



UNIVERSITI PUTRA MALAYSIA

***EFFECTIVENESS OF AN INTEGRATED SCHOOL-BASED
INTERVENTION PROGRAMME IN REDUCING BMI AND BMI Z-SCORES
AMONG ADOLESCENTS IN SEREMBAN, NEGERI SEMBILAN,
MALAYSIA***

LAI WAI KENT

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By

LAI WAI KENT

**Thesis Submitted to the School of Graduate Studies, Universiti Putra
Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of
Philosophy**

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Doctor of Philosophy

EFFECTIVENESS OF AN INTEGRATED SCHOOL-BASED INTERVENTION PROGRAMME IN REDUCING BMI AND BMI Z-SCORES AMONG ADOLESCENTS IN SEREMBAN, NEGERI SEMBILAN, MALAYSIA

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July 2021

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Recent evidence demonstrated substantial rise in the worldwide prevalence of childhood overweight and obesity. However, little is known about the prevalence and its association with socio-demographic, behavioural and psychosocial factors in Malaysia. Furthermore, there's great potential for schools to develop and encourage healthy lifestyle in students.

The objectives of the study were to determine the prevalence and predictors of overweight and obesity among adolescents, and to evaluate the effectiveness of an integrated school-based intervention programme.

This study had two phases. Phase one was a cross-sectional study involving 2,221 adolescents who were randomly selected from eight secondary schools in Seremban, Negeri Sembilan. Questionnaire was administered to assess socio-demographic, meal patterns, physical activity level, self-efficacy, self-esteem, body satisfaction, perception of body image and weight management, depression, anxiety, stress and nutrition knowledge. Body weight and height were measured and BMI-for-age z-scores (BAZ) were computed. Multivariable logistic regression was used to test the associations between predictors and the outcome variable.

In phase two, an integrated school-based intervention programme was developed based on the predictors and Social Cognitive Theory which focused on knowledge, self-efficacy, goal-setting, self-monitoring, problem solving and relapse prevention. A cluster randomised controlled trial was conducted to evaluate the effect of the intervention consisting of five-session, bi-weekly for 10 weeks (n = 200) and compared with control group (n = 200). The primary

outcomes were BMI and BAZ, whereas the secondary outcomes were breakfast consumption, physical activity level, self-efficacy, and body satisfaction which were measured by frequency of breakfast consumption, Physical Activity Questionnaire for Older Children, Healthy Eating and Weight Self-Efficacy scale, Perceived Physical Activity Self-Efficacy Scale for Adolescents and Contour Drawing Rating Scale, respectively. Generalised linear mixed model analysis was used to examine the effectiveness of the intervention at baseline, immediate post-intervention, and 3-month post-intervention, while controlling for covariates.

The response rate of phase one was 83.5%. The prevalence of overweight among participants was 17.0%, while the prevalence of obesity was 14.9%. The significant predictors of overweight and obesity were breakfast skipping, low physical activity level, low healthy eating and weight self-efficacy scores, low perceived physical activity self-efficacy scores, body dissatisfaction and perception of large body size. In phase two, the response rate was 80.3%. A significant intervention effect was found in reducing BMI and BAZ. BMI of the participants in the intervention group was reduced from 28.10 kg/m² to 27.93 kg/m², and further decreased to 27.80 kg/m², while BAZ was reduced from 2.19 to 2.12, and further decreased to 2.07, from baseline to immediate post-intervention, and 3-month follow-up, respectively. Furthermore, there was significant improvement in breakfast consumption frequency, physical activity scores, healthy eating and weight self-efficacy scores, perceived physical activity self-efficacy scores, and body discrepancy scores as compared with the control group.

The integrated school-based intervention programme was effective in reducing BMI and BAZ among overweight and obese participants. The results suggested that this programme could be integrated as one of the regular school co-curricular programmes.

