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**Asian Journal of Dietetics**

**Letter from AJD Editor in Chief**

**"Expectations for ACD2022"**

**Thinking about becoming a dietitian who is trusted and respected by society**

Shigeru Yamamoto, RD, Ph.D.

In the process of teaching dietetics for more than 40 years, I feel that dreams and worries of young dietitians are similar to what I experienced, which reminds me of my younger days and pushes me to work for them.

ACD2022 agreed with me to arrange/program two symposiums and a workshop to consider how to address the worries and dreams of dietitians. The tentative titles are, "What should we do to be dietitians trusted and respected by society", "Let's support the Asian Journal of Dietetics of the dietitians, by the dietitians and, for the dietitians", "Workshop for young dietitians on understanding the current state of the legal system of each country regarding dietitians and what should be improved".

My thoughts on such ideas come from the following. A dietitian is the most important expert on food and health. However, it is not registered dietitians (RD) but medical doctors (MD), food scientists, etc. who have defined the recommended dietary allowances (RDAs) everywhere and enteral/parenteral formulas. Looking at journal articles on clinical nutrition, most of the authors are MDs and with few RDs. In Japan, about 20 years ago, a system was established in which it is not a MD but a registered dietitian (RD) who can teach clinical nutrition in the RDA training program. It was an event at the RD Training Curriculum Committee; the chairman who was a MD, claimed that MDs could teach about illness, but not about dietetics, and this became the current law.

However, even with such major reforms of the law, it seems that it is not easy for RDs to conduct research and publish their results in journal articles. In fact, articles published by RDs, teachers and researchers in dietetic programs are biased toward food science, biochemistry, and epidemiology, and there is only a little about dietetics. To improve the situation, I think it is necessary to recognize that research in the field of dietetics is extremely difficult. For example, it's an established theory that you can lose weight if you eat less, but how to eat less is really difficult. That is, even if the theory is understood, it cannot be applied. Research on the central role that a dietitian should play may fall into this area of application/ applied research. I think that it is not easy to establish a basis for the application of dietitians because it spans not only food science and medicine but also psychology, sociology, economics, etc., making the problem very complicated and difficult to study. A symbolic example is that even though there are many papers on obesity in the United States, real-life obesity has not improved. However, unless dietitians are successful in overcoming such difficulties, dietitian will not be a profession that is trusted and respected by society. With that in mind, I founded the Journal of Asian Dietetics three years ago. It would be greatly appreciated if dietitians could use this journal to improve the research ability of RDs and use it as an opportunity to publish journal articles. I would like us to discuss it together in the symposiums and workshop.

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**Special Report: School Meal Program****Nutrition Teacher/ School Dietitian at Japanese School Lunch  
A Perspective from Vietnamese Dietitians  
No.5 in a Series**

Nguyen Huong Giang, Nguyen Mai Phuong, Nguyen Van Diep

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Japanese school lunches are not only to provide children with nutritious meals but also serve as a living textbook. Japan places a high value on food and nutrition education in schools, and correspondingly so on the professionals who provide this teaching to

students. There is at least one nutrition teacher or school dietitian in each school kitchen, cluster of schools or joint kitchen, which prepares meals for several schools in the same area (Table 1).

Table 1. Legally required number of school dietitian/nutrition teacher.

**School (students over 6 years old)**

- School kitchen
  - ✓ Schools serving lunch to more than 550 children have to have a school dietitian/nutrition teacher.
  - ✓ Schools with fewer than 549 children: There must be a school dietitian/nutrition teacher covering 4 schools.
  - ✓ Cities with fewer than 3 schools and each school with fewer than 549 children: There must be a school dietitian/nutrition teacher per city
- Satellite kitchens serving lunch to more than 1500 children must have a nutrition teacher; 1501 to 6000, two nutrition teachers; and more than 6000, 3 nutrition teachers.

**The system of training for Japanese dietitians**

Dietitian is a food and nutrition professional. In Japan, there are registered dietitian (RD) and dietitian. According to Dietitian Act published by Ministry of Health, Labor and Welfare:

**Registered Dietitians** are licensed by the Ministry of Health, Welfare and Labor. RD is a term that originated in the United States and now used commonly world-wide. Official name of Japan is a kanri-eiyooosi (management level dietitian) and was

introduced by the Japan Dietetic Association. The duties involve nutrition education relating to medical treatment for sick and injured persons, nutrition education to maintain and promote health that require a high level of professional knowledge and technique appropriate to patient's physical and nutritional condition, and food service management.

**Dietitians** are licensed by prefectural governments. Their work is providing food service management and working under the supervision of a RD when in direct patient/client nutrition care.

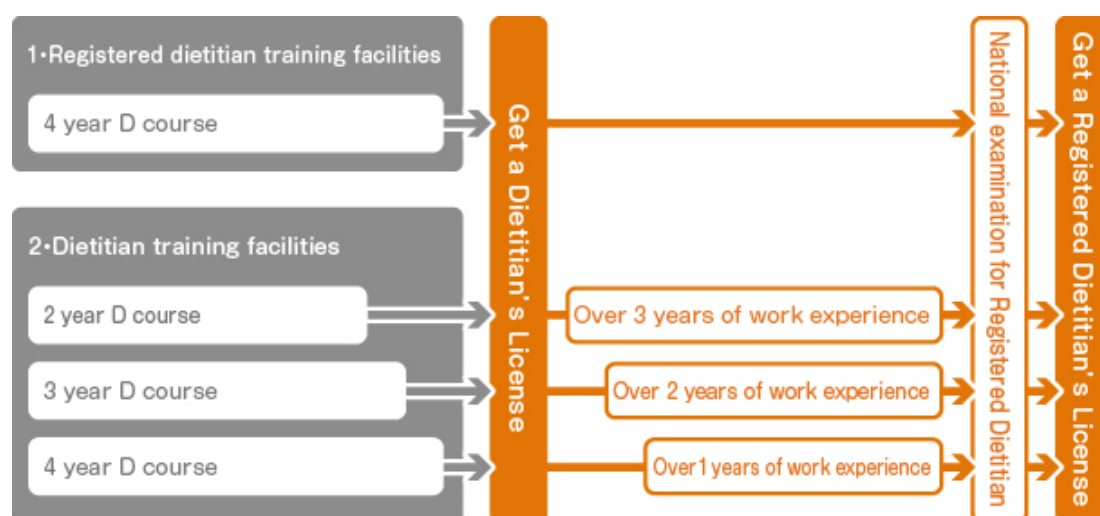


Fig 1. The licensing process for dietitian and registered dietitian (Source: Japan Dietetic Association)

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The system of training for nutrition teachers and school dietitians dates back about half a century. Before 1964, there were no job titles for the positions of dietitian and appropriate job titles were not used. At that time, the main activity of personnel involved in school lunches was food preparation. Staff mainly did cooking and planning and implementing nutrition education were done only by the request of other teacher. In 1964, the Ministry of Education introduced partial support for salaries of school dietitians at kitchens covering several schools in a given area. This was gradually expanded and eventually dietitians were placed in each school or cluster of schools.

Since the 1990s, the social environment, including the family structure, has changed considerably and nutrition-related health problems have become even more prevalent. The current Japanese life-style is not ideal for promoting health. Parents work long hours and children study at cram schools until late at night. Under such social conditions, one cannot blame them for eating take-out/ready-made foods from shops. What we can perhaps hope for is that children will make better food choices by following the example of the more appropriate items offered in the school lunch. Hopefully, it will foster better food choices by the example of the school lunch with more appropriate food choices. The knowledge and habits formed by the school lunch program can play an important role in this.

To meet this need, the school dietitian is now required to have mastered highly specialized knowledge and educational methods. A Nutrition Teacher License was established in 2005. The license is similar to that required for teachers of other subjects. There are 3 levels of personnel depending upon their academic background: graduation from a junior college, from a regular college or university, or from graduate school. A registered dietitian or dietitian can obtain the license after 3 years' experience working in a school and 8-10 lecture credits. In 2011 there were 3853 nutrition teachers but by 2021 this number has increased to 6752.

#### **Duties of school dietitian and nutrition teacher**

Job content of school dietitians and nutrition teachers are different. The same duty is providing school lunch management which include creating menus, selecting and purchasing ingredients, managing food cooking and distribution, and managing hygiene of kitchen. Each of them creates about 200 menus per year which must satisfy the dietary reference intakes, students' taste, local food culture, and traditions.

School dietitian is a person who has a license of dietitian/ registered dietitian and has the necessary knowledge or experience to carry out school lunch.

Besides managing school lunch, they support nutrition education. They do not give classes directly to children, but they may issue school lunch newsletters or support nutrition education guidance provided by other teachers.

Nutrition teacher is a person who has a dietitian/ registered dietitian license, a teacher license and has the necessary knowledge or experience to carry out school lunch. They can provide nutrition education directly to children through classes and school events and give individual consultations for children with health problems pertaining to food.

Both of them also work with other teachers, children's families, and the local community to coordinate enhanced dietary guidance.

#### **Food and nutrition education at school by nutrition teachers/school dietitians**

Education about food and health is provided in connection with the school lunch by diet and nutrition teachers/school dietitians working in tandem with teachers of other subjects. By this way, children can learn how to make healthy food choices, learn about agricultural practices, food production and distribution, and cultural traditions. For example, in a social studies class, students may calculate the distance that various foods in a school lunch on a given day have traveled from their production area to the school. Students also calculate the necessary fuel and discuss its effects on the earth's ecology. In a physical education class, students record their own changes in height and weight and learn about the nutritional contributors to their growth. In English class, English relating to the menu of the day is taught, such as the names of foods, cooking methods, table manners, nutrients, etc. Those experiences become good opportunities to learn about nutrition as well as good memories. This broad perspective on food and nutrition helps instill in children a sense of gratitude for the food they are eating and an appreciation for and interest in its origins. In addition, it is likely responsible for the remarkably low levels of food waste reported by many schools.

In conclusion, nutrition teachers/school dietitians are indispensable in providing delicious and safe lunches as well as improving food and nutrition knowledge for children. The reward of nutrition teachers and school dietitians working is to see children eat lunch with happiness and grow up every day. The work is not easy, however when they receive compliments or letters from children and teachers such as "It was delicious today", "I was able to eat vegetables that I was not good at." Or "Everyone has finished eating", they will be encouraged and rewarded for their work.

