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COVID-19 LOCKDOWN EXACERBATES FOOD INSECURITY AMONG HEMODIALYSIS PATIENTS IN PULAU PINANG, MALAYSIA

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Abstract

Introduction. Movement Control Order (MCO) imposed due to Covid-19 pandemic has disrupted economic activities. However, MCO's impact on food security at household level among vulnerable hemodialysis population is unknown. Therefore, this study was conducted to determine the impact of full-blown MCO on food intakes and body weight among hemodialysis (HD) patients according to food security status. **Method.** : In this retrospective study, multi-ethnic HD patients (n=107) were recruited from 3 dialysis centres in Pulau Pinang, Malaysia. Food security status was assessed using the validated 10-items USDA-FSSM via face-to-face interview. Differences in food intakes and post-dialysis weight before and during the full-blown MCO in 2020 were analyzed using general linear model. Modified food consumption score was used to measure food intakes before and during full-blown MCO. **Results.** Food insecurity during MCO was evidenced in 22.4% of HD patients with a greater proportion observed in female ($p < 0.001$), unemployed ($p < 0.011$), and those who had lower education level ($p < 0.012$), household income ($p < 0.003$), and number of working family members ($p < 0.016$). Regardless of food security status, significant reductions of dietary intakes were observed during MCO for fruits ($p < 0.001$), vegetables ($p < 0.005$), and kuih and snacks ($p < 0.011$) but not for fish and seafood, meat and poultry, cereal and tubers, milk and dairy product, and sugar-sweetened beverages ($p > 0.05$). Food-insecure HD patients experienced a greater reduction in

fruits, kuih and snacks intakes as compared to food-secure HD patients. Nevertheless, no significant change in post-dialysis weight (p = 0.13) was found in HD patients with and without food security problem. **Conclusion.** MCO exacerbates the food accessibility problem in food-insecure HD patients.

Keywords: *Food insecurity; Covid-19 lockdown; food intakes; body weight; hemodialysis*

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INTRODUCTION

China confirmed the first 4 cases of "pneumonia of unknown origin" connected to the seafood market in Wuhan on 29 December 2019, caused by a new coronavirus now known as Covid 19 (1). The virus spread quickly to every region in the world, and the outbreak was declared a pandemic by the World Health Organization on 11 March 2020. On 25 January 2020, Malaysia announced its first confirmed case, and the cases keep increasing. Thus, the Malaysian government has enforced a national Movement Control Order (MCO) on 18 March 2020 to minimize the spread of infection. Following the implementation of the MCO, all Malaysians were instructed to stay at home. Other prohibitions imposed included the ban of public meetings, health inspection and quarantine for Malaysians arriving from overseas, restrictions on foreign visitors entering the country, and the closing of all facilities except primary and critical utilities such as health services, sanitation, power, telecommunications, and food supply firms (2).

As a result of MCO, many have lost their source of income as most non-essential companies have been closed. This has significantly impacted food security, especially among poor and vulnerable urban households (3,4,5). According to the food and agriculture organizations (FAO), food security is defined as the situation in which all people have physical and economic access to sufficient, safe, and nutritious food to fulfill their nutritional needs and food preferences for an active and balanced life all the time. (6). A systematic analysis of food security and Covid-19 concluded that the pandemic has negatively impacted the supply and demand of food, decreased purchasing power, and reduced food production and distribution (7).

Food insecurity is a significant problem faced by households in developing countries. Although Malaysia is generally food secure at the national level (Global Food Security Index 2019), household food insecurity still exists at the household level. According to the Malaysian Adult Nutrition Survey (MANS), 2014, the prevalence of food insecurity in Malaysia was 24.8%. The implementation of MCO in Malaysia is expected to worsen the condition. A local study found that MCO has resulted in movement restrictions for the labor and the transport of agricultural inputs and outputs, a rise in food costs due to an uncertain economy, and a shift in consumption habits (8).

Hemodialysis (HD) patients possess characteristics that are at risk for food insecurity. A study found that HD patients often live on limited incomes because of the high cost of medications, treatments, and hospitalizations (9). Besides, most Malaysian HD patients were retirees (47.0%), and approximately 91.0% of the patients had low and middle household incomes (10). In addition, they often rely on other people for transportation to dialysis centers and grocery stores because of their disabling condition (11). Thus, MCO is expected to exacerbate the extent of food insecurity among Malaysian HD patients. Yet, information about food security among Malaysian HD patients remains unexplored.