Keywords: School-based intervention, overweight, obesity, adolescent, cluster randomised controlled trial

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

**KEBERKESANAN PROGRAM INTERVENSI BERSEPADU YANG
BERASASKAN SEKOLAH DALAM MENGURANGKAN INDEKS JISIM
BADAN DAN Z-SKOR INDEKS JISIM BADAN DALAM KALANGAN REMAJA
DI SEREMBAN, NEGERI SEMBILAN, MALAYSIA**

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Prevalens berat badan berlebihan dan obesiti dalam kalangan kanak-kanak dan remaja telah meningkat secara ketara. Walau bagaimanapun, sedikit diketahui mengenai hubungkait antara prevalens tersebut dengan faktor sosio-demografi, tingkah laku dan psikososial di Malaysia. Di samping itu, terdapat potensi untuk sekolah membangun dan menggalakkan gaya hidup sihat dalam kalangan pelajar.

Objektif kajian adalah untuk menentukan prevalens dan peramal berat badan berlebihan dan obesiti dalam kalangan remaja serta menilai keberkesanan program intervensi bersepadu yang berasaskan sekolah.

Terdapat dua fasa dalam kajian ini. Fasa pertama adalah kajian keratan rentas dan melibatkan 2,221 remaja yang dipilih secara rawak dari lapan sekolah menengah di Seremban, Negeri Sembilan. Borang soal selidik digunakan untuk mengumpul data mengenai profil sosio-demografi, corak pemakanan, aktiviti fizikal, efikasi sendiri, harga diri, persepsi imej tubuh, persepsi pengurusan berat badan, kemurungan, kegelisahan, tekanan, pengetahuan mengenai pemakanan, berat badan dan ketinggian dikumpul dan dianalisa. Multivariabel regresi logistik digunakan untuk menentukan hubungkait antara peramal dan pembolehubah hasil.

Pada fasa kedua, program intervensi bersepadu berasaskan sekolah dibangunkan berdasarkan peramal dan Teori Sosial Kognitif yang menumpukan pada strategi seperti memperkenalkan pengetahuan, efikasi sendiri, penetapan matlamat, pemantauan diri, penyelesaian masalah dan pencegahan berulang. Kajian percubaan rawak berkelompok dijalankan untuk menilai keberkesanan

intervensi yang terdiri daripada lima sesi yang berlangsung dua seminggu sekali selama 10 minggu ($n = 200$) berbanding dengan kumpulan kawalan ($n = 200$). Hasil utama adalah indeks jisim badan (IJB) dan IJB z-skor, manakala hasil kedua adalah pengambilan sarapan, tahap aktiviti fizikal, efikasi sendiri dan kepuasan saiz tubuh diukur dengan kekerapan pengambilan sarapan, Soal Selidik Aktiviti Fizikal untuk Kanak-Kanak yang Lebih Tua (PAQ-C), Skala Efikasi Kendiri Pemakanan dan Berat Sihat (HEWSE), Skala Efikasi Kendiri Aktiviti Fizikal untuk Remaja dan Skala Penilaian Lukisan Kontur, masing-masing. Analisis Generalised linear mixed model (GLMM) digunakan untuk menilai keberkesanan intervensi pada pengukuran awal, seurus selepas intervensi, dan 3-bulan selepas intervensi, di samping mengambil kira kovariat.

Kadar respons pada fasa pertama adalah 83.5%. Prevalens berat badan berlebihan dalam kalangan peserta kajian ini adalah 17.0%, manakala prevalens obesiti adalah 14.9%. Penyebab-penyebab signifikan berat badan berlebihan dan obesiti dalam kajian ini adalah tidak mengambil sarapan, tahap aktiviti fizikal, efikasi sendiri dalam pemakanan sihat, berat badan sihat, dan aktiviti fizikal yang rendah, ketidakpuasan badan serta persepsi saiz badan yang besar. Pada fasa kedua, kadar respons adalah 80.3%. Kesan intervensi yang signifikan didapati dalam mengurangkan IJB dan z-skor IJB. IJB peserta dalam kumpulan intervensi berkurang dari 28.10 kg/m² ke 27.93 kg/m², dan menurun berterusan ke 27.80 kg/m², manakala IJB z-skor berkurang dari 2.19 ke 2.12, dan menurun berterusan ke 2.07, dari pengukuran awal sehingga seurus selepas intervensi, dan 3-bulan selepas intervensi, masing-masing. Di samping itu, terdapat peningkatan signifikan pada kekerapan pengambilan sarapan, skor aktiviti fizikal, skor efikasi sendiri pemakanan dan berat sihat, skor efikasi sendiri aktiviti fizikal, dan skor perbezaan badan berbanding dengan kumpulan kawalan.

