



**CROSS-CULTURAL ADAPTATION AND VALIDATION
OF ADULTS' FOOD SECURITY SURVEY MODULE**

BY

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ABSTRACT

Food insecurity occurs when there is uncertainty of the availability of food or the insufficiency in quantity and quality of food required for a healthy life style, or the need to use socially unacceptable ways to acquire foods. Based on several studies conducted from 2001 to 2014 in Malaysia, 58% to 86% of households were reported as having some kind of food insecurity. However, none of those studies has mentioned the prevalence of food insecurity in the university student population. Therefore, this study had sought to assess the validity and reliability of a cross-culturally adapted English version of the U.S. Adults Food Security Survey Module (AFSSM) in the measurement of food insecurity among university students. A total of n=208 Malay university students aged between 18-25 years old were selected in this cross-sectional study using convenient sampling. The students' socio-economic status were evaluated using a self-reported questionnaire. The eleven item AFSSM was used to measure food insecurity. Content validity was assessed by an expert panel, and the questionnaire was then tested among 22 students for clarity. Internal consistency was evaluated by Cronbach's α and construct validity was assessed through exploratory factor analysis. Criterion validity was assessed by correlating the measure with a number of selected nutrition and inflammatory biomarkers. In all, the prevalence of food insecurity was measured at 56.3% (95% CI: 49.2%-63.1%), with 21.6% (n=45) of students having very low food security. Cronbach's α was observed at 0.81. Factor analysis of the AFSSM items revealed two factors: factor 1 (Insufficient food quantity) and factor 2 (Psychological). For criterion validity, only three items were significantly correlated with measured biomarkers. Item Q2 ($r=0.15$; $p=0.044$) and Q4 ($r=0.18$; $p=0.018$) were positively correlated with serum hs-CRP. On the other hand, item Q5 ($r=-0.15$; $p=0.046$) was found to be negatively correlated with serum folate levels. Only gender was significantly associated with food insecurity where female students were less likely to be food insecure (OR=0.32; 95% CI: 0.11-0.90; $p=0.030$). As for the conclusion, the cross-culturally adapted and validated English version of the AFSSM showed acceptable levels of reliability, construct validity, and criterion validity to recommend its use in assessing individual food insecurity among Malay university students.

خلاصة البحث

يحدث انعدام الأمن الغذائي عندما يكون هناك حالة من عدم التيقن من توافر الغذاء، أو عدم الكفاية في كمية ونوعية الغذاء اللازم لنمط حياة صحي، أو وجود الحاجة إلى استخدام طرق غير مقبولة اجتماعيا للحصول على المواد الغذائية. استنادا إلى العديد من الدراسات التي أجريت في ماليزيا من عام 2001 إلى 2014، تم الإبلاغ عن 58% إلى 86% من الأسر لمعانقتها بنوع من انعدام الأمن الغذائي. ومع ذلك، لم تذكر أيا من تلك الدراسات انتشار انعدام الأمن الغذائي بين الطلاب الجامعيين. ولذلك، سعت هذه الدراسة إلى تقييم صحة وموثوقية النسخة الإنجليزية لنموذج الولايات المتحدة للدراسة الاستقصائية للأمن الغذائي للبالغين الشاملة للثقافات (AFSSM) في قياس انعدام الأمن الغذائي بين طلاب الجامعات. تم اختيار 208 طلبة جامعيين ملايويين، تتراوح أعمارهم بين 18 إلى 25 سنة في هذه الدراسة المستعرضة باستخدام طريقة أخذ العينات الملائمة. تم تقييم الوضع الاجتماعي والاقتصادي للطلاب باستخدام استبيانات مبلّغ عنها ذاتيا. تم استخدام استبيان AFSSM المحتوي على 11 بند القياس انعدام الأمن الغذائي. جرى تقييم صحة المحتوى من قبل لجنة من الخبراء، وتم اختبار الاستبيان على 22 طالبا للتوضيح. تم تقييم الاتساق الداخلي باستخدام كرونباخ ألفا، وتم تقييم صحة البناء من خلال التحليل الاستكشافي للعوامل. تم تقييم صحة المعيار عن طريق الربط بين القياس وعدد من المؤشرات الحيوية للتغذية والمؤشرات الحيوية للانتهاكات. بشكل عام، تم قياس مدى انتشار انعدام الأمن الغذائي في 56.3% (95% CI: 49.2% - 63.1%)، مع 21.6% (عدد=45) من الطلاب ذوي الأمن الغذائي المنخفض جدا، وقد لوحظ أن مقدار كرونباخ ألفا كان عند 0.81. كشف تحليل العوامل لمواد نموذج AFSSM اثنين من العوامل: عامل رقم 1: (عدم كفاية كمية الطعام) وعامل رقم 2: (عامل نفسي). لصحة المعيار، ثلاثة بنود فقط كانت مرتبطة إلى حد كبير مع المؤشرات الحيوية المقاسة. البند Q2 (0.044= p ; 0.15= r) و Q4 (0.018= p ; 0.18= r) كانت مرتبطة بشكل إيجابي مع hs-CRP لمصل الدم. من ناحية أخرى، وجد أن البند Q5 (0.046= p ; 0.15= r) تناسب عكسيا مع مستويات حمض الفوليك في الدم. كان الجنس فقط مرتبطا بشكل كبير مع انعدام الأمن الغذائي حيث كانت من المرجح أن لدى الطالبات انعدام في الأمن الغذائي (OR=0.32; 95% CI: 0.11-0.90; $p=0.03$). ختاماً، أظهر إصدار اللغة الإنجليزية للـ AFSSM الموثوق والملائم لجميع الثقافات علا مستويات مقبولة من الموثوقية، وصحة البناء، وصحة المعيار لينصح باستخدامه في تقييم انعدام الأمن الغذائي الفردي بين طلاب الجامعات الملايويين.

