Research Note

Medical Nutritional Therapy for COVID-19 Inpatients

Basmawati B, Fadhlina AS, Nurul Farahanie Izzaty R, Siti Sarah Zakirah J, Norazizah M, Noor Zarirah J, Lydianis B and Sarah Khalilah K

Dietetic & Food Service Department, Hospital Tuanku Ja'afar, Ministry of Health Malaysia, Seremban, Negeri Sembilan

ABSTRACT *Introduction:* COVID-19 pandemic is a challenging period, which requires fast adaptation of the healthcare system. It is crucial for each of the patients to get access to medical nutrition therapy from dietitian due to disease progress itself will affect patient nutritional status. The study aims to identify nutritional status and diet intake of COVID-19 inpatients and to determine efficacy of method in delivering Medical Nutrition Therapy (MNT) and intervention done by dietitian. *Method:* An observational retrospective study which using convenience sampling for study population, which includes all records of the patients that fulfill the criteria. 30 Nutrition Care Process (NCP) records of COVID-19 patients warded in HTJS during COVID-19 pandemic from April 2020 to May 2020 were included. *Results:* Among 30 of COVID-19 subjects, there were 16 (53.3%) subjects given with Full COVID High Protein Diet, 3.3% (1) subject indented with Full COVID High Protein Diabetic Diet as well as Full 30 Normal Diet and Soft 30 Normal Diet each. About 36.7% (11) paediatric subjects given with Full COVID Paediatric Diet. Out of three assessment methods used, only 10% of subjects answered the questionnaire and another 90% via direct phone call due to subjects did not answered the questionnaire through *google form* after 48 hours of admission. *Conclusion:* Dietitian approach in delivering MNT should incorporate and adapt with the current new norms as align with advance technology in providing remote or virtual MNT. This study also showed that MNT still needed due to NCD factors that can elevate the risk of mortality among COVID-19 patients.

Key words: Medical nutrition therapy, pandemic, COVID -19, dietitian

INTRODUCTION

The breaking of a COVID-19 pandemic is posing unprecedented challenges and threats to patients and healthcare systems worldwide (2). The initial clinical sign of the SARS-CoV-2 related disease COVID-19 which allowed case detection was pneumonia (5). The disease primarily involves the respiratory tract but it may deteriorate to multi-organ failure and be fatal (12). In addition, death statistic reported by Crisis Preparedness and Response Centre (CPRC), Ministry of Health and Department of Statistic, Malaysia (DOSM) (20), shows that total death percentage among COVID-19 patients is 1.47% which most of them involved death among older population and person with underlying non-communicable disease (NCD). Mortality appears to be highest among older people and those with comorbidities, who are also often the most at risk of under-nutrition in society (18). Dietitian can play an important role in managing cases of NCD and under-nutrition. Identification and correction of under-nutrition is practical steps to COVID-19 patients to improve outcomes cost-effectively (20). During this pandemic period, there are number of services that were affected including dietetic profession. Based on the recent online opinion polls done among Malaysian dietitians, 57.4% to 60.7% of dietitian stated that most of the implementation of Medical Nutrition Therapy (MNT) among patients were done in appropriate steps accordingly with some constraint arising from the current situation (3). The same opinion poll also reported that 46.3% from 298 respondents among Malaysian dietitians think that dietitian could contribute towards care among infected COVID-19 patients.

There are only few guidelines available for dietitians regarding their roles during pandemic or outbreak to help them to overcome this issue. Screening is designed to be quick way of identifying those who are at significant risk of nutritional problems so that further detailed nutritional assessment can be undertaken and action can be put in place including dietary intervention via therapeutic diet alone or with oral nutrition supplement. weight and height measurements is the most crucial screening process usually carry out physically, however due to pandemic, reliable, reported values from patient need to be gained. Thus, there are a series of subjective criteria that can be used to help form an overall clinical impression of an individual's malnutrition risk category. Subjective criteria including clinical impression on body size and side effects of disease that affected oral intake. This study aims to provide baseline data on nutritional status and diet intake among COVID-19 inpatients and method in delivering MNT during pandemic.

