SNACKING HABITS, NUTRITIONAL STATUS AND PHYSICAL ACTIVITY OF ADOLESCENTS AGED 13, 14 AND 16 IN KELANTAN

NUR FATIN BINTI ZAINOL

SCHOOL OF HEALTH SCIENCES

UNIVERSITI SAINS MALAYSIA

2017

SNACKING HABITS, NUTRITIONAL STATUS AND PHYSICAL ACTIVITY OF ADOLESCENTS AGED 13, 14 AND 16 IN KELANTAN

by

NUR FATIN BINTI ZAINOL

Dissertation submitted in partial fulfillment of the requirements for the degree of Bachelor of Health Science (Honours) (Nutrition)

May 2017

CERTIFICATE

This is to certify that the dissertation entitled "SNACKING HABITS, NUTRITIONAL STATUS AND PHYSICAL ACTIVITY OF ADOLESCENTS AGED 13, 14 AND 16 IN KELANTAN" is the bona fide record of research work done by Ms NUR FATIN BINTI ZAINOL during the period from September 2016 to May 2017 under my supervision. I have read this dissertation and that in my opinion is conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation to be submitted in partial fulfillment for the degree of Bachelor of Health Science (Honours) (Nutrition).

Main supervisor,

…….

Dr Soo Kah Leng
Lecturer
School of Health Sciences
Universiti Sains Malaysia
Health Campus
16150 Kubang Kerian
Kelantan, Malaysia

Date: …….

DECLARATION

I hereby declare that this dissertation is the result of my own investigations, except where otherwise stated and duly acknowledge. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at Universiti Sains Malaysia or other institutions. I grant Universiti Sains Malaysia the right to use the dissertation for teaching research and promotional purposes.

……..

Nur Fatin binti Zainol

Date: ……

TABLE OF CONTENTS

ACKNOWLEDGEMENT

In the Name of Allah, Most Gracious and Most Merciful.

Alhamdulillah, all of honours are just for Allah, the Almighty, giving this great opportunity to continue my study in degree of Nutrition and thus completing this Final Year Project (FYP).

Firstly, I would like to express my sincere gratitude and appreciation to my supervisor, Dr Soo Kah Leng for all her wise guidance, support, dedication and motivation throughout this project. I owed a million thanks for the inspirational advices and knowledge that she share with me along the whole research.

Then, my appreciation goes to my final year project mates, Siti Izati Nurulaishah, Chan Lee Ting and Ahmad Hafizuddin for helping me conducting my research. Not forgetting all my close friends and to people who are involved directly and indirectly in sharing necessary information, whose have given me a cheerful and joyful world and beautiful togetherness. I will never forget our happiness and sadness when we were together completing this thesis. I really appreciate it. Next, of course my family especially my parents for their valuable support and continuous prayer, which give me the strength to complete this thesis.

Special thanks to author for giving me permission to use the questionnaire and also the principals, teachers and school counsellors of SMK Kadok, SMK Kuala Krai, SMK Chetok and SMK Ketereh for their useful assistance during my project. Finally yet importantly, I would like to express my appreciation to all the respondents who participated in this study.

Thank you.

TABIAT PENGAMBILAN SNEK, STATUS PEMAKANAN DAN AKTIVITI FIZIKAL DALAM KALANGAN REMAJA BERUMUR 13, 14 DAN 16 TAHUN DI KELANTAN

ABSTRAK

Kajian ini tentang tabiat pengambilan snek, status pemakanan dan aktiviti fizikal dalam kalangan remaja berumur 13, 14 dan 16 tahun di Kelantan. Responden yang terlibat dalam kajian ini terdiri daripada 291 orang remaja iaitu 110 lelaki (37.8%) dan 181 perempuan (62.2%) yang dipilih secara rawak dari empat sekolah menengah sekitar Kelantan. Objektif utama kajian ini ialah untuk menentukan tabiat pengambilan snek dalam kalangan remaja berumur 13, 14 dan 16 tahun, untuk menilai status pemakanan dan aktiviti fizikal responden dan untuk membandingkannya antara lelaki dan perempuan. Selain itu, kajian ini ingin menentukan perkaitan antara kekerapan pengambilan snek dalam sehari dengan status pemakanan dan aktiviti fizikal. Borang soal selidik termasuk maklumat sosio-demografi, maklumat antropometri, tabiat pengambilan snek dan hidangan utama serta kekerapan pengambilan snek dalam seminggu telah digunakan dalam kajian ini. Aktiviti fizikal remaja telah diukur menggunakan borang Rekod Tahap Aktiviti Fizikal Remaja (PAQ-A). Kesemua maklumat yang diperolehi dianalisa dengan menggunakan 'Pearson Chi-Square test' dan 'Mann-Whitney test' pada nilai, $p<0.05$. Kebanyakkan responden (43.0%) mengambil snek sekurang-kurangnya sekali sehari. Seramai 193 responden (66.3%) mengambil snek pada waktu petang. Snek yang paling popular dalam kalangan remaja adalah gula-gula, biskut, minuman berkafein dan teh susu. Nilai indeks jisim badan (BMI) responden telah dibandingkan dengan titik panduan yang disediakan oleh WHO, 2007.

Data menunjukkan sebahagian besar daripada responden adalah dalam kategori normal BMI (lelaki 41.1%, perempuan 58.9%). Untuk lebihan berat badan, peratusan lebih tinggi adalah dalam kalangan perempuan sementara untuk obesiti, lelaki menunjukkan peratusan yang lebih tinggi berbanding perempuan. Majoriti responden berada pada tahap aktiviti fizikal yang sederhana (lelaki 66.4%, perempuan 56.9%). Lelaki lebih aktif secara fizikal berbanding perempuan (X^2 = 17.294, $p<0.001$) dengan lebih ramai responden perempuan (39.8%) dalam kategori tahap aktiviti fizikal yang rendah berbanding lelaki (20.9%). Status pemakanan dan aktiviti fizikal menunjukkan perbezaan yang ketara antara responden lelaki dan perempuan. Walau bagaimanapun, tiada perkaitan yang ketara antara status pemakanan dan kekerapan pengambilan snek setiap hari (X^2=3.026, p=0.220) serta tiada perkaitan yang ketara antara aktiviti fizikal dan kekerapan pengambilan snek setiap hari (X^2=2.316, p=0.314).