Program intervensi bersepadu berasaskan sekolah adalah berkesan dalam mengurangkan IJB dan IJB z-skor dalam kalangan peserta yang berlebihan berat badan dan gemuk. Hasil kajian ini juga menunjukkan bahawa program ini dapat dijadikan sebagai salah satu program kokurikulum di sekolah.

Kata kunci: intervensi berasaskan sekolah, berat badan berlebihan, obesiti, remaja, percubaan rawak terkawal kluster

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

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LIST OF ABBREVIATIONS

ADRS	Adolescent Depression Rating Scale
BAZ	BMI-for-age z-scores
BMI	Body mass index
BYI-II	Beck Youth Inventories, second edition
C-HAT	<i>Cara Hidup Anda Terbaik</i> (Your Best Lifestyle)
CASPIAN-IV	Childhood and Adolescence Surveillance and Prevention of Adult Non-communicable disease
CBCL	Child behaviour checklist
CDI	Children's Depression Inventory
CDC	Centre for Disease Control
CES-D	Centre for Epidemiological Studies Depression Scale
CES-DC	Centre for Epidemiological Studies Depression Scale for Children
CI	Confidence interval
CLICK-Obesity	Comprehensive lifestyle intervention among Chinese kids against obesity
CONSORT	Consolidated Standards of Reporting Trials
CSH	Comprehensive School Health
DASS	Depression, Anxiety and Stress scale
EPaL	Eat Right, Be Positive about Your Body and Live Actively
FGD	Focus group discussion
GAD-7	Generalised Anxiety Disorder Scale
GHQ-12	General Health Questionnaires
GLMM	Generalised Linear Mixed Model
GSHS	Global School-based Student Health Survey
HBI	Healthy Body Image Curriculum

HBSC	Health Behaviour in School Children
HCDE	Home-Collaborative Dietary Education
Health-E-PALs	Healthy Eating and Physical Activity in Lebanese School Children
HealthKick	Healthy Lifestyle Intervention
HEI-2010	Healthy Eating Index
HEWSE	Healthy eating and weight self-efficacy scale
HiTS	<i>Hidangan Berkhasiat di Sekolah</i> (Healthy Meals in School)
HPM	Pender's health promotion model
ICC	Intraclass correlation
ICD-10	International Classification of Diseases 10th revision
IOTF	International Obesity Task Force
IPH	Institute for Public Health
ITT	Intention to treat
MASO	Malaysian Association for the Study of Obesity
MB-EAT-A	Mindfulness-Based Eating Awareness Training Program for Adolescents
MDA	Malaysian Dietitian's Association
MOE	Ministry of Education
MOH	Ministry of Health
MyHeARTs	Malaysian Health and Adolescent Longitudinal Research study
NCD	Non-communicable disease
NCD-RisC	Non-communicable disease Risk Factor Collaboration
NHANES	National Health and Nutrition Examination Survey
NHMS	National Health and Morbidity Survey
NICE	National Institute for Health and Care Excellence

