

**FAST-FOOD OUTLETS AVAILABILITY,
NUTRITIONAL STATUS AND HOUSEHOLD FOOD
SECURITY LEVEL AMONG ADOLESCENTS IN
KUANTAN PAHANG.**

BY

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**A thesis submitted in fulfilment of the requirement for the
degree of Master of Health Sciences (Nutrition Sciences)**

**Kulliyyah of Allied Health Sciences
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ABSTRACT

The global and local growth of fast-food outlets and the high acceptance level of their products by consumers show that people nowadays prefer easy and convenient food choices such as food from fast-food outlets due to busy and hectic lifestyle. There are abundant evidence that linked fast-food consumption with obesity and household food insecurity with overeating. However, there are not enough data mentioning the association between fast-food outlets availability with adolescent's weight status and how they relate to food insecurity level in Malaysia. Therefore, this study aims to determine the relationship of fast-food outlets availability with nutritional status and household food insecurity among adolescents in Kuantan, Pahang. Five hundred and thirty secondary high school students from district of Kuantan, Pahang, Malaysia were measured for their weights and heights. The validated food security questionnaire known as Radimer/Cornell Hunger and Food Security Instrument (Malay version) was used to measure food insecurity. The ArcGIS Network Analyst extension was used to create a network dataset to generate 400-meter, 800-meter and 1500-m service areas around each school and number of fast-food outlets available within each buffer were recorded. From a total of 530 students, 60% of them have normal BMIAZ while 16.6%, 14.2% and 9.2% were overweight, obese and thinness, respectively. This study, however, did not find any significant factors associated with adolescents' nutritional status. There were 76.6% households were classified as food insecure in which divided into household food insecure (31.5%), individual food insecure (7.6%) and child hunger (37.5%). This study also found that the adolescents with working mothers had 0.58 times odds of food insecurity compared to those whom their mothers not working (95% CI: 0.33,0.98; p-value 0.037). Spatial analysis found that, no significant association between fast-food outlets availability with adolescents' nutritional status. This study also clearly showed the co-existing of over-nutrition and undernutrition among adolescents in Kuantan. However, this study did not find any association between food insecurity and obesity among the adolescents (p-value=0.091). Further study should be done to identify the possible complex interaction of food insecurity and adolescents' weight status. Intervention study should be planned and carried out to address these alarming issues.

خلاصة البحث

يظهر النمو العالمي والمحلي لمنافذ الوجبات السريعة ومستوى القبول العالي لمنتجاتها من قبل المستهلكين، أن الناس في الوقت الحاضر يفضلون خيارات الطعام السهلة والمريحة مثل الطعام من منافذ الوجبات السريعة بسبب نمط الحياة المزدحم والمحموم. هناك أدلة كثيرة تربط بين استهلاك الوجبات السريعة والسمنة، وبين انعدام الأمن الغذائي المنزلي والإفراط في تناول الطعام. ومع ذلك، لا توجد بيانات كافية تشير إلى الارتباط بين توافر منافذ الوجبات السريعة وحالة الوزن الزائد للمراهقين ومدى ارتباطها بمستوى انعدام الأمن الغذائي في ماليزيا. لذلك، تهدف هذه الدراسة إلى تحديد العلاقة بين توافر منافذ الوجبات السريعة وحالة التغذية وانعدام الأمن الغذائي المنزلي بين المراهقين في كوانتان، باهنج. قيسست خمسمائة وثلاثين من طلاب المدارس الثانوية من منطقة كوانتان، باهنج، ماليزيا لأوزانهم وأطوالهم. استخدمت استبيان الأمن الغذائي المصدق والمعروف باسم راديمر/ كورنيل للجوع وانعدام الأمن الغذائي (النسخة الملايوية) لقياس انعدام الأمن الغذائي. واستخدمت ملحق محلل الشبكة ArcGIS لإنشاء مجموعة بيانات شبكة لتوليد مناطق خدمة بمساحة 400 متر، و 800 متر، و 1500 متر حول كل مدرسة وسجلت عدد منافذ الوجبات السريعة المتاحة داخل كل منطقة عازلة. من إجمالي 530 طالبا، 60% منهم لديهم BMIAZ طبيعي، بينما 16.6%، و 14.2%، و 9.2% يعانون من زيادة الوزن، والسمنة، والنحافة على التوالي. ولكن لم تحصل هذه الدراسة على أي عوامل مهمة مرتبطة بالحالة الغذائية للمراهقين. تم تصنيف 76.6% من العوائل على أنها تعاني من انعدام الأمن الغذائي، حيث قسمتها إلى انعدام الأمن الغذائي المنزلي (31.5%)، وانعدام الأمن الغذائي الفردي (7.6%)، والجوع بين الأطفال (37.5%). وجدت هذه الدراسة أيضا أن المراهقين مع الأمهات العاملات لديهم احتمالات 0.58 مرة لانعدام الأمن الغذائي مقارنة بأولئك الذين أمهاتهم لا تعمل (95% CI: 0.33, 0.98؛ قيمة-P=0.037). وجد التحليل المكاني أنه لا يوجد ارتباط كبير بين توافر منافذ الوجبات السريعة والحالة التغذوية للمراهقين. أظهرت هذه الدراسة بوضوح التعايش بين فرط التغذية ونقص التغذية بين المراهقين في كوانتان. ومع ذلك، لم تحصل هذه الدراسة على أي ارتباط بين انعدام الأمن الغذائي والسمنة بين المراهقين (قيمة-P: 0.091). وينبغي إجراء المزيد من الدراسة لتحديد تفاعل المعقد المحتمل لانعدام الأمن الغذائي وحالة وزن المراهقين. هذه القضايا المقلقة تحتاج إلى التخطيط لدراسة التدخل و تنفيذها لمعالجتها.