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DECLARATION

I hereby declare that this dissertation is the result of my own investigations, except where otherwise stated. I also declare that it has not been previously or is concurrently submitted as a whole for any other degrees at IIUM or other institutions.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Food insecurity is defined as “the limited or uncertain availability of nutritionally adequate, safe foods or the inability to acquire personally acceptable foods in socially acceptable ways” (Bickel et al., 2000). In general, the definition of a food insecure individual may have one or several of the following characteristics; 1) insufficient quantity of food; 2) limited diversity of food groups; 3) poor safety of food; and 4) procurement of food in socially unacceptable manners (Bickel et al., 2000). It is a complex and multidimensional concept, thus measuring food insecurity has been an ongoing challenge for researchers and practitioners (Anderson, 1990). However, the issue remains important since hundreds of millions of people and households are affected on a daily basis, not just in developing countries but developed countries too (Adams et al., 1998; Alaimo et al., 1998). Therefore, measuring food insecurity at national, regional, community and household levels is important to develop the appropriate policy and programme options (Alaimo et al., 2001). Thus, there is a need to improve the tools and frameworks used for various intervention targets, especially among the vulnerable groups of a population to achieve the optimum resource allocation (Anderson, 1990).

In response to this need, various food insecurity measurement tools were developed such as the Radimer/Cornell Food Insecurity Scale and the Household Food Security Survey Module (HFSSM) that is used primarily by the U.S. Department of Agriculture (USDA) and other U.S. agencies to measure the food insecurity problem in the U.S. (Radimer et al., 1992; Webb et al., 2006). The Radimer/Cornell

used the idea of the coping strategies of a food insecure person adopted during food insecurity measurements. On the other hand, the HFSSM approach is based on the idea that food insecurity experiences could cause predictable reactions that can be captured through a survey and summarised on a scale (Radimer et al., 1992; Webb et al., 2006). Nevertheless, both methods are considered valid and reliable to measure food insecurity status.

Because of the complexity, multidimensional nature and strong subjective element of the food insecurity construct, it is difficult to identify a single 'gold standard' against which the food insecurity scale can be validated. Therefore, food insecurity measurement tools need to be assessed through a variety of perspectives. The most common validation studies have been conducted using construct validity, Cronbach's α coefficient, and criterion validity (Rubio et al., 2003). Content validity is also applied to validate food insecurity questionnaire so that items used in the questionnaire are consistent with the understanding of food insecurity have four underlying components, namely quality, quantity, social and psychology that has been theorised from qualitative studies (Radimer et al., 1992). In addition, the response pattern of food insecurity items needs to be consistent with the understanding of food insecurity as a managed process (Radimer et al., 1992).