HD patients are susceptible to numerous complications such as protein-energy wasting (PEW), fluid and electrolyte imbalances, mineral bone disorders, and anemia due to dialysis and uremic-induced metabolic disorders (12). More than 35.0% of Malaysian HD patients were identified with PEW (13). Furthermore, the prevalence of malnutrition and inflammation was prevalent in Malaysian HD patients where a study found that about 64.4% of patients were malnourished (14). Dietary insufficiency due to economical and psychosocial constraint, and/or poor appetite and diet quality may be one of the factors contribute to malnutrition among this group (15). Thus, this poses questions on how does MCO impact the nutritional status of such vulnerable population attributed to food insecurity. Therefore, we sought to investigate the impact of full-blown MCO on food intakes and body weight among Malaysian HD patients according to food security status.

MATERIAL AND METHODS

Study Design and Patient Recruitment

This was a retrospective study for two timepoints, which is a week before MCO started (11-17th March 2020) and six weeks since full-blown MCO started (5-11th May 2020), conducted at three conveniently selected HD centers in one of the districts (i.e., Seberang Perai

Utara) located in Pulau Pinang, Malaysia. Consecutive sampling was used to recruit multi-ethic HD patients who are at least 18 years old, Malaysian and have been dialyzed for at least 3 months before MCO. Individuals with cognitive impairment, blind, deaf, mute, terminally ill patients, pregnant and lactating mother were excluded from the study. Sample size was calculated using G. Power version 3.1.9.7 (Franz Faul, Universitat Kiel, Germany) statistical software for mixed-model ANOVA, with an effect size = 0.15, significant level = 5% and statistical power = 80%. A total of 113 subjects were required after accounting for a 20% non-response rate. Ethical approval was obtained from the Ethics Committee for Research Involving Human Subject (JKEUPM-2021-049), Universiti Putra Malaysia. Informed consent was obtained from all the subjects prior to their study participation.

Study Instrument

A face-to-face interview was conducted by a trained research dietitian to assess patient's characteristic, food intakes and food security status while the patient's post-dialysis weight were retrieved from their medical records.

Patient's characteristic

The information that has been obtained for patient's characteristics were age, gender, marital status, working status, level of education, household income, number of family members, numbers of employment family members, number of comorbidities, and dialysis vintage.

Food intakes

Food intakes was measured using modified food consumption score. Modified food consumption score includes questions regarding the serving and the frequency for the patients to consumed food group in a week before and during the full-scale MCO was adapted from previous study (16). The food groups include fruits, vegetables, fish and seafood, meat and poultry, cereals and tubers, milk and dairy products, kuih and snacks, and sugar-sweetened beverages. The average consumption in dialysis days and non-dialysis days before and during full-scale MCO were calculated.

Food security status

The 10-item US FSSM was administered to each HD participant by interview to access food security status. Respondents answered "often true", "sometimes true", or "never true" to each item. For analysis purposes, responses of "often true" and "sometimes true" were coded as affirmative, whereas responses of "never true" were coded as negative. Based on the number

of affirmative responses, a subject was placed into one of two categories; food secure or food insecure. The internal consistency (Cronbach's α) of the questionnaire was 0.80, denoting a good reliability.

Post-dialysis weight

Means for post-dialysis weight were obtained retrospectively from patient's medical record. The post-dialysis body weight of the hemodialysis patients was obtained a week before full-blown MCO occur (11-17th March 2020) and six weeks since MCO full-blown started (5-11th May 2020).

Statistical Analysis

Analyses were performed using the IBM SPSS version 25. Continuous variables are presented as mean ± standard deviation while categorical variables are expressed in frequency (n) and percentages (%). The associations between food security status with continuous and categorical variables were computed using, Pearson's chi-square or independent t-test respectively. A general linear model (GLM) repeated measure (mixed-model ANOVA) was performed to examine the changes in post-dialysis weight and food intakes among hemodialysis patients before and after full-blown MCO and compare the impacts of food security status on the changes. Statistical significance was defined at $p < 0.05$.

RESULTS

Patient's characteristics

From the total of 115 patients' approach, 107 patients have been consented to participate this study, giving a response rate of 93.0%. The patient's characteristics stratified by food security status are described in **Table 1**. The HD patients consisted of 43.0 % male (n=46) and 57.0 % female (n=61) with the mean age of 52.5 ± 12.9 years. Besides, 49.5% (n=53) of HD patients were single and 50.5% (n=54) were married. For ethnicity, 80.4% were Malay (n=86), followed by 12.1% Chinese (n=13), and 7.5% Indian (n=8). In addition, most patients were not working (83.2%, n=89) and had education level up to secondary school (55.1%, n=59). Majority (79.4%) of the HD patients had lower income (n=85). Mean number of family members and working family members were 3.6 ± 1.7 and 1.2 ± 0.8, respectively. While the average number of comorbidities and dialysis vintage was 1.2 ± 1.1 and 57.5 ± 28.4 months, respectively.

