Exploratory Factor Analysis on Six Food Insecurity Questions: Data from Malaysian Adult Nutrition Survey 2014

Mohamad Hasnan Ahmad[1*], Balkish Mahadir Naidu[2] and Ruhaya Salleh[1]

[1]Institute Public Health, Ministry of Health Malaysia, Jalan Bangsar, Kuala Lumpur, Malaysia

[2]Department of Statistic Malaysia, Federal Government Administrative Centre, Malaysia

[*]**Corresponding author**: Mohamad Hasnan Ahmad, Nutritionist, Centre for Nutrition Epidemiology Research, Institute of Public Health, Ministry of Health Malaysia, 50590 Jalan Bangsar, Kuala Lumpur, Malaysia, Tel: +603-2297 9445; Fax: +603-22823114; E-mail: hasnan.ahmad@moh.gov.my, mha.hasnan@gmail.com

Citation: Ahmad MH, Naidu BM, Salleh R (2018) Exploratory Factor Analysis on Six Food Insecurity Questions: Data from Malaysian Adult Nutrition Survey 2014. Health Sci J. Vol. 12 No. 2: 555.

Abstract

Introduction: Household food insecurity is defined as the inability to provide enough food for a healthy and active lifestyle for all household members. This study aimed to reveal the risk of household food insecurity in Malaysia based on data from Malaysian Adults Nutrition Survey (MANS) 2014.

Method: Six questions adapted from the 'Household Food Security Survey Module' have been asked to 3000 respondents in MANS 2014. An Exploratory Factor Analysis (EFA) has been used to identify the main underlying structure or dimension.

Result: All of six questions establishing one underlying structure which explained 71.7% of the variance. This single structure was named 'risk of household food insecurity'. By summing score, regression approach suggested the score 21 and above indicated no risk for household food insecurity whilst the score 20 contrarily. According to this cut-off, 24.8% of Malaysian household was at risk for household food insecurity and 75.2% was secured. The risk found to be significantly different by location, strata, race and income.

Conclusion: Quarter of the Malaysian household was at the risk of household food insecurity. Immediate action by multi-sectoral agencies urgently needed to prevent the effect of household food insecurity and also reduce the prevalence in the next survey.

Keywords: Exploratory factor analysis; Food insecurity; Malaysian adult nutrition survey

Introduction

Household food insecurity represents the condition of household members as a group to toward limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways [1]. Prolong household food insecurity may lead to hunger and negative health effect. When the scale measure classifies a household into a more severe range which is food insecure with hunger, it is tell us at least some members in the household are experiencing hunger due to insufficiency of household food resources, but not necessarily all of the members [2].

A household is defined as a person or a group of person, related or unrelated who live together and share a common source of food [3]. Normally, a household will consist of parents and son or daughter who is adult and children. The parents or adults hold the responsibility to provide enough family requirements especially in food and the children either son or daughter need nutritionally adequate food to grow up healthily. Differences in demographic characteristics such as sex, age, source of income, household type, home ownership, marital status, immigrant status, and aboriginal status may be related to household food insecurity [1,4]. Herewith, household food insecurity need to be interpreted carefully as it may contain underlying factors that affect the result.

Several direct or indirect assessments can be used to assess household food insecurity. Examples of direct assessment were Food Sufficiency Status Question [5], Community Childhood Hunger Identification Project Instrument [6], Radimer/Cornell Hunger and Food Insecurity Instrument [7], Food Security Core Model [2] and The Coping Strategy Index [8]. These were questionnaire-based instruments constructed to directly determine core behaviors and experiences related to food sufficiency or food insecurity [9]. While, indirect measurements of food insecurity which include income-based measures of poverty, utilization of food security-related program, indicators of financial hardship, anthropometric

measurements, dietary intake and other health and nutrition parameters. The indirect measurement can indicate the level of vulnerability in which food insecurity may be reasonably inferred [9,10].

The Food and Agriculture Organization (FAO) of the United Nations (UN) stated that the food produced in the world is more than enough to feed everyone, yet around 800 million people still got hungry [11]. Therefore, the 2030 Agenda for Sustainable Development Goal (SDG) and the UN Decade of Action on Nutrition 2016–2025 call on all countries and stakeholders to act together to end hunger and prevent all forms of malnutrition by 2030 [12].