**Original****Factors Influence in Food Choices and Effect on The Body Composition among Staff in Institut Kanser Negara, Malaysia**

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**ABSTRACT:** *Background and purpose.* There are many factors influence individual food choices and intake. Unhealthy diet pattern and food choices may increase risk of obesity, chronic diseases and malnutrition. This study aims to determine the contributable factors influence in food choices and effect on the body composition. *Methods.* An observational pilot study was carried out on 106 participants who were staff of Institut Kanser Negara, Putrajaya, Malaysia; 77 females and 29 males, mean age  $37.97 \pm 13.17$  years old using cross-sectional and convenient sampling method. A structured self-administered questionnaire was used to attain information regarding the factors influence in food choices and the effect on the body composition to assist in weight management. There were 9 influence in factors queried which were health, mood, convenience, sensory, nutrient content, price, weight control, familiarity and ethical concern. Participants' body composition was obtained using calibrated Total Body Composition Analyser (TANITA). *Result.* About 51% of participants were underweight/normal while 49% were overweight/obese. Weight, muscle mass and fat percentage among male participants were statistically significantly higher than female,  $72.98 \pm 13.54$  kg vs  $60.65 \pm 11.76$  kg,  $51.99 \pm 6.37$  kg vs  $37.28 \pm 5.26$  kg and  $23.78 \pm 7.48$  % vs  $33.62 \pm 6.98$  % respectively ( $p < 0.01$ ). No significant differences between gender for all factors. The top factor influence in food choices was health while the least factor was ethical concern (environmental and political issues) for both genders. Overweight/obese group significantly considered health, mood, convenience, nutrient content and weight control more than underweight/normal individuals in food choices. Factors significantly associated with body weight were mood, convenience and nutrient contents while factors significantly associated with fat percentage were health, mood, convenience, sensory appeal, nutrient contents and weight control. *Conclusion.* This study concluded that health, mood, convenience, nutrient contents and weight control were the top influence in factors associated with body weight and fat percentage for healthcare providers. Hence, appropriate measures may be considered in regulating these factors as a potential approach in weight management intervention among healthcare providers.

**Keywords:** Factors, food choices, body composition

**INTRODUCTION**

Nutrition is essential to maintain body health. Malnutrition increases the risk of human morbidity and mortality. Nutrition transition, from low availability of calories mainly in the form of plant products to diets high in fats, sugars and energy-dense processed foods contribute to obesity issue. This, in turn, has been the result of rapid economic development which has taken place in Malaysia in the last quarter of the twentieth century. Malaysia has recently been ranked second highest in East and Southeast Asia in terms of being overweight (1,2).

Prevalence of obesity, whereby excessive body adipose tissue, increase in worldwide. World Health Organization (WHO) criteria for Body Mass Index (BMI) classifies a BMI of  $25-29.9 \text{ kg/m}^2$  as overweight and  $>30 \text{ kg/m}^2$  as obese (3). BMI is the most widely used index for obesity. Obesity is shown as a major determinant of non-communicable diseases such as

cardiovascular disease, cancers, type 2 diabetes mellitus, respiratory problems, gallbladder diseases, post-operative morbidity and musculoskeletal disorders such as osteoarthritis. There has been a clearly documented dramatic increase in the prevalence of obesity in Malaysia over the last three decades since large scale population data became available. In the global context, alongside development and prosperity, in many countries especially in Asia, obesity has become a leading health issue (1,2).

Obesity is a multifactorial disorder deriving from genetic and metabolic factors as well as environmental factors, socioeconomic and behavioural (4,5). These factors differ in their respective contributions to the obesity epidemic in recent decades<sup>6</sup>. Behavioural factors, however, have undergone important modifications that might account for the epidemic in obesity (7). Energy intake and energy expenditure are consequences of behaviours (e.g. choosing foods,

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eating foods, watching TV, playing sports) that are influenced by a wide range of internal and external determinants. These eating behaviours include the characteristics of the food supply, the knowledge, attitudes, emotional state and experiences of the individual, and the social and cultural context in which the behaviour occurs (7,8). In this study, investigators would like to determine the factors that influence and associate with food choices and body composition. This study provides a baseline data for further program planning.

## MATERIALS AND METHODS

### Study design

This was an observational pilot study. Cross sectional and convenient sampling method were used. Body composition screening and eating behaviours assessment via questionnaire was done among Institut Kanser Negara staff. After screening and assessment of eating behaviours, dietitian explained and counselled them based on the result of screening and assessment. This screening and assessment were aimed to increase awareness of staff on their body composition and eating behaviours. All records and questionnaires were well kept and locked in dietitians' office. There were no identifiable data/information on data collection form and questionnaire. Data was collected and extracted for analysis purposes.

### Measurement tools

Validated measurement tools were scheduled calibrated TANITA Total Body Composition Analyser model SC 300 which can provide body weight in kg (up to 0.1kg), fat percentage (up to 0.1%) and total muscle mass (up to 0.1kg). Scheduled calibrated SECA height measurement (up to 0.1cm) was used to measure height. Subject was requested to have minimal clothing, empty pocket and stand up-right with bare foot on metal plate of scale. Subject needs to be bare foot, stand up-right and face front while measuring.

Validated questionnaire of food choices were collected (8). The questionnaire contains of 36 questions. Every item was rated in a 4-point scale ranging from not important at all (1) to very important (4). Nine factors influence in food choices were assessed by the questionnaire including health (6 items), mood (6 items), convenience (5 items), sensory appeal (4 items), natural content (3 items), price (3 items), weight control (3 items), familiarity (3 items) and ethical concern (3 items) 8. Participants answered

the questionnaire by themselves with minimal assistance from investigators. Investigators explained to subject if there was problem in understanding the questionnaire and stayed in the vicinity to check the answers and to receive the questionnaires personally. The duration of data collection for each participant was approximately 15-20 min. All parameters and variable data were collected and recorded in data collection form. The variables that were being collected in the data collection form included socio-demographic (age, education level), anthropometry and body composition (weight, height, BMI, percentage of body fat and muscle mass).

### Statistical analysis

The data analysis was done using the SPSS version 23.0. Categorical data was analysed descriptively and presented as frequency and percentages. Continuous data was presented as mean and standard deviation and analysed by independent t-test which evaluated using two-tailed test of significance level at the  $p < 0.05$ . Pearson's Correlation was used for analysis since data was normally distributed to study the association between factors influence in food choices. A value of  $p < 0.05$  is considered statistically significant.

## RESULTS

Study recruited 106 participants whereby 29 were males and 77 were females, with the mean of age  $37.97 \pm 13.17$  years old. Majority of participants (46.3%) received tertiary education (degree holders) and followed by secondary level (27.4%). Using WHO BMI cut off of  $>24.9 \text{ kg/m}^2$  as overweight, 51% were categorized as underweight/normal weight while 49% were overweight/obese. Weight, muscle mass and fat percentage among male participants were statistically significantly higher than female,  $72.98 \pm 13.54 \text{ kg}$  vs  $60.65 \pm 11.76 \text{ kg}$ ,  $51.99 \pm 6.37 \text{ kg}$  vs  $37.28 \pm 5.26 \text{ kg}$  and  $23.78 \pm 7.48 \%$  vs  $33.62 \pm 6.98 \%$  respectively ( $p < 0.01$ ).

The factors associated with body weight significantly were mood ( $r = 0.246$ ,  $p = 0.011$ ) convenience ( $r = 0.218$ ,  $p = 0.025$ ) and nutrient contents ( $r = 0.197$ ,  $p = 0.043$ ). The factors associated with fat percentage significantly were health ( $r = 0.299$ ,  $p = 0.002$ ), mood ( $r = 0.290$ ,  $p = 0.003$ ) convenience ( $r = 0.326$ ,  $p = 0.001$ ), sensory appeal ( $r = 0.232$ ,  $p = 0.017$ ), nutrient contents ( $r = 0.298$ ,  $p = 0.002$ ) and weight control ( $r = 0.212$ ,  $p = 0.029$ ).

**Table 1: Body composition study participants**

	Male (n=29) (Mean $\pm$ SD)	Female (n=77) (Mean $\pm$ SD)	Total (n=106) (Mean $\pm$ SD)	p-value
Height (m)	$1.67 \pm 6.16$	$1.57 \pm 6.10$	$160.0 \pm 7.58$	0.000*
Weight (kg)	$72.98 \pm 13.54$	$60.65 \pm 11.76$	$64.02 \pm 13.39$	0.000*
BMI ( $\text{kg/m}^2$ )	$25.99 \pm 4.35$	$37.73 \pm 111.20$	$25.34 \pm 6.25$	0.358
Muscle mass (kg)	$51.99 \pm 6.37$	$37.28 \pm 5.26$	$41.30 \pm 8.62$	0.000*
Fat percentage (%)	$23.78 \pm 7.48$	$33.62 \pm 6.98$	$30.94 \pm 8.34$	0.000*

Independent t-test

\*p-value  $< 0.01$



**Table 2: Factors influence in food choices among gender and BMI groups (n=106)**

Factors	Gender groups			BMI groups		
	Male (n=29) (Mean $\pm$ SD)	Female (n=77) (Mean $\pm$ SD)	p-value	Underweight/ Normal (n=54) (Mean $\pm$ SD)	Overweight/ Obese (n=51) (Mean $\pm$ SD)	p-value
Health	3.24 $\pm$ 0.74	3.41 $\pm$ 0.62	0.215	3.21 $\pm$ 0.69	3.55 $\pm$ 0.56	0.008*
Mood	3.13 $\pm$ 0.68	3.26 $\pm$ 0.64	0.353	3.04 $\pm$ 0.65	3.43 $\pm$ 0.59	0.002*
Convenience	3.08 $\pm$ 0.71	3.26 $\pm$ 0.61	0.200	3.02 $\pm$ 0.70	3.43 $\pm$ 0.49	0.001*
Sensory	3.22 $\pm$ 0.70	3.33 $\pm$ 0.60	0.416	3.19 $\pm$ 0.63	3.42 $\pm$ 0.62	0.061
Nutrient content	3.18 $\pm$ 0.85	3.31 $\pm$ 0.68	0.425	3.08 $\pm$ 0.72	3.48 $\pm$ 0.70	0.004*
Price	3.07 $\pm$ 0.81	3.31 $\pm$ 0.66	0.116	3.17 $\pm$ 0.70	3.32 $\pm$ 0.72	0.260
Weight control	3.03 $\pm$ 0.87	3.13 $\pm$ 0.66	0.547	2.93 $\pm$ 0.75	3.30 $\pm$ 0.64	0.007*
Familiarity	3.15 $\pm$ 0.74	2.96 $\pm$ 0.67	0.211	3.05 $\pm$ 0.62	2.97 $\pm$ 0.76	0.547
Ethical concern	2.92 $\pm$ 0.99	2.88 $\pm$ 0.81	0.845	2.82 $\pm$ 0.81	3.00 $\pm$ 0.89	0.268

