

# ENTERAL TUBE FEEDING PRACTICES IN PEOPLE WITH NEUROLOGICAL PROBLEMS IN MYANMAR: A CROSS-SECTIONAL PILOT STUDY

Hsu Mon Mon Zaw, Wantanee Kriengsinyos\*, Chanida Pachotikan, Nattapol Tangsuphoom

Institute of Nutrition, Mahidol University, Nakhon Pathom, 73170, Thailand

## ABSTRACT:

**Background:** Artificial nutritional therapy is indicated in patients with a risk of malnutrition or who are malnourished on admission to maintain or restore the nutritional status. Currently, little is known about the enteral nutrition practice in Myanmar because the hospital feeding practices are uncommon in most of the public and private hospitals. The objective of this study was to describe an overview of the current situation of enteral nutrition practices among people with neurological problems in Myanmar.

**Method:** A cross-sectional descriptive pilot study was conducted by recruiting a sample of 30 hospitalized patients with neurological problems who were with feeding tubes at the Yangon General Hospital. A semi-structured questionnaire related to feeding practice was developed. Interviews with patients experiencing neurological problems were conducted in October 2015. Patient information including age, weight and height were obtained from hospital medical records. The data was analyzed by IBM SPSS statistics 19 software and summarized by descriptive analysis. The nutrient intakes were calculated by using INMUCAL-N V.3 software and compared to estimated energy requirements determined by the Harris Benedict equation.

**Results:** The results showed that 56.7% of the patients had normal BMI while 10% were underweight, 30% were overweight and 3.3% were obese. Out of 30 patients, 80% did not have previous experience of enteral tube feeding. Regarding the current feeding formula, 20 patients used commercial food while the remaining patients used both commercial and other foods. None of them made use of blenderized diets for feeding. The total energy and protein intakes of all participants were found to be inadequate and three of them had distribution of energy from protein less than 10 %.

**Conclusion:** The present study highlighted that overall energy and protein intakes are low compared to the requirements. The findings indicated that evidence-based nutritional guidelines, assessments, and effective nutrition care therapy should be implemented for the benefits of Myanmar patients with neurological problems.

**Keywords:** Enteral nutrition; Feeding practice; Blenderized diet; Myanmar; Neurological problem

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## INTRODUCTION

Nutrition plays an integral role in the prevention and treatment of a variety of diseases. For this reason, nutritional support becomes a critical part in the medical and surgical care of the patients

especially in the cases of malnutrition because there is an association between the deprivation of nutrient intake for a long enough period of time and adverse clinical consequences. Therefore, providing effective and adequate nutritional support is regarded to be a vital part of the comprehensive management of the patients particularly when the risk of the malnutrition is high [1]. Malnutrition is a

\* Correspondence to: Wantanee Kriengsinyos  
E-mail: wantanee.krieng@mahidol.ac.th

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state of condition in which there is imbalance (which can be either deficiency or excess) of nutrient intakes and leads to adverse effects on both functional and clinical outcomes [2]. It is found to be accompanied by increased morbidity and mortality rates, prolonged hospitalization, decreased immune function, impaired wound healings and higher rate of clinical complications [3].

According to the United Nations Food and Agriculture Organization estimation, 795 million people are undernourished in 2014-2016, with the vast majority of the people (about 780 million) live in developing countries and 11 million people are from developed countries [4]. Myanmar has the third highest malnutrition rates in Southeast Asia after Timor-Leste and Cambodia. Malnutrition is one of the major causes of childhood illness and mortality as approximately 1.6 million (35% of children) are stunted out of 4.4 million children under 5 years of age in Myanmar. Micronutrient deficiencies are also common in Myanmar which contributes to the burden of malnutrition [5].