SNACKING HABITS, NUTRITIONAL STATUS AND PHYSICAL ACTIVITY OF ADOLESCENTS AGED 13, 14 AND 16 IN KELANTAN

ABSTRACT

This study is about snacking habits, nutritional status and physical activity of adolescents aged 13, 14 and 16 in Kelantan. A total of 291 adolescents, 110 males (37.8%) and 181 females (62.2%) were randomly selected from four secondary schools within Kelantan. The main objective of this study was to determine the snacking habits among adolescents aged 13, 14 and 16 years old, to access nutritional status and physical activity of the respondents and to compare it between male and female. Besides, this study also determined the association between daily snacking frequency with nutritional status and physical activity. Questionnaires that included socio-demographic information, anthropometric information, snacking habits, main meals consumption and frequency of snack intake per week were used. The physical activity of adolescents were measured using Physical Activity Questionnaire for Adolescents (PAQ-A). All data obtained were analysed using Pearson Chi-Square test and Mann-Whitney test with p value < 0.05. Majority of respondents (43.0%) consumed snacks at least once per day. A total number of 193 respondents (66.3%) were afternoon snacker. The most popular snack foods and beverages among adolescents were sweet or candy, biscuits, caffeinated drinks and milk tea. Body Mass Index (BMI) value of respondents was compared with cut-off point by World Health Organization (WHO, 2007). Data indicated that most of respondents had normal BMI (Male 41.1%, Female 58.9%). Then, who was overweight, higher percentage was among female, obese male had higher percentage than female. Majority of respondents were in moderate physical activity (Male 66.4%, Female 56.9%).

Males were more physically active than females (X^2=17.294, p<0.001) with higher female respondents (39.8%) in low physical activity level category as compared with male (20.9%). The nutritional status and physical activity were significantly different between male and female respondents. However, there was no significant association between nutritional status and daily snacking frequency (X^2=3.026, p=0.220) and there was no significant association between physical activity and daily snacking frequency (X^2=2.316, p=0.314).

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

BMI	Body Mass Index
kg	Kilogram
m^2	Meter square
NHMS	National Health and Morbidity Survey
PAQ-A	Physical Activity Questionnaire of Adolescents
WHO	World Health Organization
X^2	Chi-square

SYMBOLS

%	Percentage
<	Less than
>	More than
≥	More than or equal to
N	Frequency

CHAPTER 1: INTRODUCTION

1.1 Background of Study

Adolescence is known as a period of rapid development and growth that bridge childhood and adulthood (Chin and Mohd Nasir, 2009) and a period of rapid changes in body composition (Luszczynska *et al.*, 2013). A transitional period that involves psychological, physiological and social changes may contribute towards the development of overweight or obesity and may influence the dietary and snacking habits. The predisposing factors which include among others, genetic disposition, dietary behaviours, snacking habits, physical activity, socio-demographic factors and environmental factors have been identified (Piernas and Popkin, 2010a). Genetic and metabolic factors can create the fundamental in which cultural, socio-demographic and environmental factors all combined together to determine the body weight (Piernas and Popkin, 2010a). Early identification of the risk factors is very important to decrease and reduce the public health implications. Dietary behaviours, snacking habits and attitudes also influence weight gain in adolescents. The body weight changes among adolescents always being associated with the consumption of energy dense snacks likes processed salty and sweets foods and sweetened soft drinks (Piernas and Popkin, 2010a).

World Health Organisation as cited in (Musaiger, 2011) stated that overweight or obesity is defined as a condition of abnormal or excessive fat accumulation in the adipose tissue that will lead to an extent health impaired. Overweight and obesity can be measured by various methods such as body mass index (BMI), skinfold, waist circumference, waist-hip ratio and percentage of body fat (Musaiger, 2011). Many countries use BMI while a few of the countries using waist circumference to measure obesity. The skinfold anthropometry is not commonly used (Musaiger, 2011).

Overweight and obesity has become an epidemic in many parts of the world. World Health Organization has warned of the escalating epidemic of obesity that could put the population in many countries at risk of developing non-communicable diseases (Musaiger, 2011). World Health Organization (WHO, 2014) stated that overweight and obesity are directly responsible for at least 2.8 million deaths worldwide each year. The prevalence of excess weight among children and adolescents are increasing in both developed and developing countries, but in different patterns and at very different speeds. The overconsumption of high calorie foods such as fast foods and snacks need to be improved in this modern lifestyle to decrease the prevalence of overweight and obesity especially in Asian country including Malaysia. The easy exposure to high calorie foods and snacks and heavily advertised, inexpensive and highly accessible foods promotes the unhealthy eating and the development of overweight and obesity.

A serious health problem will continuously occur for adolescents if overweight and obesity increases in developed and developing countries from year to year (Hazreen *et al.*, 2015). The prevalence of overweight and obesity among adolescents aged 10 to 16 years old for males and females in Malaysia is 14.5% (NHMS, 2011). Chinese has high prevalence of overweight, which is 8.9% to 23% as compared to Indians (8.5% to 18.3%) and Malays (5% to 17.9%) (Norimah *et al.*, 2006). The adolescents between 11 and 15 years old for the three major ethnic groups in Malaysia which are Malays, Chinese and Indians, were reported with the overall prevalence rates between 18% and 19% (Zalilah *et al.*, 2006).