APPROVAL PAGE

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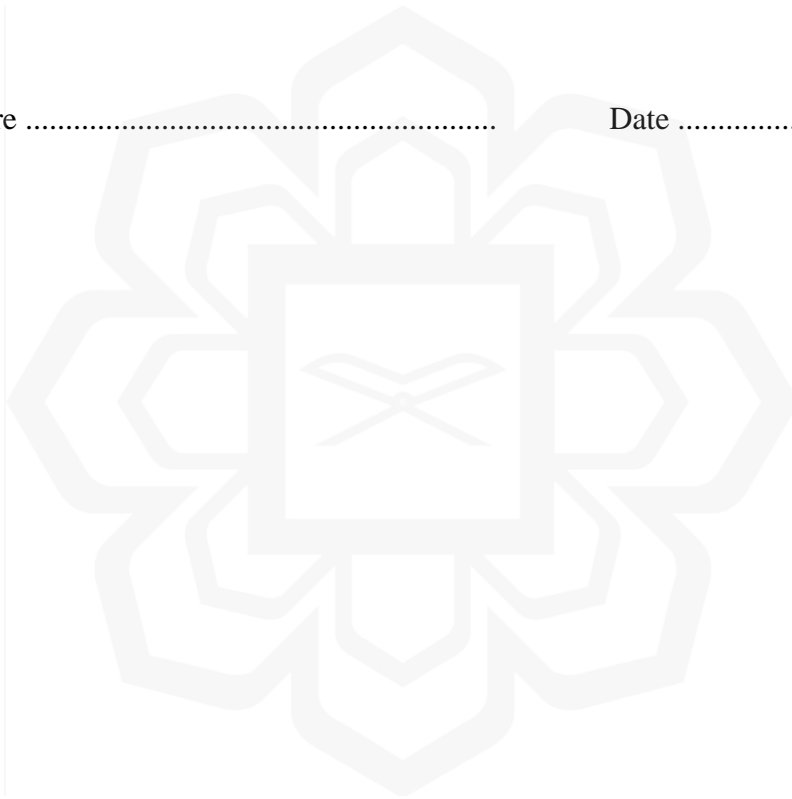
DECLARATION

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 concurrently submitted as a whole for any other degrees at IIUM or other institutions.

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*This thesis is dedicated to my beloved my mother and my late father
for always loving and believing me in everything I do in my life.*