Independent t-test

\*p-value &lt;0.01

**Table 3: Factors associated with body weight and fat percentage (n=106)**

Factors	Body weight		Fat percentage	
	r-value	p-value	r-value	p-value
Health	0.144	0.142	0.299	0.002**
Mood	0.246	0.011*	0.290	0.003**
Convenience	0.218	0.025*	0.326	0.001**
Sensory appeal	0.188	0.054	0.232	0.017*
Nutrient content	0.197	0.043*	0.298	0.002**
Weight control	0.132	0.178	0.212	0.029*

\*Pearson correlation test

\*p-value &lt;0.05

\*\*p-value &lt;0.01

## DISCUSSION

Besides hunger stimulation, many internal and external cues can trigger the immediate desire to eat or orient eating toward certain foods. A study stated that despite being an important factor of food choice, liking or eating pleasure may make only a modest contribution to overall variation in food choice and eating behaviours (9). Although it is widely believed that females place more emphasis on healthy eating compared to males, there were no significant differences between genders for all factors in this study. For both gender groups in this study, the top factor influence in food choices was health followed by sensory. This did not concur with Wardle et al. (2004) that reported women as more likely than men to report avoiding high-fat foods, eating fruit and fibre, and limiting salt (to a lesser extent), besides more likely to be dieting and attached greater importance to healthy eating (10). The least factor for both genders in this study was ethical concern followed by familiarity for female and weight control for male. As for food choice factors among BMI groups, overweight/obese group significantly considered health, mood, convenience, nutrient content and weight control more than underweight/normal weight

individuals. This is contradictory to a study among low income women by Dressler & Smith (2013) where lean/normal weight participants reported that health was influential in food choice, while overweight/obese participants expressed cost as being more of a factor (11). Both BMI groups reported that taste or sensory was of greatest importance in that study. The outcome difference might be contributed by the different setting of participants sampling. As this study focused on staff working in a healthcare setting, the knowledge of obesity-associated health risks may prompt the overweight/obese group to consider health, nutrient content and weight control in their food choices as a means of weight loss compared to their counterpart. Previous studies have shown that higher BMIs women display frequent dieting behaviour (12) and limiting calorie intake induces a counter-regulatory response which then leads to excessive calorie intake (13) and weight gain (14).

The above-mentioned factors together with sensory appeal showed a weak but significant positive association with body fat percentage regardless of BMI groups. Of these six factors, only mood, convenience and nutrient content showed a similar significantly positive but weak association with body

weight. Singh stated that the interaction between mood, emotional state, and feeding behaviours is complex and it is hypothesized that individuals regulate their emotions and mood by changing both food choices and quantities (15). It seems to be a two-way relationship between food intake, mood and obesity. Depressed mood is associated with abdominal obesity and poor diet intake (16) as such individuals showed a preference for palatable “comfort foods” which can improve negative feelings on a short-term basis (15, 17). When this behaviour is prolonged, Sharma and colleague state that persistent high-fat feeding unfavourably leads to negative emotional states, increased stress sensitivity and altered basal corticosterone levels (18). At the same time, calorie-dense food promotes higher fat percentage and obesity. The state of being obese in itself increases the vulnerability to depression and anxiety (19). Therefore, the vicious cycle of mood influence in food choices, increasing fat percentage and obesity risk leading to mood disorders should not be underestimated and deserves further exploration.

In a study by Blanck and colleague (2009) that identify four determinants of food choice among working adults, convenience was chosen as the most important of the study population, followed by taste, cost, and health. In the same study, BMI was significantly related to convenience where convenience was a more influential factor for obese person compared to overweight or non-overweight individuals (20). Such finding is similar to our finding that shows convenience as having a significantly positive association with body weight and fat percentage. According to Gordon - Larsen, neighbourhoods or in this case environments that offer access to high-quality foods are theorized to improve individual-level diet and weight outcomes of its population (21). Therefore, it is suggested that a higher availability, accessibility and convenience to healthier food options may play a substantial role in weight control by encouraging healthier food choices especially among those with higher BMI.

The current study provides evidence of influence in factors related to food choices such as health, mood, convenience, nutrient content and weight control among overweight and non-overweight individuals working in a healthcare setting. Certain factors such as mood and convenience were found to be significantly associated with body weight and fat percentage. Healthcare providers might consider measures regulating these factors as a potential approach in weight management intervention.

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**Original****Nutritional Status and Diet Characteristics in Patients with Intestinal Obstruction Due to Food Residues at Hospital in Vietnam**

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**ABSTRACT:** *Background and purpose.* Bezoars are collections of undigested foreign material that accumulate in the gastrointestinal tract. Phytobezoars are the most common, which are formed from plant fibers, especially those related to the ingestion of at-risk foods such as persimmon, guava, dried bamboo shoots and so on. Patients who undergo abdominal surgery, including bariatric surgery for obesity, and particularly gastrectomy, are prone to bezoar formation due to reduced gastric motility, loss of pyloric function, and hypoacidity. Bezoars can form months to years postoperatively. Our objective was to describe nutritional status, dietary characteristics, and some factors in patients with intestinal obstruction caused by food residues. *Methods.* A descriptive study was carried out on 43 inpatients who were diagnosed with intestinal obstruction because of bezoars. Participants will be interviewed with a set of questions about the frequency of food consumption by using food photobooks, scales, and height gauges. The patient opened his mouth to count the number of missing teeth and dentures. *Results.* There were many patients with a history of eating high-risk foods such as persimmons (40.5%) with the average weight was 168.5 grams, guava (43.6%) with the average weight was 87.4 grams. The number of patients with stomach diseases, diabetes, dental problems accounted for 69.7%, 25.5%, 43.6% respectively. Winter season recorded the most cases of intestinal obstruction with 44.3%. *Conclusion.* Research has shown that the majority of patients consumed high-risk food groups. The frequency of eating foods quite regularly, especially the foods enrich fiber content. The medical history was also account for a fairly high rate, especially digestive problems up to 88.3% of people. Therefore, screening and preventive measures for patients with risk factors, and the elderly are essential to prevent intestinal obstruction due to food residues.

**Key Words:** Bezoars, phytobezoar, high fiber foods, persimmons, intestinal obstruction

**INTRODUCTION**

Intestinal obstruction is one of the most common surgical emergencies caused by various conditions. It is the second prevalence reason only after appendicitis (1,2). There are two main types of intestinal obstruction: mechanical intestinal obstruction and functional intestinal obstruction (2). Depending on the degree of gastrointestinal obstruction and duration, intestinal obstruction is divided into acute intestinal obstruction and subacute intestinal obstruction (1).

Intestinal obstruction caused by food residues (Bezoar) is one type of mechanical intestinal obstruction. Bezoars are solidified substances formed by mixing indigestible exogenous substances with other substances in the gastrointestinal tract; bezoars are commonly found inside the stomach but can enter the small intestine via the pylorus. Once the diagnosis of bezoar is made, the bezoar is dissolved or removed, because it can cause gastric outlet obstruction, ileus, ulcerations due to pressure necrosis, and subsequent gastrointestinal bleeding (3). Bezoars are mainly classified into four types according to their composition: phytobezoars, trichobezoars, pharmacobezoars, and lactobezoars (3).

The formation and development of bezoars can

occur at any age. However, many studies showed that the nutritional status and dietary habits play a key role in producing bezoars, especially in the elderly with an imbalance in nutritional status, which could create a negative impact on their quality of life and cause increased morbidity and mortality. Phytobezoar is one of the most common bezoars around the world (4), which consists of fruit and vegetable fibers (5). This was why, older people consume a large amount of food with high-fiber content and inadequate chewing, which can lead to small bowel obstruction (6,7). These factors are partly related to dietary habits. Furthermore, the aging process and some of the related physiologic changes can predispose one to phytobezoar formation. For example, older people can find it difficult to chew food well if they have some abnormal characteristics, including losing teeth, weakening teeth, and swelling gums (8). In a study conducted by NJ Talley in 1992, the older population usually had decreased gastrointestinal motility and elastic bowel that could lead to a high chance of constipation (9). It is considered as a reason leading to the accumulate and establishment of phytobezoar in the gastrointestinal tract (10).

Worldwide, there has been a relative study on the cause of intestinal obstruction due to food residues, but most of the studies are related to the formation mechanism of food residues with the relationship between stomach diseases, pancreatitis, the reduction

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of gastric acid after gastric bypass surgery. The study conducted by Kement et al in 2012 showed that patients' surgical stomach history was a high-risk factor, which could lead to the establishment of bezoars and accounted for the largest number of causes at 48% (4). Similar results were found in others studies such as Krausz et al in Israel (1984) (5) and Bowden in Georgian (1983) (6), which showed that the percentage of intestinal obstruction patients relating to surgical stomach history were 20% and 93% respectively. The treatment of peptic ulcers with proton-pump inhibitors is also one of the risk factors for the formation of food residues by the drug's mechanism of reducing gastric acid secretion (7). In addition, long-term consumption of certain food high in insoluble fiber such as cellulose, hemicellulose, lignin, and food with an acrid taste (tannin) by these patients may also be the cause of phytobezoars. The US Food and Drug Administration allows foods to be labeled "a good source of fiber" or "high fibre" if they contain more than 2.5 g or 5.0 g of dietary fiber per serving (100g), respectively (19). In the foods at risk also contain a large amount of fiber such as persimmons (2.5g), guava (6g), bamboo shoots (4.1g), figs (2.9g). In terms of astringency, tea also contains a large amount of tannins (20). Persimmons are typical foods causing phytobezoars in some Asian countries such as Japan with 40% (11) and Korea up to 76.4% (12) of people with intestinal obstruction. The formation and accumulation of bezoars in the gastrointestinal tract rely on many factors, and it is not only related to the types of fiber but also to the quantity of that fiber at each time of consumption. A few Vietnamese studies have suggested high-risk foods, but they did not provide comprehensive information about the amount and the frequency of using these foods in the advanced formation of bezoars.