Overweight and obesity also are major risk factors for a number of chronic diseases, including diabetes, cardiovascular diseases and cancer. The increase in overweight and obesity has been substantially higher for adolescents and youth than adults, so understanding contextual factors related to the eating behaviour, snacking habits and physical activity patterns of young people is particularly very important. Obesity in adolescence has strongly linked with poor diet intake, unhealthy snacking and insufficient physical activity. World Health Organization (WHO, 2014) has recommended foods and snacks that are low in fat, sugar and salt, but high in fruit and vegetables in order to protect and prevent the development of overweight and obesity. The low consumption of fruit and vegetables and high consumption of energy-dense food and drinks, along with irregular meal consumption, skipping meals and frequent consumption of sugar sweetened beverages and snacks will lead to overweight and obesity (Wate *et al.*, 2013).

Snacking, as defined as eating something between the main meals, has been considered as one of the important sources of excess calorie intake (Cohen *et al.*, 2012). Snacking habits among adolescents has been increasing over the past two decades. In the time-based definition of snacking, usually, foods that consumed between 8:00 and 10:00 am are breakfast, between 12:00 and 2:00 pm are lunch and between 6:00 and 8:00 pm are dinner, and considered as main meals (Gregori *et al.*, 2011a). Therefore, every food item consumed between meals are considered as snack. Adolescents and youth snacking habit's between meals nearly three times per day while adults twice daily. These snacks account for 27% and 24% of total calories, respectively (Piernas and Popkin, 2010a). Starting from childhood until adolescence, balanced nutrition is very important because this is the periods of growth, development of body function and social cognitive ability (Overby and Hoigaard, 2012).

The development of overweight and obesity among adolescents is influenced by eating patterns and snacking habits (Bo *et al.*, 2014). Several eating patterns including increased portion size and increased contribution of snacking to total energy intake will increase the prevalence of overweight and obesity among adolescents (Larson *et al.*, 2016a). Obesity in adolescents and youth is associated with numerous negative health effects and an increased probability of being obese as an adult (Ames *et al.*, 2014). Snacking patterns among adolescents are associated with the energy and nutrient intakes and consequently the nutritional status. When snacks are usually consumed are energy dense, nutrient-poor foods and drinks, the frequent of snacking likely contributes to excess energy intake and weight gain (Larson *et al.*, 2016a). Steinberg and Morris as cited in (Salvy *et al.*, 2011) stated that friends and peers influence with the out of home environment have been thought to be the key determinants of adolescents' eating behaviour and snacking habits. The associations between out of home availability of snacks and unhealthy food habits are found among early adolescents (Salvy *et al.*, 2011).

In Malaysia, the transitions of lifestyle and dietary behaviours have been associated with Malaysians especially adolescents and youth, consuming diets high in fat, sugar and calories and generally practicing a sedentary lifestyle (Farah Wahida *et al.*, 2011). The problem of overweight and obesity will give a major public health challenge for Malaysia in the future. Snack consumption has increased significantly in this recent years (Cleobury and Tapper, 2014). Snack foods that also known as unhealthy foods tend to be high in fat and sugar, and give implications of weight gain, overweight and obesity (Bes-Rastrollo *et al.*, 2010). When adolescent cut back on snacks, it could help with weight loss and weight reduction.

In order to encourage adolescents to reduce the unhealthy snacking as a weight loss strategy, it is crucial to understand overweight and obese individuals' reasons for snacking. Superficially, it might appear that the most likely reason for snacking is hunger. Some research indicates that eating is not always because of hunger (Cleobury and Tapper, 2014) but the most common reason is habitual patterns. Unhealthy eating and snacking habits frequently occur and become habitual among adolescents and this habit is difficult to change by one individual (Ohtomo, 2013). It is also supported by other studies conducted with both female undergraduate students (Adriaanse *et al.*, 2011) and a community sample (Verhoeven *et al.*, 2012). Other than that, the frequent reasons for eating and snacking include external eating which means eating in response to food cues and emotional eating likes eating in response to stress and other negative emotions (Cleobury and Tapper, 2014). Stress and other negative moods can lead to increased desire to eat and the amount eaten as well as preference of less healthy snack foods. When teens become mature and independent, they tend to make their own decision in food choices.

The increase of snacking habits which are not accompanied by the increase of physical activity would give the result of higher level of calorie consumption (Cohen *et al.*, 2012). In addition, the frequency of snacking and eating away from home has increased nowadays. Adolescent and youth consume of snacks and other food rather than main meals can be influenced by their friends and peers and also by food availability (Salvy *et al.*, 2011). Friends and peer influences increase in adolescence, as do mobility and independence. The foods that are taken away from home are generally higher in solid oils, fats, and added sugars than food that prepared at home (Cohen *et al.*, 2012). The more visits to food outlets especially fast foods restaurants would be associated with increased consumption of solid oils, fats, and added sugars.

The amounts of foods eaten during snack or meal have an effect to the individuals when they eat with others such as with their family or friends. For example, it has been reported that individual are generally eat more in the company of friends or relatives than when they eat alone (Robinson and Higgs, 2013). Besides that, eating can be inhibited when the individual eat with opposite sex that is considered attractive than eating alone. When an eating partner like friends are consuming a large amount of foods and snacks, adolescents have been shown to follow this behaviour and eat a large amount too (Robinson and Higgs, 2013).

The higher intake of energy and fat during leisure time like television viewing, playing video games, using smartphone and eating out with friends related to snacking promote the consumption of nutritionally poorer diets (Snoek *et al.*, 2006). Snacking also contribute to excess energy intake that include energy-dense snack foods and beverages. However, the regular snacking may help adolescents to meet their dietary recommendations (Gebauer and Laska, 2011). More frequent the snacking habits is the greater association with excess energy intake and non-balanced nutrient intakes, and will later cause the increase of overweight and obesity among the adolescents (Razalee *et al.*, 2012).

