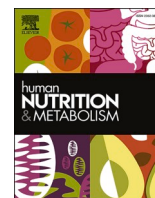




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## Food security during the COVID-19 home confinement: A cross-sectional study focusing on adults in Malaysia

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### ABSTRACT

The surge in coronavirus disease 2019 (COVID-19) transmission cases has led to the decision to execute the Movement Control Order (MCO) by the Federal Government of Malaysia. Economic activities, psychological wellbeing, and food security may be negatively affected by the implementation of MCO. Therefore, this study aims to assess the prevalence of food insecurity and its associated factors during the enforcement of MCO 1.0. A total of 162 respondents were enrolled in this study using convenience and snowball sampling approaches. Socio-demographic information was self-reported by the respondents. Food security and the presence of depressive symptoms during the MCO 1.0 were assessed with Food Insecurity Experience Scale (FIES) and Patient Health Questionnaire-2 (PHQ-2), respectively. Current findings demonstrated that the prevalence of food insecurity was 43.2%. Ethnicity, marital status, employment status, monthly earned income and being the head of a household were significantly associated ( $p < 0.05$ ) with food insecurity during the MCO 1.0. A higher odds ratio for food insecurity were observed among Malaysian Indian (OR = 2.541, CI: 1.041–6.205), those with active employment during the MCO 1.0 (OR = 4.175, CI: 1.189–14.660) and those with a monthly income of less than RM4000 during the MCO 1.0 (OR = 5.396, CI: 1.362–21.838). In conclusion, policymakers are urged to pay more attention to these vulnerable populations when formulating economic stimulus plans and coping strategies for food insecurity in the post-COVID-19 era.

### 1. Introduction

Food security refers to all individuals having physical, social and economic access to sufficient, safe and nutritious foods that can meet food preferences and dietary needs for an active and healthy life at all times [1]. It depends on numerous factors, including the synergy between the national food system and food security, socioeconomic conditions, food price fluctuation, and unexpected events in a nation, such as pandemic outbreaks, riots, war, or political instability [2]. It is predicted that the recent COVID-19 pandemic outbreak could prompt global food insecurity to an alarming extent. In addition, food insecurity has also been reported to positively associated with adverse health implications, including a higher risk of chronic diseases and behavioural problems [3].

Malaysia is one of the many countries affected by the recent COVID-

19 outbreak. The first wave of COVID-19 infection happened on January 24, 2020, and the virus continued to spread among the nation thereafter [4]. The surge in COVID-19 transmission cases has led to the decision to execute the first Movement Control Order (MCO 1.0) on March 18, 2020, by the Federal Government of Malaysia, aiming to break the chain of transmission through social distancing. Economic activities, psychological wellbeing, and food security may be negatively affected by the implementation of MCO [5]. Income loss emerged as the immediate effect of the COVID-19 crisis, arising from an almost complete close-down of economic activity in MCO. A recent study in the United Kingdom demonstrated that individuals with income losses of greater than 25% during the country lockdown were particularly at risk for food insecurity [6]. Besides, limited mobility during the country lockdown has also hindered individuals' accessibility to foods and worsening the condition. Therefore, this study aims to investigate the prevalence of

; COVID-19, Coronavirus disease 2019; MCO, Movement Control Order.

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food insecurity and its associated factors during the enforcement of MCO 1.0.

## 2. Method

### 2.1. Study design and population

This cross-sectional study was conducted from May 1st-14th, 2020 (approximately one and a half months after the enforcement of MCO 1.0). A combination of convenience and snowball sampling approaches was adopted to enroll participants in this study voluntarily. The self-administrated web-based questionnaire in English was hosted on google forms (Appendix 1) and circulated through social media platforms such as Facebook, Instagram, Tiktok and WhatsApp. Informed consent was obtained from the respondents prior to answering the questionnaire. Data were collected anonymously by not collecting name or email address of the respondents. The sample size was estimated using the formula of  $N \geq 50 + 8m$ , whereby N and m represent the number of respondents and the number of predictors, respectively [7]. Therefore, a minimum sample size of 122 respondents is required for this study. Findings in the current study were tabulated according to responses from 162 Malaysian citizens aged 21–50 years old, after excluding incomplete questionnaires. In addition, respondents with clinically diagnosed depression were also excluded from this study.