In terms of diagnoses, intestinal obstruction due to food residues does not have much difference in clinical and subclinical manifestations compared with mechanical intestinal obstruction due to other causes. That makes the rate of accurate diagnosis of the cause of intestinal obstruction because of food residue in clinical practice is not high. Therefore, most cases are diagnosed postoperatively and there will be increased morbidity and mortality rates (13). Research on gastrointestinal foreign bodies in the form of food residues in Vietnam is rare and currently, we have not found any official documents on the frequency of using foods with a high risk of forming bezoars.

## METHODS

### Study settings and subjects

This was a descriptive study that used the cross-sectional study design and was conducted for a year from January 2020 to December 2021. We collected data on a convenience sample in all departments in Hanoi Medical University Hospital during a year and got a total of 43 subjects. The inclusion criteria were that patients were diagnosed with intestinal obstruction due to food residue. The study excluded patients who had been diagnosed with other causes such as postoperative adhesions, volvulus, intussusceptions, hernia, and tumours and refused to participate in the study.

### Data collection

The established a private direct interview with participants at Hanoi Medical University Hospital. The interview usually took 45 minutes to 60 minutes, we carefully explained and listened to the participants'

answers. To limit the error in the quantity and the frequency of using food, we used a picture book about the food serving that was published by the Vietnamese National Institute of Nutrition. The patients opened their mouth and we counted the number of missing teeth and dentures. Biases were controlled by using a single equipment tool and one researcher to collect the data for all subjects.

### Statistical Analysis

The data were entered by using Microsoft Excel Workbook 2016 (Microsoft Corporation, Hanoi, Vietnam) and Stata 14.0 statistical software (StataCorp LLC, California) for analysis. The results have been presented as frequency, percentage, and mean.

### Ethics Approval

The study has been approved by the research review board of Hanoi Medical University Hospital. All participants were fully informed about the purposes of the study.

## RESULTS

The study was conducted on 43 patients (23 males and 20 females) diagnosed with intestinal obstruction due to food residue. The average age of the study subjects was  $58.7 \pm 19.1$ , the youngest was 18 years old and the oldest was 93 years old.

Table 1 shows the outcomes on the patient's clinical features and possible risk factors for bowel obstruction. Regarding medical history, Gastroenterology diseases accounted for the most proportion with nearly 70%, followed by diabetes mellitus with 25.5%. Diseases of gastric surgery, hypertension accounted for 18.6% equally. There were 43.6% of people had trouble with dental health. These problems were mostly weak teeth, lost teeth, alternative teeth, sensitive teeth. In terms of anthropometric index, the study assessed nutritional status according to BMI classification for Asian populations. The majority of patients had normal nutritional status (63.2%), the proportion of malnourished patients was 29% and at least the patients were overweight and obese (7.8%). The final section of the table was the results on the frequency of diseases in different seasons of the year. The proportion of patients with intestinal obstruction was greatest in winter (44.3%), followed by spring with 1/5 of patients. Summer and autumn accounted for 16.2% and 18.6% respectively.

Figure 1 shows the results of food intake and frequency of eating high-risk foods in the 3 months prior to the date the patient was diagnosed with bowel obstruction. Guava was the most consumed food with 43.6%, followed by persimmon with 40.5%. The proportion of patients who had ever consumed bamboo shoots and figs was more than a quarter. The average weight of persimmon was 168.5 (g), and there was a big difference between the smallest (78g) and the largest (312g) mass. The amount of bamboo shoots consumed was close to that of guava at 94.8 (g) with the former and 87.4 (g) with the latter. The weight of figs consumed was the least with 41.2 (g) on average and the smallest (28g), the largest (70g).

Table 2 provides data on the frequency of consumption of high-risk food groups over the past three months. High-fiber foods were regularly consumed by patients with a frequency of  $16.1 \pm 13.5$ . The groups of foods with acrid taste, high in fiber and acrid taste, and beverages had a large difference between the frequency of use of the subjects, at  $2.1 \pm 4.7$ ,  $3.9 \pm 8.8$ , and  $9.7 \pm 13.4$ , respectively.

Table 1. Clinical features of the patient

	All (n)	Percentage (%)
Medical history		
Gastroenterology (Stomach ulcers, Gastroesophageal reflux disease,...)	30	69.7%
Gastrectomy	8	18.6%
Diabetes mellitus	11	25.5%
Hypertension	8	18.6%
Suffering from two diseases	9	20.9%
Dental problems		
Yes (People with dental problems)	19	43.6%
No (People without dental problems)	24	56.4%
BMI (kg/m <sup>2</sup> )		
Underweight (BMI <18.5 kg/m <sup>2</sup> )	12	29%
Normal (BMI 18.5 – 24.9 kg/m <sup>2</sup> )	27	63.2%
Overweight and Obese (BMI of ≥25 kg/m <sup>2</sup> )	4	7.8%
Seasonal disease frequency		
Spring (From January to March)	9	20.9%
Summer (From April to June)	7	16.2%
Autumn (From July to September)	8	18.6%
Winter (From October to December)	19	44.3%

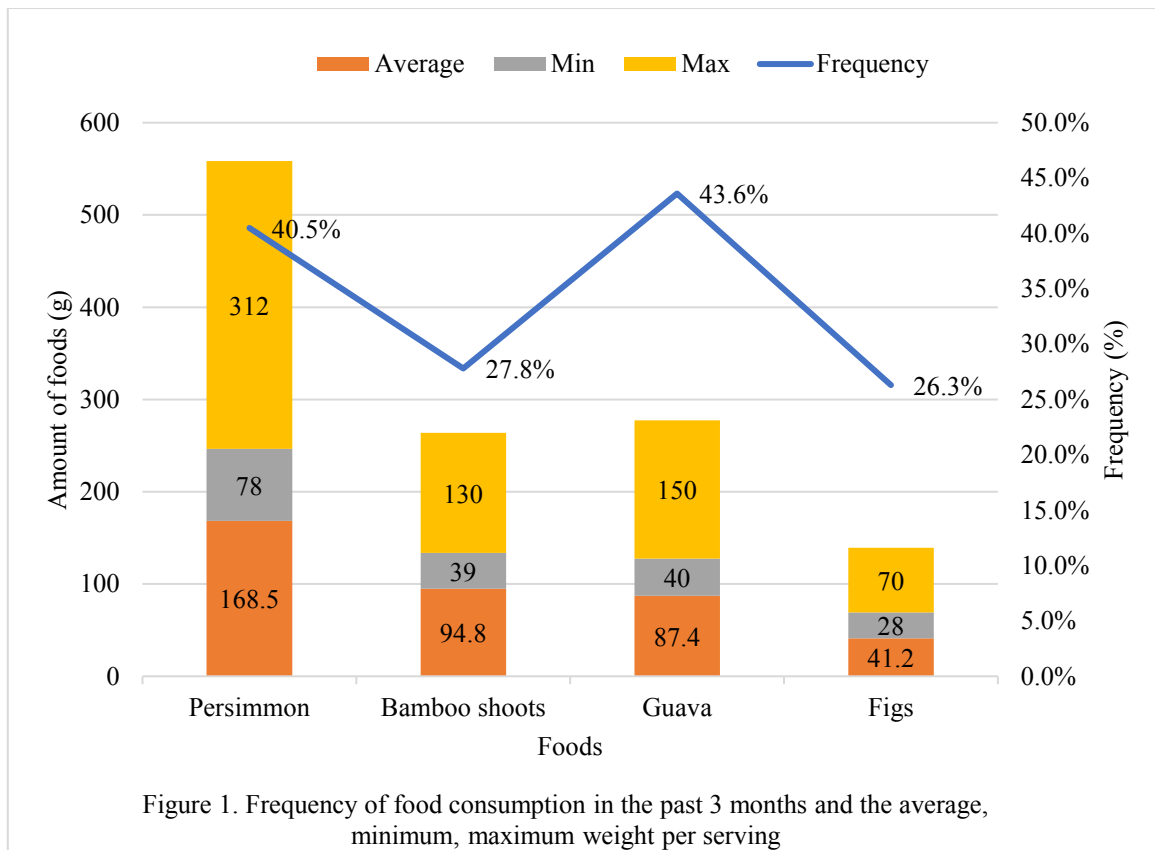


Table 2. Frequency of food consumption in the past three months

	Mean±SD	Median
High-fiber food group	16.1±13.5	11
Food group with an acrid taste	2.1±4.7	1
Food group high in fiber and acrid taste	3.9±8.8	0
Beverage group	9.7±13.4	2

## DISCUSSION

The study was conducted on 43 patients diagnosed with intestinal obstruction due to food residue at Hanoi Medical University Hospital in 2020-2021. The average age of the subjects was 58.7 years old, ranging from 18 to 93 years old. The number of males was higher than females with 53.5% of males and 46.5% of females.

There are many risk factors for intestinal obstruction due to food residue. Daily food consumption also plays an important role in the formation of bezoars in the intestinal lumen. In Vietnam, according to a study of Dong NV in 2005, 38.1% of patients had a medical history of consuming enriched fiber, acrid taste (tannin), and resin foods before admitting hospitals, in which history of eating persimmons made up the largest percentage at 26.2%, and the percentage of patients with the history of consuming dried bamboo shoots was about 5.9% (1). In another study of Hung HT in 2007, the percentage of patients with a history of consuming persimmons and patients with a history of eating dried bamboo shoots was 53.8% and 23.1% respectively (2). Moreover, there were some cases with a history of eating the orange pith, tangerine, and unripe banana (14). Worldwide, in 2012, excessive consumption of persimmon was identified in 40.5% in Kement's study in Poland (4), also in this country, Erzurumlu et al reported that 17.6% of their 34 patients with bezoars had a history of persimmon or cherry laurel intake (15). Persimmon, which grows in many areas in our region and is widely consumed, is the fruit of a number of species of trees belonging to the genus *Diospyros*. A history of persimmon intake was obtained in only 103 of the 113 patients (91.2%) by Krausz et al, since at the beginning of the study period, surgeons were not aware of the association between phytobezoar induced intestinal obstruction and persimmon ingestion (5). These figures were similar to our study, with 40.5% of patients having a history of eating persimmon in three months before being diagnosed with intestinal obstruction due to food residue. Furthermore, patients often suffered from intestinal obstruction in the first and last months of the year - these were the seasonal months of some high-risk foods such as persimmons, bamboo shoots, beans, oranges, and so on. In Hong Kong, EM Chisholm et al. reported that two-thirds of the patients in their study became ill in the last months of the year. The author has also emphasized the relationship between the season and harvest season of persimmons. In this country, persimmons are consumed a lot during the Mid-Autumn Festival as traditional culture, this is also the harvest month of persimmons. Similarly in Vietnam, August to December is also the season of persimmons, so people will consume more persimmons than other months of the year. Around this time, Vietnamese people celebrate the Lunar New Year, and bamboo shoots are often eaten during Tet meals. As a result, it is possible that cultures and food harvest seasons influence the patient's food intake. Besides, some foods were also suspected to be factors that catalyze the formation of food residues such as guava, bamboo shoots, and figs with the percentage of 43.6%, 27.8%, and 26.3%, respectively. Most previous studies have only investigated whether or not patients ate the risk foods. In our study, we studied the frequency of using high-fiber food groups, and foods with astringent taste within three months of the patient's diagnosis of

intestinal obstruction, and we also investigated the amount of food eaten using food picture books to suggest to the patient how much food was eaten. For some high-fiber foods such as persimmons, bamboo shoots and guava, the patient's average intake was 168.5 (g), 94.8 (g), and 87.4 (g), respectively. Figs are an acrid food that was also consumed regularly with an average weight of 41.2 (g).