The prevalence of food insecurity was evident in 22.4% (n=24) of the HD patients. Food insecurity was significantly higher in female ($p < 0.001$), unemployed ($p < 0.011$), and those

who had lower education level ($p < 0.012$), lower household income ($p < 0.003$), and fewer number of working family members ($p < 0.016$).

Table 1. Patient's characteristics of hemodialysis participants stratified by food security status during the full-blown MCO in Pulau Pinang.

Characteristic	Total (n=107)	Food secure (n=83)	Food insecure (n=24)	*p*
Age, years, mean ± SD	52.3 ± 13.6	52.3 ± 13.6	53.2 ± 10.2	0.768**
Sex, n (%)				
Female	61 (57.0)	39 (63.9)	22 (36.1)	**<0.001***
Male	46 (43.0)	44 (95.7)	2 (4.3)	
Marital Status, n (%)				
Single/ Separated/Widow	53 (49.5)	37 (69.8)	16 (30.2)	
Married	54 (50.5)	46 (85.2)	8 (14.8)	0.057*
Ethnicity, n (%)				
Malay	86	65 (75.6)	21 (24.4)	
Chinese				0.394*
Indian	21	18 (85.7)	3 (14.3)	
Employment status, n (%)				
Employed	18 (16.8)	18 (21.7)	0 (0.0)	**0.011***
Unemployed	89 (83.2)	65 (73.0)	24 (27.0)	
Educational level, n (%)				
None				
<Primary	25 (23.4)	19 (76.0)	6 (24.0)	
Secondary	59 (55.1)	41 (69.5)	18 (30.5)	**0.012***
Tertiary	23 (21.5)	23 (100.0)	0 (0.0)	
Household income, n (%)				
< RM 4849 (16 569 517.90 IDR)	85 (79.4)	61 (71.8)	24 (28.2)	**0.003***
≥ RM 4849 (16 569 517.90 IDR)	22 (20.6)	22 (20.6)	0 (0.0)	
Number of family members	3.6 ± 1.7	3.7 ± 1.7	3.7 ± 1.8	0.968**
Number of employed family members	1.2 ± 0.8	1.2 ± 0.8	0.8 ± 0.7	**0.016****
Number of comorbidities	1.2 ± 1.1	1.3 ± 1.0	1.7± 1.0	0.080**
Dialysis vintage, months	57.5 ± 28.4	58.1 ± 31.2	61.1 ± 29.6	0.685**

*[1]*Pearson's chi-square [2]**independent t-test [3]IDR= RM 0.00029*

Changes in food intakes

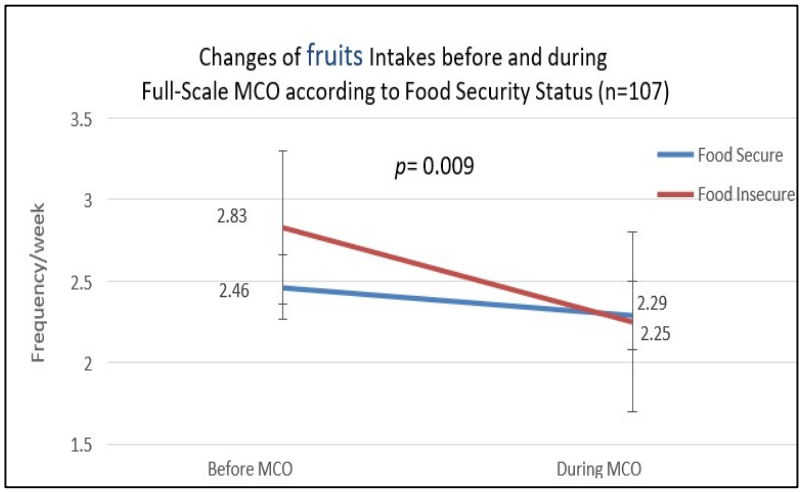
Food groups such as fruits, vegetables, fish and seafood, and milk and dairy products showed decreasing trend except for cereal and tubers, meat and poultry, and sugar-sweetened beverages as shown in **Table 2**. However, only three food groups showed significant reduction during full-blown MCO, which are fruits (p<0.001), vegetables (p=0.005), and kuih and snack intakes (p=0.011). Further examination showed that, food-insecure patients experienced a