### 2.2. Socio-demographic characteristics

Socio-demographic characteristics of the respondents, including sex, age, ethnicity, marital status, employment status during the MCO 1.0, monthly income during the MCO 1.0, household size, number of children, the status as the household head and the presence of clinically diagnosed depression were self-reported. Monthly income was categorised into two categories, which best approximates the bottom 40% (B40) ( $\leq$ RM4000) and middle 40% (M40) ( $>$ RM4000) strata [8]. Household size was classified into small (less than 5 members), medium (5–7 members) and large (more than 8 members) according to Mok, Maclean & Dalziel [9].

### 2.3. Assessment of depressive symptoms during the MCO 1.0

The presence of depressive symptoms during a four-week period of MCO 1.0 was assessed using the Patient Health Questionnaire-2 (PHQ-2) [10]. Respondents who scored  $\geq 3$  points are regarded as having depressive symptoms. The reliability of PHQ-2 in the current study was good, with a Cronbach's alpha of 0.866.

### 2.4. Food insecurity assessment

Food insecurity during a four-week period (during the MCO enforcement) was assessed using the 8-item Food Insecurity Experience Scale (FIES) by the Food and Agriculture Organization (FAO) [11]. The raw score for all eight items is an ordinal measure for indicating the food insecurity at 4 levels [12], ranging from food secure to severe food insecure. It was then further dichotomised into 2 levels (food secure/food insecure) for multivariable logistic regression analysis. The reliability of FIES in the current study was excellent, with a Cronbach's alpha of 0.916.

### 2.5. Statistical analysis

Data analysis was carried out using IBM SPSS statistics 26.0 (IBM Corp, Armonk, NY). Descriptive statistics including frequency, mean, standard deviation (SD) and percentage were used to describe variables where appropriate. Continuous variables, including age, monthly income, food insecurity and PHQ-2 scores were tested for normality. Data was considered as normally distributed if the skewness falls in the range

of  $\pm 2$ . Bivariate analysis was conducted to identify the potential factors contributing to food insecurity during the MCO 1.0. A variable that portrays a  $p$ -value of less than 0.25 ( $p < 0.25$ ) was selected as the predictor for food insecurity in a multivariable logistic regression model. Results were presented in adjusted odds ratio (AOR) and 95% confidence interval (CI), whereby a  $p$ -value of less than 0.05 ( $p < 0.05$ ) was statistically significant.

## 3. Results

Table 1 depicts the socio-demographic characteristics of the respondents. Of the 162 respondents, 84.0% ( $n = 136$ ) had a monthly earned income of less than RM 4000 before the MCO 1.0 enforcement. The number of respondents with a monthly income of less than RM 4000 increased to 88.9% ( $n = 144$ ) following the implementation of MCO. On average, there was a significant reduction ( $p < 0.05$ ) in the monthly income, with a difference of RM 580.32 before and during the MCO 1.0. In addition, findings from PHQ-2 demonstrated that 18 respondents (11.1%) were positive for depressive symptoms.

Table 2 indicates the prevalence and severity of food insecurity during the MCO 1.0. Slightly more than half (56.8%) of the respondents were food secure despite the implementation of MCO 1.0. The prevalence of individual food insecurity was 43.2%, with the majority fall in the category of mild food insecure (19.8%) and moderate food insecure (14.8%). Findings from the FISE also indicated that fifty-two ( $n = 52$ ) or 32.1% of the respondents perceived that they had fewer food varieties during the MCO 1.0, while 31.5% ( $n = 51$ ) worried about insufficient food availability to sustain their needs throughout the home confinement. Additionally, 28.4% ( $n = 46$ ) reported that they had smaller food portions during the MCO 1.0.