Malnutrition continues to be a major public health problem worldwide and also highly prevalent in hospitalized patients [6]. A narrative review which assessed the prevalence of malnutrition stated that malnutrition problem is found in 13–78% among acute care patients [7]. The prevalence of malnutrition in inpatients is also found to be as high as 50% [8]. A cross-sectional observational study concluded that the frequency of undernutrition in institutionalized elderly people with neurological diseases is high (77%) at admission according to Mini Nutritional Assessment [9].

A European multicenter survey which reported home enteral nutrition practice in Europe stated that enteral feeding was mainly used for patients with neurological disorder (49.1%) followed by head and neck cancer, digestive diseases, geriatric diseases and others. A 16-year retrospective study which presented trends in home artificial nutrition practice in Spain found that neurological disorders and cancer were the most frequent indications for enteral nutrition [10]. The observational study conducted on the caregivers of home enteral nutrition patients in Bolzano revealed that neurological diseases were the most prevalent among the patients followed by neoplastic, vascular and other causes [11].

Enteral nutrition or enteral tube feeding is the delivery of nutritionally complete feeds via a tube directly into a functional gastrointestinal tract [12]. Currently, little is known about the enteral nutrition

practice in Myanmar as there is no register of patients or published studies on enteral tube feeding. Therefore, a pilot study was designed to undertake at a General Hospital in Yangon to investigate the experiences of patients with underlying neurological problems in relation to enteral nutrition support as enteral nutrition is mostly indicated in neurological diseases.

## MATERIALS AND METHODS

A cross-sectional descriptive pilot study was conducted by means of developing a semi-structured questionnaire related to hospital-based enteral tube feeding practices and interviewed to the respondents in October 2015. This study was approved by the Ethical Review Committee from the Mahidol University (COA No. MU-CIRB 2016/045.0704, Date of Approval: 07/ Apr/ 2016). Permissions to review medical records and to survey patients were sought from relevant hospital consultants at Yangon General Hospital.

To undertake a pilot study, sample size between 24 and 50 subjects is recommended when there is no prior information as a reference [13, 14]. A minimum of at least 20 participants is suggested to be included in a pilot study which is the smallest amount that is reasonable from statistical studies [15]. At the time of data collection, there was a total of 30 tube fed patients hospitalized for various neurological problems at different medical wards and they were invited to participate in the study. The study included all Myanmar adult hospitalized patients with nasogastric feeding tubes who were willing to participate in the study. The patients were excluded from the study if nasogastric tubes were inserted for special medical instructions other than feeding such as gastric decompression or emptying of the stomach.

### Study procedure

The relevant information on current enteral nutrition practices in hospitalized patients was obtained from either the patients or the caregivers. The questionnaire was made up of two sections which included details of demographic data, tube feeding practices, medical conditions, and physiological complications encountered and other miscellaneous data and each interview took around 30 to 60 minutes to complete.

The first section contains general information about the patients. Some information including age, weight and *height were obtained* from the *hospital medical records*. The second section addresses the