Regular healthy snacks such as foods that contain low calories, fat, and sugar and high in micronutrients in meals may meet recommended nutrient intake and could improve the diet quality in populations at nutritional risk (Azadbakht *et al.*, 2016). If high energy dense foods are replaced with nutrient-rich foods likes fruits and vegetables, the weight management interventions, overweight and obesity prevention in adolescents will be more effective (Leung *et al.*, 2014).

Healthy snacking might help in the strategy for meeting the nutrients and energy needs that cannot be met with the consumption of only three main meals per day. By practising healthy eating behaviours, adolescents can meet the nutritional needs and have proper eating behaviours that are learned in their early life. It can be maintained in adulthood thus reduces the risk for major chronic disease (Chin and Mohd Nasir, 2009).

1.2 Problem Statement

Obesity is now occurring at epidemic proportions in many Asian countries including Malaysia and not only considered as a phenomenon in developed countries (Pon *et al.*, 2004). Malaysia is at the intersection of nutrition, dietary behaviours, snacking habits and lifestyle transition. Technological and economic advancements nowadays have led to increased purchasing power for foods and others, with concomitant changes in lifestyles. Malaysians adolescents tend to increase the consumption of diets that are high in fat, sugar and calories and practice sedentary lives (Farah Wahida *et al.*, 2011). More children and adolescents are overweight and obese now than ever before although the under nutrition is still found in remote parts of Malaysia likes in rural area.

Adolescents eating behaviours have come into attention because of the extraordinary meals, fast-food intake, and snacking habits (Ranjana *et al.*, 2013). Snacking habits is one of the common feature of the diet practice by adolescents. Unfortunately, food choices made by adolescents while snacking usually are the foods that have high sugar contain which means sweet snacks, high sodium and fat, and relatively low in vitamins and minerals (Ranjana *et al.*, 2013). Adolescent tend to consume too many unhealthy snacks such as crisps, chocolates, sweets, and sugared fizzy drinks. They are not consuming enough fruits and vegetables in their diet although through snacking.

In addition, fast food options likes burgers, pizzas, fried chicken and hot dogs are gaining popularity among adolescents, possibly because of their convenience, taste, price and also the influence of peers (Ranjana *et al.,* 2013). During adolescence and youth, the consumption of energy dense foods become more popular and give both short and long term health consequences, including higher body mass index (Pearson *et al.*, 2011a).

Adolescence is characterised by having higher demands for energy and nutrients needs due to rapid physiological, psychosocial and cognitive development through their aged. During adolescence, the hormonal changes help to accelerate the growth, which is faster than any other time in postnatal development. Concern over adolescent obesity has been identified due to its rapid increase in the prevalence and its associated with morbidity and mortality (Muammar *et al.,* 2014). The most number of adolescents nowadays did not have a daily intake of breakfast, fruit, vegetables and milk. At the same time, adolescents are in the process of more independent in developing their own eating and snacking habits, which are likely to be continuously in adulthood (Martens *et al.*, 2007).

Usually, adolescents adapt to unhealthy eating and snacking habits such as low fruit and vegetables consumption and high intake of energy-dense snacks and sugar-sweetened beverages. Story as cited in (Norgaard *et al.,* 2014) stated that adolescents are in phase of going through a process of creating their own identity and in a transition period with regard to their role as food consumers. This phase also include distancing themselves from parents and parents' food-related values. Adolescents tend to become more focus and aware of their own preferences and become more concern with their choices including food choices. They start searching for new food experiences.

Nicklaus *et al* as cited in (Norgaard *et al.,* 2014) find that snacks are often among the first food products adolescents can buy with their own money outside because these products are easy to buy and easy to consume in small amounts between meals. The genetic, cultural, socioeconomic, behavioural and situational factors play a role in eating behaviours, snacking habits and weight control (Gregori *et al.*, 2011a).

Electronic media such as screen time on television may displace active pursuits on advertising of junk foods and fast foods. It also will increase adolescents request for those particular foods and products (Strasburger, 2011). Usually, snacking habits increases while watching television or movies. The late nights screen time with snacks may interfere from getting adequate amount of sleep, which is also a known risk factor for overweight and obesity. Sufficient evidence has already exists to warrant a ban on junk food or fast food advertising in children's and adolescent's television programming (Strasburger, 2011).

Unhealthy lifestyle factors like skipping meals, practicing unhealthy snacking habits and food choice leading to a poorer nutrient intake that are common among this vulnerable adolescent group (Punitha *et al.,* 2015). Adolescents are given choice and preferences for taking sweetened foods, (Drewnowski *et al.,* 2012) and soft drinks, that are rich in carbohydrate and thus are also at risk for caries development. Ismail as cited in (Farah Wahida *et al.,* 2011) stated that the unhealthy snacking habits and meal skipping in most days in a week could contribute to abnormal body weight likes overweight and obesity in adolescents. Adolescents are usually concern about their body image because its plays an important role in their confidence and management of body weight, especially among girls. The assessment of body image is very important to find out the relationship in maintenance of excess weight or motivation for weight reduction (Pon *et al.*, 2004).

Since overweight and obesity problems may start early in life and their subsequent effect on morbidity in childhood and adolescence, early identification of the risk factors is important. It needs to be clearly determined to prevent and reduce the incidence of adulthood obesity. Thus, this study focused on finding the association between snacking habits, nutritional status and physical activity among adolescents in Kelantan. This problem should be treated and solved seriously because high prevalence of overweight and obesity among adolescents can affect the adulthood life later. In addition, there is no research about these issues yet in Kelantan.

