TRANSLATION AND VALIDATION OF HOUSEHOLD FOOD INSECURITY ACCESS SCALE (HFIAS) AND FACTORS ASSOCIATED WITH FOOD INSECURITY AMONG HOUSEHOLDS WITH CHILDREN AGED FIVE TO SIX YEARS OLD IN TUMPAT, KELANTAN

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LIST OF ABBREVIATIONS

AdjOR	Adjusted Odds Ratio
BMI	Body Mass Index
BR1M	Bantuan Rakyat 1 Malaysia
CCHS	Canadian Community Health Survey
CI	Confidence Interval
CSFII	Continuing Survey of Food Intake by Individuals
EFA	Exploratory Factor Analysis
FANTA	Food and Nutrition Technical Assistance III Project
FAO	Food and Agricultural Organisation
HFIAP	Household Food Insecurity Access Prevalence
HFIAS	Household Food Insecurity Access Scale
IQR	Interquartile range
KEMAS	Jabatan Kemajuan Masyarakat
KMO	Kayser-Mayer-Olkin
NHANES	National Health and Nutrition Health Survey
OR	Odds Ratio
PASTI	Pusat Asuhan Tunas Islam
ROC	Receiver Operating Characteristic

SPSS	IBM SPSS statistic
SNAP	Supplementary Nutrition and Assistance Program
SIPP	Survey of Income and Program Participation
SD	Standard deviation
TABIKA	Taman Bimbingan Kanak-Kanak
U.S HFSSM	United States Household Food Security Survey Module
VIF	Variance Inflation Factor

ABSTRAK

Pengenalan: Sekuriti makanan ditakrifkan sebagai, apabila semua orang, pada setiap masa, mempunyai capaian fizikal dan ekonomi kepada makanan yang mencukupi, selamat dan berkhasiat untuk memenuhi keperluan pemakanan dan pilihan makanan mereka untuk kehidupan yang aktif dan sihat (World Food Summit, 1996). Konsep sekuriti makanan merangkumi empat dimensi iaitu capaian, ketersediaan, penggunaan dan kestabilan. **Kaedah**: Objektif fasa satu kajian ini adalah untuk menterjemahkan soal selidik *Food Insecurity Access Scale (HFIAS)* kepada bahasa Melayu dan menentukan kesahihan dan kebolehpercayaannya. Fasa ke dua adalah untuk mengkaji ketidakjaminan sekuriti makanan isi rumah dan faktor-faktor yang berkaitan dengan nya dalam kalangan kanak-kanak berumur lima hingga enam tahun di Tumpat, Kelantan. Fasa satu telah melibatkan 60 orang ibu atau penjaga wanita kepada kanak-kanak berumur lima hingga enam tahun di Bachok, Kelantan. Fasa kedua adalah kajian irisan lintang yang telah dijalankan di 45 buah TABIKA di daerah Tumpat. Ia telah yang melibatkan 370 orang ibu atau penjaga wanita kepada kanak-kanak berusia lima hingga enam tahun. Semua responden telah dipilih secara rawak mudah. HFIAS telah digunakan untuk mengukur tahap sekuriti makanan isirumah (capaian) dan *Radimer/Cornell and Hunger scale* yang telah di terjemah secara sahih kepada bahasa Melayu telah digunakan untuk mengukur tahap sekuriti makanan isirumah (ketersediaan). Indeks jisim badan (BMI) pula digunakan untuk menentukan status pemakanan kanak-kanak. Kesahihan konstruk HFIAS yang telah diterjemahkan kepada Bahasa Melayu telah diuji menggunakan kaedah faktor analisa eksploratori. Kebolehpercayaan soal selidik terjemahan dinyatakan sebagai Cronbach alpha. Faktor yang mempunyai hubungkait dengan status ketidakjaminan sekuriti makanan dan malnutrisi kanak-kanak telah dikenalpasti melalui ujian regresi logistik berganda. **Keputusan**: Dua komponen utama telah dikenalpasti dari faktor analisa eksploratori iaitu komponen kualiti dan komponen kekurangan dengan index