In the direction of becoming a developed country and achieve the 2nd goal in SDG, Malaysia has to tackle this household food insecurity problem as early as possible. Several small scale study on food insecurity have been conducted among certain group in Malaysia [9,13]. But, there is no direct measurement of food insecurity data from nationwide study. The indirect indicator of household food insecurity may have been too late for the problem detection. Available questionnaires may be too long and complicated to using in screening the occurrence of household food insecurity. Hence, by using data from Malaysian Adult Nutrition Survey (MANS) 2014, we would like to determine if the six questions used can represent and describe household food insecurity in Malaysia.

Methods

Six items was used from the Malaysian Adults Nutrition Survey (MANS) 2014 to assess the food insecurity among Malaysian adults. The six questions were adapted from the Household Food Security Survey Module [2]. The questions referred to the experience and the frequency of the respondents related to food security within the past 12 months. First questions (01) were asked if the respondent have been experienced non-sufficient food in terms of quantity due to lack of money. The second question (02) asked if the

respondent experienced could not afford to buy variety of food due to lack of money. The third questions (03) would like to know if the family or respondent had experienced reduction in the size of meals due to lack of money. The forth question (04) asked if the family and respondent had skipped meal due to a lack of money.

The last two questions pertained to the children in the household. The fifth question (05) asked if the parents only rely on cheap and affordable foods to feed the children and the sixth question (06) asked if the parents could not afford to feed their children with various foods due to a lack of money. All answers were considered affirmative in frequency which responses include 'almost every month' as 1, ' several months, but not every month' as 2, 'only one or two months' as 3, and 'never' as 4. They also have other options to answer 'don't know', and 'refuse to answer', but both were not included in the analysis. Ethical approval was obtained from the Medical Research and Ethic Committee (MREC), Ministry of Health Malaysia (NMRR 12-815-13100).

The IBM SPSS Statistics for Windows, Version 21 was used for the statistical analysis. The Exploratory Factor Analysis (EFA) was used to uncover the underlying dimension that explain the most amount of variation among the variable. By EFA, a number of original variables were condensed into smaller number of dimension without losing much of information, and it is often called factors. After conducting EFA, factor scores by regression approach were computed and used for the subsequent analyses. Factor scores will provide information about categories of food insecurity [14].

Results

There was moderate level of agreement in all 6 items. The highest inter-item correlation was 0.853 between item 05 and 06, and the lowest was 0.635 between item 04 and 05. No item was dropped as all inter-item correlations were within range 0.3 to 0.9 **(Table 1)**.

Table 1 Descriptive statistics and inter item correlations for items in measuring household food insecurity.

Item	Descriptive statistic		Inter-item correlation					
	Mean	SD	1	2	3	4	5	6
1	3.43	0.99	1	0.83	0.683	0.641	0.709	0.724
2	3.43	0.98	0.83	1	0.694	0.642	0.752	0.768
3	3.54	0.92	0.683	0.694	1	0.698	0.705	0.702
4	3.67	0.79	0.641	0.642	0.698	1	0.635	0.679
5	3.43	2.03	0.709	0.752	0.705	0.635	1	0.853
6	3.49	0.97	0.724	0.768	0.702	0.679	0.853	1

[1]If the respondent have been experienced non-sufficient food in terms of quantity due to lack of money

[2]If the respondent experienced could not afford to buy variety of food due to lack of money

[3]If the family or respondent had experienced reduction in the size of meals due to lack of money

[4]If the family and respondent had skipped meal due to a lack of money

5If the parents only rely on cheap and affordable foods to feed the children due to a lack of money

6If the parents could not afford to feed their children with various foods due to a lack of money

Exploratory Factor Analysis (EFA) using Principal Axis Factoring based on default extraction (eigenvalue) establishing one component or underlying constructs which explained 71.7% of the variance in the 6 items as shown in **Table 2**.

Normally in the exploratory factor analysis, researcher will accepts the factor(s) if the total variance explained is within 50% to 95% [14]. Therefore, the six questions were agreed to measure household food insecurity.

