UNIVERSITI PUTRA MALAYSIA

FACTORS ASSOCIATED WITH BODY WEIGHT STATUS AMONG MALAYSIAN ADOLESCENTS LIVING IN DAY-SCHOOL HOSTELS

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FPSK(M) 2016 6

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By

LAI SOKE CHING

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Master of Science

January 2016

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the Degree of Master of Science

FACTORS ASSOCIATED WITH BODY WEIGHT STATUS AMONG MALAYSIAN ADOLESCENTS LIVING IN DAY-SCHOOL HOSTELS

By

LAI SOKE CHING

January 2016

Chair : Chin Yit Siew, PhD
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The lives of adolescents in school hostels are well-managed with respect to their daily food intake and physical activity. They are likely to be physically active and are assumed to consume nutritious food. However, little is known about their body weight status and its associated factors. Thus, this study determined the association between socio-demographic characteristics, dietary practice, physical activity, knowledge, attitude and practice on healthy lifestyle, Transtheoretical Model of behavioral change on healthy diet and exercise, and body image perception with body weight status among Malaysian adolescents living in day-school hostels.

A total of 4189 school-going adolescents (aged 13 years) were involved in this study. Information on socio-demographic characteristics, dietary practice, physical activity, knowledge, attitude and practice on healthy lifestyle, Transtheoretical Model of behavioral change on healthy diet and exercise and body image were collected using a self-administered questionnaire. Body weight and height were measured while BMI-for-age (z-score) was determined using WHO Growth Reference. One day 24-hour dietary and physical activity recalls were obtained by face-to-face interview. Multivariate general linear regression analysis was conducted.

Majority of the respondents were females (59.5%), Malays (70.5%), from rural area (70.2%) and were achieved pubertal status (65.9%). The prevalence of overweight and obesity [Both sexes: 23.3% (95% Confidence Interval [CI]: 22.1, 24.7); Males: 21.7% (95% CI: 19.8, 23.8); Females: 24.5% (95% CI: 22.8, 26.2)] was about six times higher than the prevalence of thinness [Both Sexes: 4.3% (95% CI: 3.7, 5.0); Males: 5.6% (95% CI: 4.5, 6.9); Females: 3.4% (95% CI: 2.7, 4.2)] among the respondents. The mean total daily energy intake was 2070 Kcal (95% CI: 2045, 2097) and the mean total daily energy expenditure was 1965 Kcal (95% CI: 1952, 1978). The mean score for knowledge and attitude were 18.6 (95% CI: 18.4, 18.7) and 98.9 (95% CI: 98.4, 99.2), respectively. Self-efficacy and perceived benefits on healthy diet had mean score of 15.8 (95% CI: 15.7, 15.9) and 27.8 (95% CI: 27.6, 27.9), respectively. Slightly less than half of the respondents (48.9%, 95% CI: 47.4, 50.5) had correct perception on body weight, about

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one in three respondents (32.4%, 95% CI: 31.0, 33.9) satisfied with their body size and two in three respondents (68.2%, 95% CI: 66.7, 69.6) had correct perception on healthy body size.

Bivariate analysis indicated that sex, area, pubertal status, energy expenditure per kilogram body weight, knowledge and attitude on healthy lifestyle, self-efficacy and perceived benefits on exercise, body weight status perception, body size satisfaction and healthy body size perception were significantly associated with BMI-for-age of the respondents. No associations were found between ethnicity, dietary practice, physical activity level, practice on healthy lifestyle, stages of healthy diet behavioral change, stages of exercise behavioral change, self-efficacy on exercise, perceived barriers for both healthy diet and exercise, and perceived benefits for exercise with BMI-for-age of the respondents. In multivariate general linear regression model, being female (β= 0.620) having achieved pubertal status (β= 0.408), positive attitude on healthy diet (β= 0.005), better self-efficacy on healthy diet (β= -0.014), lower energy expenditure per kilogram body weight (β= -0.075), incorrect body weight status perception (β= 0.177), dissatisfaction with body size (β= 0.144), and incorrect healthy body size perception (β= 0.113) significantly contributed to the high BMI-for-age of the respondents at $p<0.05$ level of significance explaining 34.7% of the variance in BMI-for-age ($R^2=0.347$, $F=119.512$, $p<0.001$).