kebolehpercayaan yang baik (Cronbach's α = 0.83) Sejumlah 36 (9.7%) isirumah telah dikenalpasti sebagai isirumah yang mengalami ketidakjaminan sekuriti makanan yang ringan, 64 (17.3%) sederhana dan 47 (12.7%) buah isirumah mengalami ketidakjaminan teruk. . Tahap pendidikan ibu yang tidak mendapat sebarang pendidikan formal atau hanya sekolah rendah [AdjOR: 8.77 (95% CI: 1.80, 42.69; p-value = 0.007)], jumlah pendapatan bulanan per kapita kurang dari RM130 [AdjOR: 4.71 (95% CI: 2.19, 10.08; p-value <0.001)] dan ketiadaan simpanan wang [AdjOR: 3.97 (95% CI: 2.45, 6.43; p-value <0.001)] telah dikenalpasti sebagai faktor penyumbang kepada ketidakjaminan sekuriti makanan isi rumah (capaian). Ibu yang tidak mendapat sebarang pendidikan formal atau hanya sekolah rendah [AdjOR: 3.97 (95% CI: 1.04, 15.16; p-value = 0.043)], ibu yang mempunyai pendidikan sehingga sekolah menengah [AdjOR: 4.28 (95% CI: 1.55, 11.79; p-value = 0.005)], pendapatan bulanan per kapita kurang dari RM130 [AdjOR: 3.10 (95% CI: 1.50, 6.41; p-value 0.002)], jumlah pendapatan bulanan per kapita di antara RM130 dan RM210 [AdjOR: 1.83 (95% CI: 1.10, 3.06; p-value 0.021)] dan ketiadaan simpanan wang [AdjOR: 2.71 (95% CI: 1.74, 4.22; p-value <0.001)] pula telah dikenalpasti sebagai faktor penyumbang kepada ketidakjaminan sekuriti makanan isi rumah (ketersediaan) Keluarga yang menerima bantuan kewangan [AdjOR: 1.63 (95% CI: 1.05, 2.52; p-value = 0.028)], ketiadaan pemilikan tanah [AdjOR: 1.99 (95% CI: 1.14, 3.50; p-value 0.016)] dan kanak-kanak perempuan [AdjOR: 1.68 (95% CI: 1.10, 2.56; p-nilai 0.017)] didapati berkait rapat dengan status malnutrisi kanak-kanak . **Kesimpulan**: HFIAS yang telah diterjemahkan kepada Bahasa Melayu boleh digunakan untuk mengukur komponen capaian ketidakjaminan sekuriti makanan isi rumah tempatan. Ketidakjaminan sekuriti makanan perlu di tangani dengan mengambilkira tahap pendidikan ibu dan pendapatan bulanan per kapita untuk membolehkan keluarga mempunyai simpanan bagi menjamin sekuriti makanan isirumah seterusnya menangani masalah malnutrisi kanak-kanak pra-sekolah. .

Kata kunci: Sekuriti makanan, Household Food Insecurity Access Scale (HFIAS)

ABSTRACT

Introduction: Food security was defined as, when all people, at all times, has physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preference for an active and healthy life (World Food Summit, 1996). The concept of food security encompasses of four dimensions namely access, availability, utilization and stability. **Methods**: The objective of first phase of this study was to translate the Food Insecurity Access Scale (HFIAS) into Malay and to determine its validity and reliability. The second phase was to determine the household food insecurity and its related factors among children aged five to six years in Tumpat, Kelantan. Phase one involved 60 mothers or female caregivers for children aged five to six years in Bachok, Kelantan. The second phase was a cross sectional study conducted at 45 TABIKA in Tumpat district. It has involved 370 mothers or female guards to children aged five to six years old. All participants were randomly selected. HFIAS has been used to measure the level of household food security (access) and the translated and validated Radimer / Cornell and Hunger scale has been used to measure the level of household food security (availability). The body mass index (BMI) was used to determine the nutritional status of children. The validity of HFIAS constructs translated into Malay has been tested using the method of exploratory analysis. The reliability of the translated questionnaire was expressed as Cronbach alpha. The factors that associated to the underlying status of food security and child malnutrition have been identified through multiple logistic regression analysis. **Results**: Two major components have been identified from exploratory analysis factors which are quality component and insufficiency component with good reliability index (Cronbach's $\alpha = 0.83$). A total of 36 (9.7%) households were identified as households with mild food insecurity, 64 (17.3%) moderate and 47 (12.7%) severe household food insecurity. The level of education of mothers who did not receive any formal education or only primary education [Adj: 8.77 (95% CI: 1.80, 42.69; p-value =

0.007)], total monthly income per capita less than RM130 [AdjOR: 4.71 (95% CI : 2.19, 10.08; p-value <0.001)] and the absence of monetary savings [AdjOR: 3.97 (95% CI: 2.45, 6.43; p-value <0.001)] has been identified as associated factors to the household food insecurity (access) . Mothers who have no formal education or just primary education [AdjOR: 3.97 (95% CI: 1.04, 15.16; p-value = 0.043)], mothers who have secondary education [AdjOR: 4.28 (95% CI: 1.55, 11.79; p-value = 0.005)], total monthly income per capita of less than RM130 [AdjOR: 3.10 (95% CI: 1.50, 6.41; p-value 0.002)], total monthly income per capita between RM130 and RM210 [AdjOR: 1.83 (95% CI: 1.10, 3.06; p-value 0.021)] and the absence of monetary savings [AdjOR: 2.71 (95% CI: 1.74, 4.22; p-value <0.001)] has also been identified as associated factors to household food insecurity (availability) Families receiving financial assistance [AdjOR: 1.63 (95% CI: 1.05, 2.52; p-value = 0.028)], absence of land ownership [AdjOR: 1.99 (95% CI: 1.14, 3.50;p-value = 0.016)] and girls [AdjOR: 1.68 (95% CI: 1.10, 2.56; p-value 0.017)] were found to be associated with malnutrition status of children. **Conclusion**: The HFIAS that has been translated into Malay can be used to measure the access components of household food insecurity in local setting. Household food insecurity need to be handled by taking into account the level of maternal education and monthly income per capita that will enable families to have monetary savings in order to improve household food security that will address the problem of pre-school children's malnutrition.