1.3 Significance of Study

The snacking habits may influence the nutritional status and other health related outcomes. Furthermore, this study could give benefits to several groups of people. The adolescents would receive great benefits from this research, as snacking is a typical eating behaviour that many adolescents engage in. It is very important because snack likes foods and beverages contribute to total daily energy intake. Next, the teachers and canteen dealer at school will also get benefit from the findings of this study. It can be used as guidelines for the teachers and canteen dealer in providing the healthy snacking foods for the adolescents. This research also can be beneficial to parents and caregiver by encouraging them to purchase and identify the healthy snacks that they can provide their family and children at home. All findings from this study would be beneficial for designing and evaluating health and nutrition promotion strategies that are appropriate to reduce the health problem, as well as providing useful data for the development of further research in examining the relationship between health, nutrition status, physical activity that are related to attitudes and snacking habits among adolescents. The benefits will not be limited to awareness and knowledge that could be obtained only but also for practicality in daily life especially for adolescents.

1.4 Objective

1.4.1 General Objective

To investigate the snacking habits of adolescents aged 13, 14 and 16 in Kelantan

1.4.2 Specific Objectives

1. To assess the snacking habits of adolescents
2. To assess the nutritional status of adolescents
3. To assess the physical activity of adolescents
4. To determine the association between nutritional status and snacking habits among adolescents aged 13, 14 and 16 in Kelantan
5. To determine the association between physical activity and snacking habits among adolescents aged 13, 14 and 16 in Kelantan

1.5 Research Question

1. Does nutritional status and physical activity associated with snacking habits among adolescents aged 13, 14 and 16 in Kelantan

1.6 Hypothesis

Hypothesis 1

Null hypothesis (H_0): There is no association between nutritional status and snacking habits among adolescents

Alternative hypothesis (H_A): There is association between nutritional status and snacking habits among adolescents

Hypothesis 2

Null hypothesis (H_0): There is no association between physical activity and snacking habits among adolescents

Alternative hypothesis (H_A): There is association between physical activity and snacking habits among adolescent.

1.7 Conceptual Framework

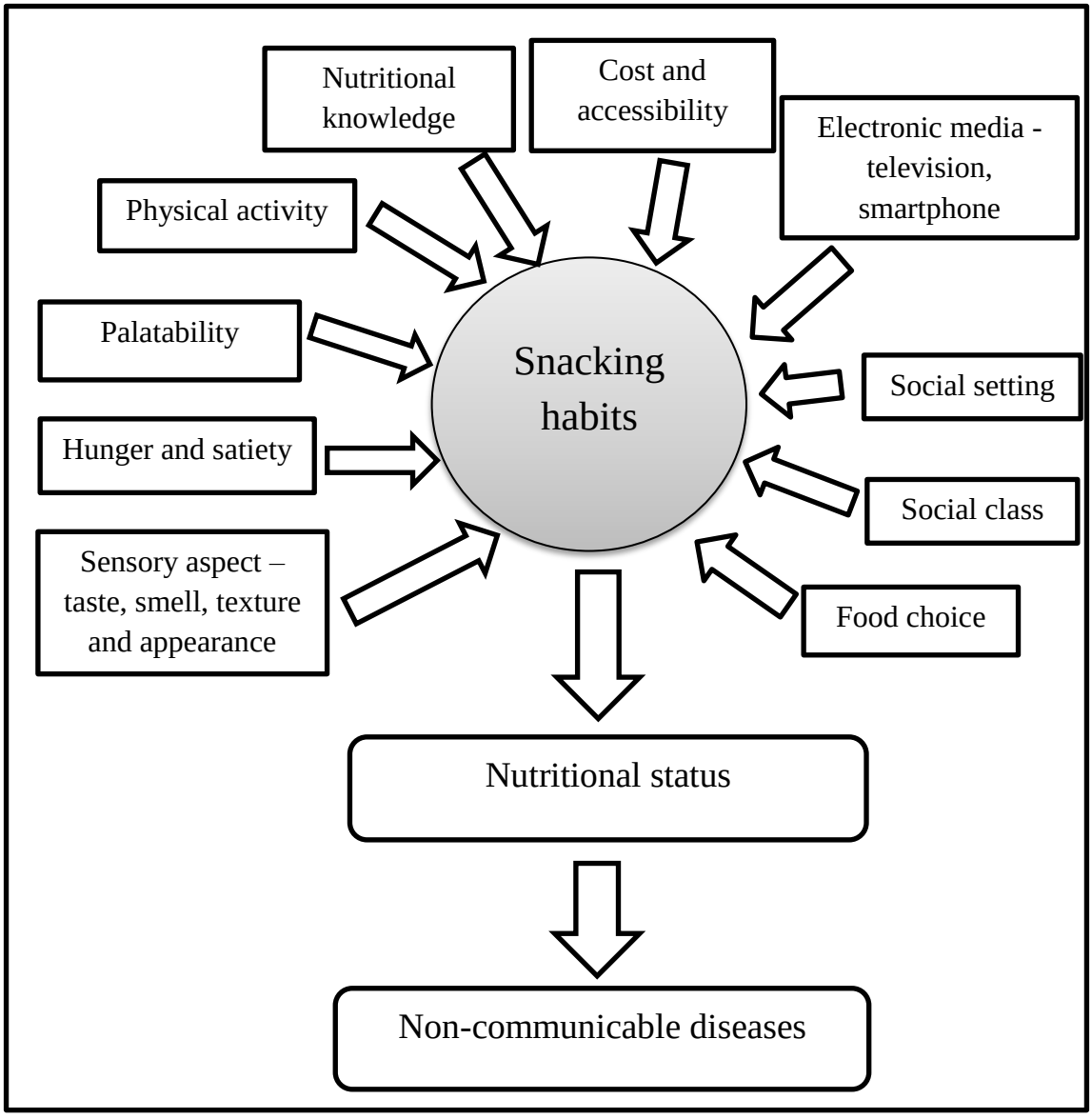

Figure 1.1

Based on Figure 1.1, sensory aspect such as taste, smell, texture and appearances will influence snacking habits among adolescents. Taste is known as a major influence in foods and snacks choice. Other than that, smell, texture and appearance of foods are thought to influence type of snacks. Hunger, satiety and palatability also influence the snacking habits among adolescents. The basic determinants of foods and snacks choice are provided by physiological needs. Adolescents need more energy and sufficient nutrients in order to do works and respond to the feelings of hunger and satiety.