Dual-form of malnutrition co-exists with overweight and obesity were more prevalent than thinness. Future healthy body weight intervention programes should emphasize on sex-specific, attitude on healthy lifestyle, self-efficacy on healthy diet and body image approach among these adolescents living in day-school hostels.

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Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Master Sains

FAKTOR BERKAITAN DENGAN STATUS BERAT BADAN DALAM KALANGAN REMAJA MALAYSIA YANG TINGGAL DI ASRAMA SEKOLAH HARIAN

Oleh

LAI SOKE CHING

Januari 2016

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Kehidupan remaja di asrama sekolah adalah diurus dengan baik dari segi pengambilan makanan harian dan aktiviti fizikal. Mereka diandaikan aktif secara fizikal dan mengambil makanan berkhasiat. Walau bagaimanapun, tidak banyak yang diketahui mengenai status berat badan dan faktor yang berkaitan dengannya. Oleh itu, kajian ini bertujuan untuk menentukan perkaitan antara ciri socio-demografi, pengambilan makanan, tahap aktiviti fizikal, pengetahuan, sikap dan amalan gaya hidup sihat, Model Transtheoretical perubahan tingkah laku ke arah pemakanan yang sihat dan senaman, persepsi imej tubuh, dan status berat badan dalam kalangan remaja Malaysia yang tinggal di asrama sekolah harian.

Sejumlah 4189 remaja yang masih bersekolah (berumur 13 tahun) terlibat dalam kajian ini. Maklumat yang merangkumi ciri sosio-demografi, pengambilan pemakanan, aktiviti fizikal, pengetahuan, sikap dan amalan gaya hidup sihat, Model Transheoretical perubahan tingkah laku ke arah pemakanan yang sihat dan senaman, dan imej tubuh telah diambil daripada responden melalui borang soal-selidik. Berat badan dan tinggi telah diukur. BMI-untuk-umur (z-skor) telah ditentukan berdasarkan Rujukan Pertumbuhan WHO. Ingatan diet 24-jam dan ingatan aktiviti fizikal 24-jam telah dijalankan melalui temuduga muka-ke-muka. Analisis regresi linear berganda telah dijalankan.

Majoriti responden adalah perempuan (59.5%), Melayu (70.5%), dari kawasan luar bandar (70.2%) dan mencapai akil baligh (65.9%). Prevalens untuk berlebihan berat badan dan obesiti [Kedua-dua jantina: 23.3% (95% *Confidence Interval* [CI]: 22.1, 24.7); Lelaki: 21.7% (95% CI: 19.8, 23.8); Perempuan: 24.5% (95% CI: 22.8, 26.2)] adalah hampir enam kali lebih tinggi daripada prevalens kekurangan berat badan [Kedua-dua jantina: 4.3% (95% CI: 3.7, 5.0); Lelaki: 5.6% (95% CI: 4.5, 6.9); Perempuan: 3.4% (95% CI: 2.7, 4.2)] dalam kalangan responden. Min pengambilan tenaga sehari adalah 2070 Kcal (95% CI: 2045, 2097) dan min penggunaan tenaga sehari adalah 1965 Kcal (95% CI: 1952, 1978). Min skor pengetahuan dan sikap masing-masing adalah 18.6 (95% CI:

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18.4, 18.7) dan 98.9 (95% CI: 98.4, 99.2). Keberkesanan diri dan manfaat yang dirasakan pada pemakanan yang sihat masing-masing mempunyai min skor 15.8 (95% CI: 15.7, 15.9) dan 27.8 (95% CI: 27.6, 27.9). Hampir separuh daripada responden (48.9%, 95% CI: 47.4, 50.5) mempunyai persepsi yang betul terhadap status berat badan, iaitu satu daripada tiga responden (32.4%, 95% CI: 31.0, 33.9) berpuas hati dengan saiz tubuh mereka dan dua daripada tiga responden (68.2%, 95% CI: 66.7, 69.6) mempunyai persepsi yang betul terhadap saiz tubuh yang sihat.