Keywords: food insecurity, Household food insecurity access scale, HFIAS

CHAPTER ONE

INTRODUCTION

1.1 Household food insecurity

Food security is a complex concept. It has variously defined and interpreted. At one end of the food security concept implies the availability of adequate supplies at a global and national level while at the other end, the concern is about adequate nutrition and well-being (Reforms, 2003).

During the 1996 World Food Summit meeting, they defined food security as:

”Food security, at the individual, household, national, regional and global levels [is achieved] when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life” (FAO, 1996). Meanwhile, food insecurity can be defined as a situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life (FAO, 1996). Household food insecurity considerably occurred when a household has a limited or uncertain physical and economic access to secure sufficient quantities of nutritionally adequate and safe foods in socially acceptable ways to allow household members to sustain active and healthy living (Wolfe et. al, 2001)

Household food security is also applicable to the family level, where the primary focus of concern is the individuals within the households. The concept of four pillars of food security

has been introduced by Food and Agricultural Organisation (FAO) during the World Food Summit meeting in year 1996 (FAO, 1996). The four pillars of food security were food availability, food access, food utilisation and stability.

Food availability refer to availability of food either through production, distribution and exchange (FAO, 2013). There are lot of factors that affected food avaibility. There were numerous tools which have been developed to measure availability component of food security, such as the Radimer/Cornell measures of hunger and food security (Radimer, et.al, 1990). It has been translated and validated for uses in Malaysia and widely used to assess household food insecurity (Sharif and Ang, 2001) . The second element in four pillars of food security is access to food. The ability of individual, household or community to access to food rests on two important aspects which are economic and physical access (FAO, 2013). The access component of food security can be measured by using Household Food Insecurity Access Scale (HFIAS) questionnaire (Coates et al., 2007). The third pillar, food utilization consisted of two important dimensions. The first important dimension is anthropometric indicators which were affected by malnutrition. The second dimension is a number of determinants or input indicators that can reflect on food quality and preparations, health and hygiene conditions which also determines the effectiveness of available food to be utilized (FAO, 2013). For a population, household or individual to be food secure, they must have a good access to adequate food at all times. This is when stability component of food security comes into play (FAO, 2013).

1.2 Factors associated with household food insecurity

Previous evidences show numerous factors that have been found to be associated with household food insecurity. Sociodemographic factors such as age of both mother and father, their educational level, occupation, household size and household income has been found to be associated with household food insecurity (Natamba et al., 2015; Shone et al., 2017; Nord, 2009; Tarasuk et al., 2014; Chinnakali et al., 2014; Abo and Kuma, 2015; Sharif and Ang, 2001). Furthermore, there were also studies that showed that the existence of dependents in the household such as children, elderly and disables and presence of chronic disease diseases within household can be associated with household food insecurity (Weathers and Robert, 2005; Weiser et al., 2009; Hackett et al., 2010; Coleman-Jensen and Nord, 2013).

Household assets and ownership status such as house ownership, crops and livestock ownership, land ownership and monetary saving also found to be associated with household food insecurity in number of studies (Rose et al., 1998; Mohammadzadeh et al., 2010; Abo and Kuma, 2015; Poulsen et al., 2015; Shone et al., 2017). Efforts toward improving household food insecurity such as food assistance programs has been shown to be effective in the rehabilitation of household food insecurity status among household (LeBlanc et al., 2006; Ivers et al., 2010; Ratcliffe et al., 2011). While studies have shown it was effective in improving household food insecurity, household who were assistance program recipient were also found to be more food insecure compared to non-recipient household (Borjas, 2004; Nord and Golla, 2009; DePolt et al., 2009; Nord, 2012).

At the national and global level, researcher and policy makers tends to focus on the supply side of the food security pillar. The most common question raised is whether there is an adequate food available. But availability alone does not assure enough access to household, and adequate calories alone do not assure a healthy and nutritional diet to the household. Meanwhile, if food security is to be measured at household or individual level, it has to address access component of food security pillar. For any household to be considered as food secure, it need to has the ability to acquire or has an access to the food needed by its members to be food secure (Pinstrup-Andersen, 2009). This is when a measurement such as Household Food Insecurity Access Scale (HFIAS) questionnaire play the role since it was developed to measure access component of food insecurity within a household (Coates et al., 2007).

1.3 Food insecurity measurement tool

Focus on food security metrics may comprised of food availability, access, utilization, the stability of food security over time, or some combination of these domains. These measures may draw from data at national, regional, household, or individual levels. Such tools may vary from easy and uncomplicated indicators for which data can be quickly collected and easily analysed toward more comprehensive measures that demands a detailed, time and resource intensive data collection and advanced analytic skills to yield results (Jones et al., 2013).