The satiety signal is important for the portion size adolescents can consume because they are unaware about this and consume excess energy. Palatability is also influenced by appetite, foods and snacks intake. When the palatability of the foods and snacks increase, the foods and snacks intake also increase. These three factors (sensory aspect, hunger and satiety, palatability) can be categorised under biological determinants for food and snack choice. Besides that, food choice and physical activity also influences the snacking habits among adolescents. The food choice related with the biological determinants that mentioned above. Next, social class and social setting affect the intake of snacks. There are clear differences in social classes and social setting regarding food, snack and nutrient intake. For example, low-income groups have a greater tendency to consume unhealthy food and snack than high-income group. It is because the unhealthy food and snacks are cheaper and affordable for them. Then, the venue where food and snacks is eaten affects the proportion and food choice. Usually accessibility of healthy food is limited when eating away from home.

Furthermore, the cost, accessibility and nutrition knowledge of food and snacks influence snacking habits among adolescents. The cost of food and snacks are important aspects of food choice. Another important physical factor influencing snacking habits is accessibility to shops, which is dependent on transport and geographical location. Usually, healthy food and snack tends to be more expensive when available at towns and cities compared to supermarkets on the suburbs. Next, nutritional knowledge and behaviour are very important in choosing the healthy foods option.

Lastly, electronic media such as television viewing and usage of smartphone also influences snacking habits. Adolescents tend to eat snacks while watching television, using smartphone in morning, afternoon, or evening. The nutritional status is the outcome of snacking habits. Consumption of unhealthy snack will increase the risk for overweight, obesity and non-communicable diseases.

CHAPTER 2: LITERATURE REVIEW

2.1 Nutrition and Adolescents Development

Adolescent period is well known as the transition from childhood to adulthood and their age is between 10 to 19 years old. It is a period of nutritional vulnerability and crucial time of rapid growth and development (Keast *et al.,* 2010). Adolescent's period include time of rapid physical, emotional and psychological changes. It is also accompanied by biological development characterized by evolving growth and maturation (Katharina *et al.,* 2011). Adolescence can build potentially critical period for body composition in their future life and also the development of obesity in adulthood (Katharina *et al.,* 2011). Adolescents also make their own food choices and often practice poor dietary patterns such as skipping breakfast, meals and rely on eating fast foods when they are away from home (Nielsen, 2002). These habits lead to higher consumption of energy-dense or nutrient-poor diets that potentially contributed to overweight or obesity (Keast *et al.*, 2010). Hence, sufficient nutrient and energy intake from a healthy balanced diet and snacks should be provided to them for optimal growth and early healthy diet and snacking habits (Washi and Ageib, 2010).

Adolescents also tend to consume fast food which in low-cost, prepared and served quickly at a fast food restaurant or shop. The consumption of fast food is directly increasing the weight, risk of obesity and diabetes. For example, individuals who consumed fast food frequently which is more than twice-weekly will gain an extra 4.5kg bodyweight and had 2-fold greater insulin resistance that increased a risk factor for type 2 diabetes compared with those individuals who consumed it less than once per week.

These example stated that the more frequent the fast food consumption of an individual, the more serious effects on the health of young teens in terms of obesity (Washi and Ageib, 2010).

Overweight and obesity prevalence among adolescents has increased dramatically and led to concern. In the early life, overweight and obesity is associated with a number of adverse physical and mental health outcomes in youth, but also later in life. Further, overweight adolescents tend to become overweight adults. Obesity occur when interaction between genetic, psychological, and lifestyle factors including diet and physical activity interact (Wouters *et al.*, 2010). Many changes have occur like the transition from eating three meals per day to an irregular meals, skipping breakfast, high-energy-density snacks, more frequent unhealthy snacking habits between meals (Keast *et al.*, 2010), fast food consumption (Musaiger *et al.*, 2009), and low vegetables and fruit consumption among young people especially adolescents. Many factors can contribute to health problems, overweight and obesity including over-eating, malnutrition and lack of physical activity. In addition, the genetic, environmental, neurological, physiological, biochemical, socio-cultural and psychological also can become the other factors that related to overweight, obesity and diseases. Environmental factors have beliefs to be a major role in rising the prevalence of overweight and obesity among adolescents (Semra and Nevin, 2011).

During puberty, the changes of adolescents such as the hormonal changes regulating appetite, satiety and fat distribution may occur and it is a time of dramatic behavioural changes in which teenagers assert independence from their parents. These changes may affect both eating and snacking behaviours and physical activity. Adolescents usually practice poor dietary and snacking habits and it might continue into adulthood.

Then, adolescents become more extremely resistant to modification and maintenance of a healthy diet early in life while it is public health importance without any support from family and others (Katharina *et al.*, 2011). Intrapersonal and interpersonal factors such as pubertal development and family relationships may affect the development of body image among adolescents. Most research addressing body image has been conducted by clinicians (Charlotte, 2010) although the majority of adolescents reported that body dissatisfaction and body image concerns are only the developmentally significant.

