serum albumin has been found to possess strong stimulatory effects on platelet aggregation. Reducing serum albumin levels may compromise the anticoagulant effect while enhancing the coagulation function, increasing the likelihood of thrombus formation. Moreover, hypoalbuminemia was found to elevate the likelihood of experiencing stroke-related complications, such as pneumonia, substantially compromising

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cognitive Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Impaired (32)</td>
</tr>
<tr>
<td>The mean age (years) (SB)</td>
<td>59.38 ± 5.8</td>
</tr>
<tr>
<td>Gender (n) (%) Man</td>
<td>25 (78.1)</td>
</tr>
<tr>
<td>Woman</td>
<td>7 (21.9)</td>
</tr>
</tbody>
</table>
both survival rates and the ability to achieve functional recovery.\textsuperscript{10}

Numerous recent investigations have elucidated the predictive significance of blood albumin levels in instances of acute ischemic stroke. The research conducted by Saher S. Hashem et al. demonstrated that serum albumin levels upon admission serve as an autonomous prognostic indicator for the functional prognosis of individuals suffering from ischemic stroke. A study by Zhou et al. showed that individuals with serum albumin levels below 35 g/L exhibited a heightened susceptibility to adverse functional outcomes and mortality.\textsuperscript{11} The adjusted odds ratio (OR) was determined to be 1.37 (95% confidence interval [CI]: 1.12 to 1.67), while the adjusted hazard ratio (HR) was found to be 2.13 (95% CI: 1.41 to 3.23).\textsuperscript{10}

**CONCLUSION**

Hypoalbuminemia, indicated by low blood albumin levels upon admission, is associated with a 1.63-fold increase in the likelihood of experiencing reduced cognitive function following a mild to moderate ischemic stroke.

**CONFLICT OF INTEREST**

This study has no conflict of interest.

**FUNDING**

The researcher bore all costs required in this study.

**ETHICS**

This research was conducted after obtaining approval and a research permit from the Head of the Emergency Room, Inpatient Room, and Neurology Polyclinic at Prof. Hospital. Dr. I.G.N.G Ngoerah Denpasar.

**AUTHOR CONTRIBUTIONS**

All authors contributed equally to the writing of this article.

**REFERENCES**

Nutrition therapy in a woman, 58 years old, with carcinoma of esophageal, oropharyngeal dysphagia mechanical, severe malnutrition, extreme risk refeeding syndrome, and cancer cachexia

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ABSTRACT

Introduction: Esophageal cancer develops from the normal squamous epithelium of the esophagus. The typical symptom is progressive dysphagia, first on solid foods and then on liquids.

Case Description: A 58-year-old female patient was diagnosed with esophageal carcinoma extending to the piriform sinus T4N3M1 (lung) Std IV ECOG II, mechanical oropharyngeal dysphagia, severe malnutrition, extreme risk refeeding syndrome, cancer cachexia, and hypokalemia. In the early stages of nutritional therapy, the patient is given a diet via total parenteral nutrition because there is no enteral access. The diet starts with a small amount. Patients was given enteral nutrition after gastrostomy tube placement. Adequate dietary support in the hospital will shorten the stay, increase immunity, lessen inflammation, lower the risk of infection, hasten healing, and lower medical expenses.

Conclusion: Management of patients with malignancies, especially esophageal, presents challenges regarding nutrition delivery and nutrient absorption. Important aspects ranging from cachexia and refeeding syndrome to micronutrient supplementation must be considered to achieve optimal nutritional targets.

Keywords: dietary support, nutritional management, cancer, malnutrition.

INTRODUCTION

Esophageal cancer is a severe malignancy with a low chance of recovery and a high fatality rate. With more than 570,000 new cases in 2018, esophageal cancer (EC) was the sixth most prevalent malignancy. Esophageal cancer frequently coexists with undernutrition and food intake problems. Patients with esophageal cancer are thought to be malnourished up to 78.9% of the time of diagnosis. The dietary care of these individuals may vary depending on the therapy and illness stage, with the goals of symptom relief, nutritional improvement, and quality of life improvement. Additionally, the majority of people with esophageal cancer experience cancer cachexia, which is a serious issue that needs to be managed by a multidisciplinary team. Thus, in this study, will perform a nutrition therapy in a woman, 58 years old, with carcinoma of esophageal, oropharyngeal dysphagia mechanical, severe malnutrition, extreme risk refeeding syndrome, and cancer cachexia.

CASE PRESENTATION

A 58-year-old female patient presented with a chief complaint of difficulty swallowing solid and liquid food in the last 4 months before admission, which had worsened 1 month before admission. For the last one month, she could not eat or drink. Weight loss has been felt since 4 months before admission. The patient's weight when healthy was 65 kg 4 months ago. The patient's weight 2 weeks ago was 50 kg. Patients also experienced decreased intake. For 4 months, the patient's intake was only 50% of healthy intake. Three months ago, she could only eat soft rice 2-3x ½ cup rice/meal; 2 months ago, she could only eat watery porridge 2-3 tablespoons, and 1 month ago, she could only eat sweetened condensed milk 1 glass/day and then spit it out again. The patient has been overweight since she was in her 20s. The patient was a passive smoker for 40 years. History of eating salted fish and

Table 1. Anthropometric examination result

<table>
<thead>
<tr>
<th>PARAMETERS</th>
<th>RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB</td>
<td>49 kg</td>
</tr>
<tr>
<td>Body Height</td>
<td>158 cm</td>
</tr>
<tr>
<td>Ideal Body Weight</td>
<td>52.2 kg</td>
</tr>
<tr>
<td>Body Mass Index</td>
<td>19.6 kg/m²</td>
</tr>
<tr>
<td>Muscle wasting</td>
<td>+3/+3</td>
</tr>
<tr>
<td>LOSF</td>
<td>+3/+3</td>
</tr>
<tr>
<td>Triceps skinfold</td>
<td>9 mm</td>
</tr>
<tr>
<td>Thigh skinfold</td>
<td>14.4 mm</td>
</tr>
<tr>
<td>Suprailium skinfold</td>
<td>14 mm</td>
</tr>
<tr>
<td>Total skinfold</td>
<td>29.4 mm</td>
</tr>
<tr>
<td>Right Handgrip strength</td>
<td>Cannot be evaluated (iv line)</td>
</tr>
<tr>
<td>Left Handgrip strength</td>
<td>13 kg/F</td>
</tr>
</tbody>
</table>
using MSG on food (+). The nutritional assessment of this patient is summarized in the following table (Table 1).

The patient was diagnosed with esophageal carcinoma extending to sinus piriformis T4N3M1 (lung) Stage IV ECOG II, mechanical oropharyngeal dysphagia, severe malnutrition, extreme risk refeeding syndrome, cancer cachexia, and hypokalemia. The patient was planned to have a gastrostomy installed as access to food.

Therapy for patients were given nutrition with energy target: 35 kcal/kgBW/day = 1715 kcal, protein target: 1.5 grams of protein/kgBW/day = 74 grams of protein (17%) starting from 10 kcal/kgBW/day = 500 kcal/24 grP/day. Before inserting the gastrostomy, the patient is given a diet in the form of total parenteral nutrition: Aminofusin hepar* 1 fl/24 hours, Dextrose 10% 1 fl/24 hours, smoflipid® 1 fl/24 hours.

The patient had a gastrostomy tube installed on the 7th day of treatment, but the gastrostomy flap was vital after post-operation day 4. The patient’s diet reached the target on the 11th day of treatment through partial parenteral nutrition. Enterally, the patient was given oligomeric formula 100 mL/4 hours via gastrostomy and parenterally peripheral smofkabiven* 1 fl/24 hours and supplementation via gastrostomy vitamin A 100,000 units/24 hours, zinc 20 mg/12 hours, vitamin B complex 1 tab/8 hours, and folic acid 400 mcg/24 hours. The patient was also given sucralfat 15 ml 15 minutes before giving the formula. The patient went home on the 12th day of nutritional care with a full diet, enterally still with an oligomeric formula of 200 mL/4 hours. While at home, the patient was given the boost optimum® formula 200 mL/4 hours, and the supplementation was continued for up to 7 days and synbiotic for 14 days.

The patient’s clinical condition, hemodynamic, and intake responses were good during the treatment, and there were no signs of refeeding syndrome. The patient experienced an increase in intake from 0 kcal/day to 35 kcal/kgBW/day on the 12th day of nutritional treatment initially using TPN. Still, after gastrostomy tube insertion, the diet was given via gastrostomy. The patient lost 1.5 kg during treatment, from 49 kg to 47.5 kg (3% in 2 weeks). The patient’s functional capacity improved, as shown by increased hand grip strength from 12 kg/F to 17 kg/F.

**DISCUSSION**

The nutritional diagnosis of malnutrition is based on The Consensus Statement of Malnutrition by the American Society of Parenteral and Enteral Nutrition (ASPEN).³ Patient starvation (eating nothing) for 2 months, patient’s weight loss 23% in 4 months and 2% in 2 weeks, muscle wasting +3/+3 (severe), loss of subcutaneous fat +3/+3 (severe), edema
right-hand strength: not evaluated (because of infusion), left left-hand strength: 13 kg/F. The patient fulfilled 5 of the 6 criteria for severe malnutrition in the context of chronic disease according to the 2012 ASPEN consensus so that the diagnosis of severe malnutrition in this patient could be established. Some of the mechanisms that cause malnutrition in cancer patients are systemic responses mediated by tumor-induced distant hormonal factors (neuroendocrine axis), non-specific responses to factors released by cancer cells, systemic inflammatory responses by cytokines produced by macrophages and anatomical factors, such as obstruction of the digestive tract by a tumor.

Cancer cachexia is a multifactorial syndrome defined by loss of skeletal muscle mass (with or without loss of fat mass) that is partially but not completely reversible with conventional nutritional support. The patient was diagnosed with cachexia cancer based on Fearon’s criteria because it met all three cachexia criteria where the patient had a 23% weight loss in 4 months and a BMI of 19.6 kg/m².

Refeeding syndrome is a clinical condition that can potentially cause death, characterized by severe changes in fluid and electrolyte balance and metabolic abnormalities in malnourished patients who have started to return to food intake. This patient was diagnosed with extreme risk refeeding syndrome due to starvation for 2 months and hypokalemia before feeding. The patient fulfills one extreme criterion based on the Irish Society for Clinical Nutrition & Metabolism (IRSPEN) criteria to establish the diagnosis of extreme risk refeeding syndrome.

After installing the gastrostomy, the patient is given an oligomeric diet in small amounts. The reason for giving an oligomeric formula was because starvation enteropathy may occur, which causes malabsorption. The demand to immediately reach the target causes nutrition to be still supported by parenteral nutrition. At POD2, there were dietary intolerance and GI complaints with 100 oligomeric administration, so oligomeric was increased by 200 c.c and parenteral was stopped. At home, the patient is given a formula containing maltodextrin, which will be easily absorbed, whey protein, and synbiotics, which are needed in starvation enteropathy, where dysbiosis is bound to occur.

Patients experience hypermetabolism, so the proteolysis process cannot be avoided.

Nutrition therapy provides adequate protein, which begins with giving 1.5 grams of protein/kg/day to minimize negative nitrogen balance and proteolysis to minimize the process of breaking down muscles. Patients are also formula-containing whey protein to help build muscle mass. The patient has chronic inflammation and is given parenteral nutrition containing omega-3; omega-3 is an anti-inflammatory.

Supplementation of vitamin A, vitamin C, zinc, vitamin B complex, and thiamine in these patients aims to prevent refeeding syndrome, help the formation of the digestive tract epithelium, and improve immune function as an antioxidant and anti-inflammatory.

The success of nutritional therapy in these patients is indicated by an increase in intake, which was initially starvation before receiving nutritional therapy to 35 kcal/kg/day after 10 days of receiving nutritional therapy, as well as an increase in the patient’s HGS which was originally 13 kg/F to 17 kg/F. In addition, during the feeding stage, the patient does not experience refeeding syndrome, a dangerous, life-threatening complication.

CONCLUSION
Management of patients with malignancies, especially oesophageal, presents challenges regarding nutrition delivery and nutrient absorption. Important aspects ranging from cachexia and refeeding syndrome to micronutrient supplementation must be considered to achieve optimal nutritional targets.

CONFLICT OF INTEREST
Authors declare that they have no conflicts of interest.

FUNDING
This study was conducted without grants, sponsors, or other funding sources.

ETHICS
The patient in this study has agreed to use personal data related to writing scientific articles. The patient has also given informed consent consciously for data collecting and publication in scientific journals.

AUTHOR CONTRIBUTIONS
The first author wrote the text of the paper. All authors did nutrition therapy.