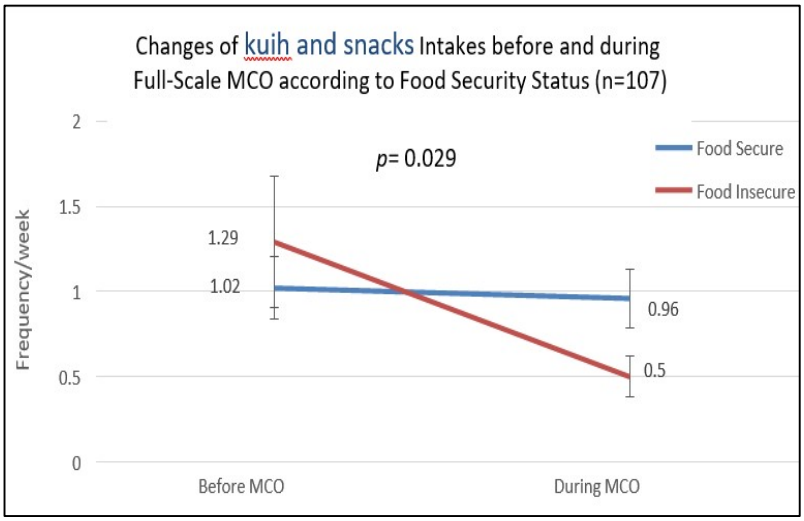
greater significant reduction in fruits (p=0.009), kuih and snacks (p=0.029) but not for vegetables (p=*0*.840), compared to food secure patients as shown in **Figure 1.**

Table 2. Frequency of food intake before and during the full-blown MCO (n=107)

Characteristic	Before MCO Mean ± SD	During MCO Mean ± SD	*p*
Fruits	2.54 ± 1.93	2.28 ± 2.07	**0.001**
Vegetables	2.82 ± 2.51	2.59 ± 2.59	**0.005**
Fish and seafoods	3.96 ± 1.97	3.90 ± 2.29	0.383
Meat and poultry	3.22 ± 1.99	3.38 ± 2.24	0.054
Cereals and tubers	15.62 ± 3.66	16.62 ± 4.32	0.070
Milk and dairy product	0.66 ± 1.20	0.65 ± 1.20	0.593
Kuih and snacks	1.08 ± 1.71	0.86 ± 1.42	**0.011**
Sugar sweetened beverages	5.94 ± 5.34	6.01 ± 5.59	0.976

[1]*Repeated measure of ANOVA*





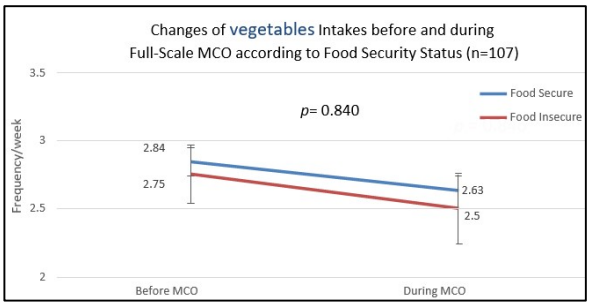


Figure 1. Changes of fruits, kuih and snacks, and vegetables intakes before and during full-blown MCO among hemodialysis patients in Pulau Pinang stratified by food security status

Changes in post-dialysis weight

Although not significant (p = 0.130), there was an increasing trend in post-dialysis weight during full-blown MCO observed in both food secure and food-insecure group as shown in **Table 3**.

Table 3.

Characteristic	Before MCO (Kg) Mean ± SD	During MCO (Kg) Mean ± SD	*p*
Food secure	65.1 ± 11.6	65.4 ± 11.6	0.130
Food insecure	58.1 ± 11.0	58.3 ± 11.0	

[1]*Mixed-model ANOVA* [2] *Kg = Kilogram*

DISCUSSION

Food insecurity was evidenced in 22.4% of HD patients in Pulau Pinang, Malaysia. Interestingly, the prevalence of food insecurity in this study was lower than the previous studies among general healthy population (17,18). A study among healthy subjects in Bachok, Kelantan, reported 29.6% experienced household food insecurity (17), whilst similar study in Hulu Langat district, Selangor was at 26.3% (18). It is postulated that the difference in the prevalence of food insecurity were attributed to the social characteristics of the study population and geographical location. Previous studies were conducted among rural population and welfare recipients, which mainly from the poor household. In contrast, this study was conducted among urban patients from private HD centers in Seberang Perai Utara, Pulau Pinang. It is anticipated that more significant proportion of patients who are poor and food insecure can be found in government-run or zakat (a state-run Islamic social welfare organization) based dialysis centers.