**Table 1** Demographic characteristics of patients according to gender showed by numbers (percentages)

|   | Male<br>(n=12) | Female<br>(n=18) | Total<br>(n=30) |
|---|----------------|------------------|-----------------|
| <b>Age groups (years)</b>                 |                |                  |                 |
| <40                                       | 1 (3.3)        | 2 (6.7)          | 3 (10)          |
| 40-50                                     | 4 (13.35)      | 4 (13.35)        | 8 (26.7)        |
| 51-60                                     | 4 (13.35)      | 4 (13.35)        | 8 (26.7)        |
| 61-70                                     | 3 (10)         | 4 (13.3)         | 7 (23.3)        |
| 71-80                                     | 0 (0)          | 3 (10)           | 3 (10)          |
| >80                                       | 0 (0)          | 1                | 1 (3.3)         |
| <b>Education status</b>                   |                |                  |                 |
| Illiteracy                                | 0 (0)          | 2 (6.7)          | 2 (6.7)         |
| Primary school                            | 0 (0)          | 5 (16.7)         | 5 (16.7)        |
| Middle school                             | 1 (3.3)        | 2 (6.7)          | 3 (10)          |
| High school                               | 4 (13.3)       | 5 (16.7)         | 9 (30)          |
| University experience (incomplete degree) | 2 (6.7)        | 3 (10)           | 5 (16.7)        |
| Bachelor's degree or higher               | 5 (16.7)       | 1 (3.3)          | 6 (20)          |
| <b>BMI groups</b>                         |                |                  |                 |
| Underweight                               | 1 (3.3)        | 2 (6.7)          | 3 (10)          |
| Normal                                    | 4 (13.3)       | 8 (26.7)         | 12 (40)         |
| Overweight                                | 7 (23.3)       | 2 (6.7)          | 9 (30)          |
| Obese                                     | 0 (0)          | 6 (20)           | 6 (20)          |
| <b>Weight loss within 6 months</b>        |                |                  |                 |
| Yes                                       | 2 (6.7)        | 1 (3.3)          | 3 (10)          |
| No  | 10 (33.3)      | 17 (56.7)        | 27 (90)         |

detailed information relating to current feeding practices such as diagnosis of the patient, details of previous tube feeding practice if present, and details of current tube feeding, product characteristics, complications, associated problems and personal preferences. A dietary recall of the tube feeding formula for a one day period was also interviewed to collect information about all the formulas (either blended foods or commercials) that was given to the patients via the feeding tubes during the 24 hours prior to the interview day.

Where feasible, patients themselves were interviewed. Otherwise, the information was obtained from a primary caregiver. Patient or family consents were also sought. Although the participants were encouraged to answer all the questions, they were allowed to skip the items if they preferred not to answer. The completed questionnaire was kept completely confidential.

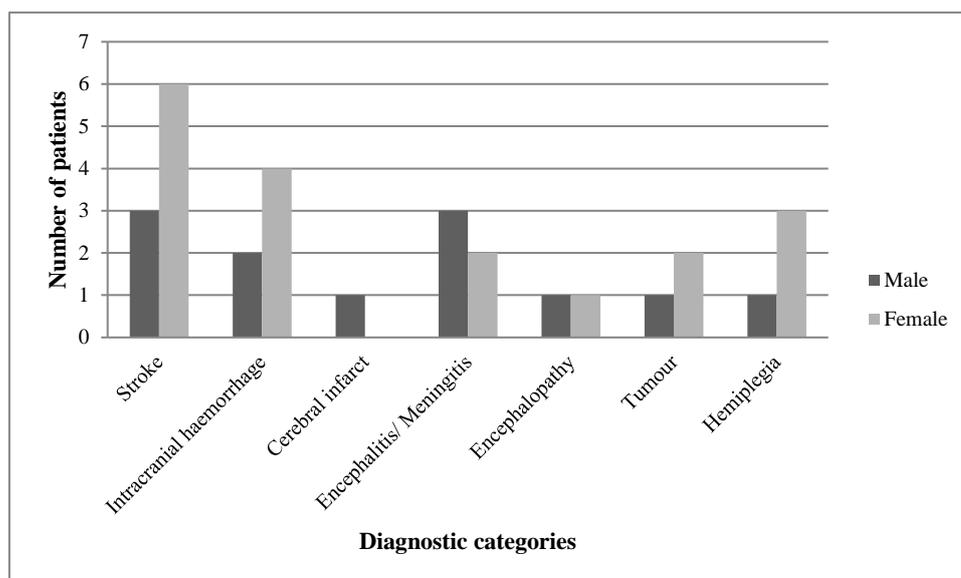
The questionnaire data was coded and descriptive statistics was analyzed by using IBM SPSS statistics 19 software. The amount of energy and nutrient intakes of the patients were calculated individually by using INMUCAL-N V.3 software based on the given dietary history together with percentage of energy distributions. The estimated energy requirement of each patient was determined by using the Harris Benedict equations (which give

an estimate of resting energy expenditure based on age, height, weight and sex) and combined with the additional energy costs (related to the patient's activity factor, injury factors which depend on the severity of the diseases, and malnutrition) to obtain the total energy expenditure [16]. Intakes of males and females were calculated with Independent t-test for parametric data between two independent samples and Mann-Whitney U test for non-parametric data between two independent samples to determine *P* values for comparisons. Level of statistical significance was set at 5% (*P* value < 0.05).