Analisis bivariate menunjukkan jantina, kawasan, status akil baligh, penggunaan tenaga per kilogram berat badan, pengetahuan dan sikap ke arah hidup sihat, keberkesanan diri dan manfaat yang dirasakan daripada senaman, persepsi terhadap status berat badan, kepuasan terhadap saiz tubuh dan persepsi terhadap saiz tubuh yang sihat mempunyai perkaitan yang signifikan dengan BMI-untuk-umur responden. Tiada perkaitan didapati antara etnik, amalan pemakanan, tahap aktiviti fizikal, amalan cara hidup sihat, peringkat perubahan tingkah laku pemakanan yang sihat, peringkat-peringkat perubahan tingkah laku senaman, keberkesanan diri terhadap senaman, halangan yang dirasakan terhadap pemakanan yang sihat dan senaman, dan manfaat yang dirasakan terhadap senaman dengan BMI-untuk-umur responden.

Analisis regresi linear berganda model menunjukkan faktor seperti perempuan (β = 0.620), mencapai akil baligh (β = 0.408), sikap yang positif terhadap pemakanan yang sihat (β = 0.005), keberkesanan diri yang tinggi terhadap pemakanan yang sihat (β = -0,014), penggunaan tenaga per kilogram berat badan yang rendah (β = -0,075), persepsi terhadap status berat badan yang salah (β = 0.177), ketidakpuasan terhadap saiz tubuh (β = 0.144), persepsi terhadap saiz tubuh yang sihat yang salah (β = 0.113) menyumbang secara signifikan terhadap BMI-untuk-umur responden yang tinggi pada tahap keyakinan $p < 0.05$ menjelaskan 34.7% daripada variasi dalam BMI-untuk-umur (R^2 = 0.347, F = 119.512, p <0.001).

Dwi-bentuk malnutrisi telah wujud di mana prevalens berlebihan berat badan dan obes lebih tinggi berbanding dengan kekurangan berat badan. Program intervensi berkaitan berat badan yang sihat pada masa depan harus memberi perhatian terhadap pengkhususan kepada jantina tertentu, sikap terhadap gaya hidup sihat, keberkesanan diri terhadap pemakanan yang sihat dan imej tubuh dalam kalangan remaja yang tinggal di sekolah asrama harian.

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ACKNOWLEDGEMENT

This dissertation would not have been possible without the support and assistance of several individuals who contributed that in one way or another contributed and extended their valuable assistance in the preparation and completion of this study.

First and foremost, I would like to extend my gratitude and appreciation to my supervisor, Dr. Chin Yit Siew for her inspiration, guidance and advice throughout the study. I am deeply appreciated and grateful for her constant encouragement and support at various stages of my study.

I am thankful to Assoc. Prof. Dr. Chan Yoke Mun and Assoc. Prof. Dr. Mohd Nasir Mohd Taib for their advice, valuable comments and timely suggestions that enabled me to complete this dissertation.

I would like to express my sincere thanks to Chong Lin Siew and Lim Shiang Cheng for their encouragement and being a good companion throughout my Master degree, and research team that giving their full support and huge contribution to this study. Without their support and commitment, this study would not have come this far.

This study will not be completed without full commitment given by Ministry of Education in conducting this study at the selected school nationwide. More specifically to all the State of Department Education, school principals, teachers, students and parents for their excellent cooperation and commitment throughout the study.

Lastly, I would like to take this opportunity to record my appreciation to my family members, especially my parents, for their love, patience and unending support throughout the process.

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfillment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

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LIST OF ABBREVIATIONS

BMI	Body Mass Index
BMR	Basal Metabolic Rate
CDC	Centers for Disease Control and Prevention
CI	Confidence Interval
EI	Energy Intake
EE	Energy Expenditure
FAO	Food and Agriculture Organization
IOTF	International Obesity Task Force
IPH	Institute of Public Health
KAP-HLQ	Knowledge, Attitude, and Practice on Healthy Lifestyle Questionnaire
MET	Metabolic Equivalent
MoE	Ministry of Education
MSNS	Malaysian School-Based Nutrition Survey
MVPA	Moderate to Vigorous Physical Activity
NCCFN	National Coordinating Committee on Food and Nutrition
NHANES	National Health and Nutrition Examination Survey
NHMS	National Health and Morbidity Survey
PAL	Physical Activity Level
RM	Ringgit Malaysia
RMR	Resting Metabolic Rate
RNI	Recommended Nutrient Intakes for Malaysians
SOC	Stages of Change
SPSS	Statistical Packages for Social Sciences
TDEE	Total Daily Energy Expenditure
TTM	Transtheoretical Model
UNU	United Nations University
UPM	Universiti Putra Malaysia
WGOC	Working Group on Obesity in China
WHO	World Health Organization
RM	Ringgit Malaysia