Ethnicity, marital status, employment status during the MCO 1.0,

**Table 1**  
Sociodemographic characteristics of the respondents.

Characteristics	n (%)	Mean $\pm$ Standard Deviation
<b>Sex</b>		
Male	67 (41.4)	
Female	95 (58.6)	
<b>Age group</b>		30.71 $\pm$ 8.91
21–30	102 (63.0)	
31–40	34 (21.0)	
41–50	26 (16.0)	
<b>Ethnicity</b>		
Malay	50 (30.8)	
Chinese	62 (38.3)	
Indian	50 (30.9)	
<b>Marital status</b>		
Single	96 (59.3)	
Others (married, divorced, widowed)	66 (40.7)	
<b>Employment status during the MCO 1.0</b>		
Unemployed	21 (13.0)	
Actively employed	141 (87.0)	
Monthly income before the MCO 1.0 (RM) <sup>a</sup>		2937.20 $\pm$ 1605.66 <sup>a</sup>
$\leq$ 4000 (B40)	136 (84.0)	
$>$ 4000 (M40)	26 (16.0)	
<b>Monthly income during the MCO 1.0 (RM)<sup>a</sup></b>		2356.88 $\pm$ 1699.79 <sup>b</sup>
$\leq$ 4000 (B40)	144 (88.9)	
$>$ 4000 (M40)	18 (11.1)	
<b>Household size</b>		4.96 $\pm$ 1.93
Small ( $<$ 5 members)	68 (42.0)	
Medium (5–7 members)	81 (50.0)	
Large ( $\geq$ 8 members)	13 (8.0)	
<b>Head of a household</b>		
Yes	50 (30.9)	–
No	112 (69.1)	
<b>Presence of depressive symptoms</b>		
Negative	144 (88.9)	–
Positive	18 (11.1)	

<sup>a</sup>Mean difference was assessed with paired samples  $t$ -test. Different alphabets denote significant difference at the level of  $p < 0.05$ .

<sup>a</sup> USD = 4.19 Malaysian Ringgit (RM) (as of January 2022).

**Table 2**

Prevalence and severity of food insecurity during the first Movement Control Order (MCO 1.0).

Food security status	n (%)	Prevalence of food insecurity (%)
Food secure	92 (56.8)	43.2
Mild food insecure	32 (19.8)	
Moderate food insecure	24 (14.8)	
Severe food insecure	14 (8.6)	

monthly earned income during the MCO 1.0 and being the head of a household were significantly associated with food insecurity during the MCO 1.0 (Table 3). Findings from multivariable logistic regression model indicated that the Malaysian Indian was nearly three times as likely to be food insecure than Malay and Chinese (AOR = 2.541, CI: 1.041–6.205). The odds of food insecurity were four times more profound among those with active employment (AOR = 4.175, CI: 1.189–14.660) than those who were unemployed. Moreover, respondents with a monthly earned income of less than RM4000 were approximately six times more likely to be food insecure than those who earned more than RM4000 in the MCO 1.0 (AOR = 5.396, CI: 1.362–21.838) (see Table 4).

#### 4. Discussion

To date, the literature on the prevalence of individual food insecurity among adults in Malaysia remains scarce. It has been reported that the prevalence of individual food insecurity was 9.5%–32.8% from the few studies conducted in Malaysia [13]. By comparison, the current findings recorded a higher prevalence of individual food insecurity (43.2%) during the MCO enforcement. In addition, the National Health and Morbidity Survey 2019 (NHMS 2019) has recently reported that the prevalence of lifetime depression among Malaysians aged 16 years old and above was 2.3% [14]. However, a review by Ng [15] indicated that the prevalence of depression among Malaysians is more likely to be between 8 and 12%. Current findings demonstrated that the prevalence of depression during the MCO was 11.1%, which is in well-agreement as in the range reported by Ng [15], but approximately five times higher than that of NHMS 2019 [14].

Financial stability in a household is one of the significant determinants for food security and psychological wellbeing. The COVID-19 outbreak has imparted several unexpected socioeconomic impacts worldwide, including household financial distress resulting from the global economic recession, coronavirus-related job loss or pay cuts [16]. Literally, food security is more likely to be compromised in individuals with lower financial literacy during MCO [17]. Coincidentally, the current findings revealed that respondents with a monthly earned income of less than RM4000 were more likely to be food insecure during the MCO 1.0. Besides, it has also been documented that there is a positive association between food insecurity and depressive symptoms, including depressive feelings, thought and behaviours [3,18]. It could be attributed to the fact that persistent food insecure individuals might have a higher urgency to always ensure food availability and adequacy at home, which eventually contributed to adverse mental health in the

**Table 3**

Association between the studied variables.