## RESULTS

### General information

Table 1 summarizes the demographic characteristics of the patients such as age, sex, education status, BMI groups, and weight loss within 6 months. As seen from the table, 60% of participants were females. The highest percentage of the patients with feeding tubes was observed in two age groups, 40 to 50 and 51 to 60 with the same percentage of 26.7%. While 6.7% of the participants were illiterate, about 30% finished high school and 20% had Bachelor's degree or even higher. According to the WHO-defined BMI categories for Asian populations, only 40% of patients were within



**Figure 1** Indications for enteral tube feeding

**Table 2** Most commonly used feeding formulas among the study participants

| Name                 | Used by number of patients (percentages) <sup>1</sup> |
|----------------------|---|
| Ensure               | 20 (66.7%)  |
| Ovaltine malted milk | 7 (23.3%)   |
| Chicken broth        | 7 (23.3%)   |
| Porridge             | 6 (20%)   |
| Glucerna             | 4 (13.3%)   |
| Gen-DM               | 1 (3.3%)  |
| Aminoleban oral      | 1 (3.3%)  |
| Cerelac              | 1 (3.3%)  |

<sup>1</sup> Some of the patients were fed with more than one feeding formula in a day and therefore, the percentages were added up to >100% based on total 30 patients

the normal range whereas 10% were underweight, 30% were overweight and 20% were obese. Although only female participants were found in the obese category, higher percentage of males was within the overweight range compared to females. A visible weight loss was noticed among 10% of the patients within previous 6 months.

#### Detailed information relating to current feeding practices

The diagnoses and duration of the hospitalization varied widely among the study patients. Based on the clinical diagnoses, the patients were divided into six different groups of neurological disorder as shown in Figure 1. The indications for enteral tube feeding in this study were stroke (30%), intracranial hemorrhage (20%), meningitis/ encephalitis (16.7%), hemiplegia (13.3%), tumor (10%), encephalopathy (6.7%) and cerebral infarct (3.3%) with differences between males and females. The highest number of the

patients was seen in stroke category when compared to other cases. Table 2 described the most commonly used feeding formulas in tube feeding patients. The majority of patients (66.7%) used Ensure as the main source of nutrient intake, followed by Ovaltine malted milk and chicken broth (23.3%), low viscosity porridge (20%), Glucerna (13.3%), and Aminoleban, Cerelac and Gen-DM (3.3%) respectively.

Table 3 presents the estimated energy requirement, total energy and macronutrient intakes among the study patients with neurological problems who were hospitalized in Yangon General Hospital and divided according to gender. Average reported energy intake of males was 1007.22 kcal/day, the minimum to maximum intakes range from 696.36 kcal/day to 1755.29 kcal/day while female was 794.16 kcal/day with the minimum and maximum intakes from 386.40 kcal/day to 1628.53 kcal/day. The average total energy requirement in

**Table 3** Estimated energy requirement, total energy and macronutrient intakes among 30 study patients with neurological problems who were hospitalized in Yangon General Hospital according to gender difference