METHODS

This is an observational retrospective study with convenience sampling. The study includes all the COVID-19 inpatients who able to tolerate orally and exclude critically ill COVID-19 patients on ventilator and were on Ryle's tube feeding. 30 out of 37 COVID-19 inpatients received Nutrition Care

*To whom correspondence should be addressed:
fadhlinasamad@gmail.com

Process (NCP) by dietitians in HTJS during pandemic from April 2020 to May 2020. The data extracted from Dietetic Care Note (DCN) and Patient Management System (SPP) including age, comorbidity, class/category of Covid-19, medication prescribe for COVID-19 treatment, sign and symptoms related with COVID-19, biochemical data, estimated food plate waste, type of special therapeutic diet prescribed by dietitians for the patient, oral nutrition supplement regime (if available) and method of delivering MNT.

The data analysis done using the IBM SPSS Statistics Version 21. Descriptive data expressed as mean. standard deviation (SD) unless otherwise stated. One Way ANOVA used for normally distributed data. Kruskal-Wallis ANOVA used for non-normally distributed data. A value of $P< 0.05$ considered as statistically significant. The data collected analyzed using an intention-to-treat basis.

RESULTS

Socio-demographic characteristics of the subjects involved in this study were presented in Table 1, 37% (n=11) of the subjects were pediatric and 63% (n=19) were adult subjects. There were 43.3% male (n= 13) and 56.7% female (n= 17). Most of the subjects were age below 19 years old (n=12). The minimum age was 2 years old and maximum age was 67 years old. There were six subjects (20%) had comorbidities comprise of hypertension, cardiovascular disease, asthma, rhinitis, diabetes or combinations. 50% (n= 15) of subjects were categorized under COVID-19 Class 2A and 7 out of 15 subjects were pediatrics case.

Table 1: Social-demographic characteristics of the subjects

Variable	Male (n=13)	Female (n=17)
Age Group, years		
≤19	5(41.7)	7(58.3)
20-39	4(44.4)	5(55.6)
≥40	4(44.4)	5(55.6)
Comorbidities		
Hypertension	0(0.0)	1(100.0)
Cardiovascular	1(100.0)	0(0.0)
Asthma	1 (100.0)	0(0.0)
Rhinitis	1 (100.0)	0 (0.0)
Combination	1(50.0)	1(50.0)
NKMI	9(37.5)	15(62.5)
Class Covid		
Class 1	2(50.0)	2(50.0)
Class 2A	5(33.3)	10(66.7)
Class 3A	4(66.7)	2(33.3)
Class 3B	1(25.0)	3(75.0)
Class 4B	1(100)	0(0.0)

Out of 30 subjects, only 20 subjects measured for potassium level, (n=1) was pediatric subject who was on antiviral medication and balance (n=19) were adult subjects. Another (n=10) pediatric subjects were not any medications therefore blood potassium level not available. Majority of the subjects showed an improving trend in potassium level except for (n=4) subjects no further blood investigation prior to discharge. Other than that, no significance blood result parameter correlates with nutritional status.

According to COVID-19 Case Category by Infectious Disease Unit, Penang General Hospital, the categories were based on classification or presentation of symptoms (cough/SOB), fever, and pneumonia, oxygen dependent and critically ill with shock/MOF/ARDS. While based on Clinical Management of SARI when COVID-19 disease is suspected (interim guidance) by WHO, listed clinical syndromes in mild illness category which interfere with oral intake such as fever, fatigue, cough (with or without sputum), anorexia, malaise, muscle pain, sore throat, dyspnea, nasal congestion or headache. Rarely patients may also present with diarrhea, nausea and vomiting.

Table 2 shows that all subjects except from COVID-19 Class 1 were presented with runny nose, cough, fever and sore throat. Five subjects were accompanied with loose stool and another two had arthralgia and myalgia. Most of the subjects presented with clinical symptoms were treated with Hydroxychloroquine (HCQ) and different COVID-19 anti-viral medication known as Favipiravir except pediatric subjects, no medication was prescribed.