REFERENCES
INTRODUCTION

Ventilator-induced muscular dysfunction primarily affects the respiratory muscles, particularly the diaphragm, in contrast to the pectoralis major. The diaphragm has persistent contractile activity throughout an individual’s lifespan, potentially elucidating its heightened susceptibility to even short periods of inactivity.\(^1\) Ventilator-induced diaphragm dysfunction (VIDD) refers to the reduction in the diaphragm’s ability to generate force, commonly observed due to mechanical ventilation.\(^2\)

A potential strategy for mitigating and reducing the severity of VIDD is appropriate nutritional therapy. In the context of VIDD, nutritional therapy can be directed towards various pathways. For instance, oxidative stress can be mitigated by administering n-acetyl cysteine (NAC), curcumin, and vitamin E derivatives. Additionally, proteolysis pathways can be suppressed by providing omega 3 fatty omega-3 branched-chain amino acids, leucine, and beta-hydroxy-beta-methyl butyrate.\(^3,4\)

Ventilator-Induced Diaphragm Dysfunction (VIDD)

VIDD refers to a reduction in the capacity of the diaphragm to generate force, specifically caused by mechanical ventilation. The prevailing belief is that ventilator-induced diaphragm inactivity is the primary cause, leading to the development of weakening as the time of mechanical breathing extends.\(^3,5\) Diaphragmatic weakness manifested in 64% of individuals within 24 hours following intubation. During the process of weaning, it has been observed that around 80% of patients experience diaphragmatic weakness. It has been shown that almost 80% of patients who require extended mechanical breathing display signs of diaphragmatic weakening. Research utilizing an ultrasound-based criterion for assessing diaphragmatic weakness revealed that 29% of patients exhibited diaphragmatic weakness during their initial attempt at spontaneous breathing, whereas 36% demonstrated such weakness during extubating.\(^6\)

Pathogenesis of VIDD

The impairment of mitochondrial function, characterized by decreased adenosine triphosphate (ATP) biosynthesis, generation, and energy use (cytopathic hypoxia), is widely recognized as contributing to cellular and organ failure in severe disease. Metabolic alterations encompass heightened release of stress hormones, cytokines, and nitric oxide, resulting in the development of insulin resistance and hyperglycemia. During the later stages, the combination of direct inhibition of mitochondria by nitrogen-reactive species and oxygen-reactive species, less hormonal stimulation, and reduced positive feedback resulting from decreased metabolic demand collectively contribute to the reduction of energy production. The principal entities susceptible to harm from a mix of ischemia and cytopathic hypoxia are excitable tissues, specifically neurons and peripheral muscles, which rely on ATP to function properly.\(^3,6\)

In a murine intensive care unit (ICU) model involving extended mechanical ventilation and pharmacological paralysis, the ubiquitin-proteasome pathway is observed to be activated early on, resulting in the partial or total degradation of muscle myosin. Additionally, calpain activation is observed after a very short period of 9-14 days of exposure to ICU settings. Muscle fiber necrosis is not associated with increased expression of calcium-handling proteins. The degradation of myofibrillar proteins occurs through a two-step process. At the outset, calpains

### Keywords

Keywords: VIDD, nutrition importance, diaphragmatic strength.
and caspases initiate the cleavage of a limited set of crucial contractile proteins, activating the ubiquitin-proteasomal degradation pathway and destroying myofibrillar proteins. The notion proposing the involvement of calcium-dependent proteins in commencing muscle protein breakdown and generating muscle degenerative alterations in VIDD is supported by evidence indicating an augmented release of calcium from the sarcoplasmic reticulum, which is related to heightened calpain activity.3,6

**Prevention and Management of VIDD with Nutritional Approach**

**Protein Availability**
The most recent clinical guidelines for acute care suggest that individuals should consume protein within the range of 1.2 to 1.5 grams per kilogram of body weight each day. Lower mortality rates are observed in those who consume this level of consumption. Consuming a combination of nutrients, including protein and energy, in quantities beyond the required amounts has been unequivocally linked to adverse consequences, including prolonged recovery time and increased muscle degradation. This phenomenon can be attributed to increased food consumption's potential disruption of autophagy. Autophagy is a significant cellular process involving sequestration, transportation, and degradation of malfunctioning and toxic intracellular proteins, organelles, and pathogens within lysosomes. Autophagia serves the dual purpose of eliminating detrimental chemicals and pathogens while offering a source of nutritious substrates. The process of autophagia holds significant importance in the context of critically ill patients since it facilitates the elimination of detrimental microorganisms.7,8

**Branched Chain Amino Acid (BCAA)**
The metabolic impact of BCAA on protein is facilitated by the activation of the mammalian target of the rapamycin (mTOR) pathway. More precisely, low-energy utilization (LEU) triggers the activation of mTORC1, which in turn accelerates the synthesis of proteins and facilitates the commencement of mRNA translation processes. The presence of stressful conditions is linked to a reduced response to the anabolic effects of amino acids. This diminished response can be attributed to alterations in responsiveness. The ingestion of leucine has been observed to decrease the AMP/ATP ratio and increase the ATP level within muscle cells, indicating that leucine is a source of energy in these cells. Based on specific research findings, it has been observed that leucine exerts a partial activation of the mechanism of rapamycin in the (mTOR) pathway by inhibiting the adenosine monophosphate protein kinase (AMPK). To clarify, the delivery of leucine has been shown to reduce AMPK activity, whereas the stimulation of AMPK has been found to hinder mTOR signaling. Leucine and the other BCAA utilize distinct metabolic pathways. The absence of branched-chain amino acid aminotransferase (BCAT) results in the preservation of BCAA in the liver, as opposed to the predominant metabolism of other amino acids in this organ. Moreover, it is worth noting that skeletal muscle harbors BCAT, and the breakdown of BCAAs in this particular tissue is believed to generate energy, thereby inhibiting AMPK activity. Consequently, this process activates the mammalian target of mTOR and subsequently enhances protein synthesis.7

**β-Hydroxy-β-Methylbutyrate (HMB)**

β-Hydroxy-β-Methylbutyrate (HMB) exerts its physiological effects on skeletal muscles through multiple mechanisms. The β-HMG compound exerts inhibitory effects on the ubiquitin-proteasome proteolytic pathway. The above mentioned route reduces phosphorylation in double-stranded RNA-activated protein kinase (PKR) and eukaryotic initiation factor 2 (eIF2). Consequently, the inhibition of protein breakdown is diminished, leading to a favorable equilibrium promoting muscle preservation. The inhibitory effects of β-Hydroxy-β-Methylbutyrate on protein degradation, which is caused by the tumor necrosis factor α (TNF-α) and angiotensin II pathways, are mediated through the suppression of caspases 3 and 8. In addition to these processes, a recent investigation has indicated that HMB (beta-hydroxy-beta-methylbutyrate) facilitates the proliferation of C2C12 myoblasts progenitor cells for myocytes in murine models. This suggests that HMB may potentially enhance muscle regeneration following damage.9

Hsieh and colleagues conducted a study with 34 individuals diagnosed with chronic obstructive pulmonary disease (COPD) receiving mechanical ventilation. The study's primary objective was to examine the impact of 3 g/d HMB supplementation on this patient population. The supplementation of HMB is correlated with decreased levels of white blood cells. A total of ten participants (55.6%) in the HMB group and four subjects (25.0%) in the control group had improved lung function. The statistical analysis yielded a p-value of 0.092, indicating a lack of significant difference between the two groups.10

**Vitamin E**
Antioxidants are beneficial in mitigating the detrimental effects of oxidative stress induced by continuous mechanical ventilation. This, in turn, aids in preventing diaphragm atrophy and contractile failure. Antioxidants can alleviate the detrimental effects of oxidative stress and exert regulatory control over the expression of genes associated with proteolysis. For example, administration of high doses of vitamin E to animals has been observed to decrease the expression levels of certain proteases, such as caspase-3 and calpain. Ventilator-induced diaphragm atrophy is mitigated by the antioxidant trolox, an equivalent of vitamin E, which protects the diaphragm.11

**Omega-3**
Research has demonstrated that eicosapentaenoic acid (EPA) exhibits modest antioxidant properties, impedes proteasome activity, hinders caspase activation, and diminishes inflammatory responses. EPA administration can modulate the sarcoplasmic reticulum function, inhibiting cytosolic calcium rise and calpain activation. Consequently, the administration of EPA may benefit from reducing respiratory muscle weakness.12

**Curcumin**
Curcumin, the principal bioactive
compound found in turmeric, has diverse physiological effects, encompassing antioxidant, anticarcinogenic, and anti-inflammatory properties. Curcumin has also been shown to inhibit muscle cell proteolysis, partly through its ability to inhibit nuclear factor Kappa-B (NF-κB) activity. This inhibition of NF-κB activity by curcumin has been found to effectively prevent proteolysis of the diaphragm and subsequent contractile failure induced by mechanical breathing.\textsuperscript{13}

**N-acetyl-cysteine (NAC)**

NAC is a scavenger of free radicals, enhancing the production of endogenous antioxidant glutathione and other antioxidant systems. Previous studies have demonstrated that the continuous administration of NAC can effectively mitigate the development of diaphragmatic muscle weakening in animal models subjected to prolonged and intermittent hypoxia. Notably, individuals with acute respiratory distress syndrome exhibit a pro-oxidant condition, which may be further intensified with the administration of NAC. This supplementation can potentially augment glutathione, thiol molecules, and antioxidant mechanisms.\textsuperscript{14}

**CONCLUSION**

Several processes contribute to the development of VIDD. The initial three components encompass oxidative stress, metabolic dysfunction, cytokines and inflammation, and alterations to proteostasis. Improved VIDD can be achieved by implementing supportive nutritional therapy, ensuring sufficient protein intake, limiting proteolysis, reducing inflammation, and mitigating oxidative stress. These interventions contribute to the enhancement of diaphragm strength in critically sick patients.

**ETHICAL APPROVAL**

Not applicable.

**CONFLICT OF INTEREST**

This study has no conflict of interest.

**FUNDING**

This review was conducted without grants, sponsors, or other funding sources.

**AUTHOR CONTRIBUTIONS**

All authors contributed equally to the writing of this article.

**REFERENCES**

Risk factors of energy and protein deficit in COVID-19 patients in ICU

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ABSTRACT

**Introduction:** Increasing energy expenditure in critically ill patients will lead to increased protein-energy requirements, negative balance and increased risk of malnutrition. This study attempts to identify risk factors for energy and protein deficits in COVID-19 patients treated in the ICU of Dr. Kariadi Central General Hospital.

**Method:** A cross sectional study of electronic medical records of adult ICU with COVID-19 between March to November 2020. Bivariate analysis with chi-square and multivariate analysis using logistic regression with 95% confidence intervals were performed.

**Results:** Of the 188 patients, 62.8% were male, 33.0% were elderly population, 28.7% of patients had energy deficit, and 43.1% had protein deficit. Bivariate analysis revealed VM usage (p=0.003) & (p<0.0001), comorbidity (p<0.0001) & (p=0.011) and vasopressor (p=0.001) & (p=0.038) were significant risk factors for energy and protein deficits. Multivariate analysis revealed comorbidity and vasopressor together as a risk factor for energy deficit (p=0.002) (PR 4.02 95% CI 1.64 – 9.84) and (p=0.025) (PR 2.64 95% CI 1.13 – 6.15) also risk factor for protein deficit are comorbidity (p=0.049) (PR 1.97 95%CI 1.00 – 3.89) and VM usage (p=0.003) (RR 3.1) 95% CI 1.47 – 6.51.

**Conclusion:** The presence of comorbidities and the use of vasopressors are risk factors for energy deficits. VMs and comorbidities are risk factors for protein deficits in COVID-19 patients in the ICU of Dr. Kariadi Hospital.

**Keywords:** Energy and protein deficit, ICU, COVID-19.

INTRODUCTION

In critically ill patients in the ICU, there is an increase in the use of energy and reserves, especially skeletal muscle protein, which will lead to increased protein-energy requirements, negative balance and increased risk of malnutrition. Several studies in critically ill patients in the ICU demonstrated the beneficial effects of adequate energy and protein intake in various clinical outcomes.

COVID-19 patients have a varied clinical spectrum. Studies suggest that up to 5-30% of infected patients presenting with acute respiratory distress syndrome (ARDS) require respiratory and hemodynamic support in the ICU. The severity of COVID-19 can cause severe malnutrition and loss of muscle mass and are well-known risk factors for death, especially in patients in the ICU. This study attempts to identify risk factors for energy and protein deficits in COVID-19 patients treated in the ICU of Dr. Kariadi Central General Hospital.

METHOD

Research using a cross-sectional approach in the adult population diagnosed with COVID-19 in the ICU of Dr. Kariadi General Hospital took place from March to November 2020 using secondary data. The dependent variable, namely energy and protein deficits, was obtained from a total protein energy intake reduction with a total protein energy target in 7 days. The independent variables studied were age group, mechanical ventilator use, comorbid diseases, lactate group, renal insufficiency, use of vasopressors, vasopressor dose group, ARDS status and feeding route. Bivariate analysis was performed using chi-square with a significant interpretation if the p-value <0.05 and multivariate analysis using logistic regression with 95% confidence intervals.

RESULTS

The samples were 188 patients, 62.8% male, 33.0% of the elderly population; 28.7% of patients had an energy deficit, and 43.1% had a protein deficit. The same study noted that patients in the ICU tend to be older (median age – 60 years), and 40% have comorbidities such as DM, heart disease and hypertension. In bivariate analysis, significant variables as risk factors for energy and protein deficits were the use of VM (p=0.003) and (p<0.0001), the presence of comorbidities (p<0.0001) and (p=0.011) and the use of vasopressors (p=0.001) and (p=0.038). The significant comorbidity in energy deficit was DM (p=0.02) and hypertension in protein deficit. In multivariate analysis, comorbidity and the use of vasopressors together caused an energy deficit (p=0.002) (PR 4.02 95% CI 1.64 – 9.84) and (p=0.025) (PR 2.64 95% CI 1.13 – 6.25). The protein deficit was simultaneously caused by the presence of comorbidities (p=0.049) (PR 1.97 95% CI 1.00 – 3.89) and the use of vasopressors and (p=0.00(3.10 95% CI 1.47 – 6.51).

DISCUSSION

In this study, it was found that the proportion of patients who had
comorbidities was more than those who did not. The most common comorbidities were DM and hypertension, associated with immune susceptibility in COVID-19 patients. These results are from several studies on COVID-19 patients in the ICU. Patients who experienced ARDS were 8 times more than those who did not, with the highest proportion of severe ARDS among subjects. Not all subjects underwent lactate examination, and the proportion of patients with lactate levels ≥4 was higher than those with lactate levels <4. Subjects in the high-dose vasopressor group had a lower proportion than those in the medium-low dose. Most subjects used VM and feeding with the EN + sPN pathway more than EN alone.