Table 2 Summary of exploratory factor analysis (EFA) for household food insecurity using principal axis factoring.

Item	Extraction Factor loadings
01. The food purchased was insufficient as I did not have money to buy more.	0.850
02. I could not afford to buy types of food which were necessary.	0.880
03. In the past twelve months, how often did you or other adult family members reduced the size of meals because there was not enough money to buy food?	0.816
04. In the past twelve months, how often did you or other adult family members skip the main meals because there was not enough money to buy food?	0.764
05. I only rely on cheap and affordable foods to feed the children.	0.872
06. I could not afford to feed the children with various foods as I did not have enough money.	0.892
Eigenvalue	4.3
% of variance	71.669

By regression approach to determine the factor scores, result suggested that score 21 and above indicated no risk for household food insecurity whilst score 20 and below indicated risk for household food insecurity. The score was the sum of the 6 questions. Based on the cut off, 24.8% of Malaysian household at risk for household food insecurity whilst 75.2% was secured. The risk was significantly different by location, strata, race and income as shown in **Table 3**.

Table 3 Household food insecurity based on factor score of selected six questions.

Socio-demographic & Nutrition characteristic	Household food insecurity (%)	95% CI	
		Upper	Lower
Malaysia	24.8	22.3	27.4
Location			
West Malaysia	20.5	17.8	23.5
East Malaysia	40.8	35.4	46.4
Strata			
Urban	21.1	18.0	24.6
Rural	32.6	28.7	36.8
Race			
Malay	21.9	18.6	25.6
Chinese	15.1	10.8	20.7
India	30.9	22.5	40.8
Others	40.5	34.8	46.5
Income			
<RM 2300.00	35.8	32.1	39.5
RM2300.00 - <RM6000.00	13.8	10.9	17.4
≥RM6000.00	4.4	2.0	9.5
Body Mass Index (BMI) Status			
Underweight	30.3	20.5	42.2
Normal	22.4	19.2	26.0
Overweight	26.5	22.3	31.1
Obese	26.6	21.4	32.5
Waist circumference (WC)			
Abdominal obesity	24.4	21.6	27.3
No abdominal obesity	27.0	22.5	32.5

BMI: Underweight: <18.5 kgm^{-2}, Normal: 18.5–24.9 kgm^{-2}, Overweight: 25.0–29.9 kgm^{-2} and Obese: ≥30.0 kgm^{-2}

WC: Abdominal obesity: Men >90 cm and Women >80 cm, No abdominal obesity: Men ≤90 cm and Women ≤80 cm

Discussion

One component established from EFA with acceptable variance indicated that the six questions able to measure household food insecurity [14]. After proceed with regression approach to determine the factor scores, about one quarter of the Malaysia household were at risk of food insecurity. The result was synchronise with the previous local subpopulation

study when 24.9% Indian households in Negeri Sembilan, found to experience household food insecurity [13]. The another earlier study among low income household in Kuala Lumpur found 27.7% households were food insecure [15]. The latest study in north-eastern Malaysia found 29.6% of the household were food insecure [16].

From an international survey, a study conducted in Tehran, Iran in 2010 reported a higher prevalence of household food insecurity when 43.7% Iranian household were food insecure [17]. The current data from one of the most developed country, United State of America reported about 85.7% of American households were food secure throughout the entire year in 2013, meaning that they had access at all times to enough food for an active, healthy life for all household members. The remaining 14.3% household were food insecure at least some time during the year, including 5.6% with very low food security [18].

According to our finding, several sociodemographic have an association with the risk of household food insecurity which are location, strata, race and income. Several studies also states that the different in sociodemographic and socioeconomic status have an impact on household food insecurity and it further associated with poorer health outcomes [19,20]. The poor health outcome of the household food insecurity is well documented especially among the young age group. Previous study reported that the caregivers in food-insecure households were two thirds more likely than caregivers in food-secure households to report that their children were at developmental risk [21].