*Thank you for always reminding me about the important of
education in my life.*

*To Muqri, Zahra, Husnina, Faqehah, Fikriah, Aisyah and Khadijah,
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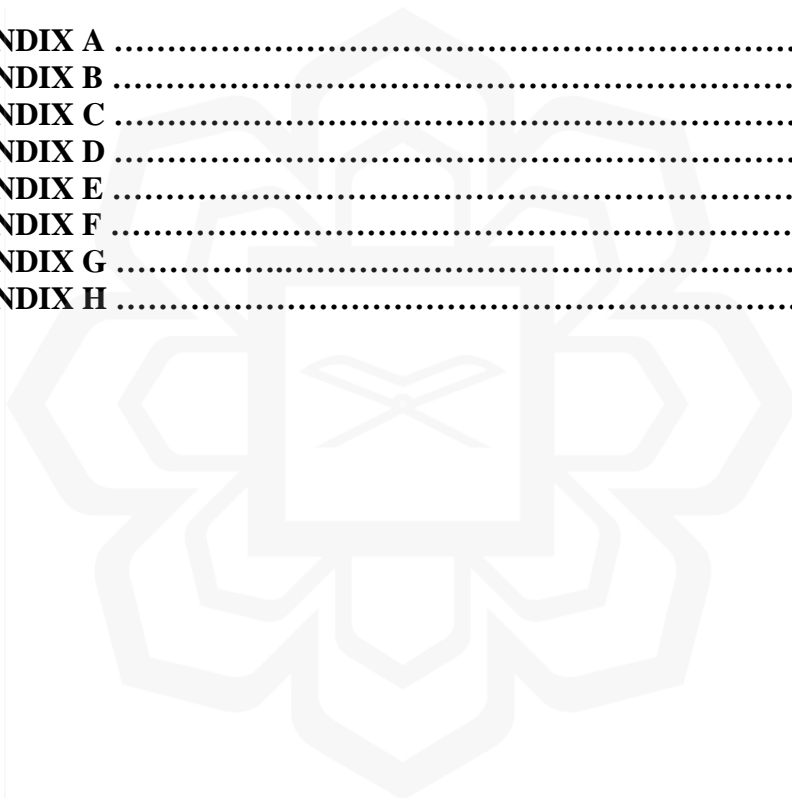
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LIST OF ABBREVIATIONS

AHEI	Alternate Healthy Eating Index
AMED	Alternate Mediterranean Diet
ASEAN	Association of Southeast Asian Nations
BMI	Body Mass Index
BMIAZ	Body Mass Index for Age Z-score
CDC	Center of Disease
DASH	Dietary Approaches to Stop Hypertension
FAO	Food and Agriculture Organization
FF	Fast-food
FFO	Fast-food Outlet
GFSI	Global Food Security Index
GIS	Geographic Information System
HAZ	Height for Age z-score
IIUM	International Islamic University Malaysia
IQR	Interquartile Range
KAHS	Kulliyyah of Allied Health Sciences
KFC	Kentucky Fried Chicken
NHANES	National Health and Nutrition Examination Survey
NHMS	National Health and Morbidity Survey
QSR	Quick Services Restaurants
SD	Standard Deviation
UNICEF	United Nations Children's Fund
USA	United States of America
US	United States
WAZ	Weight for Age z-score
WFP	World Food Programme
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF STUDY

Food is fundamental for human being. An individual need proper and adequate nutrition to stay healthy. The consumed food will be eventually converted into essential nutrients and energy needed by human body to function properly. Based on global report on food crises released in March 2017, around 108 million people in the world were severely food insecure in 2016, a dramatic increase compared to 80 million in 2015 despite international efforts to address food insecurity. This increment exemplifies the trouble faced by people to produce and access food due to conflict, record-high food prices in local markets in affected countries and extreme weather conditions such as drought and erratic rainfall caused by El Niño (Food and Agriculture Organization (FAO), 2017).

Child hunger is a very serious problem where this problem illustrates the most severe food insecurity level. According to 1996 World Food Summit, food security 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). Food insecurity is defined as limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways (Bickel et al., 2000).

Food insecurity has been linked to nutritional status, where studies have found its association with overweight and obesity (Casey et al., 2006; Jafari et al., 2017; Kaur et al., 2015; Mohammadi et al., 2013; Wilde & Peterman, 2006). Noted that all hungry people are food insecure, but not all food insecure individual are hungry as there are other factors of food insecurity such as consumption of unhealthy food and poor intake of micro-nutrients. It is important to understand that food quantity is not the only important component of food security, but food quality also plays important role in this matter. Children require adequate healthy nutrition as they are in growing phase. The consumption of inadequate and unhealthy food during this period will cause them to be susceptible to physical and mental development problem such as underweight, stunting, overweight and lower academic attainment. Among the factors that contribute to overweight and obesity is the increased intake from fast-food outlets.

The global and local growth of fast-food outlets and the high acceptance level of their products by people show that current trend in gastronomy where people nowadays prefer easy and convenient choices such as food from fast-food outlets due to busy and hectic lifestyle although it may be less healthy compare to homemade food. This study aims to investigate the mean difference between the availability of fast-food outlets and nutritional status of adolescents in Kuantan. At the same time, this study also aims to see the distribution of household food security level and nutritional status outcomes.

Adolescence is the transitional phase from childhood to adulthood. According to WHO (2020), adolescents are individuals age between 10 to 19 years old. UNICEF (2011) however dividing adolescent age group into early adolescence (10 to 14 years old) and late adolescence (15 – 19 years old) while CDC (2020) used terms young teens, aged between 12 and 14 years old and teenagers, aged between 15 to 17 years old to represent adolescent group. This study targeted adolescents aged 13 to 17 years old by referring a national representative school-based survey of adolescents in secondary schools which is The Adolescent Health Survey 2017 of NHMS 2017.