Variable	Food insecurity, $\chi^2$	p-value
Sex	0.001	0.987
Age	2.866	0.251
Ethnicity	8.984	0.011
Marital status	7.495	0.010
Employment status during the MCO 1.0	5.740	0.018
Monthly earned income during the MCO 1.0	5.058	0.036
Household size	0.658	0.762
Head of a household	4.821	0.039
Presence of depression symptoms	0.334	0.603

**Table 4**

Predictors of food insecurity during the first Movement Control Order (MCO 1.0).

Variable	Food insecurity	
	AOR (95% CI)	p-value
<b>Ethnicity</b>		
Malay	Reference group	–
Chinese	0.828 (0.364–1.884)	0.652
Indian	2.541 (1.041–6.205)	<b>0.041*</b>
<b>Marital status</b>		
Single	Reference group	–
Others (married, divorced, widowed)	2.103 (0.903–4.893)	0.085
<b>Employment status during the MCO 1.0</b>		
Unemployed	Reference group	–
Active employment	4.175 (1.189–14.660)	<b>0.026*</b>
<b>Monthly income during the MCO 1.0 (RM)</b>		
≤4000	5.396 (1.362–21.383)	<b>0.016*</b>
>4000	Reference group	–
<b>Head of a household (reference group: Yes)</b>		
Yes	Reference group	–
No	0.879 (0.346–2.232)	0.786

\*Asterisk denotes significant at the level of  $p < 0.05$ .

long run [19]. Contrary to the literature, emerging findings indicated that individual food insecurity was not associated with the presence of depressive symptoms during MCO 1.0.

The current findings revealed that the Malaysian Indians had a higher odds ratio for food insecurity than Malay and Chinese. Since the discrepancy between different ethnic groups has not been studied thoroughly in Malaysia, one of the plausible justifications could be that the Indians are more financially insecure than other ethnic groups in Malaysia [20]. Nevertheless, the current study did not observe an association between marital status and food insecurity during the MCO 1.0. This finding was in contrast with a recent study conducted in Australia, where it is reported that individuals with single marital status were more likely to be food secure [21]. Besides, findings in the current study also indicated that respondents who were with active employment during the MCO 1.0 had higher odds for food insecurity compared to those who were unemployed. Temporary closure of economic activities due to the COVID-19 home confinement had/have affected the monthly household income, exposing those with active employment at risk for food insecurity [22,23].

Furthermore, the current study also highlighted the association between household composition and individual food insecurity during the MCO 1.0. The literature claimed that household sizes negatively correlated with food insecurity, whereby food-secure households tend to be in a smaller number of family members [24]. Contrary to Silvestri [24], the current study did not reveal an association between household sizes and the incidence of food insecurity during the MCO 1.0. Although several studies suggested that being a household head is estimated to have an increased probability of food insecurity [25,26]. It is interesting to note that the current finding did not observe such association. Also, no significant association was reported between the presence of depressive symptoms and food insecurity, despite a few studies indicated that the relationship is likely to be positive and bidirectional [27,28].

Several limitations need to be noted in the current study. The web-based questionnaire was hosted on google forms and circulated through social media platforms in view of face-to-face data collection was not feasible in the time of nationwide lockdown. Therefore, only those accessible to the internet and social media platforms can respond to this survey. This study has tended to focus on food insecurity and its associated factors among Malaysian adults aged 21–50 years old during the MCO 1.0. Thus, the severity of food insecurity and the presence of depressive symptoms among Malaysian adults who are not in this age group remains unanswered. In addition, the current study is also unable to ascertain if the respondents had pre-existing depressive symptoms and were food insecure before the MCO enforcement. Given a low

sample size, findings presented in this study may not be well-reflecting the food insecurity status in Malaysia during the lockdown. Future studies may adopt a large sample size and longitudinal design to identify the directionality of associations.