There were 14 specialized COVID-19 Diet developed during pandemic focusing on high protein diet with oral nutrition supplement (ONS) and high potassium fruit. The menu plans providing average energy 1600 Kcal – 1700 calorie and 70g – 75g protein per day. High protein diet category mainly consists of 15% ONS providing 220-300 calorie; 10-14g protein. If patient could not finish their meals whereby intake only quarter or half of meal served, they will be supplemented with ONS. Another two categories which are Full 30 / Soft 30 and Full 50 / Soft 50 each indicate patient require with 30% ONS (480-560 calorie; 20-24g protein) and 50% ONS (577-657 calorie; 40-44g protein). Product given either standard flavor formula with low GI plus protein concentrated or combination with peptide formula. High potassium fruit providing 131.2-262.4mg (2.5-6.7mmol) of potassium intake with additional 340mg (8.7mmol) potassium consumed if given 30% ONS or 50% ONS. All of the pediatric subjects were prescribed with Full Covid pediatric diet. Most of the adult subjects were indented with Full COVID High Protein Diet (n=16). Besides that, 7% (n=2) of the subjects were at risk of malnutrition and prescribed with Full 30 normal diet and Soft 30

normal diet. For individuals having difficulty coordinating breathing and chewing, beverages might be a better option to efficiently increase energy intake compared to solid food.

Table 2: Clinical data according to Class of COVID-19

Variable	Class 1 n (%)	Class 2A n (%)	Class 3A n (%)	Class 3B n (%)	Class 4B n (%)
Clinical Symptoms					
Runny Nose	0(0.0)	1(100.0)	0(0.0)	0(0.0)	0(0.0)
Cough	0(0.0)	3(100.0)	0(0.0)	0(0.0)	0(0.0)
Fever	0(0.0)	3(60.0)	1(20.0)	1(20.0)	0(0.0)
Combination		8(53.3)	3(20.0)	3(20.0)	1(6.7)
Asymptomatic	4(66.7)	0(0.0)	2(33.3)	0(0.0)	0(0.0)
Medications					
Hydroxychloroquine	0(0.0)	7(43.8)	5(31.3)	4(25.0)	0(0.0)
Other Antibiotic	0(0.0)	0(0.0)	1(100.0)	0(0.0)	0(0.0)
Combinations	0(0.0)	0(0.0)	0(0.0)	0(0.0)	1(100.0)
No Medication	4 (33.3)	8(66.7)	0(0.0)	0(0.0)	0(0.0)
Commorbidities					
Hypertension	0(19.5)	0(0.0)	1(100.0)	0(0.0)	0(0.0)
Cardiovascular	0(0.0)	0(0.0)	0(0.0)	0(0.0)	1(100.0)
Asthma	1(100.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
Rhinitis	0(0.0)	1(100.0)	0(0.0)	0(0.0)	0(0.0)
Combinations	0(0.0)	1(50.0)	0(0.0)	3(50.0)	0(0.0)
NKMI	3(12.5)	13(54.2)	6(25.0)	2(8.3)	0(0.0)

Table 3: Specialized COVID-19 Diet

Special Diet	Number of Subjects (n)
Full Covi COVID High Protein Diet	16
Full COVID High Protein Diabetic Diet	1
Full COVID Pediatric Diet	11
Full 30 Normal Diet	1
Soft 30 Normal Diet	1