A study on nutritional adequacy in patients with VM concluded that meeting 80% of the targeted calories would produce better clinical outcomes. In clinical practice, it was difficult to achieve this target; previous studies on nutritional adequacy found that patients with VM could only achieve 59% of the calorie target. Several guidelines suggest evaluating until withholding EN administration in COVID patients in the ICU with hemodynamic instability represented by vasopressors and increased lactate levels. The energy and protein deficit analysis results are significant for the vasopressors but not significant for vasopressor doses. More samples are needed to test the relationship between vasopressor dose and protein-energy deficit.

There are still gaps in the protein energy target with energy and protein intake in critically ill patients in the ICU, even though feeding recommendations and protocols have been implemented. Several studies have noted that protein-energy deficits in ICU patients using VM are caused by interruption of feeding, especially the EN pathway in patients undergoing airway procedures (weaning, tracheostomy), gastrointestinal intolerance and hemodynamic instability as represented by the use of vasopressors. Especially in COVID patients with VM in the ICU, the patient’s prone position and the use of paralytic agents are one of the causes of EN interruptions. Comorbidities, especially hypertension and DM, are significantly associated with poor nutritional outcomes. Susceptibility to infection in patients with comorbidities is associated with a worse degree of inflammation and malnutrition. This is related to an increase in energy requirements and a decrease in appetite, which ends in an energy-protein deficit in COVID patients in the ICU.

CONCLUSION

The presence of comorbidities and the use of vasopressors are risk factors for energy deficits. In contrast, the use of VMs and the presence of comorbidities are risk factors for protein deficits in COVID-19 patients in the ICU.

CONFLICT OF INTEREST

This study has no conflict of interest.

FUNDING

The researcher bore all costs required in this study.

ETHICS

This research was conducted after obtaining approval and a research permit from the Health Research Ethics Committee Dr. Kariadi General Hospital with Ethical Approval No.1096/EC/KEPK-RSDK/2022.

AUTHOR CONTRIBUTIONS

All authors contributed equally to the writing of this article.

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INTRODUCTION

Burns are skin or other organic tissue injuries primarily caused by heat or radiation, radioactivity, electricity, friction or contact with corrosive chemicals.1 Major burns trigger an inflammatory response followed by hypercatabolism and exacerbated by the loss of nutrients through the wound, which causes nutritional deficiencies.2 These conditions can interfere with immune function and wound healing, which increases the risk of infection, organ damage and death. This inflammatory response tends to continue due to debridement of wound care, complications of infection or sepsis, lack of sleep, and exposure to cold environments.2 Medical, nutritional therapy (MNT) is generally developed based on hypercatabolic conditions, maintaining digestive tract conditions, micronutrient supplementation, and ensuring a proper supply of protein, essential amino acids and energy.2 This paper will review the role of protein and glutamine in managing patients with major burns.

Role of Protein in Burn Injury

Proteolysis is a metabolic feature of the hypermetabolic response to burns, which can cause skeletal muscle mass loss of up to 150 g per day or 1.5 kg in 10 days without proper nutritional support. Critical Care Medicine (SCCM)/the American Society for Parenteral and Enteral Nutrition (ASPEN) recommends providing early enteral nutrition to major burn patients, namely within 6 hours, while the European Society for Parenteral and Enteral Nutrition (ESPEN) within 12 hours.3 Protein intake plays a role in repairing damaged tissue, production of acute phase proteins, cellular immunity, and gluconeogenesis. The daily protein requirement in burn patients is as follows: for burns less than 10% TBSA is between 1.2 - 1.5 g/kg BW; for burns with 10% - 15% TBSA is between 1.5 - 2.0 g/kg BW; burns with 15% - 35% TBSA is between 2.0 - 2.5 g/kg BW; burns with above 35% TBSA will need protein between 23% - 25% of total energy. Protein intake above the recommendation will not be able to increase protein utilization/assimilation but, instead, will increase urea load and nitrogen excretion through Urine Urea Nitrogen (UUN), azotemia, osteoporosis due to mobilization of calcium from bones, and kidney stones due to increased excretion of calcium. Adequate and sufficient energy intake is needed to maintain body weight to optimize wound healing.

Role of Glutamine in Burn Injury

Glutamine is a pharmaconutrient and the most abundant amino acid in the body, accounting for more than 20% of plasma and 40% of muscle. Circulating glutamine is maintained at a relatively constant level of 150 - 200 mg/ml in healthy subjects, with higher concentrations in tissues and body fluids with low oxygen levels.3 Glutamine is secreted by enterocytes, and is used for gluconeogenesis and maintaining enterocyte cells, intestinal integrity, and immune cells. For this purpose, a glutamine supplementation of 0.3 g - 0.5 g/kg/day is required for 10 - 15 days either enteraly or parenterally.

Keywords: burn trauma, inflammation, hypermetabolism, protein, glutamine.
at 0.42 - 0.70 mmol/L. The glutamine is a normal protein component, representing 8% of all amino acids. Glutamine is a conditional amino acid and becomes essential in burn conditions. Glutamine levels appear low during critical illnesses such as traumatic burns. Meanwhile, exudate fluid from burns contains a high concentration of glutamine, which indicates a high glutamine loss in burns.

Low blood glutamine levels are also associated with poor clinical outcomes. Under normal conditions, there is a balance between glutamine production in the liver, muscles, lungs and fat cells and glutamine catabolism in kidneys, brain, intestines and immune cells. However, muscle is the most dominant producer of glutamine in burn injury due to hypercatabolism. At the same time, the liver is the most dominant organ that consumes glutamine. The liver will use 7 Amino acids produced from this protein catabolism process to produce acute phase proteins, often manifested as an increased level of CRP. This catabolic process can also be seen in urine’s increasing urea nitrogen (UUN) levels. Protein metabolism to the hypermetabolic response can be relieved by administering parenteral glutamine at 0.5 g/kg/day dissolved in 5% dextrose with a ratio of 1:5 and distributed for 14 days. This study involved 55 patients with 30% -70% TBSA burns, and the results showed a decrease in resting energy expenditure (REE), serum catecholamines, glucagon, lactate, and homeostasis model assessment (HOMA). In a prospective study of patients with extensive severe burns at 25% - 90% TBSA, glutamine supplementation reduced the incidence of bacteremia by gram-negative bacteria and lowered CRP levels. These beneficial effects of glutamine are likely due to glutamine’s ability to maintain gut integrity and immune function. Parenteral administration of 20 g/day of glutamine in adult major burn patients is associated with serial reductions in absolute neutrophil counts. However, enteral glutamine supplementation at doses of 0, 5 g/kgBW/day given every 4 hours to patients with major grade II and III burns would not reduce the time to discharge alive from the hospital. Based on guidance from ESPEN, the right time to give glutamine to burn patients is immediately after enteral nutrition administration at 0.3 - 0.5 g/kg/day for 10-15 days.

**CONCLUSION**

Glutamine plays an important role in maintaining the integrity of the digestive tract because of its status as a primary substrate for enterocyte metabolism. It also maintains the structure of the digestive tract and normal immune function. Low glutamine levels can cause loss of barrier function of the digestive tract epithelium. Still, glutamine supplementation will be able to protect the intestinal epithelium from atrophy, which in turn prevents bacterial translocation, sepsis, and organ damage.

**CONFLICT OF INTEREST**

This study has no conflict of interest.

**FUNDING**

This review was conducted without grants, sponsors, or other funding sources.

**ETHICS**

Not Applicable.

**AUTHOR CONTRIBUTIONS**

All authors contributed equally to the writing of this article.

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EDITORIAL

The role of nutrition therapy in pemphigus vulgaris: A case report

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ABSTRACT

Introduction: Pemphigus Vulgaris (PV) is a rare autoimmune disease of the skin and mucous membranes caused by autoantibodies directed against the cell surface of keratinocytes. Adequate macronutrients and micronutrients play an important role in the skin healing process.

Case Presentation: A 55-year-old male diagnosed with pemphigus vulgaris and normal nutrition status based on WHO criteria. Physical examination finds multiple skin erosions from head to upper body and oral lesions. On laboratory examination, we found leucocytosis and hypoalbuminemia. The patient is given 2100 cal/day (35 cal/Kg/day) and protein target 102 g/day (1.7 g/Kg/day). A diet plan is a regular diet with high protein and oral supplements to support the healing process, such as vitamin A, vitamin B complex, vitamin C, zinc, and Curcuma.

Discussion: High calorie and protein nutrition for preventing weight and muscle mass loss. The total calorie requirement can be 20-35 cal/Kg/day and protein requirement 1.5-2 g/Kg/day. Oral supplementation has functions for cell proliferation, reepithelization epidermis, and immune system modulator to help the skin healing process.

Conclusion: Providing high calorie-protein nutrition and supplementation on PV can prevent protein loss and speed up the skin healing process.

Keywords: Autoimmune Imun, nutrition therapy, pemphigus vulgaris.

INTRODUCTION

Pemphigus Vulgaris (PV) is a rare autoimmune skin disease characterized by blisters and erosions in the skin and mucous membranes. It is associated with impaired immune regulation that produces IgG autoantibodies that attack cell junctions (Desmoglein 1 and 3), responsible for adhesion to other cells in cell tissue and causing separation of epidermal cells and skin damage. This can cause fluid and protein disturbances, infection, and even sepsis, which is life-threatening. Effective nutrition support plays a very crucial role in the treatment of PV, along with medical therapy.1

CASE PRESENTATION

A 55-year-old male came to the Hospital Emergency Unit and was diagnosed with Pemphigus Vulgaris and normal nutritional status based on WHO. He complained of blisters and erosion skin spreading to the head, face, chest, stomach, and back (Figure 1). The blisters were getting bigger and breaking easily, causing lesions and pain. There were lesions in the oral cavity and tongue, so the patient felt pain and had difficulty eating. There was no history of any allergies and taking medication.

On physical examination, found a body weight of 60 kg, height of 160 cm, Body Mass Index (BMI) 23.4 kg/m2, muscle wasting (-), leg edema (+/+), erosion and multiple bullae, firm boundaries, irregular, pus (+), crusts (+) on the head, face, chest, abdomen, and back. The initial laboratory result showed Hb 17.9 g/dL, leukocytes 15,950/uL, platelets 307,000/uL, eosinophils 0%, basophils 0%, neutrophils 76%, lymphocytes 11%, monocytes 12%, albumin 2.97 g/dL, creatinine 0.94 mg/dL, urea N 12 mg/dL. The patient was consulted by a clinical nutrition specialist on the 8th day of treatment, with laboratory results of Hb 13.7 d/dL, leukocytes 19,250/uL, platelets 350,000/uL, and albumin 3.19 g/dL.

RESULTS

The patient was given a gradual intake with target calories until 2100 kcal/day (35 kcal/Kg/day) and 102 g/day (1.7 g/Kg/day) of protein. On the 1st day, the patient was given only 1800 kcal/day and 85 g/day

Figure 1. First day of Hospitalization
of protein in a regular diet, oral nutrition supplement and parenteral nutrition, and the patient tolerated it well. On the 2nd day, the diet was stepped up to 2100 kcal/day of calories and 102 g/day of protein and the patient tolerated it well. This plan continued until the patient was discharged.

The food plan was given to patient in the form of soft solid diet 3 times/day, addition of 6-8 egg whites/day, high protein milk 2 times/day, sliced fruit 2 times/day, extra virgin olive oil 1 tablespoon/8 hours, parenteral nutrition (soya oil dan Medium Chain Triglycerides) 100 ml/24 hours for 7 days, Ophiophagus striatus extract 1 capsule/8 hours, oral supplementation to support skin healing such as vitamin A 10,000 IU/day, vitamin B complex 1 tablet/day, vitamin C 500 mg/day, zinc 20 mg/day, curcuma 2 tablets/8 hours for 10 days. After administration of nutritional therapy, body weight remained 60 kg, laboratory results Hb 14.7 g/dL, leukocytes 12,140/uL, platelets 325,000/uL, albumin 3.25 g/dL. The comparison of laboratory values before and after nutritional intervention is shown in Figure 2. The patient showed improvement and better skin healing during hospitalization, no weight loss, no secondary infection or any complication.

**DISCUSSION**

Pemphigus vulgaris triggers hypermetabolism, which causes increased energy requirements, extensive damage to the skin layers causes protein disturbances, and the lesion in the oral cavity and tongue causes a decrease in appetite. Hence, the energy intake is not sufficient for the energy required. This causes a risk of weight loss and loss of muscle mass. The clinical nutrition specialist takes a role in convincing the patient to follow the diet plan. To prevent insufficient energy, the patient is given high-calorie and protein nutrition. Total energy requirements: 20-35 kcal/kg/day. Protein requirements are 1.5-2 g/Kg/day. Micronutrients such as vitamin and B complex have a function to help the proliferation and re-epithelialization of the epidermis, vitamin C, zinc, and curcuma as antioxidants have function in collagen synthesis and fibroblast proliferation which help in skin healing process. Parenteral nutrition contains soya oil dan Medium Chain Triglycerides (MCT) has function as additional nutrition source, immune system modulator, and help cell proliferation.

**CONCLUSION**

Providing nutritional therapy can help prevent energy deficiency and loss of body protein, characterized by hypoalbuminemia, loss of muscle mass and weight loss. In addition, it can also prevent secondary infection and help better skin healing process.

**CONFLICT OF INTEREST**

This study has no conflict of interest.

**FUNDING**

The researcher bore all costs required in this study.

**ETHICS**

The patient in this study has agreed to use personal data related to writing scientific articles. The patient has also given informed consent consciously for data collecting and publication in scientific journals.