## 5. Conclusion

Emerging findings revealed that Malaysian Indians, those with active employment and a monthly earned income of less than RM4000 had higher odds for food insecurity during the MCO 1.0. Policymakers are urged to pay more attention to these vulnerable populations when formulating economic stimulus plans and coping strategies for food insecurity in the post-COVID-19 era.

## Author contributions

All authors contributed to the study conception and design, material preparation and data collection. Data analysis was performed by Seok Tyug Tan. The first draft of the manuscript was written by Seok Tyug Tan and all authors commented on previous versions of the manuscript, read and approved the final manuscript.

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## Ethical standard disclosure

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving research study participants were approved by the Management and Science University Research Ethics Committee. Written informed consent was obtained from all respondents.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.hnm.2022.200142>.

## References

- [1] FAO. Chapter 2, Food Security: Concepts and Measurement, 2002. . Published, <http://www.fao.org/3/y4671e/y4671e06.htm>.
- [2] The Food Climate Research Network (FCRN), What is food security?, . Published, <https://www.foodsource.org.uk/building-blocks/what-food-security>, 2020. (Accessed 3 June 2020).
- [3] C.M. Johnson, J.R. Sharkey, M.J. Lackey, et al., Relationship of food insecurity to women's dietary outcomes: a systematic review, *Nutr. Rev.* 76 (12) (2018) 910–928, <https://doi.org/10.1093/nutrit/nuy042>.
- [4] World Health Organization (WHO), COVID-19 Situation: Overview in Malaysia, 2020. [https://www.who.int/malaysia/emergencies/coronavirus-disease-\(covid-19\)-in-malaysia/covid-19-situation-reports-in-malaysia](https://www.who.int/malaysia/emergencies/coronavirus-disease-(covid-19)-in-malaysia/covid-19-situation-reports-in-malaysia).
- [5] S.T. Tan, C.X. Tan, S.S. Tan, Trajectories of food choice motives and weight status of Malaysian youths during the covid-19 pandemic, *Nutrients* 13 (11) (2021) 3752, <https://doi.org/10.3390/nu13113752>.
- [6] R. Loopstra, Vulnerability to Food Insecurity since the COVID-19 Lockdown Preliminary Report, 2020. April, <https://ukdataservice.ac.uk/>.
- [7] S.B. Green, How many subjects does it take to do a regression analysis, *Multivariate Behav. Res.* 26 (3) (1991) 499–510, [https://doi.org/10.1207/s15327906mbr2603\\_7](https://doi.org/10.1207/s15327906mbr2603_7).
- [8] A.H. Hawati, W.S. Gregory Ho, I. Suraya, Demarcating Households: an integrated income and consumption analysis, *Khazanah Res Inst* 19 (Suppl 4) (2019) 11–18.
- [9] T.P. Mok, G. Maclean, P. Dalziel, Household size economies: Malaysian evidence, *Econ. Anal. Pol.* 41 (2) (2011) 203–223, [https://doi.org/10.1016/S0313-5926\(11\)50020-7](https://doi.org/10.1016/S0313-5926(11)50020-7).
- [10] J. Arrieta, M. Aguerrebere, G. Raviola, et al., Validity and utility of the patient health questionnaire (PHQ) -2 and PHQ-9 for screening and diagnosis of depression in rural chiapas, Mexico, A Cross-Sectional Study 73 (9) (2017) 1076–1090, <https://doi.org/10.1002/jclp.22390>.
- [11] T.J. Ballard, A.W. Kepple, C. Cafiero, The Food Insecurity Experience Scale: development of a global standard for monitoring hunger worldwide, 2013. [https://www.fao.org/oh/FIES\\_Technical\\_Paper\\_v1.1.pdf%0A](https://www.fao.org/oh/FIES_Technical_Paper_v1.1.pdf%0A). Published. (Accessed 28 May 2020).