Household food insecurity access scale (HFIAS) was developed based on empirical research that employed adaptations of the United States Household Food Security Survey Module (U.S HFSSM) in low- and middle-income countries. It is a set of nine generic questions that

was developed to represent universal domains of the access component of household food security (Coates et al., 2007). This scale produced a score from 0 to 27 to reflect a single statistical dimension of food security. It was designed as simple tool that can be used for targeting, monitoring, and evaluating the efforts to rectify the food insecurity. A 4-level categorical variable reflecting prevalence of food insecurity could also be determined from these data. HFIAS included only 9 questions, that requires the respondents to recall experiences of food insecurity over past four weeks, and integrates frequency response questions (e.g., if the condition was experienced rarely, sometimes, or often) into the calculation of the scale score (Jones et al., 2013).

On the other hand, The Radimer/Cornell hunger and food insecurity instrument has been developed in the United States to assess household hunger and food insecurity (Radimer et al., 1992). It categorizes the households into four categories of food insecurity which are food secure, household food insecurity, individual food insecurity and child hunger.

Radimer/Cornell consists of 10 questions with 3 optional answers which are, "not true", "sometimes true" or "often true". The "not true" answer was considered a negative answer and the "sometimes true" or "often true" was considered positive answer. Participant will be classified as household food insecure if he had positive answers to one or more items in question 1 to 4 but not question 5 to 10. Participant will be classified as an individual food insecure if there was a positive answer to one or more of items from question 5 to 8 but not to question 9 and 10. Child hunger occurs when there is positive answer to question 9 and 10 (Radimer et al., 1992). In Malaysia, Radimer/Cornell has been widely used to assess food security status in term of availability of food in the household. It has been translated and validated into Malay language in Kuala Lumpur in 2001 for use in Malaysia (Sharif and Ang, 2001).

In term of nutritional status, household food insecurity has been identified as possible underlying associated factors for malnutrition among children (Frongillo et al., 1997). Food insecurity has been shown to have an effect on health and wellbeing throughout the life cycle and has been associated with child dietary intake and weight status (Pérez-Escamilla et al., 2000; Oh and Hong, 2003; Cook and Frank, 2008). Household food insecurity was reported to be associated with protein energy malnutrition such as stunting, wasting, and underweight, which affects one-quarter of the children around the world (Alvarado et al., 2005; Baig-Ansari et al., 2006; Phengxay et al., 2007).

1.4 Problem statement

Food insecurity is one of the public health problems that have gained interest to many people around the large part of the world including policy makers, practitioners, and academics. It is because the outcomes of food insecurity can influence almost every level of society. For example, the food price crisis and subsequent food riots in 2007–2008 happened in Africa countries highlighted the critical role of food security in maintaining political stability (Jones et al., 2013). There are 870 million people worldwide who are still consuming fewer calories than their daily requirement and its close association of physical and mental health consequences of such deprivation has make the public health importance of food security indisputable (FAO, 2013). Importantly, household food insecurity has been shown to have a negative impact on children especially in poor developing countries (Kac et al., 2012; Psaki et al., 2012).

1.5 Justification of study

Food insecurity is a global public health issue. The appropriate measurement of food security is important in targeting food and economic aid, supporting early famine warning and global monitoring systems, evaluating nutrition, health, and development programs and in development of government policy across many sectors (Jones et al., 2013). To date, there was no such validated tool available in Malaysia to measure household food insecurity (access) in our local setting. Household Food Insecurity Access Scale (HFIAS) questionnaire has been established to be appropriate to assess household food insecurity (access) in developing countries (Knuepple et.al, 2009; Fatemeh et.al, 2011).

Numerous studies have shown the impact of household food insecurity toward preschool children. It is not only affecting children nutritional status and health but also affecting with child behaviour and psychosocial dysfunction and also contributes toward poor school performance and academic delays (Murphy et al., 1998; Wehler et al., 1998; Alaimo et al., 2001; Jyoti et al., 2005). In Malaysia, out of this 26 billion population, 9.7% or 2 521 399 are children from the age of five to nine years old and in Kelantan, total children age five to nine years old was 10.9% of total population. This 10.0% of the population will play an important role in our nation future development and progress, therefore, it is important to improve the household food insecurity for their optimum health and well being.

1.6 Research Questions

1. Is the HFIAS a valid and reliable tool to assess household food insecurity (Access) among Malaysian household with children age five to six years old in Tumpat?
2. What are the nutritional status of children of aged five to six years old in Tumpat?
3. What are the associated factors that related to household food insecurity (access and availability) among children age five to six years old in Tumpat?

1.7 General Objective

To translate, validate the Malay translated of Household Food Insecurity Access Scale (HFIAS) Questionnaire and to study the household food insecurity and its associated factors among the households with children aged five to six years old in Tumpat, Kelantan.

1.8 Specific Objectives

1. To translate and determine the validity and reliability of the Household Food Insecurity Access Scale (HFIAS) questionnaire to the Malay language.
2. To describe the nutritional status of children aged five to six years old in Tumpat.
3. To determine the proportion of household food insecurity (access, availability) among households with children aged five to six years old in Tumpat.
4. To determine the associated factors with household food insecurity (access and availability) and child nutritional status among households with children aged five to six years old in Tumpat.