In addition to the intake of large amounts of cellulose materials, other possible risk factors include a history of gastrointestinal surgeries (such as gastrectomy, gastrojejunostomy, and other stomach diseases) or diabetes caused by various factors. In our study, there were 69.7% of patients with a history of previous gastric diseases, 18.6% of those had gastric surgery. The percentage of people having surgery was less than other studies around the world such as F Serour with 34 patients (83%) having a history of previous gastric surgery for ulcer (16). Partial gastrectomy can reduce gastric acid secretion, resulting in a weakly acidic environment and a decrease in gastric motility; thus, removal of undigested solids from the stomach is likely delayed, thereby causing high amounts of viscous contents to form inside the stomach, which is prone to bezoar formation (17). We also collected 25.5% of patients with a history of diabetes, this number was lower than Metin Kement's study with 28.6% (4). Through these studies, we realized that gastric diseases could be a risk factor for intestinal obstruction, so we needed to have measures and plans to prevent early intestinal obstruction in patients.

Moreover, we also found that 43.6% of patients had problems with teeth, jaws, and faces. These patients were mostly missing teeth or were using dentures. This makes it difficult for the person to chew and swallow. As a result, the food is not crushed enough, so when consuming a large amount of fiber, it can cause blockage of the intestinal lumen because the intestine cannot be digested. People who have missing teeth or dentures often struggle to chew all the foods they wish to eat. Without a full set of teeth, food selection may be narrow. Some people complain that they could't chew vegetables or meats. Others will suffer psychological effects when they avoid socializing and eating meals out in restaurants with friends or family. Poor masticatory performance was associated with significantly lower intakes of insoluble and dietary fiber for both sexes (18).

Based on this study, we found that patients with intestinal obstruction due to food residue in Vietnam also regularly consume high-risk foods as in other countries around the world. Vietnam is a tropical country, so it has a wide variety of foods. Each season will have different quality foods and very reasonable prices, guiding people to choose foods to consume regularly. Consuming large amounts of these foods in combination with a medical history such as stomach problems or dental issues increases the risk of food residue formation. Therefore, it is necessary to have backup plan or instruct patients on how to choose the right food for themselves.

In conclusion, it can be seen that most patients have consumed high-risk food groups with a fairly regular frequency. Fiber-rich foods were eaten by the patients the most, especially persimmons, with an average serving weight of more than 168 grams. Research also showed that the disease often occurs in the cold months

in Vietnam. In addition, a history of diseases such as diabetes (25.5%), stomach disease (88.3%), or dental problems (43.6%) was also common in the study subjects. Therefore, screening and preventive measures for patients with risk factors, and the elderly are essential to prevent intestinal obstruction due to food residues.

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**Case report****Protein Energy Malnutrition with Refeeding Syndrome after Bariatric Surgery**

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**ABSTRACT** *Background and purpose:* Protein energy malnutrition (PEM) with refeeding syndrome might develop post-bariatric surgery. Case report aimed to describe the clinical practice on a morbidly obese patient post-bariatric surgery, presented PEM with refeeding syndrome. *Case presentation:* A 50 years old-morbidly obese patient presented PEM (prolonged inadequate oral intake with 12kcal/kg/day and 0.5 g/kg/day protein intake; low biological value protein source), low electrolyte profile and anasarca (gained 10.9 kg with generalized edema) 20-months post-bariatric surgery (51% weight reduction) in bariatric clinic. During the hospitalization (42 days), oral full enteral feeding with standard formula and protein modular supplement was implemented for the first 2-weeks and followed by high protein diet with oral nutrition supplementation. There were clinical and nutrition improvement upon discharged including resolved anasarca, improved energy protein intake, increased in handgrip strength (from 7.8 kg to 11.2 kg) and serum albumin level (from 23 g/L to 32 g/L). She achieved progressive recovery in body weight (gained 7.4 kg, without edema); improved energy protein intake and handgrip strength during 2-month post-discharged follow up in bariatric clinic. *Discussion and Conclusion:* PEM in obese patient post-bariatric surgery has high risk of refeeding syndrome upon rapid advancement in nutritional intake. Progressively nutrition commencement with full enteral feeding and followed by high-protein normal diet with oral supplement support is prescribed to optimize nutrition status during hospitalization. As conclusion, individualized and routine follow-up by dietitian post-bariatric surgery is recommended to early detection of PEM and followed by appropriate intervention to prevent further nutrition deterioration.

**Keywords:** Protein energy malnutrition, refeeding syndrome, bariatric surgery

**INTRODUCTION**

Prevalence of obesity increased in recent decades and reach alarming level. Obesity is a chronic life-threatening disease and leads to worldwide public health concern (1). Studies on bariatric surgeries were proven as an effective and enduring treatment for clinically severe obesity (2, 3). The two main operations are laparoscopic sleeve gastrectomy and Roux- en- Y gastric bypass (4). Gastric bypass procedures are associated with increased nutritional deficiencies because the procedure is more complex and changes the gastrointestinal anatomy. Protein energy malnutrition (PEM) with refeeding syndrome might develop post-bariatric surgery (5). Case report aimed to describe the clinical practice on a morbidly obese patient post-bariatric surgery, presented PEM with refeeding syndrome.

**CASE PRESENTATION**

There A 50 years old-morbidly obese patient, with underlying diabetes mellitus and hypertension, underwent bariatric surgery (gastric bypass) in August 2019. Diabetes mellitus and hypertension were resolved and not on any medication post-bariatric surgery. About 20-months post-bariatric surgery, she achieved 51% weight reduction but she presented protein energy malnutrition (PEM), low electrolyte profile and anasarca (gained 10.9kg with generalized edema) upon clinic follow up. She attended 7 follow up sessions under surgeon in bariatric clinic but only first

and second follow up sessions with dietitian. After assessment, dietitian identified a few nutrition problems including prolonged inadequate oral intake with 12kcal/kg/day and 0.5g/kg/day protein intake past 6 months; low biological value protein source and food myths. Due to afraid of weight gain, she restricted her food choices and amount of meal intake.

During the hospitalization (42 days), oral full enteral feeding with standard formula and protein modular supplement was implemented for the first 2-weeks. In order to address refeeding syndrome, the feeding strength was initiated at low calories level and stepped up gradually concurrently with electrolyte correction. On the third week of admission, high-protein normal diet and oral supplement support 3-times per day were started after oral feeding was established. Moreover, frequent comprehensive and individualized nutrition counseling includes nutrition education, calories counting, food labeling, customized dietary planning, and the empowerments to live a healthier lifestyle were carried out. There were clinical and nutrition improvement upon discharged including resolved anasarca, improved total daily energy and protein intake, increased in handgrip strength (from 7.8kg to 11.2kg) and serum albumin level (from 23 g/L to 32g/L). She achieved progressive recovery in body weight (gained 7.4kg, without edema); improved total daily energy and protein intake and handgrip strength during 2-month post-discharged follow up in bariatric clinic.

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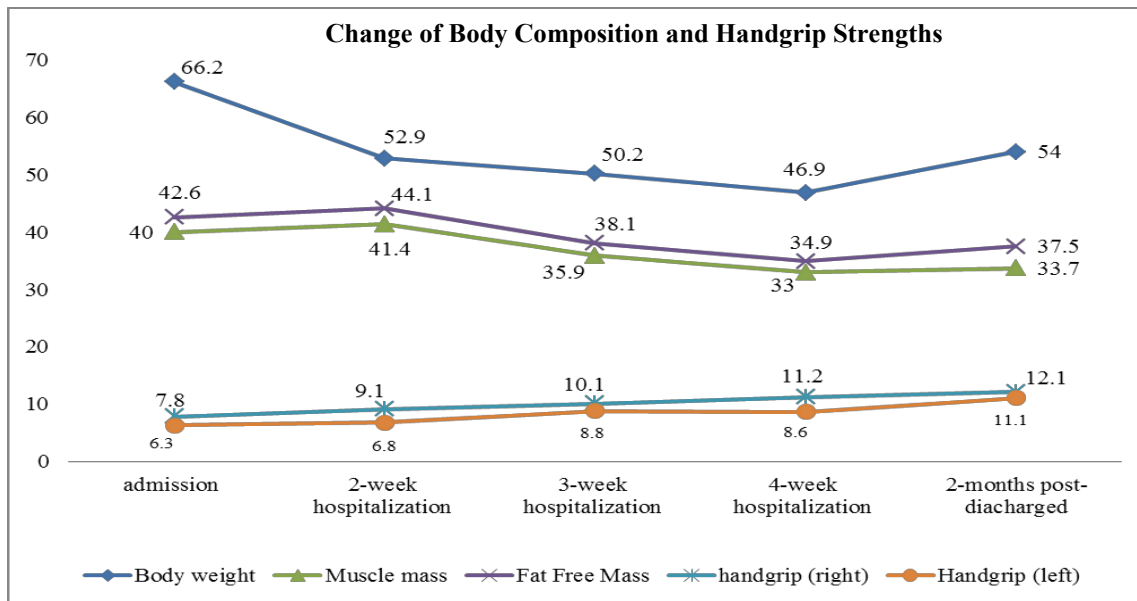