**AUTHOR CONTRIBUTIONS**

All authors contributed equally to the writing of this article.
The Role of Probiotic in Gut-Brain Axis of Cognitive Impairment and Alzheimer’s Disease Patient: A Review

Ni Made Meilani1*

ABSTRACT

Alzheimer’s disease (AD) is a neurodegenerative disease that affects thinking, behavior, and inability to do everyday tasks. There are no effective treatments for this condition. It only can slow the progression of the disease. Recently, it has been reported that the physiology and inflammation of the central nervous system (CNS) might be affected by gut bacteria. The nervous system and the gastrointestinal tract communicate through a bidirectional networking of signaling pathways called the gut-brain axis. Because of the regulating effect on gut microbiota, probiotics have been considered a prevention and promising adjuvant treatment for cognitive impairment and AD. This review aimed to elucidate the role of probiotics in the gut-brain axis of cognitive impairment and AD patients. Six randomized controlled trial studies were included in this review. The experimental group received different types of probiotics and followed during 12-24 weeks of intervention. The studies showed significant results in the parameters of cognitive function. Certain nutritional interventions may prevent and slow AD progression and improve cognitive function. Probiotics become one of the promising adjuvant therapies for AD. Further research still needs to be explored to draw more definitive conclusions.

Keywords: Alzheimer’s disease, probiotic, cognitive impairment, gut-brain axis.

INTRODUCTION

The gut-brain axis is a two-way network between the gastrointestinal tract and the central nervous system. This network does not but also includes humoral, metabolic and immune pathways. The study continues to reveal this mechanism of action to clarify the direct and indirect measure of gut microbiota on the affective and cognitive center of the brain. Studies show that fluctuations in gut microbiota are associated with the communication system.1

Neurological disorders are anticipated to become more prevalent as life expectancy increases in most nations.2 Neurodegenerative diseases are pathologically, clinically and genetically heterogeneous disorders defined by the progressive degeneration of glia or neurons or the networks and synapses connection. Cognitive impairment is a condition among older adults. Most people will experience symptoms such as difficulty remembering, inability to perform simple arithmetic and start forgetting words. Studies found that 1.0% of individuals with MCI will develop Alzheimer’s disease (AD) annually.3 According to the Centers for Disease Control and Prevention (CDC) in 2020, as many as 5.8 million people were diagnosed with AD, predicted to double in 5 years after age 65.4 In Indonesia, the number of people living with AD is estimated at 1 million people in 2012 and expected to double in 2030.4

Probiotics are live microorganisms that have an enormous effect on the composition and metabolic output of the gut microbiota.5,6 Multiple animal studies demonstrate that probiotics can enhance brain health, and human studies examining probiotics’ effect on cognitive function have provided positive results. This review shows the benefit of probiotics in the gut-brain axis in patients with cognitive impairment and AD.

ROLE OF PROBIOTIC IN GUT-BRAIN AXIS

This review aims to review the role of Probiotic in Gut-Brain-Axis in Patients with cognitive impairment and AD. Probiotic supplement showed promising effect in preventing and reducing the progression of AD. Gut microbiota interact with the pathogenesis of AD via multiple pathways: neuroinflammation, Aβ abnormality, tau phosphorylation, dysregulation of neurotransmitter and oxidative stress.7,8 In Akbari et al. study, the experimental group with probiotics had a significant result in the Mini Mental State Examination (MMSE) score compared with control group.9 Study by Akhgarjand et al. also found a similar result, they found a significantly MMSE improvement in the B. longum intervention group.7 Asaoka et al. and Kobayashi et al. found MMSE showed the improvement of cognitive function on some subscales scores.7,9 But study of Agahi et al. stated that the cognitive function using Test Your Memory (TYM) assessment indicated no difference between the control and probiotic groups.10 Tamtaji et al showed significant improvement in MMSE score on probiotic group.11 Some of the secondary outcomes such as measurement of inflammation, oxidative stress, metabolic profiles, brain atrophy, gut microbial analysis also gave a positive results.

The relationship between probiotics and brain function described in three main
pathways, such as immune modulation, endocrine pathways and neuronal regulation. Via immune modulation, small chain fatty acids (SCFAs), act as the main metabolites, produced by the fermentation of gut microbiota, suppress pro-inflammatory mediators while upregulating the anti-inflammatory mediators.74 The hypothalamic-pituitary-adrenal (HPA) axis is activated by probiotics via endocrine pathways. Further, the HPA axis will stimulate adrenal release of cortisol, which is the most potent anti-inflammatory hormone.9 Probiotics also stimulate the production of glucagon-like-peptide-1 (GLP-1) and peptide YY (PYY) hormones by intestine enteroendocrine L-cells (EECs). Via neuronal regulation, probiotics secrete certain neurotransmitters such as glutamate (GLU) or modulate the secretion of neurotransmitters via enterochromaffin cells (EC) such as serotonin (5-HT). These neurotransmitters and neuroactive metabolites exert neuroprotective effects in concert, preventing neuronal apoptosis.10

According to the result of clinical studies, probiotic consumption has a beneficial effect on people with cognitive impairment and AD. All of these probiotics are known to be good bacteria that inhibit the growth of detrimental bacteria and strengthen the immune system. Probiotics serve a crucial role in the interaction of the gut-brain axis, improving both the brain and the gut.11

This review provides evidence-based research on the function of probiotics in slowing the progression of AD. The clinical trials have demonstrated that probiotics should be incorporated into the treatment of AD. Regarding this statement, no adverse effects associated with the use of probiotics for AD have been reported. In the future, more clinical trials will be required to detect AD specific alterations in the gastrointestinal microbiome. However, numerous scientific gaps remain to be investigated. Consequently, a more deeper investigation about the relationship between nutrition and AD is advised.

CONCLUSION

Certain nutritional interventions may prevent and also slow the progression of AD and improve cognitive function. Probiotics become one of promising adjuvant therapy for AD. Further research still needs to be explored to draw more definitive conclusions.

CONFLICT OF INTEREST

This study has no conflict of interest.

FUNDING

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ETHICAL APPROVAL

Not Applicable.

AUTHOR CONTRIBUTIONS

All authors contributed equally in the writing of this article.

REFERENCES

Administration of oligomeric enteral formula in a patient with grade A pancreocutaneous fistula, post laparotomy et causa colonic perforation in flexura lienalis adenocarcinoma

Eka Puspa Dewi1*, Wiji Lestari1, Lily Indriani Oktovia1,2, Wina Sinaga1,2, Nita Nurul1, Wella Angelia1

ABSTRACT

Introduction: The risk of fistula increases in patients undergoing gastrointestinal surgery. Pancreocutaneous fistulas can increase the risk of sepsis and malnutrition. The problem that often occurs in fistulas is high output fistulas, an increase in fistula production of more than 500 mL/day. The administration of oligomeric formula is known to reduce fistula production significantly. This case report aims to describe the provision of oligomeric enteral nutrition in patients with grade A pancreatic fistula.

Case presentation: A 51-year-old male patient was admitted to the ICU with a grade A pancreocutaneous fistula. On the 14th day of POD treatment, a pancreocutaneous fistula appeared with a fistula production of 600 mL/24 hours; from the results of drain analysis, it was found that amylase was 279 U/L and lipase was 2139 U/L indicates the presence of a high output pancreatic fistula. The patient was given oligomeric enteral nutrition from the 15th day of POD treatment. There was a decrease in fistula production when administering the oligomeric formula.

Conclusion: Providing oligomeric enteral nutrition is effective in helping to reduce fistula production and amylase-lipase output in patients with high-output pancreatic fistulas.

Keywords: High output fistula, oligomeric enteral formula, pancreocutaneous fistula.

INTRODUCTION

Flexural splenic adenocarcinoma is a colon cancer in the distal transverse or proximal descending colon 10 cm from the flexure. The incidence of splenic flexure adenocarcinoma is relatively rare, 1-8% of all colon cancers. Hemicolectomy is the most common surgical procedure for flexural splenic colon cancer.1 The risk of fistula increases in patients undergoing gastrointestinal surgery, accounting for 9-40% of all postoperative complications. The pancreocutaneous fistula is an abnormal duct between the pancreas and the skin that secretes pancreatic enzymes with an elevated amylase content three times the normal serum value. Pancreocutaneous fistula may increase the risk of sepsis and malnutrition.1,2

Three grades of pancreocutaneous fistula based on the International Study Group on Pancreatic Fistula (ISGPF) are grade A if pancreocutaneous fistula has no clinical impact and requires little change in management.3 Grade B if pancreocutaneous fistula requires a change in management or adjustment of the clinical course. Grade C if the pancreocutaneous fistula requires a major change in management. In the case of the patient, pancreocutaneous fistula grade A.3,4

The problem that often occurs in the fistula is high output fistula, which is an increase in fistula production of more than 500 mL/day. The administration of oligomeric formulas is known to reduce fistula production significantly. This case report aims to describe the provision of oligomeric enteral nutrition in a grade A pancreocutaneous fistula patient post laparotomy with colon perforation in stage 2A flexura lienalis adenocarcinoma.

CASE PRESENTATION

A 51-year-old male patient has been admitted to the ICU with grade A pancreocutaneous fistula, post laparotomy and causa colonic perforation in stage 2A flexural splenic adenocarcinoma. According to ASPEN criteria, the patient with a body mass index of 28.9 kg/m2 had severe malnutrition. On the 14th day of POD treatment, a pancreocutaneous fistula appeared with a fistula production of 600 mL/24 hours, from the results of drain analysis obtained amylase 279 U/L and lipase 2139 U/L indicating a high output of pancreatic fistula. The patient was given oligomeric enteral nutrition on the 15th day of POD treatment.

Oligomeric enteral nutrition was started at 500 kcal, increasing gradually to 1400 kcal on the last day of treatment in the ICU. The administration of oligomeric formula used contained protein in the form of protein hydrolysis and some fat in the form of triglyceride (MCT) 40%. There was a decrease in fistula production that could be observed from the 17th POD day of oligomeric formula administration. On the last day of treatment in the ICU, fistula production...
was found to be at least 50 mL/24 hours, with the results of the anal and lipase drain levels also decreasing to 120 U/L and 1515 U/L, and the fistula closed spontaneously.

**DISCUSSION**

The oligomeric enteral formula is a complete nutritional formula with a peptide composition that is not a whole protein obtained through the process of hydrolysis of whey protein into oligopeptides, dipeptides, and tripeptides which are sources of nitrogen and fat, especially in the form of medium chain triglyceride (MCT). The administration of oligomeric formula minimizes pancreatic enzyme secretion, thereby reducing the volume and output of amylase.\(^5\) Hydrolyzed whey protein and MCTs are beneficial in conditions of impaired absorption because they can be absorbed more easily and quickly and protect the integrity of the intestinal mucosa. Fats in the form of MCT can be directly absorbed through the intestinal mucosa into the portal vein as their absorption is independent of pancreatic digestive enzyme bile salts and are rapidly oxidized as an energy source, resulting in less stimulation of pancreatic exocrine secretion than standard formulas, and can decrease pancreatic activity.\(^6,7\)

The oligomeric formula’s more effective absorption and minimal stimulation of pancreatic enzyme secretion resulted in decreased fistula production and amylase-lipase secretion in this patient.

**CONCLUSION**

Oligomeric enteral nutrition given starting from 500 kcal, increasing gradually up to 1400 kcal on the last day of treatment in the ICU, is effective in helping to reduce fistula production and amylase-lipase expenditure in patients with high output pancreocutaneous fistula.

**CONFLICT OF INTEREST**

This study has no conflict of interest.

**FUNDING**

The researcher bore all costs required in this study.

**ETHICS**

The patient in this study has agreed to use personal data related to writing scientific articles. The patient has also given informed consent consciously for data collecting and publication in scientific journals.

**AUTHOR CONTRIBUTIONS**

All authors contributed equally to the writing of this article.

**REFERENCES**

Medical nutrition therapy in a patient with guillain-barré syndrome, type 2 diabetes mellitus, and vitamin D deficiency: A case report

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ABSTRACT

Introduction: Patients with Guillain-Barre Syndrome (GBS) are susceptible to malnutrition due to immobility and high inflammatory conditions, which cause significant autonomic dysfunction, a progressive loss of muscle mass, and respiratory failure signs. Maintaining respiratory muscle mass is a specific goal of medical nutritional therapy.

Case Illustration: A 59-year-old man with GBS, type 2 diabetes mellitus (DM), and vitamin D deficiency. The patient has uncontrolled blood sugar, high inflammatory markers, low calcium ions and vitamin D deficiency. The patient experiences decreased muscle strength in all four extremities, especially both upper arms. According to recommendations, the patient was given calories and protein according to energy recruitment of 28–33 kcal/kg BW/day and protein of 1–1.2 g/kg BW/day. Patients experienced improvements in blood glucose control and motor status.

Discussion: Patients with a risk of experiencing malnutrition due to hypermetabolism. In this patient, inflammatory markers during treatment were still high. Prevention of respiratory muscle wasting is important because the main causes of death in GBS are pneumonia and respiratory distress syndrome. Medical nutritional therapy in GBS patients plays a role in preventing a decrease in muscle mass, especially in maintaining muscle mass. A sufficient amount of protein, carbs, fat, and vitamins are given to the patients.

Conclusion: Providing nutritional and medical therapy improves GBS patients’ motor status and blood glucose.

INTRODUCTION

A rare but devastating post-infectious immune-mediated neuropathy is Guillain-Barré syndrome (GBS). It is brought on by an autoimmune reaction that destroys peripheral nervous system nerves, leading to symptoms including tingling, weakness, and numbness that can become paralysis.1

Patients with Guillain-Barre Syndrome (GBS) are at risk for malnutrition due to high levels of immobilization and inflammation. Increased inflammation causes severe autonomic dysfunction and progressive muscle mass loss, with respiratory failure symptoms and muscle mass decreases.1,2 Nutritional medical therapy plays a role in preventing the loss of fat-free mass, especially to maintain respiratory muscle mass. This case report aims to know the importance of nutritional medical therapy in GBS.