Based on several studies conducted from 2001 to 2014 in Malaysia, 58% to 86% of households were reported to have some kinds of food insecurity (Sharif and Merlin, 2001; Shariff and Khor, 2005; Mohamadpour et al., 2014). Thus, the need for a valid and reliable tool that can be easily used in the field has long been felt in the country. To date, a few validation studies have been carried out to validate food insecurity questionnaires in Malaysia. To begin with, Sharif and Merlin (2001) modified the Radimer/Cornell questionnaire to measure food insecurity in low-income

urban households in Kuala Lumpur, Malaysia. They found a high level of food insecurity (67%) in the sample (27.7% households' food insecurity; 10.0% adult food insecurity, and 27% child hunger) and the authors claimed some support of validity for the instrument. However, no internal consistency value was reported in their study. In another study, Sharif and Khor (2004) have claimed to evaluate some kind of criterion validity of the Radimer/Cornell questionnaire in the rural parts of Malaysia. They concluded that the Radimer/Cornell Hunger and Food Security Instrument has some validity aspects after looking into some anthropometric and socio-demographic correlates. Still, no information about Cronbach's α was given. In their study, more than 50% of the households were considered as food insecure. In 2005, Sharif and Khor assessed the internal consistency of the adapted version of Radimer/Cornell's questionnaire in order to measure food insecurity and its relation towards obesity among rural Malays and Indians in Kuala Selangor. They claimed that the internal consistency of the ten items range from 0.80 to 0.90. This is the first evidence of Cronbach's α value found in Malaysian study to date. They found that 58% of women in the study were food insecure and the BMI level was higher for food insecure women.

As far as is concern, the Radimer/Cornell questionnaire has generated considerable interest throughout the developing world and has been adapted as a food security measurement tool, especially in Malaysia (Sharif and Merlin, 2001; Shariff and Khor, 2005; Mohamadpour et al., 2014). However, the Adult Food Security Survey Module or AFSSM, a subset of the HFSSM which is based on the universal experience of food insecurity may be more suitable to be used to measure food insecurity as compared to the coping strategy that is well encapsulated in the Radimer/Cornell measure. Several local studies in Malaysia have validated the

Radimer/Cornell food insecurity measurement (Sharif and Merlin, 2001; Shariff and Khor, 2005; Mohamadpour et al., 2014). However, none of the researchers have validated measures other than the Radimer/Cornell questionnaire.

At the same time, the Malaysian government is promoting greater participation in tertiary education as a strategy to address Malaysia's long-term economic challenges, particularly among socio-economically disadvantaged population groups that are at most risk of food insecurity. There has been no published study to determine the prevalence of food insecurity within the Malaysian university student population. Therefore, it is critical for researchers, policy makers, governmental and non-governmental agencies and all interested sectors to invest their time and resources in the process of developing such tools that provide valid and reliable measures of food insecurity, especially in the university students' population in Malaysia.

1.2 STATEMENT OF THE PROBLEM

Food security is an essential element in achieving good nutritional and health and has an influence in reducing poverty. Information about the current understanding on food security can help scientists, policy makers and program practitioners conduct research and maintain outreach programs that address the issues of poverty and the promotion of food security. At the same time, the Malaysian government is promoting greater participation in tertiary education as a strategy to address Malaysia's long-term economic challenges, particularly among socio-economically disadvantaged population groups that are at most risk of food insecurity. There has been no published study to determine the prevalence of food insecurity within the Malaysian university student population. Internationally, the prevalence of food insecurity among university

students has recently been estimated to be 21% in Hawaii and 12 % to 47 % in Australia. Valid measures of food insecurity are critical to accurately evaluate the food insecurity problem, and from our knowledge, there is little evidence on the existence of studies on the cross-cultural adaptation of food insecurity measurement tools conducted among the university students, especially in our population. Therefore, this study would like to assess the validity and reliability of a locally-adapted English version of the Adult Food Security Survey Module (AFSSM) used on the university students' population.