Fig 1. Change of Body Composition and Handgrip Strength

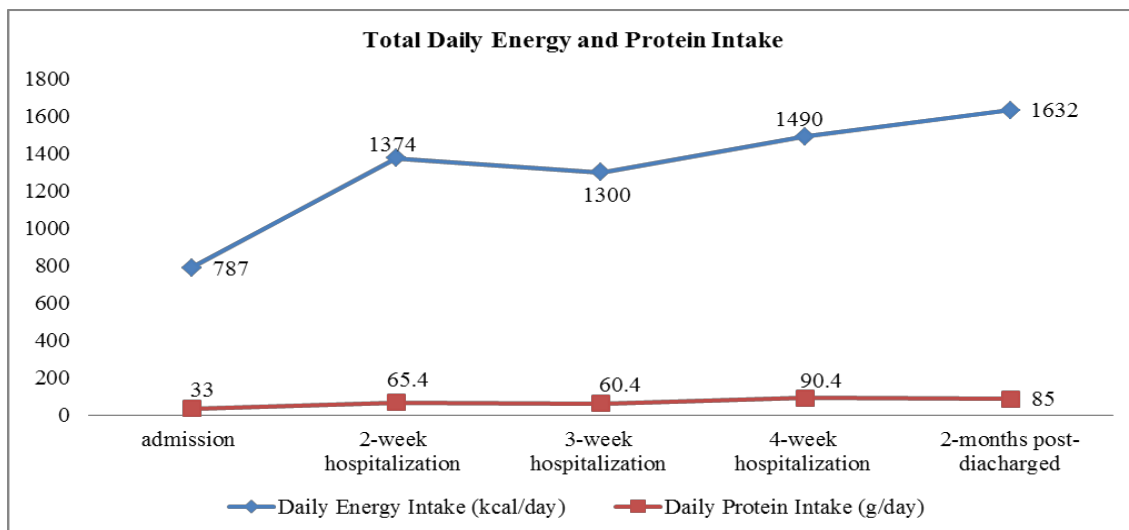


Fig 2. Total Daily Energy and Protein Intake

### DISCUSSION

Bariatric surgery is proven convincing and successful treatment approach for obesity. A sustainable weight loss, remission of obesity-related comorbidities and well-being are the recognized post-bariatric outcomes. In spite of multiple clinical benefits, a number of nutritional complications can develop especially in the long term, which could cause serious detriment to patients' health (6).

After bariatric surgery, the inadequate oral intake is considered common (7). Those patients who do not adhere to the recommended diets are at a greater risk of developing relevant malnutrition (8). Current PEM after bariatric surgery case was due to non-adherence to nutrition recommendation, food intolerances to good quality protein, small stomach pouch, and

increased protein requirement to maintain muscle mass, food faddism or inability to recognize high quality protein which is in line with the previous study (9). Patients often have postoperative intolerance to protein-rich foods and protein digestion is impaired by reduced mixing with pancreatic enzymes, which results both from mechanical factors (1, 10).

Refeeding syndrome is a severe electrolyte disturbance and metabolic abnormalities when reinstitution of unrestricted enteral or parenteral nutrition in malnourished patients (11). However, obese patients who lose weight after bariatric surgery are also susceptible to the refeeding syndrome (11). PEM in obese patient post-bariatric surgery has high risk of refeeding syndrome upon rapid advancement in nutritional intake (12). Energy supply in enteral feeding

(standard formula and modular protein supplement) in current case was followed as recommendation which aim 25% of energy requirements and stepped up after three days. The protein requirements is 1.2 to 1.5g/kg/day by using the adjusted weight in obese individuals (13).

This case report demonstrated the approaches on the refeeding syndrome of obese patient after bariatric surgery. Concurrent with intravenous electrolyte correction, the nutrition management was initiated with progressively nutrition commencement with full enteral feeding for two weeks and followed by high-protein normal diet with oral supplement support is prescribed to optimize nutrition status during hospitalization (14). Dietitian-led tailored nutrition counseling that establish goal and create individualized dietary plan (7) and motivation to foster responsibility for self-care (15) as well as regular nutrition monitoring are crucial to secure the compliance with the healthy dietary recommendation and promote healthy weight loss post-bariatric period (7). The current case report revealed that regular nutrition monitoring and individualized management by dietitian is crucial to ensure healthy weight loss and prevent PEM post-bariatric surgery (16). This case report intends to strengthen a shift in the conventional post-bariatric unimodal follow up approach to multidisciplinary approaches.

As conclusion, PEM and refeeding syndrome is a potential fatal complications post-bariatric surgery. Hence, dietitian is a mandatory role in the rehabilitation strategy of post-bariatric surgery in outpatient setting in order to monitor nutrition status closely, ensure adequacy of dietary intake and subsequently prevent the risk of PEM and life-threatening complications.

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**Case Report:****Nutrition Support for Controlling Blood Glucose  
in a Case Series of Covid-19 Patients with Hyperglycemia**Yen Ma Ngoc<sup>1\*</sup>, Thao Tran Phuong<sup>2,3</sup>, Oanh Ninh Thi<sup>1</sup>, An Bui Tuong<sup>1</sup>, Linh Nguyen Thuy<sup>1,2</sup><sup>1</sup>*Department of Nutrition and Dietetics, The COVID-19 Hospital, Hanoi Medical University Hospital, Vietnam.*<sup>2</sup>*Hanoi Medical University, Hanoi, Vietnam.*<sup>3</sup>*Jumonji University Graduate School, Saitama 352-8510, Japan.***INTRODUCTION**

COVID-19 caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was recognized as a pandemic that has posed a threat to human being global. As of March 2022, the total number of deaths is approximately 6 million people and more than 450 million is the total number of cases worldwide (1).

Mortality and morbidity rates of COVID-19 disease increase significantly in certain population groups such as males, older adults, or patients with comorbidities. Among these, hyperglycemia and diabetes mellitus (DM) have received a lot of attention. Hyperglycemia and DM may be caused by the infection of SARS-CoV-2 to the pancreas through angiotensin-converting enzyme 2 (ACE2), where it is highly expressed compared to other organs, leading to pancreatic damage with subsequent impairment of insulin secretion and development of hyperglycemia even in non-DM patients (2). Apart from that, adipocyte infection and routine steroid treatment could be attributed to insulin resistance and elevated blood glucose (3). Many large studies proved that hyperglycemia and DM may deteriorate the progression and severity of COVID-19 and associate with poorer prognosis and high mortality in suffered patients (4-6). Many studies proved that commercial food suitable for diabetic patients was mostly lower in carbohydrates than the controlling food (7). The use of diabetes-specific nutrition formula (DSNF) has consistently been shown to improve postprandial glucose levels compared to standard test foods such as oatmeal of similar caloric content (8). DSNF could either affect directly through  $\beta$ -cell stimulation and insulin release and/or indirectly through glucagon-like peptide-1 (GLP-1) secretion. In some trials comparing DSNF and standard formula, most DSNF used were oral nutritional supplements (ONS) (8-10). It can be seen that the total carbohydrate mainly ranged from 26 – 31 grams, equivalent to 35-55% total energy, compared to approximately 56 grams of oatmeal (8). A systematic review analyzing 23 different randomized controlled trials showed that DSNF significantly reduced the postprandial rise in blood glucose (by 1.03 mmol/l), peak blood glucose concentration (by 1.59 mmol/l), and glucose area under the curve (by 7.96 mmol) (9). In the ICUs, two different DSNFs outperformed a standard formula in terms of insulin use, plasma glucose, and glycemic variability (11).

Because diabetic patients are easily affected and prone to harbor severe symptoms of COVID-19, and because DSNF proved their efficacy in controlling blood glucose as well as other indicators in diabetes, therefore DSNF has been applied more frequently to decrease glucose level, in addition to pharmacological therapy. Besides, in Vietnam, many hospitals use Blenderized Tube Feeding (BTF) foods which makes by kitchen staff with rudimentary technology. Because it has a short expiry date with 24 hours in the fridge, it is not suitable for nourishing the Covid-19 patients during the high peak of the pandemic. In this study, we apply the Nutrition Care Process (NCP) of The Covid-19 Hospital to improve the nutritional condition for those patients and aim to report some cases that consumed a kind of commercial BTF manufactured in Vietnam, which is designed for patients with hyperglycemic. In addition, this product with a reasonable price and a high convenience and therefore become popular in Vietnam during the Covid-19 pandemic.

**METHODOLOGY**

A case series was conducted at the R13 – Intensive Care Unit at the COVID-19 Hospital which belongs to Hanoi Medical University Hospital. Our clinical study is a case series that includes 10 eligible patients identified during the study registration period (consecutive, formal). It describes the experience of a small group of patients (observational, descriptive research design), contains demographic information about them, 24 hours dietary records, and blood glucose (the lowest and highest blood glucose results each day) during five days consecutive from the initial day to day 5. We collected data on EMR (Electronic Medical Record) on the ISOFH software.

**Inclusion Criteria:** At admission, patients were diagnosed to have COVID-19 based on PCR testing. All patients had severe COVID-19 infection, which warranted their admission to the hospital. Patients were admitted to the COVID-19 Hospital for at least five days. In addition, the patients were diagnosed with diabetes and presented disorder hyperglycemia with blood glucose above 10 mmol/dl and used nasal tube feeding. All patients received subcutaneous basal-bolus insulin therapy in the hospital for glucose management. Patients were fed by FOMEAL CARE products that specific design for tube-fed patients with high blood glucose.

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**Exclusion Criteria:** Patients with evidence of a negative for SARS-CoV2 and negative nasopharyngeal smear. Patients had a normal range of blood glucose and did not use tube feeding. In addition, we excluded covid-19 patients who were supported with extracorporeal membrane oxygenation (ECMO), were prone positioning, and had risks of refeeding syndrome.

**Data collection:** *Nutritional assessment according to GLIM 2018* Assessment nutritional status: we used GLIM 2018 criteria for assessing malnutrition in COVID-19 patients. GLIM 2018 consists of phenotypic criteria (non-volitional weight loss, low body mass index, reduced muscle mass) and etiologic criteria (reduced food intake or assimilation, disease burden/inflammatory condition). (Questionnaire 1)

**Body mass index (BMI):** We collected the weight and the height of patients through electronic medical records or by asking directly caregivers. BMI category according to WHO classification: BMI < 18.5 Kg/m<sup>2</sup>: Underweight; BMI 18.5–24.9 Kg/m<sup>2</sup>: Normal weight; BMI 25.0–29.9 Kg/m<sup>2</sup>: Pre-obesity; BMI > 30 Kg/m<sup>2</sup>: Obesity.

**Non-volitional weight loss:** we asked patients or caregivers by mobiphone or previous medical staff to know patients' weight loss status.