NMRR	National medical research register
NSM	Nutrition Society Malaysia
OR	Odds ratio
PAQ-C	Physical Activity Questionnaire for Older Children
PHQ-9	Patient Health Questionnaire
PPASC	Perceived Physical Ability Scale for Children
PROSTAR	<i>Program Sihat Tanpa AIDS untuk Remaja</i> (Healthy Programme Without AIDS for Youth)
RCT	Randomised controlled trial
ROC	Receiver Operating Characteristic
RSES	Rosenberg Self-Esteem Scale
SCARED	Screen for Child Anxiety Related Disorders
SCT	Social cognitive theory
SD	Standard deviation
SDQ	Strengths and Difficulties Questionnaire
SPOM	Strategy for the Prevention of Obesity – Malaysia
SPPA-R	Self-Perception Profile for Adolescents – Revised
SPPC	Self-Perception Profile for Children
SPSS	Statistical package for social sciences
STAI	State-Trait Anxiety Inventory
STAI-C	State-Trait Anxiety Inventory for Children
UK	United Kingdom
US	United States
USPSTF	US Preventive Services Task Force
WC	Waist circumference
WHO	World Health Organisation

CHAPTER 1

INTRODUCTION

1.1 Background

Obesity is recognised as a serious public health threat and a global epidemic (Wang & Lim, 2014) and some have even described it as a global pandemic (Popkin et al., 2012; Roth et al., 2004; Swinburn et al., 2011). Childhood overweight is defined as having a body mass index (BMI)-for-age and sex greater than or equivalent to one standard deviation, while childhood obesity is defined as having a BMI-for-age and sex greater than or equivalent to two standard deviations (de Onis et al., 2007). Recent evidence has warned the alarming rise in the rate of prevalence of childhood overweight and obesity throughout the world. According to the Non-Communicable Disease Risk Factor Collaboration (NCD-RisC) report on the estimated trends for body weight status among children and adolescents aged five to 19 years from 1975 to 2016 in 200 countries, the global age standardised prevalence of obesity in children and adolescents increased from 0.7% to 5.6% among girls, and from 0.9% to 7.8% among boys (NCD Risk Factor Collaboration, 2017). In terms of numbers, obese girls increased from five million to 50 million in between 1975 and 2016, while the number of obese boys grew from six million to 74 million in between 1975 and 2016. In addition, there were 213 million overweight children and adolescents in 2016. The report also mentioned that although the rise in mean BMI for children's and adolescents has plateaued in many high-income countries since 2000, it has however accelerated in south, east, and southeast Asia. These results concur with findings of a study which found that the growth in excess weight among children and adolescents has plateaued in countries with high-income, but continued to grow in countries with low- and middle-income (Ng et al., 2014). The plateauing of children's and adolescents' BMI in high-income countries, while adult BMI persists to increase, might be due to specific initiatives by the government, schools, community groups, and notable individuals who have increased public awareness about childhood overweight and obesity, leading to changes in nutrition and activities that are adequate to restrain the rise in mean BMI (NCD Risk Factor Collaboration, 2017).

The increase in obesity is commonly acknowledged as a consequence of an inequality between energy consumption and expenditure, with an increase in positive energy balance being strongly correlated with the lifestyle adopted and dietary intake preferences (Sahoo et al., 2015). By using the Ecological Systems Theory, Davison and Birch (2001) suggested that food consumption, physical activity, and sedentary behaviour are risk factors for childhood obesity. The impact of such risk factors is moderated by factors such as age, gender, as well as susceptibility to weight gain. The development of such risk factors is determined by parenting practices and familial characteristics, such as parents' food consumption and activity behaviours, nutritional knowledge, child feeding practices, along with peer and sibling interactions. In addition, school

environment characteristics, such as structured periods for activity and dietary quality of school lunches, as well as community, demographic, and larger environmental factors, for instance parent work-related demands (i.e., work hours and leisure time), ethnic background, availability and accessibility of the recreational facilities, influence parenting styles and children's daily eating and activity patterns. Nonetheless, there is increasing evidence suggesting that an individual's genetic background is important in determining obesity risk (Sahoo et al., 2015). In addition, obesity is a complex disorder caused by multiple genetic and non-genetic factors (Han et al., 2010).