|   | Male (n= 12)     |                 |         |         | Female (n= 18)   |                 |         |         |
|---|------------------|-----------------|---------|---------|------------------|-----------------|---------|---------|
|   | Mean ± SD        | 95% CI          | Min     | Max     | Mean ± SD        | 95% CI          | Min     | Max     |
| Total energy intake (kcal) <sup>1a*</sup>         | 1007.22 ± 280.18 | 829.21-1185.24  | 696.36  | 1755.29 | 794.16 ± 304.18  | 642.90-945.43   | 386.40  | 1628.53 |
| Carbohydrate intake (grams) <sup>1*</sup>         | 148.26 ± 79.12   | 97.99-198.53    | 104.26  | 391.86  | 105.76 ± 50.87   | 80.46-131.06    | 24.29   | 256.81  |
| % energy <sup>1</sup>                             | 57.04% ± 11.48%  | 49.75%-64.33%   | 44.75%  | 89.30%  | 52.30% ± 10.57%  | 47.04%-57.55%   | 17.70%  | 66.30%  |
| Fat intake (grams) <sup>2</sup>                   | 29.17 ± 8.97     | 23.47-34.87     | 14.80   | 44.40   | 26.65 ± 9.20     | 22.08-31.23     | 11.76   | 48.14   |
| % energy <sup>1</sup>                             | 26.97% ± 7.14%   | 22.44%- 31.51%  | 8.58%   | 34.88%  | 31.02% ± 6.73%   | 27.67%-34.36%   | 20.49%  | 51.45%  |
| Protein intake (grams) <sup>1</sup>               | 36.00 ± 10.14    | 29.56-42.44     | 15.74   | 54.39   | 32.54 ± 13.10    | 26.03-39.06     | 8.40    | 66.81   |
| % energy <sup>1</sup>                             | 15.12% ± 4.25%   | 12.42%-17.82%   | 3.59%   | 20.05%  | 16.68% ± 4.94%   | 14.23%-19.13%   | 8.70%   | 30.79%  |
| Estimated energy requirement (kcal) <sup>2*</sup> | 1980.85 ± 213.41 | 1845.26-2116.44 | 1743.48 | 2326.83 | 1606.78 ± 200.95 | 1506.86-1706.71 | 1192.76 | 2109.73 |
| Energy needs (kcal) <sup>2</sup>                  | 973.62 ± 278.16  | 796.89-1150.36  | 475.35  | 1538.20 | 812.62 ± 315.97  | 655.49-969.75   | 133.64  | 1463.82 |

**Abbreviations:** 95% CI= 95% Confidence interval, SD= Standard deviation

<sup>1</sup> P values obtained from Mann-Whitney U test

<sup>2</sup> P values obtained from Independent t-test

\* Statistically significant association between the samples

P values were determined for comparisons between intakes of males and females were calculated with Independent t-test for parametric data between two independent samples and Mann-Whitney U test for non-parametric data between two independent samples. Level of statistical significance was set at 5% (P value < 0.05).

**Table 4** Additional feeding practices information

|   | Frequency | Percent   |
|---|-----------|-----------|
| <b>Duration of the provided enteral nutrition</b>         |           |           |
| 1-2 days  | 5         | 16.7%     |
| Less than one week  | 12        | 40%       |
| Less than one month                                       | 9         | 30%       |
| More than one month                                       | 4         | 13.3%     |
| <b>First experience of tube feeding</b>                   |           |           |
| Yes   | 24        | 80%       |
| No  | 6         | 20%       |
| <b>Current tube feeding formula</b>                       |           |           |
| Blenderized diet  | -         | -         |
| Commercial formula (Ensure, Glucerna etc.)                | 20        | 66.7%     |
| Other   | 10        | 33.3%     |
| <b>Reasons of choosing the current feeding formula</b>    |           |           |
| Hospital suggestion                                       | 16        | 53.3%     |
| Easy preparation  | 3         | 10%       |
| Nutritional adequacy                                      | 11        | 36.7%     |
| <b>Tolerance to tube feeding</b>                          |           |           |
| Yes   | 28        | 93.3%     |
| No  | 2         | 6.7%      |
| <b>Complications due to tube feeding</b>                  |           |           |
| Vomiting  | 1         | 3.3%      |
| Diarrhea  | 4         | 13.3%     |
| Abdominal discomfort                                      | 3         | 10%       |
| No problem  | 22        | 73.3%     |
| <b>Nutritional status during tube feeding</b>             |           |           |
| Improved  | 6         | 20%       |
| Stable  | 21        | 70%       |
| Getting worse   | 3         | 10%       |
| <b>Problems of feeding formula</b>                        |           |           |
| No problem  | 28        | 93.3%     |
| Viscosity/ tube blockage                                  | 2         | 6.7%      |
| <b>Satisfaction with the current tube feeding formula</b> |           |           |
|   |           | <b>op</b> |
| Not satisfied   | 8         | 26.7%     |
| Average   | 10        | 33.3%     |
| Satisfied   | 12        | 40%       |