1.9 Research Hypotheses

1. The Household Food Insecurity Access Scale (HFIAS) is a valid and reliable tool to assess household food insecurity (access) among households in Tumpat, Kelantan.
2. Socio demography, occupational profile, nutritional status, ownerships status, monetary saving, monetary and food recipient status and presence of elderly, chronic diseases and disability are associated with household food insecurity (access and availability) and child nutritional status among households with children aged 5 to 6 years old in Tumpat, Kelantan

CHAPTER TWO

LITERATURE REVIEW

2.1 Household food insecurity

2.1.1 Concept and definitions

It all started in mid-1970, during which the global food crisis happened, food security concept started to arise and being recognised. At first, the primary focus of attention was on food supply issues. The issues of concern at that time were to assure the availability and maintain the price stability of basic foodstuffs at the international and national level. This has led to the World Food Summit in 1974 to discuss the volume and stability of food supplies. During World Food Summit 1974, food security was defined as:

"Availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices" (FAO, 1974).

By the year 1983, Food and Agricultural Organisation (FAO) started to recognize the important of balancing between demand and supply in maintaining food security. This has led to the expansion of food security concept by including securing access by vulnerable people to available supplies. At that time, the food security equation has included:

"Ensuring that all people at all times have both physical and economic access to the basic food that they need" (FAO, 1983).

In the year 1986, with the introduction of the highly influential World Bank report "Poverty and Hunger" (Reutlinger, 1986), people started to focus on the temporal dynamics of food insecurity (Clay, 2002). In its report World Bank tried to introduce the new widely accepted distinction between chronic food insecurity which associated with problems of continuing or structural poverty and low incomes, and transitory food insecurity, which involved periods of intensified pressure which can be caused by natural disasters, economic collapse or conflict within the country. This has led to a new concept of food security with addition of:

"access of all people at all times to enough food for an active, healthy life".

By the mid-1990s people started to identify food security as an important problem starting from the individual to the global level. However, there was a continuous concern on protein-energy malnutrition which put more pressure on access to a sufficient food. The definition of food security was later has been broadened to include food safety and also nutritional balance, reflecting the importance of food composition. The 1996 World Food Summit meeting, redefined food security as:

"Food security, at the individual, household, national, regional and global levels [is achieved] when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO, 1996).

2.1.2 Pillars of food security

The pillars of food security have been introduced during the World Food Summit meeting in year 1996 (FAO, 1996). The important of the four pillars of food security had been reemphasized during World Food Summit 2009 meeting which was done in Rome, Italy (FAO, 2009). The four pillars of food security that has been emphasized again and again by FAO were food availability, food access, food utilisation and stability.

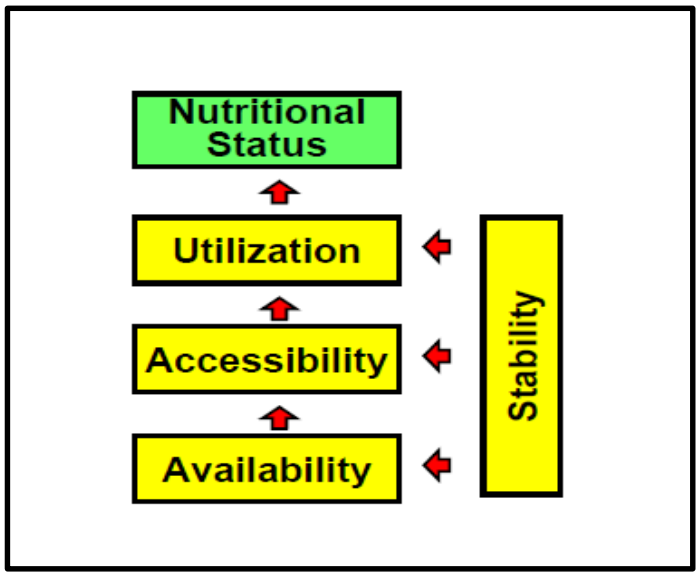

Figure 2.1 Pillar of food security

(Gross *et al.*, 2000)

i. Food availability

There were three main elements that have an influenced on food availability which are production, distribution and exchange (Gregory et al., 2005). Food production are determined by number of factors including land ownership and use; soil management; crop selection, breeding, and management; livestock breeding and management; and harvesting (FAO,