CASE ILLUSTRATION

A 59-year-old ma59-year-old with type 2 diabetes mellitus (DM) and vitamin D deficiency. The patient has uncontrolled blood sugar, high inflammatory markers (C-reactive protein 5.6 mg/dL), low calcium ion (0.9 mmol/L) and vitamin D deficiency (vitamin D 25 OH total 8.6 ng/mL). The patient experienced decreased muscle strength in all four extremities, especially in both upper arms. Muscle strength in the upper extremities is 3 in the upper arm and forearm and 0 in the hands and fingers. Muscle strength in the lower extremities, 4 in the upper and lower legs and 3 in the feet and toes. According to recommendations, the patient is given calories and protein, 28–33 kcal/kg BW/day energy, and 1–1.2 g/kg BW/day (Figure 1). The patient had improved motor status in the upper extremities at discharge. Muscle strength in the upper extremities: 3 in the upper arm and forearm and 1 in the hand and fingers. Muscle strength in the lower extremities, 4 in the upper and lower legs and 3 in the feet and toes. The patient also had improvement in blood glucose control (Figure 2).

Figure 1. Energy (A) and protein (B) intake monitoring
DISCUSSION

Patients with GBS are at risk for malnutrition due to a hypermetabolic and hypercatabolic state due to the disease's endocrine, infectious and inflammatory components. The inflammatory condition during treatment was still high in these patients, characterized by increased inflammatory markers. Prevention of respiratory muscle wasting is important because the leading causes of death in GBS are pneumonia and respiratory distress syndrome. Medical nutrition therapy in GBS patients plays an important role in preventing a decrease in muscle mass, especially in maintaining respiratory muscle mass. We give the patient, in this case, energy and protein according to recommendations. Providing adequate protein achieves a positive protein balance: muscle protein synthesis is higher than muscle protein breakdown. Proper energy of carbohydrates and fats is needed for a protein-sparing effect to prevent muscle protein from being used as an energy source. Vitamin D in GBS patients promotes immunomodulation of autoimmune disease and improves immunity resistance.

CONCLUSION

Medical nutrition therapy helps improve motoric status and blood glucose in GBS patients.

CONFLICT OF INTEREST

This study has no conflict of interest.

FUNDING

The researcher bore all costs required in this study.

REFERENCES

Altering risk practice of food nutrition choice among medical students: A formative study

Nathalia Safitri¹*, Perigrinus Sebong², Felita Surya Rini³

**ABSTRACT**

**Introduction:** Medical students are susceptible to neglecting the information on the food packages. This study aims to identify predictor factors and provides recommendations for nutrition literacy programs for medical students.

**Methods:** The formative research applied the BEHAVE framework to investigate the current practices of reading nutrition information among medical students in Semarang City. Medical students collected data through open-ended questions and self-questionnaires (n=68). Univariate and linear regression tests were used with significance (p-value < 0.05).

**Results:** The study participant's majority were female (69.1%), with a mean age of 19.6 (SD= 1.30) years. Among 68 respondents, 33 (48.5%) were normal weight, 10 (14.7%) were underweight and obese class I, 9 (13.2%) were obese class II, and 6 (8.8%) were overweight. Normal weight had a lower risk or tended to read nutrition information labels routinely compared to underweight (OR=1.15), obesity class II (OR=1.11), overweight (OR=2.28), and obesity class II (OR=3.37). Participants were prone to purchasing food without nutrition information and neglected recommended nutrition choice practices, such as reading nutrition composition and information about food producers.

**Conclusion:** Medical students’ high abnormal body mass index ratio could be due to a combination of the predictor and social determinants factors. These factors need to be modified risk behavior through increased literacy in reading food nutrition information on the food packages.

**Keywords:** Food label, obesity, risk factor, student, nutrition information, formative study.

**INTRODUCTION**

An unhealthy and unbalanced diet leads to obesity among reproductive age.¹² Basic Health Research found that in 2013, the prevalence of obesity among the adult male population was 19.7%, higher than in 2010 (7.8%). While the adult female population was 32.9% in 2013 compared to 2010 (15.5%).¹³ Previous evidence confirms that diet practices among the Indonesian population are less healthy. The unhealthy consumption pattern is influenced by cultural, economic, industrialization, knowledge of nutrition information, and technological developments.⁴ These determinant factors encourage people to shift towards new habits by choosing ready-to-eat and packaged food for reasons and affordability.⁵ Six This pattern of consumption pattern food needs to be more considerable because it contains sodium, sugar, saturated fatty acids, trans fatty acids, and preservatives. However, evidence on university students remains unexplored in Indonesia.⁷ Previous studies have shown that medical students are susceptible to unhealthy dietary habits. Medical students have even neglected the nutrition information label on the package label.⁸⁹ The behavior of reading nutrition labels has not become a concern due to a lack of awareness to notice the nutritional composition of food packages. The evidence emphasized by the National Consumer Protection Agency found only 6.7% of the population in Indonesia was aware of the nutrition information labels. Although several articles report the results of nutritional choice studies, key gaps in developing interventions for reading food information labels still exist. These gaps include how to combine and weigh information provided by expert informants versus that of regular faculty members, which has not been developed systematically. Therefore, understanding such factors and the processes that can be employed to develop effective interventions at multiple levels (individual and organizational) is highly needed. This study aims to establish baseline data for nutrition promotion programs among medical students. The specific aim is to identify significant predictors of nutrition choice and to develop a recommendation for reducing predictors of risk practice behavior.

**METHODS**

This study was designed as formative research and conducted at the Faculty of Medicine, Soegijapranata Catholic University, Semarang, Indonesia.¹⁰¹¹ The research team developed questionnaires to identify the most neglected determinants of specific behaviors of interest. It used the BEHAVE framework developed by the Academy for Educational Development to translate findings into context-specific social and behavior change strategies.¹¹ Verbal consent was obtained from all participants before their inclusion in the study. Data were collected from medical students using structured questionnaires to assess risk practices relating to nutrition information on the food packages from May to June 2023. Information on the Body Mass Index at the time of the survey was obtained. We also collected demographic information such as participants’ ages and sex. The data on participants’ characteristics, including age, gender, and body mass index (BMI) presented descriptively. The significance level of a predictor was determined by...
either P values <0.05 or, in the case of odds ratio, if the confidence of interval (CI) did not cross 1.

RESULTS

A total of 68 medical students were included in the study. The majority were female (69.1%), with a mean age of 19.6 (SD= 1.30), ranging from 16 to 23 years (Table 1). This age range was selected for design reasons relating to impact assessment. Regarding the BMI, among 68 respondents, 33 (48.5%) were normal weight, 10 (14.7%) were underweight and obesity class I, 9 (13.2%) were obesity class II, and 6 (8.8%) were overweight.

Univariate analysis showed males and females did not significantly differ in practicing reading nutrition information on food packages. In contrast, the risk estimates of the participants’ age had a positive association. However, age was not statistically significant for reading nutritional information on the food package. Interestingly, the interaction between weight status (body mass index) and reading nutrition information was not statistically significant. Normal weight had a lower risk or tended to read the nutrition information on the food packages compared to underweight (OR=1.15), obesity class II (OR=1.11), overweight (OR=2.28), and obesity class II (OR=3.37). The interaction term between weight status and reading nutrition information did not reach significance, meaning that weight status did not modify the relation between knowledge and practicing reading nutrition information on food packages.

The examination was conducted with a regression model for the predictors’ factor test. All items were partially included in the statistical test. The results found four predictor factors with significant values higher than 0.05 (table 2). The expired date information, food serving size, registration number, and received information on how to read food labeling emerged as significant predictors for practicing reading nutrition information on the food packages. Therefore, serious risk factors in this study, such as not reading nutrition composition and food producer profiles, purchasing food products without nutrition information, and low levels of understanding regarding nutrition information on the food packages, should be modified or intervened immediately.

DISCUSSION

Our findings revealed significant inconsistencies between basic knowledge and practices. Reading the nutrition composition on the food package, reading the information about food product manufacture, purchasing food products without nutrition information labels, and understanding the nutrition information on the food package are the predictors of reading nutritional information on food packages. There are serious risk factors in this study should be modified or intervened immediately. The well-understood nutritional information on food labels reflects an ability to calculate quantitative information and to understand the nutrition information contained in the food packages. This study found that medical students are prone not to read the nutrition information on packaged foods due to a lack of nutritional literacy. Inadequate nutrition information regarding understanding nutrition terms such as serving sizes and the nutrients contained leads them to ignore the nutritional information on packaged foods. This study is in line with previous studies. Reading nutrition information on the food packages needed additional time. Medical students are prone to neglect nutritional information and prefer buying products without labeled nutrition

Table 1. Univariate analysis of respondent characteristics and reading nutrition information

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR</th>
<th>(95% CI)</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (Male vs. Female)</td>
<td>0.409</td>
<td>0.075-2.221</td>
<td>0.369</td>
</tr>
<tr>
<td>Age (&lt;20 yrs vs &gt;20 yrs)</td>
<td>1.88</td>
<td>0.205-17.36</td>
<td>1.000</td>
</tr>
<tr>
<td>BMI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Underweight</td>
<td>1.15</td>
<td>1.022-1.217</td>
<td>0.581</td>
</tr>
<tr>
<td>Normal</td>
<td>0.50</td>
<td>0.085-2.932</td>
<td>0.608</td>
</tr>
<tr>
<td>Overweight</td>
<td>2.28</td>
<td>0.221-23.51</td>
<td>0.438</td>
</tr>
<tr>
<td>Obesity Class I</td>
<td>3.37</td>
<td>0.529-21.522</td>
<td>0.212</td>
</tr>
<tr>
<td>Obesity Class II</td>
<td>1.11</td>
<td>1.022-1.213</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Table 2. Predictors of reading nutritional information on food packages

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Coef. Linear</th>
<th>Adjusted R square</th>
<th>Significant (p &lt; 0.05)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading the expiration date of food product</td>
<td>2.79</td>
<td>0.09</td>
<td>0.007*</td>
</tr>
<tr>
<td>Reading the food product brand</td>
<td>5.59</td>
<td>0.31</td>
<td>0.000*</td>
</tr>
<tr>
<td>Reading the netto information on the food product package</td>
<td>3.07</td>
<td>0.11</td>
<td>0.003*</td>
</tr>
<tr>
<td>Reading the food serving size on the package</td>
<td>2.51</td>
<td>0.07</td>
<td>0.014*</td>
</tr>
<tr>
<td>Reading the nutrition composition on the food package</td>
<td>1.54</td>
<td>0.02</td>
<td>0.126</td>
</tr>
<tr>
<td>Reading the registration number of food product</td>
<td>2.29</td>
<td>0.06</td>
<td>0.025*</td>
</tr>
<tr>
<td>Reading the information about food product producer</td>
<td>1.40</td>
<td>0.01</td>
<td>0.164</td>
</tr>
<tr>
<td>Purchase food products without nutrition information labels</td>
<td>1.30</td>
<td>0.01</td>
<td>0.197</td>
</tr>
<tr>
<td>Understanding the nutrition information on the food package</td>
<td>0.63</td>
<td>0.09</td>
<td>0.529</td>
</tr>
<tr>
<td>Received the information on how to read the nutrition information on the food package</td>
<td>3.62</td>
<td>0.15</td>
<td>0.001*</td>
</tr>
</tbody>
</table>
information. During the transition of an epidemic of noncommunicable diseases, reading nutrition information on food packages is a basic effort to reduce the incidence of obesity. People with inadequate knowledge have difficulties adopting dietary behavior changes, which can cause nutritional problems even if it is not a direct impact of nutritional disorders. Therefore, findings provide erroneous beliefs about nutritional information and food choice practices to shape health promotion messages for the university context. This proposed predictive analytics is based on an individualized auto-regression that will be applied for personalization when there is insufficient data on the compliance ratio of a type of intervention related to modifying risk behaviors. Despite this study being limited to a specific population and potentially being sensitive to the additional data available over time, we adopt a strategy to prioritize personal factors based on the greatest improvement possible behavior and a standardized framework supported by biomarkers of health outcomes. The findings presented in this paper are relevant for the design of nutrition health promotion interventions.

**CONCLUSION**

This study presents how formative research can identify and quantify knowledge, attitudes, and determinants of nutritional choice practices and shape communications strategies to address the most salient behavioral determinants. These findings are likely applicable to other faculty in the university in Semarang. The high ratio of weight status among medical faculty in the university in Semarang. The findings are likely applicable to other faculty in the university in Semarang. The findings are likely applicable to other faculty in the university in Semarang.

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Nutrition therapy in HIV patient with peptic ulcers, severe anemia and severe malnutrition: A case report

Made Adinanta Purnawijaya

ABSTRACT

Introduction: HIV is a sexually transmitted disease that still has a high incidence rate. In general, one of the main problems in people with HIV is the problem of significant weight loss. Complications that can arise, especially in the gastrointestinal tract, are diarrhea, nausea, vomiting, painful swallowing, heartburn, and sometimes bleeding in the gastrointestinal tract, which leads to anemia.

Case Report: A 48-year-old woman came to the emergency room complaining of weakness, blackness, stomach pain and decreased appetite. Past medical history was HIV with uncontrolled medication. Examination found heartburn (+) anemic conjunctiva (+). Endoscopy found an ulcer in the stomach; DL results obtained Hb of 2.6g/dL. The therapy given was in the form of injection of pantoprazole, sucralfate syrup and folic acid 2 mg, injection of mecobalamin, zinc 20 mg, and PRC transfusion 6 kolf. The nutritional status of the patient is classified as underweight. Weight loss (+) of 6 kg for 2 weeks (11.7%). From nutritional therapy, the patient was given an intake of 2100 kcal, 280 gr KH, 90 gr protein, 60 gr fat (chopped soft food, 2 x 200 kcal Peptamen milk formula, and 2 x 200 cc fruit juice). After treatment for 1 week, the patient was allowed to go home with Hb 8.8 g/dL and a weight of 46.1 kg; Lila was 21.8 cm with complaints that had improved increased food intake.

Conclusion: Providing nutritional therapy, routine ARV drug administration, and family support are needed to improve the condition of patients with HIV infection.