2.2 Snacking Habits and Physical Activity

Snacks refer to all foods and drinks consumed outside the three main meals which is breakfast, lunch, dinner and are referred to as morning, afternoon, and evening snacks, which make up the "snack occasions" (Wang *et al.*, 2012). The term ''snack'' is defined as small number of items characterized by low nutrient and high energy density such as candies, cookies, salty snacks, soda and others (Bo *et al.*, 2014). Another definition include the time criterion which lead us to consider snacks as the eating occasions between the main meals (Gregori *et al.*, 2011b). In some studies, snack foods is defined as anything consumed between main meals whether core or non-core food items, while other studies focus only on snacks consumed at a specific time of day or on individual snack-food items (Niven *et al.*, 2015). Each country has different define of snacking habits in relation to frequency, size and energy content of snacks. Adolescents' perceptions and views about the availability and convenience of foods and snacks could influence their dietary intake. Snack foods are commonly available at adolescents' home and school environments. From this availability of unhealthy foods at home and schools, it would promote the consumption of obesity foods and drinks.

Next, snack occasions including morning snacking that is considered as food consumption between breakfast and lunch, afternoon snacking between lunch and dinner and evening snacking after dinner (Bo *et al.,* 2014). Lastly, "snacker" means a person that consumes any snack (Wang *et al.*, 2012) during any times not including three main meals. Most snackers consumed snacks at different occasion during the day. The snacks intake have been chosen based on different type of criteria such as based on taste, healthiness, and importantly the price (Wadhera and Capaldi, 2012) . A survey showed that youth and adolescents always categorized the low-fiber, high-fat, sweet foods and beverages as snacks, which is the mostly attributed to higher energy intake, greater energy density, and lower nutrient adequacy (Keast *et al.*, 2010). Foods that contain lower calories, fat, and sugar and high in micronutrients and fiber are considered as regular healthy snacks that can help to meet the recommended nutrient intake and improve diet quality in populations at nutritional risk (Keast *et al.*, 2010).

The snack foods that consumed between meals usually contribute to an unhealthy diet. It is because the snack consumption includes the diets of poor nutritional quality and typically the consumption of high energy-dense foods that are rich in sugar or saturated fat (Feeley *et al.*, 2012). Importantly, the increase in snacking typically reflects an increase in snacking of unhealthy foods likes savoury, sweet and salty snacks (Larson and Story, 2013). One of the contributors to overweight is snacking habits because it increased the consumption of energy-dense, high-sugar, and high-fat foods. However no study have establish a correlation between snacking and overweight (Ritchie, 2012).

Some previous studies stated that snack consumption which means the foods eaten in between meals is positively associated with overweight (De Vet *et al.*, 2015). Snacking can contribute to approximately 25% and 35% of the total daily energy intake of adolescents eating behaviours (Piernas and Popkin, 2010b). Furthermore, most of snacking incidence has increased in all age groups especially adolescents (De Vet *et al.*, 2015). Besides increase in snacking frequency, the sizes of the consumed portions also have increased.

Major modifiable lifestyle factors such as nutrition and physical activity are related to the development of non-communicable diseases (Priyali *et al.*, 2010). Adolescents must accumulate at least 60 minutes of moderate to vigorous physical activity per day, According to another research, there is no more than one third of the adolescents seemed to achieve this physical activity recommendations. When adolescents can maintain their regular physical activity, healthy dietary and snacking habits during adolescence, it will contribute to several positive health outcomes, including healthy weight maintenance especially for adult years later (Menschik *et al.*, 2008). By decreasing physical activity level, eating unhealthy snacks and increasing sedentary behaviours among adolescents can lead to incidence of chronic diseases.

Sedentary behaviour is defined as little physical movement and lower energy expenditure like sitting and watching television. This behaviour can become serious risk factors of chronic diseases. The food consumption and snacking habits of adolescents depend on the type of activity they practice. For example, the unhealthy food and snacks consumption has association with screen viewing behaviours. Therefore, the higher sedentary behaviours of one adolescents lead to high consumption of food and directly increased the risk of obesity.

Parental support for physical activity has been associated with healthy physical activity habits among adolescents (Kuo *et al.*, 2007). When adolescents become more active in physical activity patterns, they tend to decrease in time spent watching television, the advent of video games and the internet (Janssen *et al.*, 2004). Among girls, the most obvious causes of increased body fatness are decreased in physical activity and an increased consumption of energy (Mokabane *et al.*, 2014). Parents that do not have knowledge about snacking habits may not know what healthy diet means, or what health problem that are related to unhealthy diet and it will give the bad outcomes like increase in body fatness. The higher consumption of foods and beverages at snack occasions has measured for a large portion of adolescents overall dietary intake. Therefore, snacking habits are important to consider as a component of dietary counselling and public health strategies targeting to solve this problems (Larson *et al.*, 2016b).

2.3 Snacking Habits and Nutritional Status

Adolescents' eating behaviour is one of the functions of individual such as attitudes, beliefs, knowledge, food preferences, dieting and for environmental influences like social environmental, macro-system and physical environmental (Kourlaba *et al.*, 2009). Environmental factors that influences adolescents' eating, snacking behaviours and food choices include family members, teachers, peers, friends, marketing and advertising, as well as accessibility and availability of foods either far or near from their home. However, availability and accessibility of certain foods reflects the family's socio-economic status and lifestyle (Kourlaba *et al.*, 2009).

There is more than one study, which found that there is a significant association between adolescents' food preferences with family socioeconomic status. However, the studies that investigate the association between lifestyle characteristics of adolescents and eating behaviour are limited (Kourlaba *et al.*, 2009). The finding in some current study stated that higher healthy snack was significantly associated with decreased prevalence of overweight and obesity among adolescents. It is because the consumption of healthier snacks was related to lower total energy, carbohydrate, fat, and saturated fatty acid intake (Azadbakht *et al.*, 2016). Snacking also increased the likelihood of meeting selected national food recommendations but the increased energy intake associated with snacking may reflect the energy density and portion sizes of foods and beverages consumed as snacks (Kerr *et al.*, 2009). Meals are different from snacks where meals can be associated with eating with family, sitting, presence of ceramic versus paper plates, cloth napkins, and large portion sizes, whereas snacks are associated with eating alone, standing, and smaller portions (Wansink *et al.*, 2010).