2013). Changes in rainfall and temperatures can give impact on the crop production (Gregory et al., 2005). The use of land, water, and energy for food production often competes with other uses such as urbanisation, which effect on food production (Godfray et al., 2010). Storage, processing, transport, packaging, and marketing of food were part of food distribution (FAO, 2013). Increase in the price of supplying water and fertilizer as well as the price of moving food to national and global markets can be due to poor transportation infrastructure (Godfray et al., 2010

ii. Access to food

Food access refers to individuals and household's affordability and food allocation, as well as food preferences (Gregory et al., 2005). Poverty can limit individuals and household access to food, and can also increase the vulnerability of an individual or household to food price spikes (Ecker and Breisinger, 2012). The ability of an individual, household or community access to food rests on two important aspects which are economic and physical access. Economic access was determined by disposable income, food prices and the provision of and access to social support. Physical access, on the other hand was determined by the availability and quality of infrastructures which includes availability of ports, roads, railways, communication as well as food storage facilities and other installations that facilitate the functioning of markets (FAO, 2013). Access to food can be affected by individual and household location from food resources (Garrett and Ruel, 1999). Household access to food can be determined by assets of a household which included household income, land ownership, products of labor, inheritances, and gifts (FAO, 2013).

iii. Utilization

There were two important dimensions in food utilization. The first important dimension is anthropometric indicators which affected by nutritional status. These indicators include wasting or being too thin for one's height, stunting or being too short for one's age and underweight or being too thin for one's age. The anthropometric measurements especially for children under five years of age are considered to be effective as an approximation of the nutritional status of the entire population. The second dimension is a number of determinants or input indicators that can reflect on food quality and preparations, health and hygiene conditions which also determines the effectiveness of available food to be utilized (FAO, 2013).

Outcome indicators of food utilization, most of the time will convey the impact of inadequate food intake and poor health. Wasting, for example, is the result of short-term inadequacy of food intake, an illness or an infection, whereas stunting can either be caused by prolonged inadequacy of food intake, repeated episodes of infections and/or repeated episodes of acute undernutrition (FAO, 2013).

iv. Stability

The last element that has been included as four pillar of food security was stability. For a population, household or individual to be food secure, they must have a good access to adequate food at all times. They should not be at risk of losing access to food as a

consequence of sudden shocks for example during an economic or climatic crisis or during a cyclical event such as seasonal food insecurity (FAO, 2013).

2.2 Burden of household food insecurity

2.2.1 Global burden

Food insecurity is a global public health burden. Recent estimates of global food and nutrition security showed that even though the number of hunger had declined, about 795 million people worldwide were still chronically undernourished in 2012–2014. Among low income countries, 791 million people lived in low-income countries where food access remains a major challenge to food security. This was particularly important in the poorest regions of the world such as sub-Saharan Africa and parts of Southern Asia (FAO, 2016).

Data from developed countries shown that in the year 2011, 14.9% of households in the United States were classified as food insecure (Coleman-Jensen et al., 2012), Of these food-insecure households, more than one-third or 5.7% experienced very low food security (Coleman-Jensen et al., 2012). The United States Department of Agriculture's economic research report indicates that at least some time during the year in 2013, 14.3% of American households were classified as food insecure. Another 5.7% of the household was reported to have very low food security, which means food intake of at least one household member was disrupted because the household were lacking of money and other resources. It is also estimated that 62% of all food-insecure households were a recipient in 1 or more of the 3 largest federal food and nutrition assistance programs in United States (Coleman-Jensen et al., 2014).

Based on data from poor African countries such as study by Knueppel et al. (2010) found that, in rural Tanzania there were only 20.7% of the households were categorised as food secure. Another 69.3% of the households were categorised as food insecure. Form the 69.3%, 8.4% were mildly food insecure, 22.8% were moderately food insecure and 48.1% were categorised as severely food insecure. This household survey was done among 237 respondents by using HFIAS questionnaire. A study conducted in Butajera district in Ethiopia among 1516 respondent, researcher found that, there were only 11.9% of the household were food secure. Most of the household in this study were moderately food insecure (50.3%). This was followed by mildly food insecure (21.6%) and severely food insecure (16.2%) (Gebreyesus et al., 2015).

In a community based comparative cross sectional study was conducted in Sekela District, Western Ethiopia from February 5–27, 2014 with a total sample size of 576 households having at least one children less than 5 year's old found out, out of all households involved in the study 14.1%, 36.2% and 23.8% had experienced either mild, moderate and severe food insecurity conditions, respectively (Mulu and Mengistie, 2017). In Wolaita Sodo town, researchers found that about 37.6% households were food insecure. Of those households, 10.8% were mildly food insecure, 23.2% and 3.6% households were moderately and severely food insecure, respectively (Tantu et al., 2017).

For an Asian population perspective, such as study conducted in Esfahan, Iran, they found that, the prevalence of household food insecurity among respondents was 36.6% (95% CI 0.33, 0.40). Another study conducted in urban city, Varamin, Iran found that food security was only observed in 21 % of households. Mildly, moderately and severely food insecure

households were 46.5%, 25.0% and 7.5 %, respectively (Salarkia et al., 2014). Another study that used HFIAS questionnaire to assess household food insecurity status was conducted by Mohammadi et al (2012) in Iran capital city, Tehran. In this cross sectional study involving 416 household, they found that 11.8%, 14.4% and 17.5% of the households were severely, moderately and mildly food insecure, respectively. The other 56.3% were categorised as food secure household.