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

World Health Organization [WHO] (2000) defined obesity as abnormal and excessive fat accumulation in the body. Obesity may impair health and is among the most common non-communicable diseases that causes morbidity and mortality throughout the world. The transitions in economic development and urbanization resulted in lifestyle changes, with increased consumption of energy-dense food and lack of physical activities (Popkin, 2001). This concomitant transition in nutrition has contributed to nutritional problem in which thinness and obesity co-exist. Globally, the rate of obesity is increasing dramatically and extended from developed countries to developing countries.

Previous studies conducted in developed countries had shown the high prevalence in overweight and obesity (Ogden, Carroll, Kit, & Flegal, 2012b, 2014; Schönbeck et al., 2011). For instance, a study conducted among Dutch children and adolescents showed increasing trend in which the prevalence have increased two to three fold in overweight and four to six fold in obesity since 1980 compared to the year 2009 (Schönbeck et al., 2011) according to the International Obesity Task Force (IOTF) Classification. Another study conducted in the United States revealed that about two in five youth (16.9%) aged 2 to 19 years old were obese (Ogden et al., 2014), which is based on the Centers for Disease Control and Prevention (CDC) BMI-for-age growth charts. However, the data remained unchanged compared with that in 2009-2010 (16.9%) (Ogden et al., 2012b), despite the high prevalence in obesity.

On the other hand, studies on Asian countries reported that the prevalence of overweight and obesity were more prevalent than thinness using different cut-offs. For example, in Vietnam, Tang et al. (2010) used the IOTF Classification to categorize body mass index according to age and found that the prevalence of overweight (14.7%) and obesity (18.9%) among adolescents aged 6-19 years was higher than the prevalence of thinness (7.6%). China, as one of the world's fastest growing economy (Gupta & Wang, 2009), reported an escalating epidemic of overweight and obesity among children and adolescents aged 7-18 years from 1985 to 2010 (male: 20.2% to 33.2%; female: 2.3% to 19.1%) by using the Working Group on Obesity in China (WGOC) standard (Zhang & Wang, 2012). In India, Gupta et al. (2011), also using the IOTF Classification, found that there has been a decline in the prevalence of thinness (11.3% to 3.9%) accompanied by an increase in the prevalence of obesity (9.8% to 11.7%) from 2006 to 2009 among urbanite adolescents aged 14-17 years in New Delhi (North India) reflecting the effects of nutrition transition (Gupta et al., 2011).

Malaysia is also currently undergoing an active epidemiological and nutrition transition with a rapid increase in adolescents overweight and obesity. Data from the National

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Health and Morbidity Survey (NHMS) III in 2006 (Institute for Public Health [IPH], 2008), which was based on the CDC 2000 reference (weight-for-age), reported that the prevalence of thinness (weight-for-age < -2SD) and overweight (weight-for-age > +2SD) among Malaysian adolescents aged less than 18 years were 13.2% and 5.4%, respectively (IPH, 2008). Subsequently, the National Health and Morbidity Survey (NHMS) IV in 2011 (IPH, 2011) has revealed that the prevalence of thinness (BMI-for-age < -2SD) and obesity (BMI-for-age > +2SD) among Malaysian adolescents aged less than 18 years were 12.2% and 6.1%, respectively (CDC 2000 reference) (IPH, 2011). The latest Malaysia School-Based Nutrition Survey 2012 focused on school-going adolescents aged 10 to 17 years reported that the prevalence of thinness (BMI-for-age < -2SD) and obesity (BMI-for-age > +2SD) were 7.4% and 12.3%, respectively. As such, the co-existence of thinness, overweight and obesity prevalent are of public health concern, particularly because obesity is a forewarning risk factor of non-communicable diseases (IPH, 2013).

Previous studies found that both under- and over-nutrition during adolescence have important short- and long-term implications. Over-nutrition among adolescents is associated with several adverse outcomes in adulthood including cardiovascular disease (Alp et al., 2014), metabolic syndrome (Steinberger & Kelly, 2014), and psychological outcomes (Brixval, Rayce, Rasmussen, Holstein, & Due, 2012). Additionally, under-nutrition during adolescence has been linked to psychiatric disorders (Bühren et al., 2013), delayed growth and pubertal development (Ferrar & Olds, 2010).

