

Socio-Demographic, Dietary and Physical Activity Determinants of Adolescents Overweight and Obesity in Kelantan

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ABSTRACT: The increasing prevalence of overweight and obesity among adolescents in Malaysia has become a serious epidemic. The objective of this study was to determine the association between socio-demographic, dietary habits and physical activity risk factors with overweight and obesity prevalence. A cross-sectional study was conducted among 178 secondary school students aged 13 to 16 years old in Bachok district (n=88) and Kota Bharu district (n=90). A self-administered questionnaire on demographic, socio-economic status, dietary habits and physical activity information was used; standard anthropometric measurements: body weight, height and body mass index (BMI) were obtained. Results show that the mean BMI of the respondents was 21.04 ± 4.87 kg/m². The prevalence of overweight and obesity (30%) was greater among respondents from Kota Bharu district as compared to Bachok district. The mean household income of the respondents from Kota Bharu district was significantly greater than that of Bachok ($p < 0.05$). Data also showed a significant association between students' residence, household income, frequency of fast food consumption, breakfast skipping and physical activity with overweight and obesity prevalence ($p < 0.05$). In conclusion these findings demonstrated the contributing factors towards body weight problems among the adolescents. This information is useful for the planning of health and nutrition programmes as well as intervention strategies to combat adolescent obesity.

Keywords: Adolescent, overweight, obesity

Introduction

The Malaysian population is increasing from year to year as reported by the Malaysian Department of Statistics. For instance the population was 26.1 million in 2004 and this number has increased to 27.2 million in 2007. Moy *et al.* (2004) showed that 20% of the Malaysian population comprised children and adolescents who aged between 5 to 20 years old. In United States, it was noticed that the increasing obesity rate in children was parallel with that of adults (Matthew *et*

al., 2003). These trends are alarming because obese children tend to become obese adults. Note that childhood obesity is often associated with a plethora of psychosocial disorders and cardiovascular disease risk factors (Fagot *et al.*, 2001; Freedman *et al.*, 2001; Sinha *et al.*, 2002).

Upsurge in adolescent obesity could be explained by many related factors that influence energy intake or expenditure. The imbalance food intake which is high in fat and cholesterol but low in fiber content is

blamed to be the main culprit. Also, lack of physical activities is believed to cause obesity (Phupakdi *et al.*, 2005). In fact, increasing consumption of fast foods, convenient or ready-to-eat meals, soft drinks, junk foods and sweets were evident. It is noted that, physical patterns in adolescents have also been deviated from playing at the field to playing computer games, watching television and the internet. Excessive food intake which is carbohydrate dominant, also raises great concerns.

Body weight is also associated with various factors such as personal attitude and behaviour towards food, ethnicity and genetic, environmental issues, local culture and family economic status. The rapid development in economy and industries was witnessed especially in cities in the past few decades. This in turn creates health discrepancies between urban and rural areas including weight problems (Moy *et al.*, 2004). Thus, residence factor should be a crucial aspect to be paid attention. Prevalence of overweight in urban cities as compared to the rural areas was 21.8% and 15.2% (Mohd, 2002). The rise of economic level and living standard as well as the phenomena of both working parents in the family will eventually increase the children's pocket money. With the raise in spending capacity, the teenagers would be easily

influenced by mass media in their food attitude and behaviour, eating habits, social and physical activities.

The socio-ecological model was the conceptual framework that guided the selection of variables in this study. It recognizes the interwoven relationship that exists between the individual and their environment (Moore, 2011). This paradigm characterizes environmental settings as having multiple physical, social and cultural dimensions that can influence the variety of health outcomes (WHO, 1984). In our study, the first level- individual identifies the biological and personal factors that related to the problem of overweight and obesity, for instance, sex, age, personal lifestyle, dietary habit and physical activity. The second examines the effects of a person's closest social circle- family members, teachers and peers, on influencing their food choices. The third level explores the physical settings such as residence, schools and neighbourhood which pose an effect on the issue of children and adolescent body weight problem. The fourth level looks at the broad societal factors, including social and cultural norms, economy, mass media, educational and social policies which would be associated to the above issue.

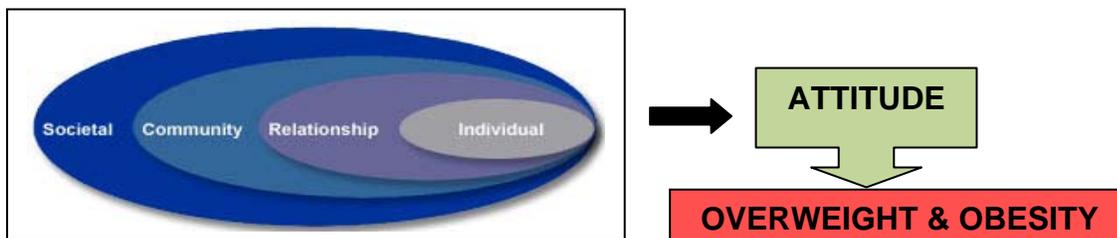


FIGURE 1- Socio-ecological Model

The aim of the study was to determine the association between socio-demographic, dietary habits and physical activity risk factors with overweight and obesity prevalence among adolescents in Kelantan.