In a small study carried out in the Beqaa Valley area of Lubnan, they found that only 47.3% of the household were food secure. The other 52.7% of households were food insecure in which 17.7% were mildly food insecure, 12.9% were moderately food insecure and 21.1% were severely food insecure (Naja et al., 2015). In a cross-sectional study that was conducted in an urban resettlement colony of South Delhi, India among 250 respondents, they found that a total of 77.2% households were classified as food-insecure, with 49.2% households being mildly food-insecure, 18.8% of the households being moderately food-insecure, and 9.2% of the households being severely food-insecure (Chinnakali et al., 2014).

There were also study done that focused on high risk population such as a cross-sectional survey among randomly selected Inuit children aged three to five years in 16 Nunavut communities in Canada during the period from 2007 to 2008, they found that nearly 70% of Inuit pre-schoolers resided in households rated as food insecure. Out of the 70.0%, 31.0% of children were experiencing moderately food insecure, and 25.1% were severely food insecure (Egeland et al., 2010). In a cross-sectional study involving low-income households with preschool children who receive food supplements in Antioquia, Colombia they found that about 48.2% of the households were categorized as food secure and more than one-third of the respondents were mildly food insecure (37.9%). One tenth of the sample was categorized

as a moderately food insecure household and another 3.8% exhibited severe food insecurity (Hackett et al., 2009).

2.2.2 Burden of household food insecurity in Malaysia

In a study done among 137 Malay pre-school children aged 4-6 years old from Taman Sang Kancil found that only 34.3% of the households involved in the study were food secure, while 65.7% experienced some kind of food insecurity. Out of the 65.7%, 27.7% respondents were household food insecure, 10.9% individuals were food insecure and 27.0% fell into the child hunger category (Sharif and Ang, 2001). A study done in Sabak Bernam district among rural communities in seven villages and two palm plantation found that at least 58.0% of the women involved in the study reported some degree of food insecurity. From 200 respondents interviewed in the study, 14% were household food insecure, 9.5% adult food insecure and 34.5% reported child hunger (Shariff and Khor, 2005).

In a bigger scale study done in Malaysia to look for food insecurity prevalence, study was conducted in three states in peninsular Malaysia namely Selangor, Negeri Sembilan and Kelantan. In this study, the prevalence for food insecurity were 78.4% in which household food insecure, comprised of 26.7% followed by individual food insecure 25.3% and child hunger, 26.4% (Shariff et al., 2014). Specifically, a study conducted in a rural area of Kelantan, found that approximately 83.9% of the women involved in the study reported that members of their household had experienced some degree of food insecurity. Out of the 83.9%, 29.6% experienced household food insecure, 19.3% individual food insecure and 35.0% reported child hunger (Ihab et al., 2012).

2.3 Factors associated with household food insecurity

2.3.1 Age of father and mother

Based on community-based cross-sectional study that was done among 779 households from February to March, 2015 they found that households headed by persons aged >65 years were 6.5 times more likely of being food insecure compared to household headed by persons aged 18–44 years, AOR = 6.51 (95% CI 3.25, 13) (Shone et al., 2017). This finding was supported by another study done also in Ethiopia that found an association between household head's age and food insecurity status (Abo and Kuma, 2015). Maternal age also found to be associated with food security status. Based on study done in Uganda among 403 respondents, researcher found that maternal age has a positive association with food insecurity status (Natamba et al., 2015).

2.3.2 Education level

Study in United States in 2007 has shown that about half (55.0%) of households with food-insecure children had no adult with any education beyond the high school level. Other than that, from the data, it has been shown that among households with children experiencing very low food security, 59% had no adult members with more than a high school degree (Nord, 2009).

Educational level of household head was found to be associated with food security status. Study in Ethiopia shown that, illiterate household head has an increased odds of experiencing food insecurity in the household (Feleke and Bogale, 2009). This finding was supported by

study done by Abo and Kuma, (2015). They found that the probability of being food secure among female-headed households increases by 1.11 times as education level of female headed households increase by one year of formal education.

Chinnakali et al. (2014) from her study in Delhi, India found that mother's education level was significantly associated with food security, as mother educational level improved, it improved the food security level (OR 0.37, 95% CI 0.15-0.92; $p \leq 0.03$). Based on multinomial logistic regression from study by Shariff and Ang (2001), household with lower educational level of mothers (OR=0.749; $p<0.05$) and fathers (OR=0.802; $p<0.05$) had a higher odds of experienced food insecurity in their household

2.3.3 Occupation of the household

Based on data derived in United States in 2009, employment and higher income will not guarantee food security. Based on the data, more than two-thirds or 69.0% of households with children classified as having low food security actually had one or more persons employed full-time. Other than that, 62% of children with very low food security actually lived in households with one or more persons employed full-time (Nord, 2009). Nationwide longitudinal study done in New Zealand showed significant association between household food insecurity and unemployment status in the household (Carter et al., 2010). Shariff and Ang (2008) revealed in their study among 200 respondents in Selangor that household with non-working mother had a higher odd of experiencing food insecurity in their household (OR=6.15; $p<0.05$).