men was 1980.85 kcal/day with the minimum intake of 1743.48 and maximum intake of 2326.83 kcal/day. Likewise, the average total energy requirement of female was 1606.78 kcal/day, the minimum intake is 1192.76 kcal/day and the maximum intake was 2109.73 kcal/day.

The highest carbohydrate intake in terms of energy distribution percentage can be seen in male which is 89.3% and the lowest is 17.7% by females. However, the highest percentage of energy from fat is contributed by females of 51.45% and the lowest by males, 8.58%. Likewise, the lowest percentage of energy distribution by protein is found in male which is 3.59%. However, the maximum protein intake is 30.70% which is still within the recommended ranges. Apparently, total energy intake, carbohydrate intake and estimated energy

requirements show a statistically significant difference between male and female. Conversely, intakes of fat and protein, percent distributions of all the macronutrients and energy needs did not differ significantly between males and females.

Additional information relating to feeding practices was described in Table 4. 56.7% of the patients were provided with enteral nutrition for less than a week. Among all the patients, only 20% had previous experience of tube feeding practice. Most patients/ caregivers preferred commercial formula as their enteral feeding choice as 66.7%, used commercials and the remaining patients used both commercials and other foods. None of them made blenderized diets for feeding. The reason for choosing the formula can be varied, but 53.3% followed the instructions from their healthcare

providers. A large proportion of the participants had no complications due to the feeding formula (73.3%) as well as no problem in regarding to current enteral nutrition practice (93.3%). Overall, 40% of patients/ caregivers were satisfied with current feeding formula.

## DISCUSSION

This is the first study to evaluate the enteral tube feeding practices in Myanmar. The study is mainly focused on the patients with neurological problems in Myanmar because cerebrovascular diseases are the most common causes of death in the country according to World Health Organization. The results also showed that the highest number of patients with tube feedings have underlying stroke when compared to other cases. This finding is consistent with the statistical result from World Health Organization Myanmar profile which reported that stroke was the leading cause of death killing 56.2 thousand people in Myanmar in 2012, followed by lower respiratory tract infections, ischemic heart disease, tuberculosis and chronic obstructive pulmonary disease. Besides, nervous system disorders are the most common indications for enteral feedings in patients because of the risk of malnutrition which can be associated with neurogenic dysphagia [17].

The present study highlighted the fact that the energy requirements of the patients were found to be not sufficient and macronutrient intakes were imbalance compared to the requirements. On average, energy intakes of all patients were relatively lower than the total energy expenditure. Percentage distributions of energy from macronutrients were imbalance as carbohydrate was found to be higher and that of fat and protein were inadequate in some patients. The energy intakes of all patients were lower than the total energy expenditure and can lead to malnutrition. The possible explanation for the under delivery of nutrients could be that the caregivers of the patients did not follow the physicians' prescriptions. During the time of data collection, although there was no hospital nutritionist or dietitian, it was observed that the clinicians provided the family members with a sample table for enteral formula preparation which comprises different items such as Ensure, Glucerna, milk powder and protein packets together with sugar to choose based on personal preference and can be prepared for feeding in a day based on estimated requirements which is approximately 2000 kcal/

day. Nevertheless, the calculations are not based on the individual total energy requirement per day and this may lead to over or under estimation of the calorie intake. Despite the feeding format was given to the caregivers, the total calorie intake according to the survey was relatively low and the considerable variations in macronutrients intakes were noted. The actual calorie intake was not even close to the requirements or the calculated hospital feeding standard.