It is also noteworthy that adolescent obesity may persist into adulthood and increases the likelihood of adult morbidity and mortality (Dietz, 1998). Regardless of the reference cut-off points used for weight status, the increasing epidemic of overweight and obesity among adolescents is of worrying. Treatment of these epidemics in adolescents is challenging, and prevention is the only feasible option to curb this public health problem. Thus, a better knowledge of the body weight status and the risk factors associated with them is a pre-requisite for setting up health promotion programs.

1.2 Problem Statement

Adolescence is a period which involves dramatic physical, psychological, and cognitive changes. In order to achieve optimal growth and development during adolescence, the nutritional requirements during this period are the highest across the life span (National Coordinating Committee on Food and Nutrition [NCCFN], 2010). However, immature cognitive abilities, increasing autonomy in making decisions, and susceptibility to environmental influences during this stage may contribute to unhealthy nutritional and lifestyle choices among adolescents (Stang & Story, 2005) which in turn, may become risk factors for thinness, overweight and obesity (De-Jong et al., 2013; Law, Mohd Nasir, & Hazizi, 2013). The thinness, overweight, and obesity generation is not only a serious and costly health condition but such health complication will also affect the growth and development of the country.

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Previous local national studies revealed that thinness, overweight, and obesity coexist among adolescents in Malaysia (IPH, 2011; IPH, 2013). Meanwhile, the latest nationwide studies, focused on school-going adolescents, reported that the problem of overweight and obesity was more prevalent than the problem of thinness among school-going adolescents (IPH, 2013; Poh et al., 2013). However, most of the local nationwide studies have been conducted among school going adolescents (Baharudin et al., 2013; IPH, 2008; IPH, 2011), not adolescents attending and living in day-school hostels.

In fact, there are two types of government-financed residential schools in Malaysia, which are fully residential school (*Sekolah Berasrama Penuh*) and day-school facilitated with school-hostel (*Sekolah Berasrama Harian*) (Ministry of Education Malaysia [MoE], 2012). Fully residential school is established to nurture outstanding students to excel in academics as well as co-curriculum and students are required to live in school hostels provided. On the other hand, day-schools facilitated with school hostel is established to provide conducive and safe accommodation for less privileged students who live too far from school to commute daily. Although they moved away from home to stay in a different environment which is in school hostels, studies have yet to focus on this group of adolescents.

According to the MoE (2012), meals are standardized for all these adolescents living in school hostels and extra-curriculum activities are included in their daily schedule. Since they are likely to consume nutritious food and active in physical activity, it is hypothesized that the prevalence of overweight and obesity would be low among this group of adolescents. However, the current trend of under- and over-nutrition among adolescents is prevalent in Malaysia, and studies on nutritional status among adolescents living in day-school hostels are limited (Baharudin et al., 2014; Poh et al., 2013). Therefore, it is timely to determine whether overweight and obesity are prevalent among adolescents living in day-school hostels.

Overweight and obesity among adolescents are a multifactorial disease. Many previous studies have shown that the prevalence of overweight and obesity among adolescents appears to be associated with sociodemographic characteristics (Baharudin et al., 2013; Khambalia, Lim, Gill, & Bulgiba, 2012). Previous studies also reported that excess energy intake (Soo, Wan, Abdul, & Lee, 2011) and low physical activity level (Su et al., 2014; Teo, Nurul-Fadhilah, Aziz, Hills, & Foo, 2014) were significantly associated with overweight and obesity. Obese adolescents had higher energy intake, and the mean energy intake was above the RNI compared to normal weight and underweight counterparts (Fara Wahida, Chin, & Barakatun Nisak, 2012; Soo et al., 2011). Typical eating patterns such as meal skipping and snacking are known to be associated with overweight and obesity (Dixit et al., 2014). Meanwhile, physical activity is very much related to energy expenditure whereby an increase in moderate-vigorous physical activities predicts reduced in BMI-z-score (Trinh, Campbell, Ukoumunne, Gerner, & Wake, 2013). With the different setting in day-school hostels, do they have the similar dietary practice and physical activity?