Conclusion

In conclusion, EFA revealed that the risk of household food insecurity in Malaysia was endangering of one quarter of Malaysian household and it consistence with the finding from other subpopulation local studies. Prompt action by government and private bodies as well as community become very necessary to intervene and avoid the adverse effect of this food insecurity catastrophe. Further study should investigate more to the levels of food security and find the comprehensive model to reduce the high prevalence of food insecurity in Malaysia.

Acknowledgment

Funding

Conflict of interest

The authors declare that they have no conflict of interest.

References

1. Stuff JE, Casey PH, Szeto KL, Gossett JM, Robbins JM, et al. (2004) Household food insecurity is associated with adult health status. J Nutr 134: 2330-2335.

2. Bickel G, Nord M, Price C, Hamilton W, Cook J (2000) Guide to measuring household food security. US Department of Agriculture, Food and Nutrition Service, Office of Analysis, Nutrition, and Evaluation, pp: 1-75.

3. Leone T, Coast E, Randall S (2010) Did you sleep here last night? The impact of the household definition in sample surveys: a Tanzanian case study. European Population Conference.

4. Nord M, Jemison K, Bickel G (1999) Prevalence of food insecurity and hunger by state, 1996-1998. Food Assistance and Nutrition Research Report, pp: 1-18.

5. Briefel RR, Woteki CE (1992) Development of food sufficiency questions for the third national health and nutrition examination survey. J Nutr Educ 24: 24-28.

6. Wehler CA, Scott RI, Anderson JJ (1994) Development and testing process of the community childhood hunger identification project scaled hunger measure and its application for a general population survey. In Conference on Food Security Measurement and Research; Papers and Proceedings, Washington DC.

7. Kendall A, Olson CM, Frongillo EA (1995) Validation of the Radimer/Cornell measures of hunger and food insecurity. J Nutr 125: 2793.

8. Maxwell D, Watkins B, Wheeler R, Collins G (2003) The coping strategies index: A tool for rapidly measuring food security and the impact of food aid programmes in emergencies. CARE Eastern and Central Africa Regional Management Unit and the World Food Programme Vulnerability Assessment and Mapping Unit, Nairobi.

9. Shariff ZM, Khor GL (2008) Household food insecurity and coping strategies in a poor rural community in Malaysia. Nutr Res Prac 2: 26-34.

10. Tarasuk V (2001) Discussion paper on household and individual food insecurity. Health Canada.

11. http://www.undp.org/content/undp/en/home/sustainable-development-goals.html

12. http://www.who.int/nutrition/publications/foodsecurity/state-food-security-nutrition-2017/en/

13. Mohamadpour M, Sharif ZM, Keysami MA (2012) Food insecurity, health and nutritional status among sample of palm-plantation households in Malaysia. J Health Popul Nutr 30: 291-302.

14. Williams B, Brown T, Onsman A (2012) Exploratory factor analysis: A five-step guide for novices. AJP 8: 1.

15. Sharif ZM, Ang M (2001) Assessment of food insecurity among low income households in Kuala Lumpur using the Radimer/Cornell food insecurity instrument-A validation study. Malays J Nutr 7: 15-32.

16. Naser AI, Jalil R, Muda W, Manan W, Nik W, et al. (2014) Association between household food insecurity and nutritional outcomes among children in Northeastern of Peninsular Malaysia. Nutr Res Prac 8: 304-311.

17. Mohammadi F, Omidvar N, Houshiar-Rad A, Khoshfetrat MR, Abdollahi M, et al. (2012) Validity of an adapted household food insecurity access scale in urban households in Iran. Pub Health Nutr 15: 149-157.

18. Coleman-Jensen A, Gregory C, Singh A (2014) Household food security in the United States in 2013. USDA-ERS Economic Research Report 173.

19. Willows ND, Veugelers P, Raine K, Kuhle S (2009) Prevalence and sociodemographic risk factors related to household food security in Aboriginal peoples in Canada. Pub Health Nutr 12: 1150-1156.

20. Laraia BA (2013) Food insecurity and chronic disease. Adv Nutr 4: 203-212.

21. Rose-Jacobs R, Black MM, Casey PH, Cook JT, Cutts DB, et al. (2008) Household food insecurity: associations with at-risk infant and toddler development. Pediatr 121: 65-72.