The possible explanation for hypocaloric intake and macronutrients imbalances could be that the caregivers changed the feeding plan according to their economic situation. For instance, either the quantity or the frequency of feeding was reduced, lower the amount of formula unlike the prescription by adding more water or modified the feeding plan according to their preferences and resulted in inadequacy of the nutrients delivered. Most of the patients with enteral feeding tubes relied on commercial formulas but not the blenderized feeds. Ensure is the most widely used feeding formula according to the survey because Ensure is believed to provide complete and balanced nutrition, has a desirable color and odor, and is easy to prepare. Ovaltine malted milk was also widely used by the patients with financial problems who are not affordable for Ensure. The major reasons for choosing the current feeding formula were hospital suggestion, easy preparation and nutritional adequacy. Some families who could not afford to commercial formulas used chicken broth or porridge which were not included in the recommended feeding plan. Therefore, only a few nutrients were delivered compared to actual requirements. Unlike this study, a prospective cross-sectional study in the United States evaluated that the blenderized tube feeding was used by 55% of adult home enteral nutrition patients and 80% of the patients expressed a desire to use if adequate information is provided. The study also found that blenderized feeding has significantly less reported gastrointestinal problems and better tolerance when compared to commercial formulas [18]. A European multicenter survey stated that commercial formulas were used in almost all patients instead of home-made blended diets which can be partly due to costs and funding [19].

There are a number of limitations in the current study, including single-center, cross-sectional study design, small sample size, the answers were depended on a respondent's recollection (possibility of a cognitive bias in 24-hour dietary recall) and

over or underestimation of nutrients given, etc. The overall findings indicated that evidence-based nutritional guidelines, assessments, and effective nutrition care therapy should be implemented for the benefits of Myanmar patients with neurological problem. The research and development of enteral nutrition services are also needed to formulate energy dense cost-effective blenderized formulas from local ingredients suitable for low and middle income families that cannot afford the expensive commercially prepared formulas. Funding is one of the major challenges in the management of enteral nutrition therapy in Myanmar hospitals because of the lack of nutrition departments or nutrition teams which are responsible for the care of the tube feeding patients. Therefore, it is even more difficult to provide home enteral nutrition services to the tube-fed patients as there is no local standards for the routine procedures or in the cases of emergency.

It has been reported that the home enteral nutrition services are generally related to overall health expenditure on both government and private sectors and percentage of the gross domestic product (GDP) expended on health in different countries [20]. Home enteral nutrition is typically uncommon in many African and Asian countries where the figure is less than 4%–5% of the GDP. On the contrary, the use of home enteral nutrition is more common than other parts of the world in the United States where the GDP expended on health from private expenditure alone was 11.7% in 1991. Western European countries, where organized home enteral nutrition services exist, follow closely to the United States as the expenditure on health is usually 6%–9% of GDP [21]. In Myanmar, the number of patients on enteral tube feeding is currently unknown. Enteral nutrition practice has not been approved in Myanmar and there is no legislation or national guidelines until now.

## CONCLUSION

In order to provide safe and effective enteral nutrition therapy to those who are unable to meet their nutritional requirements in different healthcare settings, there are many issues to take into consideration. These issues include development of standards, guidelines and policies for the enteral nutrition therapy, the knowledge of the patients and/or caregivers to safely manage the feeding tube and the feeding regimen, the role of the dietitians/nutritionist in patient care and management, hospital nutrition units and effective nutritional care therapy,

the knowledge and expertise of the healthcare providers with the wide variety of enteral equipment and associated complications, accessible and affordable formulas (blenderized or commercial) according to the socioeconomic status of the patients, multidisciplinary team work approach, funding by government at all levels etc.

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