**Reduced muscle mass:** nurses or doctors or dietitians would examine or observe some positions on patients' bodies. These are temples, clavicle, shoulder, scapula, thenar, thigh/knee, and calf. In terms of Subcutaneous fat loss, we examine or observe some body's locations such as orbital fat pads, buccal fat pads, and triceps.

**Reduced food intake or assimilation:** we asked patients or caregivers or previous medical staff to know patients' intake status or we observed patients' eating during the initial 24 hours entering the hospital in the case we could not obtain any information from patients or caregivers or previous medical staffs.

**Blood glucose tests:** Nurses would check patients' blood glucose before patients' meal time (the main and snack meals) four times a day (6 am; 11 am; 5 pm; 9 pm). All patients had not eaten till nurses examined their blood glucose. They used the ACCU-CHEK Guide machine (Mannheim Germany) for measuring capillary blood glucose for all patients.

**Nutrition requirement calculation:** Following the ESPEN guidelines on clinical nutrition in the intensive care unit, dietitians calculated nutritional requirements for each patient based on their weight and patients' condition at each phase of the COVID-19 disease. After that, they chose suitable meal codes and/or nutritional products for each participant. The number of patients' meals (3 - 4 meals) would follow patients' nutritional requirements.

+ The patient's meals were provided according to the nutritional intervention plan, the nurse nourished the patient and recorded the number of food intakes each meal. Dietitians would synthesize the 24-hour dietary records. In our research, participants were fed by Fomeal care. Fomeal care is real food that blends meals for diabetes patients or patients with high blood glucose

disorder. One portion was packed in a bottle with a net 250ml. The ingredients include macronutrients (14.5 grams protein, 6.6 grams lipid, 25.5 grams carbohydrate), micronutrients (13 vitamins and 12 minerals, and omega 3,6,9. The noticeable characteristics are high fiber content (4 grams per bottle) and low glycemic index (GI = 33±17).

### Research implementation

The research was applied the Nutrition Care Process (NCP) of the Nutrition and Dietetic Department at The COVID - 19 Hospital, which include four steps: Nutrition Screening and Assessment, Nutrition Diagnosis according to GLIM 2018 criteria, Nutrition Intervention Plan (nutritional requirements: (protein, lipid, carbohydrate, fiber, meal distribution, and so on), and reassessment a nutritional plan. In our hospital, dietitians would carry out four steps in NCP, nurses would respond to feeding patients through tube-feeding. NST took responsibility for assessment effective nutritional intervention and blood glucose improvement. If patients' blood sugar was unstable and/or insufficient nutrition, the dietitian will change dietary (energy, carbohydrate, and fiber).

**Ethics/Consent:** The study has been approved by the research review board of Hanoi Medical University Hospital. All participants were fully informed about the purposes of the study.

### RESULTS

We presented a case series of 10 patients diagnosed positive with COVID-19 and diabetes mellitus. They were of age group ranging from 67 to 92 years, of which there were five female patients (50%). The study group had a BMI from 19.0 to 27.6 kg/m<sup>2</sup>, including two patients with BMI over 25 kg/m<sup>2</sup>.

Most of the patients in the study had a severe COVID-19 condition accounted for 80% (8/10 patients), and critical Covid patients were 20% (2/10 patients). All patients had comorbidities, 100% of patients with diabetes mellitus, followed by 50% (5/10 patients) of patients with hypertension and 40% (4/10 patients) of other comorbidities. In addition, seven patients had more than two types of commorbidities. In terms of respiratory therapy, those patients had applied with diversity therapies. Seven patients were supported oxygen by using invasive ventilation (intubation), followed by two patients receiving oxygen masks, and only one patient had non-invasive ventilation (BIPAP).

Table 2 shows that the percentage of patients over 70 years old with BMI < 20 was 30% (3 patients). The percentage of patients with moderate weight loss was 40% (4 patients), which was lower than the proportion of patients without weight loss (60%). Regarding loss of muscle mass characteristics, seven patients did not experience a loss of muscle mass, three patients had a mild to moderate loss of muscle mass, and no patients had a severe weight loss. All patients in our study had a reduction in dietary intake under 50%. Based on GLIM 2018, all patients in our study had a risk of moderate malnutrition at admission.

Table 3 describes the nourishing process of 10 patients during the first five days in the ICU at the



COVID-19 Hospital. For the energy, it reached the recommendation in the first four days. On day 5, the average nourishing energy had a small reduction and achieved 80-99% of the energy requirement. In terms of protein intake, on day 2, day 3, and day 4 of feeding, the average amount of protein in patients' dietary was got to over 95% of the protein requirement. However, on day 1, the average amount of protein among 10 patients' dietary was achieved only 88.8% of this recommendation, and the figure for day 5 was the lowest, at about 76.7%. Besides, the carbohydrate and fiber were completely satisfied with the recommendation. During the research period, the percentage of lipid proportion was not reaching the recommendation ranging from 65% to 74.9 %.

This diagram illustrates the variability of blood glucose and fiber content in the diet of 10 patients during the first 5 days of admission. The highest and lowest blood glucose tended to decrease gradually in the first 5 days. The highest average blood sugar among all participants on day 1 was 21.0 mmol/dL, peaked at 22.1 mmol/dL on day 2, and tended to decrease gradually in the following days. The lowest average blood sugar of 10 patients on day 1 was 8.9 mmol/dL, increased to 12.2 mmol/dL on day 2, and fell to 7.4 mmol/dL on day 5. By contrast, the average amount of dietary fiber showed an upward trend, and it was 14 grams on the beginning day to 18.4 grams on the last study day.

### Questionnaire 1.

#### ASSESSMENT OF NUTRITIONAL STATUS AND REFEEDING SYNDROME

Full name: \_\_\_\_\_ Gender: \_\_\_\_\_ Age: \_\_\_\_\_ Weight (kg): \_\_\_\_\_ Height (cm) \_\_\_\_\_  
Diagnose \_\_\_\_\_

I. Assessment of nutritional status – GLIM 2018		Level		
		Normal	Mild- Moderate	Severe
<b>1. Body mass index (BMI)</b>	Mild: BMI >20 if < 70 Age or > 22 if ≥ 70 age	<input type="checkbox"/>		
	Moderate: < 20 if < 70 age or < 22 if ≥ 70 age		<input type="checkbox"/>	
	Moderate: < 18.5 if < 70 age or < 20 if ≥ 70 age			<input type="checkbox"/>
<b>2. Weight loss % (unintended)</b>	Mild	<input type="checkbox"/>		
	Moderate		<input type="checkbox"/>	
	Severe			<input type="checkbox"/>
<b>3. Food intake (Compared to normal)</b>	Mild	<input type="checkbox"/>		
	Reduce <50% of food intake		<input type="checkbox"/>	
	Reduce < 75% of food intake			<input type="checkbox"/>
<b>4. Reduced muscle mass</b>	Mild to moderate	<input type="checkbox"/>		
	Moderate		<input type="checkbox"/>	
	Severe			<input type="checkbox"/>
<b>Classification of malnutrition:</b>		<b>Classify</b>		
<b>II. DIANOSTIC CRITERIA FOR THE RISK OF REFEEDING SYNDROME</b>				
High risk of Refeeding Syndrome if patients have a factor below:		Moderate risk of Refeeding Syndrome if patients have two factors below:		
<input type="checkbox"/> BMI: < 16,0 kg/m <sup>2</sup>		<input type="checkbox"/> BMI: 16-18.5 kg/m <sup>2</sup>		
<input type="checkbox"/> Weight loss level: severe		<input type="checkbox"/> Weight loss level: moderate		
<input type="checkbox"/> Reduced muscle mass/ Subcutaneous fat loss: severe		<input type="checkbox"/> Reduced muscle mass/ Subcutaneous fat loss: mild to moderate		
<input type="checkbox"/> Reduced caloric intake 75% of total estimated energy requirement		<input type="checkbox"/> Reduced caloric intake 50% of total estimated energy requirement		
<input type="checkbox"/> Reduced Potassium, Phosphorus ≥ 30%		<input type="checkbox"/> Reduced Potassium, Phosphorus < 30%		

**Table 1: Patient characteristics**

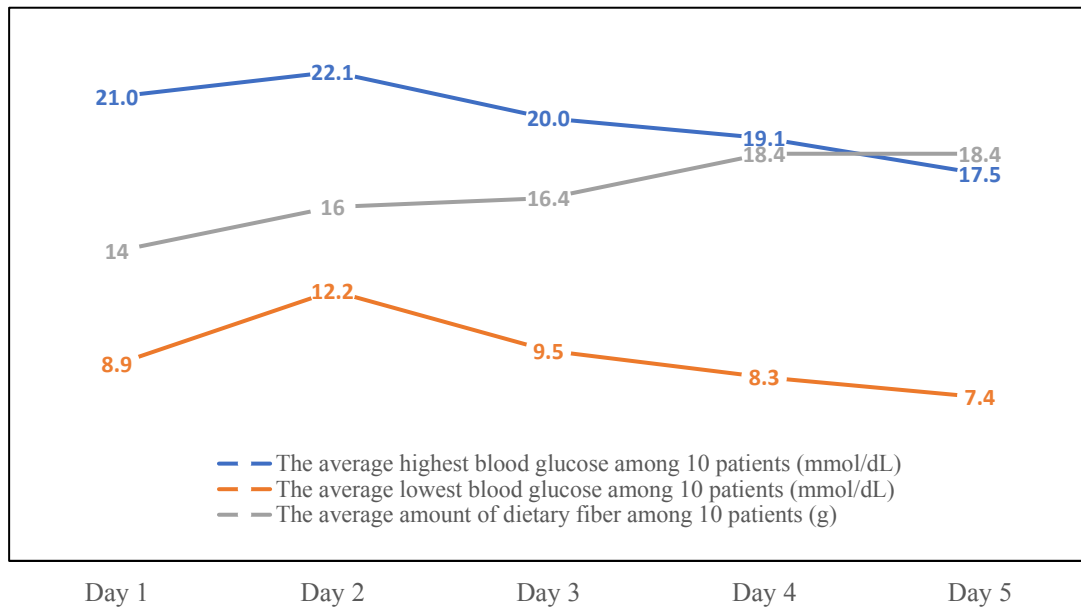
<b>Patients No.</b>	<b>Gender</b>	<b>Age</b>	<b>Weight (kg)</b>	<b>Height (cm)</b>	<b>BMI (kg/m<sup>2</sup>)</b>	<b>Severity of COVID-19 disease</b>	<b>Past medical history</b>	<b>Respiratory therapy</b>
1	Male	74	61	155	25.4	Covid-19 severity	Diabetes, Hypertension	Breathing oxygen through mask
2	Female	80	47.6	148	21.7	Covid-19 severity	Diabetes, Hypertension, Heart failure	Invasive mechanical ventilation (endotracheal)
3	Female	78	55	153	23.5	Covid-19 severity	Diabetes, Hypertension	Breathing oxygen through mask
4	Female	67	65	160	25.4	Covid-19 severity	Diabetes	Invasive mechanical ventilation (endotracheal)
5	Male	76	55	170	19.0	Covid-19 severity	Diabetes, Hypertension	Invasive mechanical ventilation (endotracheal)
6	Female	92	45	152	19.5	Covid-19 severity	Diabetes, Heart failure	Non-invasive ventilation (CPAP or BIPAP)
7	Male	72	65	169	22.8	Covid-19 Critical level	Diabetes, Hypertension	Invasive mechanical ventilation (endotracheal)
8	Male	77	54	168	19.1	Covid-19 Critical level	Diabetes, Heart failure	Invasive mechanical ventilation (endotracheal)
9	Male	90	54.4	161	21.0	Covid-19 severe	Diabetes	Invasive mechanical ventilation (endotracheal)
10	Female	74	78	168	27.6	Covid-19 severe	Diabetes	Invasive mechanical ventilation (endotracheal)