1.3 AIM OF THE STUDY

The aim of this study is to explore the validity and reliability of the English version of AFSSM for practical application in local settings amongst young adults in the sub-urban university setting.

1.4 RESEARCH OBJECTIVES

The study is aimed to achieve the following objectives:

- 1- To evaluate the content validity of AFSSM.
- 2- To evaluate the face validity of the English version of AFSSM in the study location.
- 3- To evaluate the construct validity and reliability of the English version of AFSSM.
- 4- To determine the criterion validity of AFSSM with selected nutritional and biomarker measures.

1.5 STUDY SITE

This study was conducted at UiTM Puncak Alam, which is one of the satellite campuses of Malaysia's largest university in terms of size and student enrolment. This campus which sits on 1085 acres of land is located just about 5 km from Bandar Baru Puncak Alam. During the conduct of this study, there were three main faculties in the UiTM Puncak Alam campus, namely the Faculty of Pharmacy, Faculty of Business and Faculty of Health Sciences. In the near future, at least 15 more faculties will operate there and are capable of supporting more than 40,000 students. During the academic semester, it is home to some 5,000 students comprised mainly of Bumiputeras and a few international students, particularly those undergoing post-graduate training. The UiTM system makes use of the English language as a primary teaching delivery method. For the undergraduate level, the university only enrolls Bumiputera students where students from poor families are given the main priority. "Destini Anak Bangsa" is one of the university's programs to improve the socio-economic balance of the Malaysian population through academic means. This policy is protected by the virtue of Article 153 of the Constitution of Malaysia.

Bandar Baru Puncak Alam is a main township in the Kuala Selangor district in Selangor, Malaysia. It is located approximately 48 km in the Northwest direction from Malaysia's capital city, Kuala Lumpur. The area was previously developed from its origins as a palm estate owned by FELDA within the locale of Bukit Cherakah. This township initially started to develop during the late 1990's by a private company. In the present day, the town is developed with its own shopping facilities, university, large areas of housing projects and shop lots. Based on current projections, the town

will expand to be capable to accommodate 350,000 people, up from the 25,000 existing population.

1.6 THESIS STRUCTURE

This section outlines the structure of the thesis.

CHAPTER 2 presents the literature review that is relevant to this study and thesis. In this chapter, the exploration of concepts and definitions of food security is presented. Then, a review of the current situation of food insecurity and its position as a public health issue is explored. In this chapter, an elaboration of food insecurity measurements is also presented. Finally, it also explores the relevance of food insecurity and the various validation techniques available.

CHAPTER 3 describes the methodology pertaining to this study. In this section, the study design employed in this study is elaborated on. The chapter also discusses methodological issues for questionnaire validation, anthropometrics measurement and biological samples' handling and measurement.

CHAPTER 4 present the results of this study. For each study, a brief introduction of each study will be followed with the results of the study findings. Both descriptive and inferential results of the statistical analysis are provided in this chapter. The validity of the research tool is provided in this section. The prevalence of food insecurity is also identified here. The relationship between anthropometric measures and various biomarkers in relation to food insecurity is also provided in this chapter.

CHAPTER 5 provides a general discussion of the study findings. It also highlights the limitations of the study and some suggestions for future research. Finally, the conclusion of the major findings in the thesis is presented in **CHAPTER 6**.

CHAPTER TWO

LITERATURE REVIEW

2.1 FOOD INSECURITY

This chapter examines the issues and topics related to food insecurity. First, the definition of important terms will be described. Measurements of food security are also discussed in this section. Next, an overview of the extent of food insecurity both globally and in Malaysia will be described. In this chapter, we will also describe the food insecurity issue related to university students. Then we also explore the root of the problem, describe the associated factors and people affected by food insecurity, and explain its consequences. The final section of this chapter will discuss the cross-cultural validation techniques related to food insecurity measurements. Findings of the review form a foundation of the research reported in this thesis.

2.1.1 The concept and definition of food insecurity

The study on hunger has become one area of interest of policy makers and researchers throughout the latter half of 1980. Hunger is a condition where an uneasy or painful sensation or feeling of weakness is caused by the lack of food (Anderson, 1990). However, the lack of an operational definition for hunger was a major barrier in the progression of monitoring and improving the condition (Maxwell, 1996). Different views and perspectives have been used when examining hunger and this has led to the introduction of the food-security concept (Radimer et al., 1992).