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Meanwhile, knowledge, attitude, and practice on healthy lifestyle have been reported as factors associated with overweight and obesity (DeBar et al., 2012; Noor Aini et al., 2006; Wilson, 2007). However, previous study revealed that knowledge had a positive association with attitude but no significant association with practice (Jha, Bajracharya, & Shankar, 2013), suggesting that practice on healthy lifestyle might not in accordance with their knowledge on healthy lifestyle. It is recommended that study to be undertaken among adolescents living in day-school hostels as little is known on the level of knowledge, attitude and practice on healthy lifestyle among this group adolescents.

Concern was also given to the body image disturbances whereby higher body image discrepancy scores were more likely to have greater BMI (Farah Wahida, Mohd Nasir, & Hazizi, 2011). This is particularly obvious during adolescence as they experience significant physical changes in their body and more concern on their body image (Khor et al., 2009). Moreover, adolescents living in day-school hostels might have more peers influence as they spend greater time with peers as compared to parents. Hutchinson and Rapee (2007) had highlighted that the importance of the peer environment in body image during adolescence, specifically, girls' perceptions of their peers' body image predicted their own level of body image concern. Therefore, there is a need to understand the influences of body image concern on their body weight status among adolescents living in day-school hostels.

In addition, psychosocial behaviors such as stages of change, self-efficacy, perceived benefits and perceived barriers to healthy diet (Vereecken et al., 2009) and exercise (Lee, Nigg, Diclemente, & Courneya, 2001) were significantly associated with overweight and obesity. A local cross-sectional study reported that respondents who are in action or/ maintenance stage had higher self-efficacy and perceived benefits on fruit and vegetable intake (Wong, Zalilah, Mirlanili, & Mohd Nasir, 2014). Moreover, self-efficacy was found to be positively and directly associated with physical activity level in adolescents (de Farias Júnior, Florindo, Santos, Mota, & Barros, 2014). However, little is known about these psychological factors in relation to body weight status among adolescents living in day-school hostels.

In order to fulfill the current knowledge gap, this study assessed the prevalence of body weight status among a representative sample of Malaysian adolescents living in day-school hostels. It also aimed to investigate the possible associations between knowledge, attitude and practice on healthy lifestyle, health behavioral change on nutrition and exercise, dietary practice, physical activity as well as body image with BMI-for-age among these adolescents. Furthermore, the contribution of the above factors to BMI-for-age is determined.

1.3 Significance of the Study

The findings of this study can contribute and update the data on the prevalence of body weight status among adolescents living in day-school hostels in Malaysia. For example, the findings of the study can serve as one of the reference sources for the Ministry of

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Health on policy and program planning regarding the issue of malnutrition among adolescents living in day-school hostels in Malaysia. In addition, dietary practice data could be used by Ministry of Health in understanding the dietary practice of the adolescents, and further help in improving menu planning in school hostels.

Since the problem of under- and over-nutrition exists among adolescents in Malaysia, a study on factors associated with body weight status among adolescents is both timely and relevant. This study also determines the potential factors that contribute towards the BMI-for-age of the adolescents. Generally, this study provides an overall view of the factors relating to body weight status, as dietary practice, physical activity, behavioral change, body image, knowledge, attitude and practice on healthy lifestyle are taken into consideration. Moreover, this study provides information concerning factors which are more contributive to the variation in the body weight status of adolescents.

The result of the study is beneficial to health practitioners, such as nutritionists in providing advice to the community on concerning healthy lifestyle practice through the improvement in knowledge, attitude and practice on healthy lifestyle, modification on dietary practice and physical activity, understanding on behavioral change as well as the correct perception of body image. Additionally, policy makers, health agencies, program planners and community leaders can use this information as a reference for future research. For example, the results can serve as baseline data to develop an appropriate health intervention program to educate and promote healthy living and active lifestyle among adolescents living in day-school hostels. At the same time, findings from this study can also be used to develop a module focused on healthy living and active lifestyle as cores for any nutritional intervention program.

1.4 Objectives of the Study

1.4.1 General Objective

To determine the factors associated with BMI-for-age among adolescents living in day-school hostels in Malaysia.

1.4.2 Specific Objectives

1. To determine the body weight status among adolescents living in day-school hostels in Malaysia.
2. To determine the association between socio-demographic characteristics, dietary practice, physical activity, knowledge, attitude and practice (KAP) on healthy lifestyle, transtheoretical model of behavioral change on healthy diet and exercise, body image factors and BMI-for-age among adolescents living in day-school hostels in Malaysia.