**Table 2. Diagnostic Assessment Global Leadership Initiative on Malnutrition (GLIM) 2018**

Assessment criteria			Quantity	Percentage
Phenotypic				
1	Low BMI (kg/m²)	< 18.5 (< 70 years old)	0	0%
		< 20 (>= 70 years old)	3	30%
2	Weight loss	Mild	6	60%
		Moderate	4	40%
		Severe	0	0%
3	Reduced muscle mass	Mild to moderate	7	70%
		Moderate	3	30%
		Severe	0	0%
Etiologic				
1	Food intake	Mild	0	0%
		Reduce <50% of food intake	10	100%
		Reduce < 75% of food intake	0	0%
2	Disease burden/ Inflammatory condition	COVID-19	10	100%

**Table 3. The nourishing process of 10 patients in the first 5 days in Intensive Care Unit (ICU)**

Nutritional values		Day 1	Day 2	Day 3	Day 4	Day 5
Energy	Energy (kcal) (Mean $\pm$ SD)	877 $\pm$ 213	840 $\pm$ 171	861 $\pm$ 184	966 $\pm$ 147	1150 $\pm$ 147
	Recommended demand- Energy	<b>870-986 kcal/kg /day (15-20kcal/kg body weight /day)</b>				<b>1160-1411 kcal/kg/day (20-25 kcal/kg/ body weight /day)</b>
	Percentage Recommended demand (%)	Achieve 100% recommended demand				Achieve 80-99% recommended demand
Protein	Protein (grams) (Mean $\pm$ SD)	51.5 $\pm$ 14.9	58 $\pm$ 11.8	59.5 $\pm$ 12.7	66.7 $\pm$ 10.1	66.7 $\pm$ 10.1
	Recommended demand - Protein	<b>58 <math>\pm</math> 9.6</b>	<b>58 <math>\pm</math> 9.6</b>	<b>58 <math>\pm</math> 9.6</b>	<b>69.6 <math>\pm</math> 11.5</b>	<b>87 <math>\pm</math> 14.4</b>
	Percentage Recommended demand (%)	88.8 %	100%	102.6%	95.8%	76.7%
Lipid	Lipid (grams) (Mean $\pm$ SD)	27.7 $\pm$ 6.8	26.4 $\pm$ 5.4	27.1 $\pm$ 5.8	30.4 $\pm$ 4.6	30.4 $\pm$ 4.6
	Recommended demand - Lipid	<b>40.6 <math>\pm</math> 6.7</b>	<b>40.6 <math>\pm</math> 6.7</b>	<b>40.6 <math>\pm</math> 6.7</b>	<b>40.6 <math>\pm</math> 6.7</b>	<b>40.6 <math>\pm</math> 6.7</b>
	Percentage Recommended demand (%)	68.2%	65%	66.7%	74.9%	74.9%
Carbohydrate	Carbohydrate (grams) (Mean $\pm$ SD)	109.2 $\pm$ 28.6	102 $\pm$ 20.8	104.5 $\pm$ 22.3	117.3 $\pm$ 17.8	117.3 $\pm$ 17.8
	Recommended demand- Carbohydrate	<b>Minimum 100-120g/day</b>				
	Percentage Recommended demand (%)	Achieve 100% recommended demand				
Fiber	Fiber (grams) (Mean $\pm$ SD)	14 $\pm$ 4.2	16 $\pm$ 3.3	16.4 $\pm$ 3.5	18.4 $\pm$ 2.8	18.4 $\pm$ 2.8
	Recommended demand- Carbohydrate	<b>14g fiber/1000 kcal</b>				
	Percentage Recommended demand (%)	Achieve 100% recommended demand				



**Fig 1. Blood glucose status and dietary fiber content of study subjects for 5 consecutive days**

## DISCUSSION

The cut-off values of BMI in our study followed the WHO WPRO Asian (12). It can be seen that 4 out of 10 patients have the BMI of overweight and obesity, especially a female patient with a BMI of 27.6. Obesity is a risk factor for severe infection. It has been shown that obesity is associated with worse cytokine storms, the severity, and the longer duration of viral infections (13,14). A retrospective case series conducted in the UK showed that all the patients were overweight or obese (15). Other factors may be related to the fact that obesity may mechanically impair ventilation with reduced aeration of the lung bases that lead to accumulation of secretions and increased risk of infections (16). The patients mainly had comorbidities such as hypertension and heart failure. A case series of 5 patients who suffered from diabetic ketoacidosis, also indicated some common diseases apart from hypertension and congestive heart failure, involving dyslipidemia, end-stage renal diseases, and chronic obstructive pulmonary disease (17). Severe COVID-19 was diagnosed based on Guidelines on diagnosis and treatment the COVID-19 patients - Vietnamese Ministry of Health - 2022 (Breathing beat over 25 or under 10 per minutes; SpO<sub>2</sub> < 94% without any oxygen supportive therapies or have to use Non-invasive ventilation (High-flow nasal cannula - HFNC, CPAP, BiPAP) and Invasive mechanical ventilation: the image of lungs on X-ray or CT were hurt more than 50%), which is similar/different to a case series of observations among 8 patients (18).

Hospitalized patients with COVID-19 are at high risk of malnutrition due to an increase in nutritional requirements and a severe acute inflammatory response.

All of the candidate patients in our study were recognized as malnutrition, according to GLIM criteria. A retrospective, multicenter study was conducted in 85 diabetic COVID-19 patients from three hospitals in China indicated the prevalence of undernourishment was 41.18% according to NRS-2002. Besides, NRS-2002 and serum pre-albumin were independent predictors of the grade of severity of COVID-19. The malnourished group had more severe illness than the normal nutritional group and had a longer length of in-hospital stay and higher mortality (19). Another retrospective study illustrated similar results, but the prevalence of malnutrition was even higher, at least 60% (20). Of 10 patients, there were 6 cases with mild weight loss and 4 patients with moderate weight loss in our cases report. We did not list which patients had moderate or severe malnutrition to discuss the differences between different ages and severity of malnutrition. Another descriptive, follow-up study used two types of nutritional parameters, BMI and MUST, measured at three different time points (21). According to the Subjective Global Assessment (SGA), 27 out of 75 patients admitted due to a COVID-19 infection had malnutrition. Patients not well nourished were older than patients with an SGA grade A (22). We did not find any research evaluating nutritional state with Global Leadership Initiatives on Malnutrition (GLIM) (23), possibly because GLIM has just been updated and widely published since 2018, therefore there were not many studies using it as a tool.

We followed global guidelines and consensus in terms of nutritional therapy for ICUs patients, which hypocaloric nutrition (not exceeding 70% of energy expenditure) should be prescribed (24). This is based on

the metabolic response to critical illness. In brief, the 'ebb' phase is characterized by hemodynamic instability and hormonal changes (including insulin resistance) in order to prioritize the delivery of energy substrates to vital tissues (25,26). This phase leads to endogenous glucose production as well as lower energy expenditure compared to pre-injury. The 'flow' phase involves the breakdown of tissue to provide substrates to cover the immediate needs for the "fight or flight" response and to reduce the risk of bleeding and infection. The anabolic recovery phase has been described as the resynthesis of lost tissue and the body may be more metabolically able to process delivered nutrients (27,28). Protein accepted the protein amount delivered by the energy target. After day 3, targeted energy gradually reaches 80-100% measured requirement. Protein target varies by different guidelines, progressively increasing to 1.3g/kg/day (24,25), or expected to be in the range of 1.2 – 2.0 g/kg/day (30). Energy intake of patients in our study achieved 100% energy requirement in the first 4 days in the ICU, but intake in day 5 seemed to be lower than patients' demand, possibly due to the lack of medical workforces during the peak time in Vietnam.

Most study patients were severe and critically ill, therefore their blood glucose seemed high. Our study shows that both the maximum and minimum preprandial glucose experienced a downward trend during the time of using the commercial BTF. In contrast, fiber consumption increased day by day. Some other controlled trials that used similar specialized nutrition formulas also concluded about the reduced glycemic effect of DSNFs (31-33). The low glycemic index of most DSNFs partially contributes to this effect. The commercial BTF with an average GI is  $33 \pm 17$ , is a suitable product for diabetes patients. This was not to mention that most of the participants found it easy to tolerate this product during the feeding process. Even so, according to FAO/WHO, the GI of this product is classified as a low GI, therefore it is officially accepted for patients with critical illness, impaired glucose tolerance and/or diabetes. Blood sugar changes after taking this product were significantly lower than those after taking glucose at 15 minutes, 45 minutes, and 60 minutes. Thus, the studied product is safe for diabetic patients because it may gradually increase blood glucose and help to prevent glucose instability and the progress of diabetic complications.

## CONCLUSION

Personalize nutritional interventions for patients through the nutritional care process (NCP) for each individual with suitable nutritional products for the patient's condition, which could contribute to improving the nutritional status and blood sugar control for the patient. Dietitians and other medical staff play a key role in taking care of the Covid-19 patients during the pandemic.

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