Nutritional status is the physiological state of an individual that results from the relationship between nutrient intake and requirements and from the body's ability to digest, absorb and use these nutrients (FAO, IFAD & WFP, 2013). There are two factors that usually associated with individuals' nutritional status which include external factors and internal factors. External factors include as food safety, cultural, social, economic factors while internal factors, which include age, sex, nutrition, behaviour, physical activity and diseases of the person (Upadhyay & Tripathi, 2017). The most common method used to assess nutritional status are anthropometry measurement, biochemical data, clinical data, dietary intake. In this study, the anthropometry measurement of adolescents was obtained to assess their nutritional status.

1.2 PROBLEM STATEMENT

Household food insecurity usually linked with poor nutritional status (stunted and underweight) of children while obesity always associated with overeating. The focus of food insecurity recently shifted to the relationship of food insecurity level with obesity (Franklin et al., 2013).

The prevalence of worldwide underweight and stunted children has dropped from 25% and 39.6% in 1990s to 14.3% and 23.8% respectively in 2014 (UNICEF, 2015). Unlike under-nutrition problem, the prevalence of childhood obesity between 1971–1974 and 2009–2010 increased by 3.3-fold (Fryar et al, 2012; Ogden et al., 2012) whereas for severe pediatric obesity rose 4-fold between 1976–1980 and 1999–2006 (Wang et al., 2011). The prevalence of childhood obesity stated above are including children and adolescent. A child is a person 19 years or younger unless national law defines a person to be an adult at an earlier age (World Health Organization [WHO], 2020).

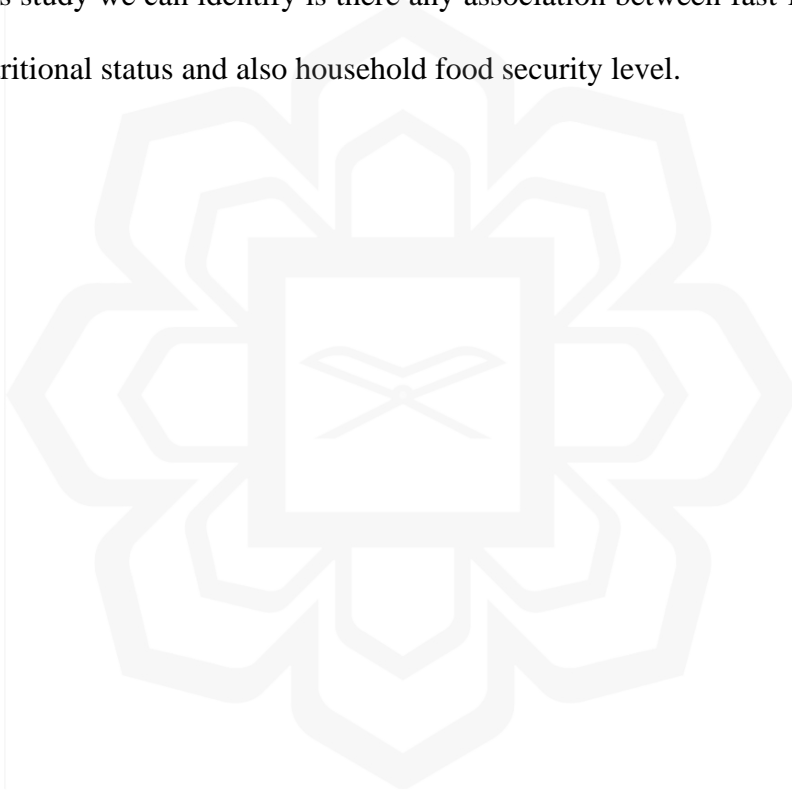
According to Institute for Public Health, (2015) in National Health and Morbidity Survey (NHMS) 2015 report, 17.7% of Malaysian adults were obese while overweight individuals make up 30% of the population. The prevalence of the childhood obesity in Malaysia increased from 5.4% in 2006 to 6.1% in 2011 and recently increased to 11.9% in 2015 as reported in NHMS 2006, NHMS 2011 and NHMS 2015 (Institute for Public Health, 2015; Institute for Public Health, 2008; Institute for Public Health Malaysia, 2011). The recent prevalence was doubled from the childhood obesity prevalence in 2006.