2.3.4 Marital status

Study in United States found that among the major characteristic of households who were particularly vulnerable to household food insecurity were household headed by a single woman with children. This group comprised of 30.8% from all sample and all of them had children under the age of 6 years (16.7%) (Nord, 2009). Data collected among 60000 respondents in Canada found that the most vulnerable household were lone parent families headed by women. About 33.5% of these household were found to be food insecure (Tarasuk et al., 2014). Tantu et al. (2017) on the other hand, found that factors that were associated with household food insecurity among Ethiopian women were marital status (single household head) AOR = 4.06 (95% CI 1.24, 13.27). This finding was supported by Shone et al. (2017) as she found out that in her study, households headed by female were more likely to be food insecure than households headed by males AOR = 2.1 (95% CI 1.15, 3.74).

Study done in rural India through National Sample Survey on consumer expenditure, has shown that widow-headed households are more disadvantaged than other types of female-headed households (Dreze and Srinivasan, 1997). Marital status was shown to have an association with household food insecurity level. Study by Shone et al. (2017) found that households headed by single parent were likely to be food insecure than married AOR = 2.6 (95% CI 1.53–4.26). similar with Feleke and Bogale, (2009) they concluded that household head who was unmarried has a higher odd of experiencing food insecurity.

2.3.5 Number of family members

Shone et al. (2017) found that the odds of households with larger family size to be food insecure was higher compared to households with smaller family sizes AOR = 2.4 (95% CI 1.7, 3.5). This was supported by study done in Dire Dawa Town in which it shown the odds of experiencing food insecurity increased by 1.5 times with every increased in number of family member (Feleke and Bogale, 2009). Abo and Kuma, (2015) also found the similar finding in which he found that the odd of having food insecure with increased number of households member.

Study in Pakistan among 300 respondents showed that households with family members of more than 10 had 7.87 reduced odds of being food secured. Higher number of family members will increased the food need and consumption. This will lead to food insecurity. This finding was similar to the study done among 600 Ethiopian. It has been shown that households with more than seven household members were 69 percent less likely to become food secured. It was suggested that at the household level, food insecurity was aggravated by large family sizes among the respondent (Asefach and Nigatu, 2007). Briefly, larger household size was found to be significant risk factors for food insecurity in a study done in Kuala Lumpur (Sharif and Ang, 2001).

2.3.6 Number of children

Study in Canada in 2012 shown that households with children under the age of 18 were at greater risk for food insecurity than households without children (Tarasuk et al., 2014). Country wide, population based survey done in United States shown that, presence of

children in the household was significantly associated with household food insecurity (Furness et al., 2004). Study done in Lebonan found that severe household food insecurity among household was associated with the numbers of children in the household (OR 1·2, 95% CI 1·0, 1·4) (Ghattas et al., 2014). This finding was supported by study conducted by Natamba et al. (2015) where they found an association between numbers of children in the household and food insecurity.

In Malaysia, study done in Sabak Bernam among 200 respondents found that food insecure households were likely to have more children (OR=1.71; $p<0.05$) (Shariff and Khor, 2008). Other study done in Kuala Lumpur also shown almost similar result (Sharif and Ang, 2001). Numbers of school going children in family has been found to be significantly associated with household food insecurity (Asefach and Nigatu, 2007).

2.3.7 Household income

There were numerous studies performed worldwide that showed the negative association between household food insecurity and family income. In United States, studies showed that low income household was significantly associated with household food insecurity (Alaimo et al., 1998; Furness et al., 2004). It was also suggested that low income household might be more significantly associated with household food insecurity due to lack of saving buffer and also liquidity constraint (Prell, 2001). Low income household was associated with a higher likelihood to experience food insecurity in the household (Tarasuk et al., 2014). Study in Colombia found a similar finding where there was a significant association between household income and food insecurity level (Hackett et al., 2010). Similarly, study by Tantu et al. (2017) among 609 households in Ethiopia found that higher monthly income were

associated with reduce risk of experiencing household food insecurity (AOR = 0.013, (95% CI: 0.004, 0.05).

Study in Pakistan in 2010 showed that households in higher income group were 15 times more likely to become food secure as compared to the households in lower income group (Bashir et al., 2012). Sidhu et al., (2008) on the other hand found that with every increased of Rs. 1000 in the monthly income of households would reduce the probability of food insecurity by 30% among household in India.

2.3.8 Number of dependents

Household with elderly was found to be food insecure compared to household without elderly members (Nord et al., 2010). Study done among 2,784 low-income households with pre-school children in Colombia found a significant association between the presence of the elderly in the household and food insecurity (Hackett et al., 2010). Apart from elderly, disables also influenced household food insecurity. Study has shown that people with disabilities was more likely to experience food insecurity. Most of the time, people with disabilities have relatively constrained economic resources which was due to their higher poverty rate and lower employment rate compared to those without disabilities (Weathers and Robert, 2005)

Extensive data has shown the association between disability with poverty and household food insecurity in the United States. The study focused on two groups of households that include adults with disabilities. The first group were households with a working-age adult with a disability that was prevented to work or not in the labor force-disabled, whereas second group