Obesity-related medical conditions affect almost every organ system in the body. It is associated with a wide range of adverse health consequences including sleep problems, respiratory problems, gastrointestinal problems, endocrine disorders, nervous system disorders, cardiovascular risk factors, orthopaedic disorders and psychiatric disorders (Barlow, 2007). Psychological comorbidities, such as depression, poorer perceived health-related quality of life, emotional and behavioural disorders and self-esteem are adversely associated with childhood overweight or obesity (Rankin et al., 2016). Overweight and obese children experience significantly more bullying than normal-weight children (Van Geel et al., 2014). Many overweight children experience weight-teasing by peers and family members, and are bothered by the teasing which is associated with disordered eating behaviours that may subsequently place them at increased risk for weight gain (Neumark-Sztainer et al., 2002).

In addition, childhood overweight and obesity often persist into adulthood and thus increase the risks of developing non-communicable diseases (NCDs) such as diabetes and cardiovascular diseases at a younger age (World Health Organization, 2016). A review has suggested that being overweight and obese during childhood and adolescence have adverse consequences on premature mortality and physical morbidity in adulthood (Reilly & Kelly, 2011).

The implications of the dramatic rise in obesity not only include health consequences, but also the increased financial burden at societal levels (Wang & Lim, 2014). Research on the economic effects of childhood obesity is scarce compared with that of adult obesity. However, the evidence indicates that early onset of childhood obesity has substantial economic consequences to individuals and society if a life-time perspective is taken. While the short-term incremental economic costs of childhood obesity may be comparatively small, the early onset of obesity and its associated chronic diseases may affect the lifelong educational and labour force consequences of a person, thus placing a substantial long-term burden on health-care systems, employers, and society as a whole (World Health Organization, 2016).

The growth in the prevalence of obesity and its complications highlight the global need for improved strategies in obesity prevention and control (Dietz et al., 2015). Prevention is always desirable to treatment and is commonly seen as the best approach to reverse the growing worldwide prevalence of obesity,

particularly because body weight tracks from childhood into adulthood (Johnson et al., 2006). Early detection and treatment for obesity in children aged six years and older may result in weight status improvements (Force, 2017).

1.2 Problem statement

Adolescence can be defined as a transitional period between childhood and adulthood. The transition into adolescence is defined by the biological and social-psychological experience of puberty, neuro-cognitive and emotional development; changes in social relationships with parents, family members, friends, and peers; and emergence of romantic interest (Graber & Hill, 2014). Changes in adolescence influence the disease spectrum and health-related behaviours; they are responsible for the epidemiological transition that takes place during the second decade from infectious diseases to non-communicable conditions (World Health Organization, 2014). Kim-Spoon and Farley (2014) suggested some predictors of health-risk behaviours among adolescents including physical vulnerability (physical condition and environment in which adolescents grow up), cognitive vulnerability (immaturity in brain development, heightened reward sensitivity, reduced cognitive control, poor working memory, less effortful control and negative attributional styles), and emotional vulnerability (poor emotion regulation and avoidance coping strategies). Adolescents' developing capacities influence how they expect about their health and future, and what affects their decisions and actions (World Health Organization, 2014). Health-related decisions made during adolescence track strongly into adulthood, either leading to or moderating a social burden of illness (Sadler & Gupta, 2014).

The trend in children's and adolescents' mean BMI has accelerated in Southeast Asian countries (NCD Risk Factor Collaboration, 2017). Among these countries, Malaysia ranks top in terms of prevalence of childhood obesity (Ng et al., 2014). In Malaysia, according to the National Health and Morbidity Survey (NHMS), the prevalence of obesity among children under 18 years has increased substantially between 2011, 2015 and 2017 from just 6.1% to 11.9% and to 14.8%, respectively (Institute for Public Health, 2017a; Institute for Public Health, 2015; Institute for Public Health, 2011). These could be related to the nutrition transition associated with changes in the foods and beverages consumed along with reduced physical activity. In Malaysia, the underlying causes of nutrition transition are associated with the food environment, changes in lifestyle and behaviour as well as government policies, including taxes and subsidies (Goh et al., 2020). However, there is a lack of the prevalence of overweight and obesity and its association with socio-demographic, behavioural and psychosocial factors.