Obesity and overweight are the result of “caloric imbalance” where amount of calorie intake is higher than calorie expended by the body (Daniels et al., 2005). Fast-food is known to offer caloric dense meals with lower price (Downs, 2013). An

International study looking at the frequency of fast-food intake found that children in the frequent and very frequent groups had a BMI that was 0.15 and 0.22 kg/m² higher than those in the infrequent group (p<0.001) (Braithwaite et al., 2014). Another study in Riyadh City found significant association between childhood obesity and the fast-food consumption among children aged 6 to 15 years old with their weight status (Almuhanna et al., 2014).

While there were many studies conducted to investigate the contribution of fast-food consumption to obesity, there are not enough data on the association between fast-food outlet distribution with adolescent's weight status and how they relate to food insecurity level in Malaysia. This study is in line with second goal of Malaysia Sustainable Development Goals (SDG) which is to end hunger, achieve food security and improve nutrition and promote sustainable agriculture. To achieve this goal, data on the prevalence of food security level, nutritional status and the causes of these problem were important. The status of this SDG is that the hunger is manageable, but the double burden of malnutrition is rising (Malaysia Prime Minister's Department, 2017). Therefore, from this study the situation of malnutrition among adolescents in Kuantan can be assessed. Double burden of malnutrition is characterized by the coexistence of under-nutrition along with overweight and obesity, or diet-related non-communicable diseases, within individuals, households, and populations, and across the life course (WHO 2017).

This present study also accentuates the usage of Geographic Information System (GIS) in nutrition-health field. This system starting to gain more attention among nutrition-health researcher in Malaysia. Therefore, from this study we can promote the potential of GIS in this field as it capable to visualize information on a map which can facilitate stakeholders and policy makers for policy planning. As Malaysia is burdened with both under and over-nutrition problem, more research need to be done to address these problems by improving national nutrition policy. Therefore, from this study we can identify is there any association between fast-food availability with nutritional status and also household food security level.



1.3 RESEARCH QUESTIONS

- i. What is the prevalence of adolescents' nutritional status and household food security level in Kuantan, Pahang?
- ii. Do socio-economic and demographic affecting adolescent's nutritional status and food security level in Kuantan, Pahang?
- iii. What is the distribution of nutritional status and food insecurity among adolescents in relation to geographical area across the district of Kuantan?
- iv. Are there any association between adolescents' BMI status, food security level with fast-food outlets availability?

1.4 HYPOTHESES

- i. There is high prevalence of obesity and household food insecurity level in Kuantan, Pahang.
- ii. There are no association between socio-economic and demographic with adolescent's nutritional status and household food security level in Kuantan, Pahang.
- iii. There is no clustered pattern of distribution of overweight and obesity and household food insecurity level in Kuantan, Pahang.
- iv. There are significant association between adolescents' BMI status, household food security level with fast-food outlets availability.

1.5 RESEARCH OBJECTIVES

1.5.1 General Objectives

To determine the relationship of fast-food outlets availability with nutritional status and household food insecurity among adolescents in Kuantan, Pahang.

1.5.2 Specific Objectives

- i. To investigate the prevalence of nutritional status (obesity and stunting) and household food insecurity among adolescents in Kuantan, Pahang.
- ii. To study factors associated with household food security level and nutritional status of adolescents in Kuantan Pahang.
- iii. To identify the distribution of fast-food outlets, household food security level and the nutritional status among adolescents using the Geographic Information System (GIS).
- iv. To investigate the association between the availability of fast-food outlets with adolescents' nutritional status (BMI status) and household food security level.

1.6 JUSTIFICATION OF THE STUDY

There are two reasons why this study is relevant to be conducted. Firstly, the research on food security is rapidly expanding in Malaysia as we can see many studies had been done to find out the indicators and consequences of food insecurity to nutritional outcome on the household member. The growth of fast-food outlets can be one of the co-factors that contribute to food insecurity which illustrate the availability and accessibility to unhealthy food, or it could be the other way round where being food insecure increase the visits to fast-food outlets. The availability of food high in fat, salt and sugar through Fast-food (FF) or takeaway outlets was associated with obesity (Fraser & Edwards, 2010). There is no research done yet to investigate the relationship between fast-food outlets availability, food insecurity and nutritional status outcomes in Kuantan. Therefore, this study can contribute and add on the existing body of evidence regarding this problem.

Secondly, geographic information system (GIS) and spatial analysis also were used in this study. The use of GIS and spatial analysis is not widely practice in Malaysia especially in the study of food security but there is growing interest from researchers to use this system in their research nowadays. This system enables researchers to visualize, question, analyze, and interpret data to understand relationships, patterns, and trends. The GIS is useful in integrating the spatial data with health-related data where it makes possible to visually detect areas in need of attention. Therefore, the relationship between nutritional status, food insecurity and geographical characteristics can be determined.