1600-1700 calorie; 70-75 gram protein		
HIGH PROTEIN DIET (additional commercial soybean/ full cream milk 2 pack/day + dates 20-40 g/day)	**SUPPLEMENT ONS 30%** (additional low GI flavored milk + protein concentrated 6g/day+ dates 20-40 g/day)	**SUPPLEMENT ONS 50%** (additional low GI flavored milk + protein concentrated 6g/day + 1 bottle 50 ml of peptide drink+ dates 20-40 g/day)
Full COVID High Protein Diet	Full 30 Normal Diet	Full 50 Normal Diet
Full COVID High Protein Diabetic Diet	Full 30 Diabetic Diet	Full 50 Diabetic Diet
Full COVID Pediatric Diet	Soft 30 Normal Diet	Soft 50 Normal Diet
Soft COVID High Protein Diet	Soft 30 Diabetic Diet	Soft 50 Diabetic Diet
Soft COVID High Protein Diabetic Diet		
Soft COVID Pediatric Diet		

DISCUSSION

With the increasing burden of liver diseases on the world' s and Currently, there is no nutrition guidelines specifically for patients with or at risk for COVID-19 infection, yet guidelines from Evidence Analysis Library is still applicable and can be used to provide guidance when working with COVID-19 infected patients. However, some adjustments might be required to meet the increased metabolic and functional needs caused by the COVID-19 infection and treatments.

Hence COVID-19 patient should have access to nutritional care as a part of healthcare services. This study used virtual assessment approaches through three main methods including self-answering questionnaire from *google form*, direct phone call to patient and or via call to ward staff. Self-answering questionnaire can be reached through link or QR Code stamped on patient's diet tray. For IT illiterate patients, the approaches were done through phone call or ward staff assistance. Out of these three methods, only 10% of subjects answered the questionnaire and another 90% via direct phone call due to subjects did not answered the questionnaire through *google form* after 48 hours of admission. The assessment included anthropometry, sign and symptoms, which may affect food intake and estimated current intake in ward. These approaches in line with Greenhalgh T et al (9), which state that every protocol made to avoid in-person assessment of patients with COVID-19. According to Deepa H et,al (11), due to limited resources and

staff during the COVID-19 pandemic, some nutrition screening procedures require flexibility to better meet the safety and operational needs of an organization. Special coordination such as conducting nutrition screening using patient-room telephones can be considered to minimize staff exposure.

Nutritional intervention should be tailored according to subject's needs by changing to specific diet for COVID-19 and it can be met by oral nutritional supplements (ONS). ESPEN in Expert Statements and Practical Guidance for Nutritional Management of Individuals with Sars-Cov-2 Infection stated that COVID-19 patients need more energy than normal. The patients require high calorie, high protein meals and snack for each mealtime to help prevent weight loss or further weight loss, and maintain lean muscle mass while helping the body to build better immune system to fight the infection. A study showed that the requirement for Covid-19 patients likely to be higher than normal due to the pathology of COVID-19 infection. According to MNT for COVID-19 Quick Guide energy and protein requirement for prevention and treatment of malnutrition in individuals at risk or infected with COVID-19 are as follows: Energy needs for polymorbid patients aged >65 years is 27 kcal/kgBW/day while for severely underweight polymorbid patients is 30 kcal/kgBW/day, this value also as guidance for energy intake in older persons. Protein needs in older person is 1g/kgBW/day meanwhile in polymorbid medical inpatients in order to prevent body weight loss, reduce the risk of complications and hospital readmission and improve functional outcome requirement should be more than > 1g/kgBW/day.