Keywords: anemia, HIV, malnutrition, peptic ulcer

INTRODUCTION

HIV is a sexually transmitted disease that still has a high incidence rate so far. According to WHO data, in 2021, there will be 38.4 million people living with HIV worldwide. In general, one of the main problems in people with HIV is the problem of significant weight loss. Poor nutritional status is often associated with disease progression, increased morbidity, and reduced survival rates.

Several other complications in HIV patients, especially in the digestive tract, diarrhea, nausea, vomiting, difficulty swallowing, heartburn and sometimes gastrointestinal bleeding caused by decreased intake and appetite, candidiasis infection, cytomegalovirus infection, herpes simplex, and idiopathic. Reduced intake and the possibility of gastrointestinal bleeding sometimes mean HIV patients can also experience anemia. Appropriate nutrition to HIV patients and administering therapy can determine the health outcomes of HIV patients. This case report aims to describe the importance of nutrition therapy in patient with HIV infection with complications

CASE PRESENTATION

A 48-year-old woman came to the Emergency Room with weakness as the main complaint since 1 week ago; other complaints are black defecation, heartburn, and decreased appetite. Past medical history indicated that the patient was an HIV patient with uncontrolled medication. From the physical examination, blood pressure was 110/60 mmHg, pulse 88x/minute, respiration 20x/minute, intestinal peristalsis (+) normal impression, heartburn tenderness (+), conjunctival anemia (+). The endoscopic investigation found ulcerous lesions in the stomach, and laboratory examination found a decrease in Hb, namely 2.6, with the impression of normochromic normocytic anemia. Patients were given therapy in pantoprazole injection, oral sucralfate syrup and folic acid 1x 2mg, mecobalamin injection 3 times a day, zinc tablets, O2 via nasal cannula 2 lpm, and NaCl infusion. The patient also plans to receive 6 kolf of PRC transfusion for her anemia. From the anthropometric status of the patient, the patient's weight was 45 kg, height 160 cm, with a BMI of 17.5 kg/m². The patient got 6 kg of weight loss during the last 2 weeks (11.7%). Nutritional therapy is given gradually by reviewing complaints about the patient's condition and whether the black defecation is still. The doctor starts the nutritional therapy with an intake of 900 kcal, increasing gradually until 160. In the end, when the patient goes home, it contains 200 grams of carbohydrates, 70 grams of protein, and 50 grams of fat in the form of soft food and chopped side dishes three times a day, then also given Peptamen milk formula twice a day, and fruit juice twice a day. Patients are routinely monitored for Hb levels every 2 days or after transfusion, and their daily
intake is also monitored. After monitoring for approximately 1 week, the patient was allowed to go home with hemoglobin when discharge was 8.8 g/dL and weight when the patient discharged was 46.1 kg, with an increase in arm circumference to 21.8 cm. At home, patients are advised to monitor their regular food that contains a high-calorie, high-protein diet, be given an appropriate treatment, and regularly control their treatment.

**DISCUSSION**

Therapy for HIV patients must consider the patient’s accompanying conditions, especially the risk of worsening nutritional status, which is usually caused by a lack of food intake due to anorexia, depression, opportunistic infections, nausea, vomiting, diarrhea and others. The patient’s diet is given a high intake of calories and protein which should be divided into small portions and often to not burden digestion and prevent nausea and vomiting, and more optimal administration, and should also be given foods that are not overly seasoned, spicy, tea, sour and foods that makes bloating and nausea. According to the WHO, the intake required is usually increased by 10% of the daily energy requirement in asymptomatic patients and by 20-30% in patients with symptoms. Besides providing macronutrients such as carbohydrates, protein and fat, micronutrients such as vitamins A, B, C, E, and zinc should also be considered in patients with HIV. The provision of these micronutrients can prevent complications such as anemia and help increase the patient’s immune system to fight infections that often occur in people with HIV. Micronutrient deficiency conditions can also contribute to oxidative stress, which is a condition that can accelerate immune cells; providing adequate nutrition and intake can improve the general condition and response to ARV treatment. In addition to both nutritional and drug therapy, support from the family is very influential for enthusiasm and preventing psychological impacts that worsen the patient’s intake and condition.

**CONCLUSION**

Nutrition therapy is needed in all patients with HIV, whether with symptoms or not. Providing nutritional therapy is useful for preventing complications such as malnutrition, gastrointestinal disorders, and infections; routine ARV drug administration and family support are needed to meet treatment and intake, and the patient’s condition can improve and carry out daily activities properly.

**CONFLICT OF INTEREST**

This study has no conflict of interest.

**FUNDING**

The researcher bore all costs required in this study.

**ETHICS**

The patient in this study has agreed to use personal data related to writing scientific articles. The patient has also given informed consent consciously for data collecting and publication in scientific journals.

**AUTHOR CONTRIBUTIONS**

All authors contributed equally to the writing of this article.

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The benefits of procyanidin for lung cancer: A systematic review

Clara Alverina¹, Bambang Wirjatmadi²

INTRODUCTION

Proanthocyanidin is the source of procyanidin, a subclass of flavonoid. Generally present in nuts, grains, and fruits. Procyanidin has shown promise in numerous studies as an antioxidant, anti-inflammatory, anti-cancer, anti-atherothrombotic, hypoglycaemic, and hypotensive substance.¹ The material that is currently accessible on procyanidin’s advantages in treating lung cancer in human cells is comprehensively reviewed in this study.

METHODS

Relevant keywords consisting of “Procyanidin” AND “Cancer” were explored in Pubmed. Data was pooled from 20 to 30 May 2023. Studies were screened to exclude non-human studies, unrelated study topics, a publication of more than ten years and studies published in languages besides English and Indonesian. This study aligns with the PRISMA flow diagram, and the data summary was extracted in a table. For the quality of the study that used in this systematic review, we use the National Institutes of Health (NIH) Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies.

RESULTS

The database search identified 291 studies for preliminary review. All studies were screened, 288 were excluded, and three were included in this systematic review. The characteristics of the included studies are summarized in Table 1. The main mechanisms of procyanidin were anti-inflammation and antioxidant activity. The final results found that procyanidin has anti-neoplastic and chemopreventive functions.

DISCUSSION

The first study in 2016 reported that procyanidin has an anti-neoplastic effect via major eicosanoid signaling pathways. Procyanidin acted as a natural COX-2 inhibitor and an inducer of PGIL. It increased 15-HETE production and inhibited caspase 3. Caspase 3 plays an important role in cell apoptosis.² In line with the study, Mao et al. reported that procyanidin significantly increased PGE3, which has anti-proliferative and anti-inflammatory activities. It also increased omega-3 PUFAs, EPA and DHA, with anti-inflammatory and immunomodulatory properties.² ³⁴ In another study in 2019, procyanidin had a chemoprevention effect. Using a maximum dose of Leucoselect Phytosome, 4 caps a day, procyanidin decreased the expression of Bronchial Ki-67, a marcell proliferation marker also down-regulated miR-19a, -19b, and -106b that correlates with decreased cell proliferation and induction of apoptosis.³

CONCLUSION

Procyanidin has antioxidant and anti-inflammatory activity that can inhibit the proliferation of cancer cells. Future research is still needed to understand procyanidin’s benefits on other cancers.

CONFLICT OF INTEREST

This study has no conflict of interest.

FUNDING

This review was conducted without grants, sponsors, or other funding sources.

ETHICS

Not Applicable.

AUTHOR CONTRIBUTIONS

All authors have contributed to this research process, including conception, design, collection and assembly of data, analysis and interpretation of the data, drafting of the article, and critical revision of this manuscript.
Table 1. Overview of the characteristics of the included studies

<table>
<thead>
<tr>
<th>Authors</th>
<th>Country</th>
<th>Study Quality</th>
<th>Material</th>
<th>Sample</th>
<th>Method</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mao JT et al.</td>
<td>USA</td>
<td>Good</td>
<td>Leucoselect phytosome (standardized oligomeric procyanidins complexed with soy phospholipid)</td>
<td>20 person, high risk heavy active or ex-smokers, 21 years of age or older, with a smoking history of at least 30 packs/years</td>
<td>Sample extraction using bronchoscopy, cell cultures, MTT assay, cell death ELISA, Quantigene assay, SIRNA transfection, Quantification of 15-HETE, Quantification of 6-keto PGF1α, PTGIS ELISA, Quantification of caspase 3 activity</td>
<td>Procyanidin increased PG1 and 15-HETE production acted as a natural COX-2 inhibitor. Procyanidin also inhibited caspase 3, which abrogated apoptosis.</td>
</tr>
<tr>
<td>Mao JT, et al</td>
<td>USA</td>
<td>Fair</td>
<td>Leucoselect phytosome (standardized oligomeric procyanidins complexed with soy phospholipid)</td>
<td>6 person, high risk heavy active or ex-smokers, with a smoking history of at least 30 packs/years, age 46 – 68</td>
<td>Sample extraction using bronchoscopy and biopsy, histopathology grading, expression of Ki-67, measurements of serum MiR-19a, -19b and -106b</td>
<td>Procyanidin decreases the expression of Ki-6 downregulated miR-19a, -19b and -106b.</td>
</tr>
<tr>
<td>Mao JT, et al</td>
<td>USA</td>
<td>Fair</td>
<td>Leucoselect phytosome (standardized oligomeric procyanidins complexed with soy phospholipid)</td>
<td>6 person, high risk heavy active or ex-smokers, with a smoking history of at least 30 packs/years, age 46 – 68</td>
<td>Blood sample extraction, lipidomics, chromatographic and mass spectrometric analysis, measurements of serum PGE, and LTB4, cell cultures, PrestoBlue Cell viability/proliferation assay</td>
<td>Procyanidin increased omega-3 PUFA, EPA, DHA and PGE3, In vitro, procyanidin inhibited the proliferation of preneoplastic and lung cancer cells.</td>
</tr>
</tbody>
</table>

REFERENCES

Medical nutritional therapy for gingival mucoepidermoid cancer patient: A case report

Yosua Yan Kristian1*, Wiji Lestari1, Yohannessa Wulandari1, Nurul Ratna Mutu Manikam1

INTRODUCTION

Mucoepidermoid carcinoma is one of the most common types of oral cancer. Nearly 30% of cancer patients are malnourished, induced by metabolism alteration, therapy side effects, dysphagia, and anorexia. The common side effects of radiation therapy in the oral cavity are mucositis, xerostomia, odynophagia, and ageusia. Multidisciplinary approach is essential in cancer management, which includes a haemat-oncologist, surgeon, otolaryngologist, radiotherapist, and clinical nutrition to provide optimal treatment and prevent further complications. Nutritional therapy begins from the diagnosis of the disease until either homecare follow-up or palliative care. This case report aims to present the personalized-medical nutritional therapy for gingival mucoepidermoid cancer patient.

CASE PRESENTATION

A 22-year-old woman was diagnosed with gingival mucoepidermoid carcinoma T4aN0M0 and had undergone a mandibular reconstruction, followed by radiotherapy treatment. Eight months before hospitalization, the patient had a body weight of 54 kg. During the first visit to the clinical nutrition unit, she had difficulty swallowing solid food. She was obese with BMI of 19.5 kg/m². Hand dynamometer measurement was normal for both hands. Functional capacity score based on Eastern Cooperative Oncology Group (ECOG) was one. Her laboratory results were within normal limits, with hemoglobin 12.2 g/dL. She had stomatitis. During the radiotherapy treatment, she had dysgeusia and ageusia during the intake and decreased body weight. She lost 1.7 kg within 2 months during the radiotherapy. We educated the patient and gave her oral nutrition support, smaller serving portions, and changed the consistency of the meal. We also orally prescribed omega-3, vitamin B complex 2 mg, zinc 30 mg, and vitamin C 500 mg. Her highest calorie intake was 34 kcal/kgBW with 1.2 g/kgBW protein. After the radiotherapy, her body weight was 46.5 kg (loss 14% from initial weight), with a BMI of 18.8 kg/m².

We followed up with the patient for three months, and she could maintain her intake at 40 kcal/kgBW, with the highest protein intake of 1.6 g/kgBW. At the end of the follow-up, she had an increased hand dynamometer strength and body weight, and her ECOG score was zero. Her body weight in the last follow-up was increased by 1.3 kg after the radiotherapy, which was 47.8 kg, with a BMI of 19.9 kg/m².

DISCUSSION

This case report presented a 22-year-old man with gingival mucoepidermoid cancer. Medical nutrition therapy in cancer patients is essential to tackle malnutrition and cachexia, which will lead to increased complications. Better outcomes in albumin serum, body weight, and chemoradiotherapy tolerance were observed in early nutritional support. The radiotherapy side effects such as mucositis, dry mouth, ageusia and dysgeusia are common during radiotherapy. These side effects emerge in the second to fourth weeks of radiotherapy due to the declining cell proliferation, which resulted in cell atrophy. A nasogastric tube (NGT) is preferred in patients with severe mucositis who cannot tolerate oral nutrition. Inadequate intake is commonly found in these patients, and NGT improves their intake with a better outcome. We did not perform NGT placement on the patient. The minimal energy intake target of the patient was 25-30 kcal/kgBW, and protein intake was up to 1.5-2 g/kgBW, according to the European Society of Clinical Nutrition (ESPEN) recommendation. Nutritional management, including zinc and vitamin C, was given to the patient. Zinc stimulates epidermal growth factor receptor (EGF-R), a key role in activating transcription factors and cell proliferation. Additionally, zinc also has antioxidant properties. The recommendation for mucositis and dysgeusia is 25 to 220 mg. On the other hand, vitamin C is
known for its effect on collagen synthesis and improves wound healing, with a dose of 500-1000 mg/day.\textsuperscript{13,17} She was encouraged to consume omega-3 fatty acids food sources, such as mackerel, salmon, and milkfish. Omega-3 has anti-inflammatory properties and increases appetite in anorexic patients.\textsuperscript{12} After thorough nutritional management, she regained her body weight and maintained her functional capacity at the end of the treatment, as seen in Figure 1.