- [12] Food and Agriculture Organization of the United Nations, The Food Insecurity Experience Scale: Frequently Asked Questions- FAQs, vol. 2016, 2016.
- [13] C. Siwar, F. Ahmed, R.A. Begum, Household food insecurity, nutritional outcome and coping strategies: evidence from Malaysia, *J. Food Agric. Environ.* 12 (1) (2014) 19–23.
- [14] Institute for Public Health, Ministry of Health, Findings National Health and Morbidity Survey 2019: Non-communicable Diseases, Healthcare Demand, and Health Literacy, 2020.
- [15] C.G. Ng, A review of depression research in Malaysia, *Med. J. Malaysia* 69 (August) (2014) 42–45.
- [16] S.P. Joseph Louis, S.T. Tan, Socio-demographic disparities in the eating behaviour of Malaysian children during the COVID-19 lockdown, *Osong Public Heal Res Perspect* 12 (3) (2021) 196–199, <https://doi.org/10.24171/j.phrp.2021.0053>.
- [17] K.G. Carman, G. Zamarro, Does financial literacy contribute to food security? *Int. J. Food Agric. Econ.* 4 (1) (2016) 1–19, <https://doi.org/10.1016/j.physbeh.2017.03.040>.
- [18] L.C. Ivers, K.A. Cullen, Food insecurity: special considerations for women, *Am. J. Clin. Nutr.* 94 (6) (2011) 1740–1744, <https://doi.org/10.3945/ajcn.111.012617>.
- [19] M.A. Davey, L.J. Flamm, H.T. Kassa, C.A. Latkin, Food insecurity and depressive symptoms: comparison of drug using and nondrug-using women at Risk for HIV, *J. Community Psychol.* 42 (4) (2014) 469–478, <https://doi.org/10.1038/jid.2014.371>.
- [20] Agensi Kaunseling dan Pengurusan Kredit, Financial behaviour and state of financial well-being of Malaysian working adults, 2018, *AKPK Financ Behav Surv* 2018 (2018) 1–70.
- [21] A.N. Seivwright, Z. Callis, P. Flatau, Food insecurity and socioeconomic disadvantage in Australia, *Int. J. Environ. Res. Publ. Health* 17 (2) (2020), <https://doi.org/10.3390/ijerph17020559>.
- [22] UNICEF, Preliminary Report: A Survey on Impacts of COVID-19 Pandemic on Children and Young People and Their Needs: Online Survey Conducted between 28 March and 10 April 2020, 2020. <https://www.unicef.org/thailand/press-releases/8-10-youth-worried-about-their-family-income-due-covid-19>.
- [23] S.T. Tan, C.X. Tan, S.S. Tan, Physical activity, sedentary behavior, and weight status of university students during the covid-19 lockdown: a cross-national comparative study, *Int. J. Environ. Res. Publ. Health* 18 (13) (2021) 7125, <https://doi.org/10.3390/ijerph18137125>.
- [24] S. Silvestri, D. Sabine, K. Patti, et al., Households and food security: lessons from food secure households in East Africa, *Agric. Food Secur.* 4 (1) (2015), <https://doi.org/10.1186/s40066-015-0042-4>.
- [25] C.A. Swann, Household history, SNAP participation, and food insecurity, *Food Pol.* 73 (August) (2017) 1–9, <https://doi.org/10.1016/j.foodpol.2017.08.006>.
- [26] M. Sileshi, R. Kadigi, K. Mutabazi, S. Sieber, Analysis of households' vulnerability to food insecurity and its influencing factors in East Hararghe, Ethiopia, *J Econ Struct* 8 (1) (2019), <https://doi.org/10.1186/s40008-019-0174-y>.
- [27] C.W. Leung, E.S. Epel, W.C. Willett, E.B. Rimm, B.A. Laraia, Household food insecurity is positively associated with depression among low-income supplemental nutrition assistance program participants and income-eligible nonparticipants, *J. Nutr.* 145 (3) (2015) 622–627, <https://doi.org/10.3945/jn.114.199414>.
- [28] M.M. Weigel, R.X. Armijos, M. Racines, W. Cevallos, N.P. Castro, Association of household food insecurity with the mental and physical health of low-income urban Ecuadorian women with children, *J Environ Public Health* 2016 (2016), <https://doi.org/10.1155/2016/5256084>.