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3. To determine the contribution of socio-demographic characteristics, dietary practice, physical activity, knowledge, attitude and practice (KAP) on healthy lifestyle, transtheoretical model of behavioral change on healthy diet and exercise, body image factors towards BMI-for-age among adolescents living in day-school hostels in Malaysia.

1.5 Null Hypothesis

1. There is no significant association between socio-demographic characteristics, dietary practice, physical activity, knowledge, attitude and practice (KAP) on healthy lifestyle, transtheoretical model of behavioral change on healthy diet and exercise, body image factors and BMI-for-age among adolescents living in day-school hostels in Malaysia.

2. There is no significant contribution of socio-demographic characteristics, dietary practice, physical activity, knowledge, attitude and practice (KAP) on healthy lifestyle, transtheoretical model of behavioral change on healthy diet and exercise, body image factors and BMI-for-age among adolescents living in day-school hostels in Malaysia.

1.6 Conceptual Framework

Overweight and obesity prevention is necessary because obesity in adolescence is a strong predictor of obesity in adulthood. Moreover, overweight and obesity is associated with a range of serious complication such as type 2 diabetes, cardiovascular disease, and psychosocial problem. Hence, it is imperative to determine the prevalence and factors associated to BMI-for-age among adolescents living in day-school hostels in Malaysia as depicted in Figure 1.1. In the present study, knowledge, attitude and practice on healthy lifestyle, behavioral change, dietary practice, physical activity, body image, are proposed as influencing factors that may predict overweight and obesity among adolescents living in day-school hostels in Malaysia.

Knowledge is considered a prerequisite to intentional performance of health-related behaviors (Worsley, 2002). As knowledge in the health behaviors domain accumulates, changes in attitude are initiated. When changes in attitude accumulate over a period, it results in behavioral changes. For example, knowledge in nutrition knowledge was positively and significantly related to attitude (Webb & Beckford, 2014) and affect the dietary quality (Lin, Yang, Hang, & Pan, 2007). Therefore, this further predicts the occurrences of overweight and obesity.

The Transtheoretical Model (TTM) uses several constructs from other health behavior theories which offer a view of when, how and why people change their behavior (Prochaska & Velicer, 1997). This model includes two levels: i) the stages of change

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(SOC), which reflect the temporal dimension of the behavior, and ii) a set of constructs that explain how people evolve along the SOC. These are named decisional balance, representing the perceived benefits and perceived barriers of engaging in behavior, and self-efficacy, reflecting the person's confidence in performing health behavioral change (Prochaska & Velicer, 1997).

As for the dietary practice, the present study includes eating behavior as a risk factor for overweight and obesity. Many studies have confirmed the association between meal skipping behavior and overweight (de Gouw et al., 2010; Stea, Vik, Bere, Svendsen, & Oellingrath, 2014). Adolescents who ate five meals a day have a lower risk for overweight/ obesity (Jääskeläinen et al., 2013) whereas breakfast skippers have higher body mass index-for-age z scores (Deshmukh-Taskar et al., 2010b). Indeed, meal skipping contributes to frequent snacking behavior which in turn contributes to higher energy intake (Teo, Sedek, & Zalifah, 2012).

On the other hand, physical activity, which encompasses physical activity level and energy balance (Al-Haifi et al., 2013; de Gouw et al., 2010; Pahkala et al., 2013) are known to be associated with overweight and obesity. Sustained increase in moderate-vigorous physical activities predicts reduced BMI scores (z-score) (Trinh et al., 2013). Watching more television and using the computer more were associated with overweight and obesity (de Gouw et al., 2010).

The body image perception is also included in the present study. Previous findings have identified the perception of body weight, and perception of body size are directly and indirectly contributing to overweight and obesity (Alwan, Viswanathan, Paccaud, & Bovet, 2011; Perkins, Perkins, & Craig, 2010; Perkins, Perkins, & Craig, 2014). For example, a study by Perkin, Perkin and Craig (2010) found that overestimating peer weight norms was associated with greater risk of being overweight and underestimating peer weight norms was associated with greater risk for being underweight while accurate perception were more likely to have appropriate weight-control behavior (Alwan et al., 2011).