CONCLUSION

Since the early diagnosis, personalized medical and nutritional therapy is essential for gingival mucoepidermoid cancer patients to prevent malnutrition and cachexia.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

FUNDING

No specific funds were obtained for this study.

ETHICS

Informed consent was obtained from the subjects.

AUTHORS’ CONTRIBUTIONS

All authors made substantial contributions to the study.

REFERENCES


![Figure 1. Body weight (A) and handgrip strength (B) changes](Image)
Protein provision for burn injury with heart failure patient: A case report

Yosua Yan Kristian1, Wiji Lestari2, Yohannessa Wulandari3, Wina Sinaga1

ABSTRACT

Introduction: Burn injuries have a high mortality rate, notably in the higher burn injury degrees and patients with comorbidities. High energy and protein requirements in burn injury patients must be addressed as soon as the patient becomes stable. Despite having a high energy requirement, underfeeding is common.

Case description: A 69-year-old woman with heart failure and superficial to deep dermal burns at 30% of total body surface area was hospitalized in burn unit care for 23 days. A multidisciplinary team, including clinical nutrition physicians, treated her. Her nutritional and protein needs were covered optimally, and she recovered without complications.

Conclusion: Optimal protein intake is essential in recovering injured patients with heart failure complications.

Keywords: injury, heart failure, nutrition, critical illness

INTRODUCTION

Burn injuries cause 195,000 deaths in Indonesia yearly, and the mortality rate is higher in geriatric patients with heart and pulmonary-related diseases than the most common comorbidities.1,2 Patients with higher burn injury degrees need comprehensive care in the care unit (ICU).3 Medications such as vasopressors and inotropes are often used in hemodynamically unstable and heart failure patients and affect splanchnic blood vessels, which influence nutritional support given to the patients.

Underfeeding and low protein intake is common practice in the ICU due to the hemodynamic status and prolonged fasting, which lead to lower nutritional status, poorer clinical outcomes, and prolonged length of stay.4,5 This case report describes the importance of protein provision in burn patients with heart failure.

CASE PRESENTATION

A 69-year-old woman was admitted to the intensive burn unit care with superficial to deep dermal burns at 30% of total body surface area at the face, neck, and superior-inferior bilateral extremity region, with laryngeal obstruction and heart failure functional class I-II. The burn injury resulted from the exploded stove in her kitchen, and the patient was rushed to the hospital. After the primary survey and resuscitation, the patient was admitted to critical burn unit care. She was 53 kg, 155 cm, and had a 22 kg/m2 body mass index. Significant laboratory results were leucocytosis, hyperlactatemia, increased procalcitonin, and hypoalbuminemia, with chest x-ray (CXR) showing cardiomegaly and pulmonary edema. The echocardiography results were mild tricuspid regurgitation, grade I diastolic dysfunction, and an ejection fraction of 61.4%. The patient was given a norepinephrine dose of 0.1 mcg for seven days. A nasogastric tube (NGT) was inserted for eight days, and she started to take soft meals within the first week of admission. There were no signs of NGT intolerance. Her total cumulative fluid balance was 2100 mL without signs of volume overload. There were no acute heart failure events during hospitalization.

The patient lowest and highest energy intake was 400 kcal and 2300 kcal, respectively. Her lowest intake was on the ninth day due to fasting before wound debridement. The total energy requirement was reached within five days. She managed to get protein as high as 1.8 g/kgBW, supplemented with a density and high glutamine formula. She was prescribed multiple micronutrients, such as zinc 2x20 mg, vitamin C 2x250 mg, folic acid 1x1 mg, and vitamin B1 2x50 mg. She was discharged after 23 days of treatment in the hospital, and her wounds were healing optimally without any complications. Her laboratory and CXR results showed improvements before being discharged from the hospital.

DISCUSSION

This case report discussed a 69-year-old woman with heart failure and superficial, deep dermal burns admitted to a critical burn unit. During the burn injuries, inflammatory mediators will be released, resulting in vasodilatation and lower cardiac output, which leads to hypoperfusion, including in the splanchnic circulation. This leads to disruption in the gastrointestinal mucosa, enzymes, motility, and immune system.6,8 Furthermore, heart failure aggravates hypoperfusion symptoms.7 Additionally, enteral nutrition is recommended to be given to the patients within 24-48 hours after intensive care unit admission; on the other hand, it should be postponed in patients with a vasopressor dose of more than 0.3 mcg/kg/min, and hemodynamically unstable patients.5

Oral or enteral feeding is necessary to increase the mucosal barrier defense system, providing an energy source to the gut and increasing growth factor.6,8 The nutrition intake is provided gradually.
EDITORIAL

during the acute phase, with a total energy target calculated with the Xie or Toronto equation. A High proteolysis rate occurs during the burn injury, and we aim to give the patient protein of at least 1.2 g/kgBW with a high glutamine formula. The protein intake of the patient is presented in Figure 1. Glutamine is an alternative energy source for rapidly dividing cells, increases heat shock protein production, and is a glutathione precursor. Glutamine in doses 0.2-0.5 g/kgBW/day increases immunity and reduces mortality.

Inadequate protein intake in heart failure patients leads to more prevalent signs of congestion and a higher mortality risk; thus, obtaining optimal protein intake is crucial. Hersberger et al. suggested that individualized nutritional support is superior to a standardized protocol for heart failure patients. The quality and quantity of the protein given must be considered in giving nutritional support to the patients. The patient recovered quickly and was discharged without any cardiac complications.

CONCLUSION

Optimal medical and nutritional therapy with adequate protein intake is essential for recovering burn injury patients with or without complications.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

FUNDING

No specific funds were obtained for this study.

ETHICS

Informed consent was obtained from the subjects.

AUTHORS’ CONTRIBUTIONS

All authors made substantial contributions to the study.

REFERENCES

6. Herndon DN. Total Burn Care. 5 ed. Edinburgh: Elsevier; 2017. hal. 279-316.

Figure 1. Protein intake
Clinical factors associated with constipation severity in hemodialysis patients in Semarang, Indonesia

Esti Widiasih*, Rina Purnamasari², Muhammad Omar Rusydi³

ABSTRACT

Introduction: Most hemodialysis patients complain of constipation with varying degrees of severity. This condition is often treated with laxatives. Long-term use of laxatives can lead to dangerous complications. This study aims to analyze what factors influence the severity of constipation to improve constipation management.

Methods: This research is an observational analytic study with a cross sectional approach. The study was conducted on 60 adult patients at a hemodialysis clinic in Semarang, Indonesia, who underwent hemodialysis twice a week and complained of constipation according to ROME III criteria. We analyzed the relationship between the severity of constipation symptoms and clinical risk factors that contribute to constipation.

Results: The results showed that there was a strong relationship between the PAC-SYM score and age (r=0.580, p=0.000), physical activity (r=(0.575), p=0.000), amount of fiber intake (r=(0.367), p=0.004), total fluid intake (r=(0.468), p=0.000), duration of hemodialysis (r=0.628, p=0.000) and presence of comorbid diabetes mellitus (p=0.01).

Conclusion: The conclusion of this study can be used to improve more comprehensive management by improving nutrition education regarding adequate fiber and fluid intake, improving physical activity, and controlling sugar levels for patients with diabetes mellitus to reduce symptoms of constipation in hemodialysis patients.

Keywords: CKD, constipation, constipation severity, hemodialysis

INTRODUCTION

Constipation is a complaint in many hemodialysis patients with varying degrees of severity. Most patients use laxatives to treat their constipation complaints. A study by Sumida et al. reported that chronic constipation and the free use of laxatives have a high risk of incident heart disease, coronary artery disease, ischemic stroke and death. Population-based surveys have reported an association between decreased physical activity and constipation. Physical activity was reported to be lower in hemodialysis patients than in healthy subjects and older patients. Various comorbidities in hemodialysis patients can cause secondary constipation, such as diabetes mellitus, autonomic neuropathy, and cerebrovascular disease. A large number of drugs, such as serotonin receptor blockers (5-hydroxytryptamine [5-HT]), opioids, anticholinergic agents, anticonvulsants, antihypertensive agents, antidepressants, and chemotherapeutic agents, can cause constipation.

Hemodialysis patients generally limit their intake of vegetables and fruits rich in fiber to prevent hyperkalemia. The average dietary fiber intake from previous studies was reported to range from 5.9 to 16.6 g/day, making it lower than the fiber requirement in healthy individuals. Restricted fluid intake has also been implicated as a cause of constipation in dialysis patients. Wu et al. demonstrated that interdialytic weight gain is correlated with longer colonic transit times. Physiologically, more fluid intake can soften stools or increase lubrication in the digestive tract.

This study aims to find the relationship between clinical factors that influence the severity of constipation suffered by hemodialysis patients. Information from research results can be used to consider the best management to reduce the severity of constipation in hemodialysis patients.

METHODS

This research is an observational analytic study with a cross sectional approach. The study was conducted from September to October 2022. We included 60 hemodialysis patients at the Semarang City hemodialysis clinic who complained of constipation. The sampling technique uses the total sampling method. Subject inclusion criteria were having complaints of constipation according to ROME III criteria. The patients can communicate, are aged 40–60 years, and have undergone hemodialysis for at least 6 months. The research instrument included The Patient Assessment of Constipation-Symptoms (PAC-SYM) questionnaire. International Physical Activity Questionnaire (IPAQ) printed questionnaire to measure physical activity level, checklist sheet to assess diabetes mellitus and hypertension comorbidities, data sheet consumption history of constipation-precipitating drugs, Semi Quantitative-Food Frequency Questionnaire (SQ-FQ) form, Food Model and Nutri Survey Application to calculate the amount of fiber and fluid intake. Research data analysis used Pearson’s correlation and Spearman’s rank
## Table 1. Table of characteristic data

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>%</th>
<th>Mean ± SD</th>
<th>Median (min-max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAC-SYM score (0-48)</td>
<td>60</td>
<td>100</td>
<td>9.55 ± 2.53</td>
<td>9.5 (4 – 15)</td>
</tr>
<tr>
<td>Total daily fiber intake (gram)</td>
<td>60</td>
<td>100</td>
<td>5.83 ± 0.95</td>
<td>5.8 (4.3 – 8.2)</td>
</tr>
<tr>
<td>Total daily water intake (mL)</td>
<td>60</td>
<td>100</td>
<td>896.50 ± 175.41</td>
<td>900 (500 – 1200)</td>
</tr>
<tr>
<td>Age (year)</td>
<td>60</td>
<td>100</td>
<td>52.48 ± 5.15</td>
<td>53 (41 – 66)</td>
</tr>
<tr>
<td>IPAQ score (METs)</td>
<td>60</td>
<td>100</td>
<td>1685.0 ± 753.93</td>
<td>1500 (600 – 3200)</td>
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<td>Length of time undergoing hemodialysis (year)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 1 year</td>
<td>19</td>
<td>31,7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-3 years</td>
<td>21</td>
<td>35.0</td>
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<tr>
<td>&gt; 3 years</td>
<td>20</td>
<td>33,3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Man</td>
<td>32</td>
<td>53,3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Woman</td>
<td>28</td>
<td>46,7</td>
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<td></td>
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<tr>
<td>Comorbidities</td>
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<td></td>
</tr>
<tr>
<td>- Diabetes mellitus (DM)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-DM</td>
<td>29</td>
<td>48,3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DM</td>
<td>31</td>
<td>51,7</td>
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<td></td>
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<tr>
<td>- Hypertension (HT)</td>
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<td></td>
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<tr>
<td>Non-HT</td>
<td>22</td>
<td>36,7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HT</td>
<td>38</td>
<td>63,3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medications that trigger constipation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Take medication</td>
<td>28</td>
<td>46,7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No medication</td>
<td>32</td>
<td>53,3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Table 2. Table of correlation test results on pac-sym scores

<table>
<thead>
<tr>
<th>Variable</th>
<th>PAC-SYM score Mean ± SD</th>
<th>p</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total daily fiber intake (gram)</td>
<td>0.004 *</td>
<td>-0.367</td>
<td>Significant, negative, moderate</td>
</tr>
<tr>
<td>Total daily water intake (mL)</td>
<td>&lt;0.001 *</td>
<td>-0.468</td>
<td>Significant, negative, moderate</td>
</tr>
<tr>
<td>Age (year)</td>
<td>&lt;0.001 *</td>
<td>0.580</td>
<td>Significant, positive, strong</td>
</tr>
<tr>
<td>IPAQ-Physical Activity (METs)</td>
<td>&lt;0.001 *</td>
<td>-0.575</td>
<td>Significant, negative, strong</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Length of time undergoing hemodialysis</th>
<th>PAC-SYM score Mean ± SD</th>
<th>p</th>
<th>r</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 year</td>
<td>7.79 ± 1.87</td>
<td>&lt;0.001 *</td>
<td>0.628</td>
<td>Significant, positive, strong</td>
</tr>
<tr>
<td>1-3 years</td>
<td>9.24 ± 2.36</td>
<td>&lt;0.001 *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 3 years</td>
<td>11.55 ± 1.79</td>
<td>&lt;0.001 *</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Pearson Correlation Test*  
*Rank Spearman’s test*

## Table 3. Table of independent-t test results on pac-sym scores

<table>
<thead>
<tr>
<th>Variable</th>
<th>PAC-SYM score Mean ± SD</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Man</td>
<td>9.88 ± 2.55</td>
<td>0.291 *</td>
</tr>
<tr>
<td>- Woman</td>
<td>9.18 ± 2.50</td>
<td></td>
</tr>
<tr>
<td>Diabetes Mellitus (DM)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Non-DM</td>
<td>8.45 ± 2.26</td>
<td>0.001 *</td>
</tr>
<tr>
<td>- DM</td>
<td>10.58 ± 2.35</td>
<td></td>
</tr>
<tr>
<td>Hypertension (HT)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Non-HT</td>
<td>10.41 ± 2.30</td>
<td>0.404 *</td>
</tr>
<tr>
<td>- HT</td>
<td>9.05 ± 2.55</td>
<td></td>
</tr>
<tr>
<td>Medications that cause constipation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Take medications</td>
<td>9.61 ± 2.69</td>
<td>0.872 *</td>
</tr>
<tr>
<td>- No medication</td>
<td>9.50 ± 2.42</td>
<td></td>
</tr>
</tbody>
</table>

*Independent T-test*  
*Mann Whitney test.*

Data were collected from the results of interviews with 60 subjects, and confirmation of the interview data was confirmed with the patient's medical record data. The severity of constipation is indicated by the total PAC-SYM score, where the lowest score is 4, and the highest is 1, with an average score of 9.55 ± 2.53. This score indicates a high rate of severity of constipation in hemodialysis patients.
The results of the PAC-SYM score were then correlated with data on clinical factors that were thought to influence the severity of constipation, consisting of gender, age, daily activity level, total fiber intake, total fluid intake, duration of hemodialysis, presence or absence of comorbid diabetes and hypertension and the effect of consumption drugs that trigger constipation.