The categorization of foods as ‘‘snacks’’ or ‘‘meals’’ have been based on subjects’ previous experiences with food and not based on the current environment. People categorize what they eat as snacks, as they know that foods are less satiated and they will eat more. A number of studies have found that snacking can lead to weight gain (Wadhera and Capaldi, 2012). One of the reasons in increasing the obesity in adolescents is the change in their food consumption, exercise patterns and physical activity level (Musaiger *et al.,* 2009). A general complex process like food choice usually depends on culture and can be influenced by many different factors such as personal, social, economic and emotional (Bargiota *et al.*, 2013).

Teenagers make many more choices for themselves when they grow up than when they are still children. However, since eating is one of the social act and social networks, family parents, and friends can affect their food choices even more. Through this factors, they will be offered more foods choice and availability of many foods which could influence their eating patterns (Bargiota *et al.,* 2013). Otherwise, adolescents’ always diet and practice unhealthy weight control behaviours including skipping meals and using diet pills and laxatives to reduce weight in short time. It is proven that the above mention method are ineffective in achieving weight loss and may even contribute to excessive weight gain and other negative health outcomes (Savage and Birch, 2010). Studies suggest that parental support play an important role in adolescents’ development of physical activity, dietary intake, and weight control habits. Parental support to make healthy food choices among their children has been associated with positive dietary habits including higher intake of fruit and vegetables and intake of calcium-rich foods.

2.4 Determinants of Adolescents Snacking Habits

2.4.1 Nutritional Knowledge

Adolescents always engage in typical eating behaviour like snacking. Eating patterns can give significant positive and good effect on healthy growth and development during childhood and adolescence. Through the rapid sociological and technological developments along with the development in food industry, it have changed nutritional habits of many people like adolescents and then they are more likely to eat processed foods (Semra and Nevin, 2011). It is important to provide nutritional information and knowledge to adolescents when they are still young because by introducing good nutritional habits to them, they will know and choose the healthy nutritional foods and preferences (Semra and Nevin, 2011).

Many adolescents engage in unhealthy snacking behaviour by increasing the amount and frequency of unhealthy consumption of snacks. There is important for the broad-based food knowledge and safety education among consumers, especially adolescents, who are the food handlers in future. Nowadays, many studies examine the public perceptions of food hazards that only focused almost exclusively on adult consumers and neglected the views of adolescents. However, it is very important to get the opinions from adolescents, as they also make their own food choices. From years to years, attitudes and adolescent's interest toward food safety as well as toward health and nutrition are likely to develop (Gavaravarapu *et al.*, 2009).

Snacking patterns started since childhood will continue into adulthood. It is important to establish healthy eating patterns in early life and reduce the consumption of unhealthy snacks to promote good health. To make sure all this happen, it is important to monitor and control the adolescent snacking patterns by giving them knowledge and information (De Vet *et al.*, 2015).

When snacking of unhealthy foods become a habits, it is difficult to change because habit plays an important role in eating behaviours. When people repeatedly engage in the same behaviour in the same context, it can become habits. For example, when someone or adolescents regularly eats chocolate or sweet foods while watching television, this behaviour can become a habit and automatically related to specific situation. Dietary behaviour assumed as habitual because it reflect some repeated behaviours that is performed every day. Eating meals and snacking is something that most people do on a daily basis so it is considered as habit. Some study stated that habit strength correlated moderately strong with dietary behaviours (Benjamin *et al.*, 2011).

From prospective study among a representative community sample related to unhealthy snacking, it showed that habit strength was the most important predictor of unhealthy snacking and that habit strength outperformed someone intentions to eat healthily every day (Verhoeven *et al.*, 2012). The findings stated that the importance of habit strength in eating and snacking, but snacking behaviours remains unknown whether it has already become habitual during adolescence or habit strength as it is strongly associated with snacking in adolescents. This is important for us and adolescents to know because once snacking become habitual, these habits are difficult to break. If snacking proves as habitual in adolescents, this require some interventions to improve healthy eating intentions that are usually developed for adolescents (Verhoeven *et al.*, 2012).Public health strategies to support healthy snacking and lifestyle are important and actually, it is based on both an individual and environmental approach.

The individual approach including for adolescents aims to inform people about the basics of a healthy diet in such a way as to enable them to translate their knowledge into dietary practice. Adolescents usually are already fully capable of reflecting on their dietary practices and food choices. It is because autonomy become more important and adolescence's family do not influence much in their food choice. Therefore, nutritional education and knowledge for adolescents at this time could expect to be the most successful (Sichert-Hellert *et al.*, 2011). In addition, nutritional knowledge and information for adolescents are influenced by biological and social factors likes age, gender and social status (De Vriendt *et al.*, 2009).

One of the major modifiable determinants of chronic disease has come from nutrition. When practicing healthy eating habits during adolescence, the unhealthy dietary and snacking behaviours that cause fatness can be eliminated. The nutrition interventions during adolescence to increasing the consumption of fruits and vegetables and to decreasing the consumption of energy-dense foods is very important to prevent the development of chronic conditions and health problems (Piernas and Popkin, 2010b). The knowledge and useful information for adolescents along with their understanding to practice healthy dietary and snacking habits during key life stages of adolescence is required.

The availability of high calorie soft drinks beverages and food products in school vending machines should be restricted in order to improve the food environment in schools (Larson and Story, 2010). Besides that, adolescents' beverages and snack consumption was highly associated with their attitudes, perceived behavioural control and their intentions regarding the use of beverages and extra foods. The knowledge and information about healthy foods can affect and decrease the use of soft drinks and snacking behaviour (Kocken *et al.*, 2015).