Djalalinia et al. (2015) reviewed that obesity is a risk factor for metabolic disorders and leads to serious health consequences for individuals and burden for the health care system as a whole. The review also mentioned that obese individuals were more often suffer from significant joint pains, disorders and they also experienced social and psychological impairments.

Taking into account of the prevalence, health consequences, and cost associated with childhood obesity, there has been considerable benefits in determining successful interventions to avoid or manage weight gain in children and adolescents (Bleich et al., 2018). Reviews on changing health behaviours have shown that interventions based on theory or theoretical constructs are more effective than those lacking a theoretical base (Glanz & Bishop, 2010). In addition, for intervention to be effective, behaviour change techniques (BCTs) should target relevant mechanisms of action described in behavioural theory (Michie et al., 2018).

Social cognitive theory (SCT) was used to frame this study. This theory proposes a multidimensional causal framework in which self-efficacy beliefs interact with goals, outcome expectations, and perceived environmental barriers and facilitators in the regulation of human motivation, behaviour, and well-being (Bandura, 2004). SCT provides a comprehensive and well-supported conceptual framework for understanding the factors that influence human behaviour and the process through which learning occurs, offering insight into a wide variety of health-related issues.

There is great potential for schools to develop and encourage a healthy lifestyle in children across all socio-economic and ethnic disparities (Siegrist et al., 2011). As Crocker and Yanovski (2009) suggested, behaviour change as an approach to weight loss may include motivation to increase physical activity and reduce screen time, psychological training to encourage improvements in eating habits or exercise, family counselling to support weight loss goals, and school-based changes to promote healthy eating and physical activity. These approaches also include regular visits with a counsellor individually or in group sessions.

Some health promotional activities are conducted in schools, for instance, Young Doctor Club (*Kelab Doktor Muda*), PROSTAR (abbreviation for “Program Sihat Tanpa AIDS untuk Remaja”, Healthy Programme Without AIDS for Youth), C-HAT (abbreviation for “Cara Hidup Anda Terbaik”, Your Best Lifestyle) and HiTS (abbreviation for “Hidangan Berkhasiat di Sekolah”, Healthy Meals in School). These programmes are developed from the collaboration between Ministry of Health and Ministry of Education through the concept of empowerment. However, these programmes are only existed in selected schools and the effectiveness of the programme is not evaluated. There were other school-based intervention studies have been done in Malaysia, but the findings are not disseminated across agencies and public.

This study aimed to explore the prevalence of overweight and obesity among a representative sample of Malaysian, school-going adolescents. It also aimed to investigate the possible associations and contributions of behavioural, psychosocial and psychological factors with body weight status among these adolescents. Furthermore, the study was also intended to evaluate the effectiveness of an integrated school-based intervention which were developed

based on the predictors and SCT by conducting cluster randomised controlled trial.

1.3 Significance of study

The findings of this study can contribute towards the update of data on body weight status among school-going adolescents in Seremban, Negeri Sembilan. Findings of this study could provide better understanding on the predictors of overweight and obesity among adolescents. By determining the significant predictors of overweight and obesity, it would enable researchers to better help the community in addressing the problems and planning preventive measures. Results of this study can also help to highlight areas of deficiencies in adolescents' daily practices.

A school-based intervention programme has been developed based on the predictors, literature search and social cognitive theory. The intervention would benefit the participants by creating awareness about their current body weight status through series of health education sessions. In addition, strategies for promoting healthy diet, physical activity and mental health, skills to cope with the current problems had been integrated into this health education tool to help them in moving towards a healthy and active lifestyle.