Tables 1 and 2 show the correlation test results between age and the PAC-SYM score obtained a significant correlation score ($p = 0.000$) with a strong correlation coefficient ($r = 0.580$). Correlation studies between the level of physical activity and the severity of constipation found a significant correlation ($p = 0.000$) with a strong correlation coefficient ($r = -0.575$). The negative coefficient shows the opposite direction of correlation, namely, the lower the IPAQ score, the more severe the symptoms of constipation in hemodialysis patients.

The results of the correlation analysis between the amount of fiber intake and the PAC-SYM score obtained a significant correlation score ($p = 0.004$) with a moderate correlation coefficient ($r = -0.367$), which indicates a negative correlation direction, namely the lower the amount of fiber. Consumed, the worse the symptoms of constipation felt by the patient. The results of the correlation analysis between the amount of fluid intake and the PAC-SYM score obtained a significant correlation ($p = 0.000$) with a moderate correlation coefficient ($r = -0.468$), which indicates a negative correlation direction, namely, the lower the amount of fluid intake. The more water consumed, the worse the symptoms of constipation felt by the patient.

The results of the non-parametric correlation test between the length of time undergoing hemodialysis and the PAC-SYM score obtained a significant correlation score ($p=0.000$) with a strong correlation coefficient ($r=0.628$).

Table 3 shows the results of comparative data analysis between gender scores and PAC-SYM found no significant difference ($p = 0.291$). Comorbid diabetes mellitus, the subject obtained the analysis results that there was a significant effect, namely, comorbid diabetes influenced the incidence of constipation in hemodialysis patients. Comorbid hypertension in the subjects showed that the analysis results did not significantly affect ($p = 0.40$) the incidence of constipation in hemodialysis patients. Consumption The things that trigger constipation commonly consumed by hemodialysis patients are antihypertensive and iron supplementation drugs. Analysis of drug consumption data showed no effect of drug consumption on the level of constipation symptoms ($p=0.872$); this result could be due to taking data on a nominal scale so that more detailed results were not obtained for each type of drug.

DISCUSSION
The study's results stated that age and duration of hemodialysis were significant risk factors for constipation that could not be corrected. Still, the amount of fiber, fluid intake, and daily activity level were risk factors that could be corrected. Blood sugar levels can control comorbid diabetes. According to previous reports, constipation is a very common complication in patients on dialysis, with an incidence of 53% (8%–57%). Constatpation in CKD is difficult to treat because it is multifactorial. Therefore, each approach must consider all factors to improve constipation symptoms. The solution currently widely used in cases of constipation in hemodialysis patients is using laxatives, including osmotic laxatives; these laxatives generally contain magnesium, which can cause dangerous hypermagnesemia. Progressive increases in the dose of this drug carry the risk of loss of intrinsic innervation action and the tolerable effect of laxatives.

Dietary guidelines for hemodialysis patients often fail to make fiber intake recommendations because fiber-rich food sources are also sources of potassium, so there is concern about the risk of developing hyperkalemia if they eat too much plant-based foods. Physicians opt for simple dietary restrictions rather than routinely referring patients for dietary counseling, often leading to worsening conditions. While well-meaning, the evidence to support the concern about hyperkalemia caused by plant-based foods is low. A cohort study failed to identify an association between a diet rich in fruits and vegetables and serum potassium levels. Interestingly, the association of higher fruit and vegetable intake tends to support a lower risk of death in patients undergoing hemodialysis. Current recommendations for achieving adequate fiber intake for the general population are a diet containing 2–3 servings of fruit/day, 1–2 servings of vegetables/day, 1 serving of legumes/day, and 2–5 servings of whole grains/day. We propose to adopt this diet for hemodialysis patients who do not have hyperkalemia by routinely evaluating their blood potassium levels. If there is hyperkalemia, nutritional education is needed to replace fruits and vegetables with high potassium content with safe fiber supplementation such as prebiotics with special doses according to the patient’s condition. Lifestyle-based therapy for constipation, in a recent meta-analysis, Gao et al. suggested that exercise, such as walking, could effectively improve constipation-related symptoms and quality of life in the hemodialysis population. Although the effect of exercise on constipation is insufficient, exercise habits are associated with other beneficial effects.

CONCLUSION
The conclusion of this study can be used to improve more comprehensive management by improving nutrition education regarding adequate fiber and fluid intake, increasing physical activity and controlling sugar levels for patients with diabetes mellitus to reduce the severity of symptoms of constipation in hemodialysis patients. The next research suggestion is to make a cohort study to find a more accurate value for each risk factor influencing constipation severity.

CONFLICTS OF INTEREST
The authors declare there is no conflict of interest.

FUNDING
The researcher bore all costs required in this study.

ETHICS
The research was conducted after passing ethical clearance from the Faculty of
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All authors contributed equally to the writing of this article

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INTRODUCTION

Obesity is a chronic and systemic disease defined by a pathological accumulation of fat mass associated with an increased risk of morbidities, such as diabetes and cardiovascular diseases. Since 1975, the global burden of obesity has nearly tripled. Traditionally, obesity is diagnosed through body mass index (BMI), the body weight ratio in kilograms to the squared value of body height in meters (kg/m²). Therapy for patients with obesity

Obesity therapy aims to improve quality of life, prevent further weight gain, reduce body weight, maintain reduced body weight, and improve obesity-associated risk factors and co-morbidities. If the patient’s BMI is ≥ 30 kg/m², the first approach can be motivating. The next treatment approach is an anamnesis daily life situation. Other treatments should be done; the first one is lifestyle intervention. Lifestyle interventions have three main components: nutrition, physical activity, and behavior. Intervention in nutrition can be done in various ways, such as maintenance of energy intake, meal replacement (low carbohydrate, low fat), intermittent fasting, and personalized nutrition. In physical activity aspects, the intervention includes weight loss programs. Intervention in the behavior aspect may be using digital tools or self-monitoring of nutrition intake and physical activity. Suppose the treatment before could not be done. In that case, there are other treatments, including bariatric surgery (gastric bypass) or the use of drugs to decrease the appetite, stomach emptying, nutritional absorption, or greater satiety.

The goal of improved health is not solely reducing body weight. Even without experiencing weight implementation, advantageous behavioral changes to prevent weight gain can improve general health and quality of life. Patients who achieve a reduction in body weight ranging from 3% to 5% demonstrate notable improvements in triglyceride (TG) and blood glucose (BG) levels and decreased risk of developing type 2 diabetes. Patients also experience improvements in polycystic ovarian syndrome (PCOS) and fertility. Patients improve blood pressure, LDL cholesterol, and HDL cholesterol levels by reducing their body weight by 5-10%. In addition, there is also a reduction in the probability of experiencing emergent depression and a drop in mobility associated with the aging process. There also may be improvements in knee functionality, such as increased speed, walking distance, and pain reduction, as well as improvements in symptoms related to urinary incontinence and sexual function in both males and females. The reduction of body weight by at least 10% has the potential to minimize the risk and symptoms associated with obstructive sleep apnea (OSA), as well as enhance the non-alcoholic steatotic hepatitis activity score. Reducing body weight by 5-15% can decrease the risk of hepatic steatosis. In addition to this, they are also associated with enhancements in quality-of-life assessments. Scientific evidence suggests that deliberate attempts to lose weight can reduce the probability of specific obesity-related cancers, such as endometrial cancer.

Weight loss demands the implementation of calorie restriction to attain a condition of negative energy balance. The recommendations of calorie levels to achieve weight loss can be established as target ranges or as a reduction target relative to the individual’s baseline calorie intake. The recommended calorie target for weight loss in men is around 1,500 to 1,800 kcal/day, while in women it is around 1,200 to 1,500 kcal/day. The selection of appropriate targets for patients may vary based on individual factors such as height, weight, age, activity level, and personal desires. Referring individuals to a Registered Dietitian to establish personalized objectives is recommended.

Personalized therapy for patients with obesity

The importance of individualized dietary patterns, nutritional quality, and establishing a positive connection with food should be emphasized in nutrition interventions aimed at implementing mindfulness-based eating practices. It has been shown to potentially decrease food cravings, decrease reward-driven eating behaviors, enhance body satisfaction, and increase awareness of hunger and satiety cues. Both intermittent and continuous calorie restriction have been found to result in similar short-term reductions in

Obesity therapy is aimed to improve quality of life, reduce body weight, prevent further weight gain, and improve risk factors of comorbidities. The therapy is done by implementing behavioral changes, dietary management, and special nutrients. Behaviors that can maintain an increase in physical activity should be promoted. The caloric balance should also be kept at a deficit while maintaining a proper macronutrient ratio to achieve optimal results. Lastly, implementing special nutrients such as prebiotics and antioxidants can lower the risk of comorbidities and improve a patient’s well-being.

Keywords: obesity therapy, dietary management, behavioral changes, nutritional medical therapy

Dietary management of obesity in primary care

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Obesity has been found to induce harmful effects on cellular structures, systemic inflammation, insulin sensitivity, and decrease chronic potential to impact body weight, influence advantageous outcomes, such as the modifications has been shown to have administration of probiotics or dietary manipulating gut microbiota through the effects. Furthermore, it is well-tolerated there have been no recorded adverse this therapeutic approach is safe since treating obesity. First and foremost, emerged as a promising method for treating obesity. The first is the portfolio, which encompasses a dietary pattern centered around the intake of four constituents: plant sterols, viscous soluble fiber, soy protein, and nuts. The advantages of portfolio dietary patterns include reducing LDL-C levels and increasing HDL-C levels efficiently, comparable to the effects of statin medications, regardless of any associated weight loss. Furthermore, it exhibited improvements in cardiometabolic risk variables. The second dietary pattern is the Mediterranean diet, which emphasizes plant-based foods such as vegetables, fruits, whole grains, and potatoes. Using a Mediterranean food pattern has been shown to potentially lead to improved cardiometabolic risk factors and overall health outcomes. The third dietary pattern is DAHS, which emphasizes consuming vegetables, fruits, whole grains, low-fat dairy products, poultry, fish, and nuts. The DASH dietary pattern is efficacious in reducing blood pressure levels, irrespective of any concurrent weight loss.8

The utilization of prebiotics has shown the ability to modify the composition of gut microbiota and exert influence on several aspects such as food intake, appetite, body weight and composition, as well as metabolic activities. These effects are achieved through manipulating gastrointestinal pathways and modulating the bacterial population in the gut.9 Manipulation of gut microbiota has emerged as a promising method for treating obesity. First and foremost, this therapeutic approach is safe since there have been no recorded adverse effects. Furthermore, it is well-tolerated by individuals and considered suitable for prolonged utilization. Furthermore, manipulating gut microbiota through the administration of probiotics or dietary modifications has been shown to have advantageous outcomes, such as the potential to impact body weight, influence glucose and fat metabolism, enhance insulin sensitivity, and decrease chronic systemic inflammation.10

Antioxidants are substances that can neutralize free radicals and mitigate their harmful effects on cellular structures. Obesity has been found to induce inflammation in macrophage cells, leading to their polarization into M1 macrophages due to the inflammatory response. Macrophages polarized towards the M1 phenotype exhibit the ability to release inflammatory cytokines, including TNFα and IL-6. These cytokines have been implicated in developing pancreatic dysfunction, ultimately resulting in the manifestation of insulin resistance. Insulin resistance contributes to developing type 2 diabetes mellitus (DM), characterized by elevated blood glucose levels. This metabolic condition can increase reactive oxygen species (ROS), inducing oxidative stress. Obesity can lead to generating reactive oxygen species (ROS) by many mechanisms, including producing superoxide, oxidative phosphorylation, and the auto-oxidation of glyceraldehyde. Consequently, this process can result in the development of oxidative stress. Obesity has elevated free fatty acids (FFA) and adipokines, which have been implicated in impaired insulin sensitivity and developing type 2 diabetes and dyslipidemia. Furthermore, obesity has an impact on the buildup of fat, leading to elevated levels of free fatty acids (FFA), triglycerides (TG), and low-density lipoprotein (LDL) while simultaneously red the development of dyslipidemia. There are several antioxidant compounds from natural ingredients that have antiobesity activity, including resveratrol (grape, berries, nut), curcumin (turmeric), quercetin (apple berries, cauliflower, cabbage, beans), anthocyanin (coloring pigments of fruits or plants), and other antioxidants (Okra polysaccharides, green tea, strawberry ellagitannins [ET]).11

CONCLUSION

In conclusion, obesity therapy can be done at the primary care level. Treatment should implement behavioral change and dietary management, adjusted to therapeutic goals and the patient’s ability and preferences. Special nutrients can also be given to support improvement towards optimal results. When given properly, obesity therapy in primary care can help patients lose weight, maintain it, and improve comorbidities, risk factors and well-being.

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