In summary, as shown in Figure 1.1, factors explaining the development of BMI-for-age are supported by previous studies and empirical literature. Hence, the present study would focus on knowledge, attitude and practice on healthy lifestyle, behavioral change, dietary practice, physical activity and body image as independent variables which contribute to body weight status among adolescents living in day-school hostels in Malaysia.

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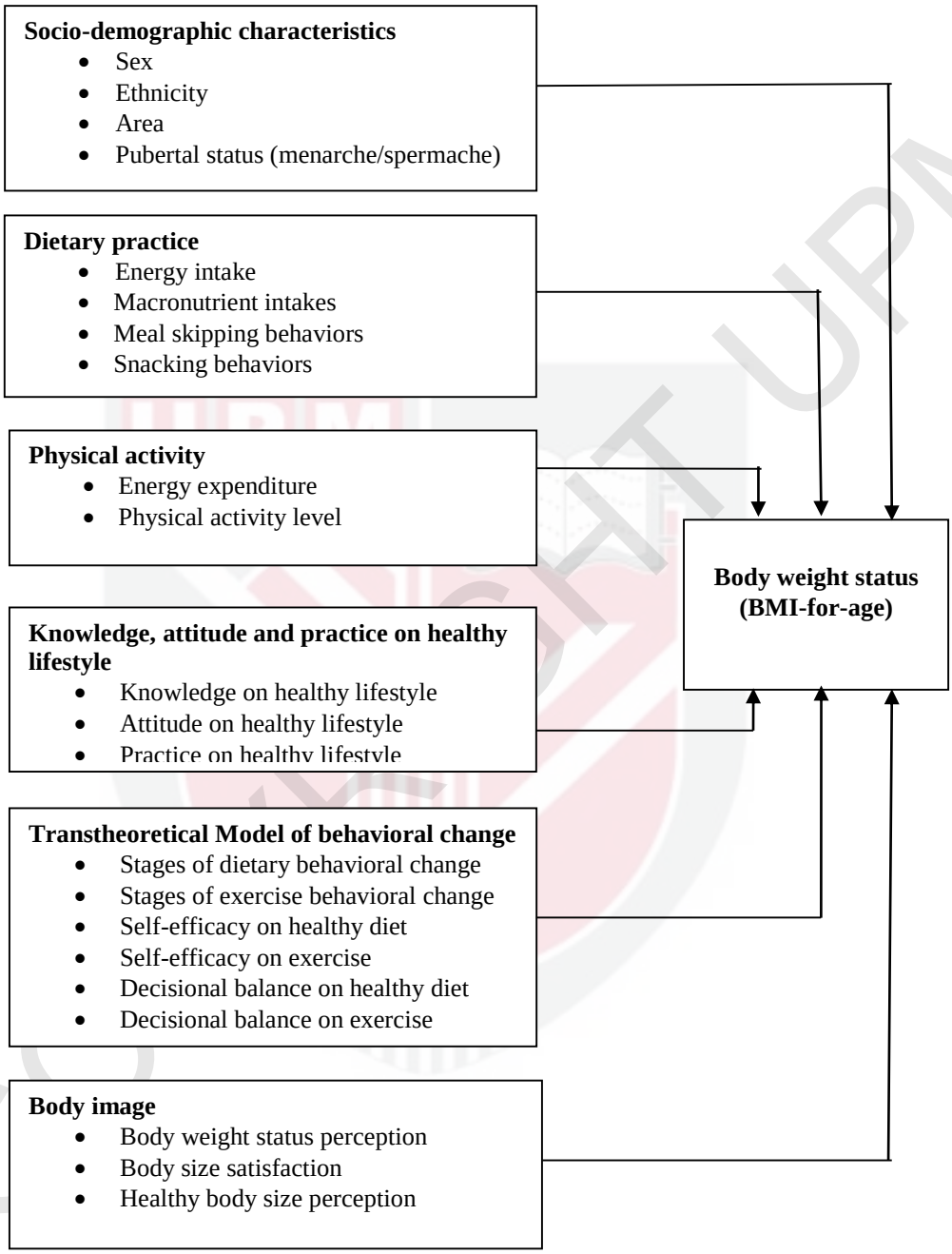

Figure 1.1: Conceptual framework

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