Luigia B et.al (15) stated that during hospitalization, oral nutrition supplement (ONS) are useful in case of malnutrition or for those cases which intake only 50-60% and as for dysphagia cases, it is mandatory to modify diet consistency in addition to ONS. Nutrient-dense food and beverages, including oral nutrition supplements are good methods to increase calorie and protein intake thus can help prevent weight loss and maintain lean muscle mass (11). The menu included full COVID high protein diet, full COVID high protein diabetic diet, soft COVID high protein diet, soft COVID high protein diabetic diet, full 30 normal diet, full 30 diabetic diet, full 50 normal diet, full 50 diabetic diet, soft 30 normal diet, soft 30 diabetic diet, soft 50 normal diet, soft 50 diabetic diet, soft COVID pediatric diet, and full Covid pediatric diet. Basically, all COVID -19 adult subjects were auto indented with full COVID high protein diet while COVID -19 pediatric subjects were auto indented with full COVID pediatric diet upon admission but subsequently changed to another type of diet depend on their needs after seen and intervened by dietitians. COVID -19 subjects who received full 30 and soft 30 were also received additional oral nutrition supplements (ONS) to increase their energy and protein intake. Since they unable to finish their meal on account of their health condition/symptoms which interfere with their oral intake. As part of dietary intervention, pediatric cases (n=4, 1-6years old), who were still bottle feeding were given with growing up formula and (n=3, ≥7years old) were given commercial full cream milk during supper which provided average energy and protein supplemented 338.6kcal; 11.5g and 150kcal; 8g respectively. All COVID -19 diet specially designed as high protein diet category providing up to 75 g protein per day. Another two categories which are Full 30 / Soft 30 and Full 50 / Soft 50 each indicate patient require with 30% ONS (480-560 calorie; 20-24g protein) and 50% ONS (577-657 calorie; 40-44g protein). Product given either in form of powder or ready to drink. This in line with the intervention done by Riccardo Caccialanza M.D et.al (4), which stated that if nutritional risk is detected after screening procedure, it is encouraged to prescribe the patient with oral nutrition supplement; two to three bottles (125/200 mL/d) of protein-calorie ONS (600/900 kcal/d; 3555 g/d of proteins) provided to patients, to be consumed between or immediately after meals.

There were few subjects developed hypokalemia during the stay. Hypokalemia is an electrolyte characterized by low serum potassium concentrations (normal range: 3.5 – 5.0 mEq/L). Hypokalemia is classified into stages of mild (3.0-3.4 mEq/L), moderate (2.5-2.9mEq/L) and severe (<2.5 mEq/L). Pathophysiology of COVID-19 infection itself might be the cause of hypokalemia in COVID -19 patients. COVID-19 infection develop when Sars-CoV-2 invades human cells via binding angiotensin I converting enzyme 2 (CE2) on the cell membrane (16). The final effect increases reabsorption of sodium and water, and thereafter increases blood pressure and excretion of potassium (K^+) (21). So, the dietitians provide dietary intervention for hypokalemia by providing high and moderate potassium food such as banana, milk, green leafy vegetables, dates and other potassium-containing food to the hypokalemic patients with average 131.2 – 262.4mg (2.5-6.7mmol) potassium.

According to contemporary review by Cohn J.N et.al (6), national council on potassium in clinical practice, for prevention of hypokalemia, a dosage of 20 mmol/d potassium in oral form is generally sufficient, and 40 to 100 mmol/d sufficient for its treatment A study by Aboujamous.H et.al (1) reveals that every 10 mEq of potassium administered increase serum potassium levels by a mean value of 0.13 mEq/L. The result of the study also further reveals that intravenous potassium appears to impact serum potassium levels similarly to the impact of oral potassium. After intervention done by dietitians and medical practitioners, there were improvement in subjects blood potassium level prior their discharge.

In conclusion, Medical Nutritional Therapy (MNT) is a fundamental aspect in managing malnutrition regardless of pandemic. Dietitians play a significant role and should proactively implement appropriate nutrition care plans (NCP) to assess, prevent and treat malnutrition among COVID -19 patient. The management and guidance provided in this study can assist dietitian in assessing and intervening patients infected with COVID -19 who are hospitalized. Although it has been created and done in response to the COVID -19 pandemic crisis, it could be suitable for every situation in the future that might limit the availability of healthcare system and adopt to the new norms and align with IR4.0 revolution.

COMPLIANCE WITH ETHICAL STANDARDS

This study approved by MREC with reference number KKM/NIHSEC/P20-1591 (4). No potential conflict of interest was reported by the authors.

ACKNOWLEDGMENTS

We would like to thank Director and Deputy Director of Hospital Tuanku Ja'afar, Seremban for permission and approval in conducting this study. We also would like to thank the Director General of Health Malaysia for his permission to publish this research.

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