In this study, HD patients experienced significant reduction in fruit and vegetable intakes during full-blown MCO, which was consistent with previous studies among general healthy adults in Zimbabwe (19), Italy (20) and China (21). Possible explanations for the changes in food intakes during MCO include the unavailability of foods at home. Fruit and vegetables have a limited shelf life, making transportation inefficient (21). Reducing the frequency of grocery shopping has resulted in lower purchases of perishable items such as fresh fruits and vegetables (22-24). Furthermore, low market supply may also be one of the reasons for reduction in fruits and vegetables intake during lockdown (8,25). According to the Department of Agriculture (DOA), the production of vegetables and fruits in Pulau Pinang decreased at an average daily rate of 3% and 1.3% during the first phase of MCO (8). Other reasons reported by patients who change food intakes during MCO include boredom, more time to cook, diet restrictions, anxiety, and food preferences.

There were no significant changes were observed in fish-seafood, meat-poultry, and cereal-tubers food groups. It is expected that inelastic items may be unlikely to change as these foods are taken mainly in every main meal (16). Besides, there was no significant change in milk-dairy products observed. This might be attributed to the fact that milk and dairy product are not frequently consumed by most, including HD patients (26,27). Although non-significant, the increasing trends in sugar-sweetened beverages consumptions were detected during full-blown MCO. Therefore, further assessment in practice is needed to identify problematics foods from these food group. Increased consumption of these food items due to prolonged MCO may cause serious health effects in HD patients including impaired lipid profile and poor phosphate control (28,29).

Interestingly, our finding also indicate that food insecure patients experienced a greater reduction in fruits, kuih and snacks intakes. Similarly, Litton et al (2021) indicated that food-insecure participants had significantly lower consumption of fruit and vegetables during lockdown than food-secure participants (25). The reason behind that is those with food insecurity are far more likely to see cost as a barrier to consume fruits and vegetables (25). In Malaysia, the market price for vegetables were increased during MCO and stormy weather making them cannot be transported efficiently (30).

Despite the changes in food intake, there was no significant change in post-dialysis weight was found in HD patients with and without food security problem. This finding was not in agreement with other studies conducted among healthy population (21, 31-33). There are several plausible explanations for this finding. During the first phase of MCO, all outdoor sports

and recreational activities were not allowed in Malaysia (2). Therefore, an enforced lockdown may reduce physical activity, resulting in increasing weight. However, in terms of physical activity level, HD patients already live a sedentary lifestyle even before MCO (34,35). In addition, a diminished appetite was reported by some of the HD patients during the interview. Anorexia or defined as a lack of appetite, is frequent among HD patients, accounting for one-third of all cases (36,37). Anorexia decreases oral total calorie and protein intake, contributing to malnutrition and protein energy wasting (38).

The finding of this study brings an essential topic to the table. The reduction in fruits and vegetable consumption among HD patients during full-scale MCO may have a detrimental health impact as MCO prolongs. Previous guidelines (MNT for CKD, 2005) advised HD patients to restrict their dietary potassium to 2 to 3 g per day (39). However, according to the KDIGO controversy conference in 2019, the benefits of this practice are entirely theoretical and not supported by rigorous randomized controlled trials (40). In addition, an observational study shows a poor correlation between dietary potassium intake and serum potassium (41,42). Compared to animal-based potassium, the study found that plant-based potassium is less likely to cause hyperkalemia (42,43). In fact, plant-based potassium might help to alleviate hyperkalemia by providing sufficient fiber to facilitate the fecal removal of potassium in end-stage renal disease patients (42,43). Therefore, it is very important for the health practitioner to access the vegetables and fruits consumption especially during the pandemic, and to suggest food-insecure patients with low-cost fruits and vegetables.

This study has some limitations. Due to strict standard operating procedure imposed during data collection, face to face encounter were very brief and limited. Therefore, a more thorough nutritional assessment could not be performed. As such, we only able to provide a superficial insight on the extension of food insecurity problems in this population hampered by recall bias and limited food group exploration. Hence, prospective study with more comprehensive nutritional and dietary assessment is needed to verify the study findings.

CONCLUSION

This study revealed that MCO decreased intake of kuih and snacks, fruits, and vegetables, while, food security status is one of the critical aspects that exacerbates the food accessibility problem among food-insecure HD patients. The reduction of fruits and vegetables consumption might negatively impact the existing nutritional problems among this vulnerable population. Food insecurity, unlike other nutrition-related problems, can be episodic and

concealed from view. Therefore, all HD patients should be screened for food insecurity using appropriate measures, especially during the pandemic. This will improve the delivery of publicly or privately funded nutrition programs to support this vulnerable group.

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CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported by the authors.

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