This intervention if proven effective would be useful for improvement in the school health programme. This study would benefit the healthcare and/or education providers as they would be able to use the modules developed in this study in the prevention of overweight and obesity among adolescents.

1.4 Research questions

The following research questions guided this study:

1. What is the prevalence of overweight and obesity among the adolescents?
2. What are the predictors of overweight and obesity among the adolescents?
3. Is the intervention programme effective in reducing participants' BMI and BMI z-scores?
4. Is the intervention programme effective in:
 - a) improving participants' frequency of breakfast consumption?
 - b) increasing participants' physical activity level?
5. Is the intervention programme effective in:
 - a) improving participants' healthy eating and weight self-efficacy?
 - b) improving participants' physical activity self-efficacy?
 - c) improving participants' body image dissatisfaction?

1.5 General description of study

This study consists of two phases. Phase one of the study is a cross-sectional study to determine the prevalence and predictors of overweight and obesity among adolescents in Seremban, Negeri Sembilan. Phase two of the study is a two-arm parallel, single blinded, cluster randomised controlled trial of an intervention programme for the same cohort of adolescents in Seremban, Negeri Sembilan.

1.6 Significance of study

1.6.1 Phase one

1.6.1.1 General objective

To determine the prevalence and predictors of overweight and obesity among adolescents in Seremban, Negeri Sembilan.

1.6.1.2 Specific objectives

1. To determine the socio-demographic characteristics (sex, ethnicity and age), behavioural factors (eating behaviour, physical activity level), personal factors (healthy eating and weight self-efficacy, physical activity self-efficacy, self-esteem, body image perception, perception of weight management, depression, anxiety, stress and nutrition knowledge) of the adolescents in Seremban, Negeri Sembilan.
2. To determine the prevalence of body weight status (severe thinness, thinness, normal, overweight, obesity) of the adolescents in Seremban, Negeri Sembilan.
3. To determine associations between socio-demographic profiles, nutritional assessment, physical activity level, self-efficacy, self-esteem, perception of body image, perception of weight management, depression, anxiety and stress, nutrition knowledge, and body weight status among adolescents in Seremban, Negeri Sembilan.
4. To determine the predictors of overweight and obesity among adolescents in Seremban, Negeri Sembilan.

1.6.2 Phase two

1.6.2.1 General objective

To develop, implement and evaluate the effectiveness of an integrated school-based intervention programme among overweight and obese adolescents in Seremban, Negeri Sembilan.

1.6.1.2 Specific objectives

1. To develop an integrated school-based intervention programme among overweight and obese adolescents in Seremban, Negeri Sembilan.
2. To determine the socio-demographic characteristics, anthropometric measurements, behavioural factors (breakfast consumption, physical activity level) and personal factors (healthy eating and weight self-efficacy, physical activity self-efficacy, and body satisfaction) of the participants in the intervention and control groups at baseline.
3. To implement and evaluate the effects of the intervention (between and within groups) at immediate post-intervention and 3-month post-intervention on:
 - a) participants' anthropometric measurements (BMI and BMI z-scores).
 - b) participants' breakfast consumption and physical activity.
 - c) participants' healthy eating and weight self-efficacy, physical activity self-efficacy and body satisfaction.

1.7 Research hypotheses

1.7.1 Phase one

1. Socio-demographic characteristics, behavioural factors and personal factors are significantly associated with body weight status among adolescents in Seremban, Negeri Sembilan.
2. Socio-demographic characteristics, behavioural factors and personal factors are significant predictors of body weight status among adolescents in Seremban, Negeri Sembilan.

1.7.2 Phase two

1. The intervention programme is effective in reducing participants' BMI and BMI z-scores.
2. The intervention programme is effective in:
 - a) improving participants' frequency of breakfast consumption

- b) increasing participants' physical activity level
- 3. The intervention programme is effective in:
 - a) improving participants' healthy eating and weight self-efficacy
 - b) improving participants' physical activity self-efficacy
 - c) improving participants' body satisfaction



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