The fundamental concept of food security can be further identified from the many definitions of food security. According to Maxwell (1996), the concept of food security is based on many definitions and the key defining characteristic of household food security is “secure access at all times to enough food”. Based on that definition, food security can be divided into four concepts, namely; secure, access, time and enough. In addition, Ganapathy et al. (2005) added to our understanding of the concept of food security related to food access in terms of sufficient quantity and quality of available food. On the other hand, the conceptualization of food security goes beyond the adequacy of quantity and quality and should be expanded into four major important concepts of availability, accessibility, acceptability and adequacy (Koc & Dahlberg, 1999).

In relation to the above concepts, food security requires that a sufficient supply of food be available and accessible to all equally (quantity). Meanwhile, acceptability addresses food’s culture which means that the food available and accessible should respect individuals’ cultural traditions. Finally, adequacy refers to the long-term sustainability of food ecosystems (quality) (Norhasmah et al., 2010).

Based on a study by Radimer (1992), there are four components to the concept of food insecurity that can be applied in the household and individual dimension, namely quantity, quality, psychological and social components. Quantity and quality are two components related directly to food. Quantity refers to inadequate or depleted quantities of food such as running out of the usual food supply in a household or insufficiency food intake as an individual. Quality refers to the nutritional aspects of food such as energy, vitamins and minerals, and the right proportions of proteins, fats and carbohydrates to maintain health. It also refers to the ability to buy the appropriate

quality and suitable kinds of food for the household to meet the individuals' dietary needs.

In addition to the individual and household level discussed above, Anderson (1990) reported that there are three important elements of food insecurity at the community level. The three elements are the quantity and quality of available food, physical accessibility of food which means the location of stores and transportation systems, and the affordability of food prices compared to the level of disposable income.

As for food security, the definition of the term has gone through three major paradigm shifts since the World Food Conference in 1974. These shifts are; firstly, the shift from a global and national level towards the household and individual level. Then, the definition changed from the food first perspective to the livelihood perspective. Finally, food security has shifted from objective indicators to subjective perception (Maxwell, 1996).

The broad definition of food insecurity was developed by an expert panel who convened in 1989 at the Life Science Research Office (LSRO) (Anderson, 1990). Food insecurity exists when the availability of nutritionally adequate and safe food or the ability to acquire acceptable food in a socially acceptable way is limited or uncertain. The most severe form of food insecurity results in households where children experience reduced food intake and hunger (Bickel et al., 2000).

By the mid-1990s, food security was recognized as a significant concern at the individual, household, national, regional and global levels (Maxwell, 1996). Food security is achieved when all people have physical and financial access to adequate, safe and healthy food to meet their dietary needs and food preferences for an active and healthy life at all times. In 2002, FAO refined the definition of food security as a

situation when all people have physical, social and economic access to sufficient, safe and nutritious food that meet their dietary needs and food preferences for an active and healthy life at all times (FAO, 2008). This latest definition incorporates the social aspect which emphasizes that food should be accessed in a socially acceptable way (i.e. foods purchased from shops, markets or supermarkets), and not through unacceptable ways (i.e. food obtained from welfare, wild foods or stealing).

The operational definitions of food insecurity vary between international organizations. One of the most comprehensive definitions describes food insecurity as “the limited or uncertain availability of nutritionally adequate, safe foods or the inability to acquire personally acceptable foods in socially acceptable ways” (Bickel et al., 2000). Implicit in this general definition is the notion that a food insecure individual may have one or several of the following characteristics, namely; 1) insufficient quantity of food; 2) limited diversity of food groups; 3) poor safety of food; and 4) procurement of food in socially unacceptable manners, including begging, relying on charity, scrounging, stealing, exchanging sex for food, and other illicit activities (Bickel et al., 2000).

Food insecurity which has been defined as “the limited or uncertain availability of nutritionally adequate and safe foods,” can exist with or without hunger, which is defined as the uneasy or painful sensation caused by the lack of food (Bickel et al., 2000). There are several terms that are closely related to food insecurity such as hunger, undernourishment and malnutrition which are briefly explained in Table 2.1.