Methodology

Study background

This cross sectional study was conducted from January to February 2008. Three schools were chosen purposively from Kota Bharu districtly, namely SMK Kubang Kerian 1, SMK Kubang Kerian II, SMK Kota Bharu whereas SMK Bachok, SMK Badak, and SMK Long Yunus were from Bachok district. Permission to conduct the study was obtained from Kelantan State Department of Education, the respective school. Ethical approval was granted by the research committee of Universiti Sains Malaysia. Written informed consent was obtained from the parents prior to the study.

Sampling method

According to the study by Noor uI-Aziha *et al.*, 2007, the prevalence for school children in Kelantan who were at risk of overweight was 12.8%. Thus, the minimal sample size calculated based on the formula by Naing (2007) was 190 respondents as follows:

$$n = \frac{Z^2 p(1-p)}{d^2}, \text{ where}$$

n = estimated sample size

Z = standard value at confidence level at 95%

= 1.96

p = estimated prevalence for at risk of overweight among school children in Kelantan

= 12.8%

d = level of significance set at 5%

= 0.05

Thus,

$$\begin{aligned} n &= \frac{1.96^2 \times 0.128(1-0.128)}{0.05^2} \\ &= 171.5 \\ &= 172 \end{aligned}$$

By taking into account a 10% drop-out rate, the desired sample size for this study was 190 respondents. Simple random sampling was applied to select 32 respondents from Form One, Two and Four for each school. The inclusion criteria were secondary school children age 13 to 16 years; able to stand upright for height measurement; able to read and write; understand in Bahasa Malaysia and able to answer the questionnaire.

Data collection

The instrument used in this study comprised three components with Part A being about the respondent's personal, social and demographic information; Part B consisted of 19 questionnaires regarding risk factors on psychosocial, dietary habits and physical activity; Part C was the anthropometric measurements on body weight, height and body mass index.

The content of the questionnaire had been validated by three experts in the related field. It was also pretested among 18 school children who had similar background with the study group. Part A and B were self-administered with the presence of research assistants to assist the respondents and ensure that the questionnaire was completed.

Anthropometric measurements were taken using standard techniques. Body weight was measured with a portable electronic weighing scale (SECA model 881). All participants were informed to wear minimum clothing and stand still in the middle of the scale's platform. Reading of weight was taken twice to the nearest 0.1 kg.

Height was measured using a portable height stadiometer (SECA body meter 206). All participants were told to be barefoot, legs straight, and to look straight ahead at the horizontal plane. Reading of height measurement was taken twice to the nearest 0.1 cm. Body mass index (BMI) was derived using equation: weight in kilogram divided by height in meter square; BMI = weight (kg) / height (m)². BMI categorization was defined as underweight with BMI <18.5 kg/m²; normal with BMI 18.5-24.9 kg/m²; overweight with BMI 25.0-29.9 kg/m²; and obese with BMI ≥30 kg/m² (WHO 2006).

Statistical analysis

Data were analysed using Statistical Package for the Social Sciences Version 12.0 (SPSS 12.0). Independent t-test was used to examine the differences of continuous data. Chi-square test was used to determine the association between BMI status and socio-demographic characteristics such as

residence and household income, dietary habits and physical activity. P values <0.05 were considered statistically significant.

Results

Of the total respondents (n=178), 51% were from the schools in Kota Bahru; 36.5% of them were boys whereas 63.5% were girls. Mean age was 14.3 ± 1.3 years. Age grouping were done almost equally where 60 respondents were from Form One and Two respectively, while 58 respondents were from Form Four. Almost all respondents (98.3%) were Malays. The mean BMI was 21.04 ± 4.87 kg/m². **Table 1** shows the mean value of socio-demographic characteristics and anthropometric measurements of the respondents. The mean household income of the respondents from Kota Bahru district was significantly greater than that of Bachok district (p<0.05). No significant differences were observed in other variables.

TABLE 1- Socio-demographic characteristics and anthropometric measurements according to residence [presented as number (%) or mean±SD and p]

Characteristics	Bachok (n=88) n(%), mean±SD	Kota Bahru (n=90) n(%), mean±SD	p-value
Age(years)	14.2±1.1	14.5±0.9	0.522
Ethnicity			
Malay	87(98.9)	88(97.8)	N/A
Chinese	0(0)	1(1.1)	
Indian	1(1.1)	1(1.1)	
No. of siblings	6.3±2.8	5.1±3.4	0.164
Household income (RM)	984.2±758.9	1588.7±1476.2	0.004
Frequency of body weighing/ year	1.9±1.1	2.5±1.9	0.429
Anthropometric measurements			
Weight(kg)	48.2±11.1	53.8±9.1	0.055
Standing height(cm)	151.4±9.3	152.6±7.2	0.134
Body mass index(kg/m ²)	20.9±4.6	23.3±5.1	0.058

p<0.05, independent t-test

N/A: non-applicable

FIGURE 2 shows the prevalence of malnutrition according to BMI categories and residence factor. The prevalence of overweight and obesity among secondary school children were higher in Kota Bahru district as compared to Bachok district. A significant relationship between residence and BMI status of the students was indicated

in **TABLE 2**. The table also demonstrates that household income above poverty line, frequent consumption of fast foods, frequent breakfast skipping and physical inactivity have significantly contributed to the higher percentage of overweight and obesity among the secondary school students ($p < 0.05$).

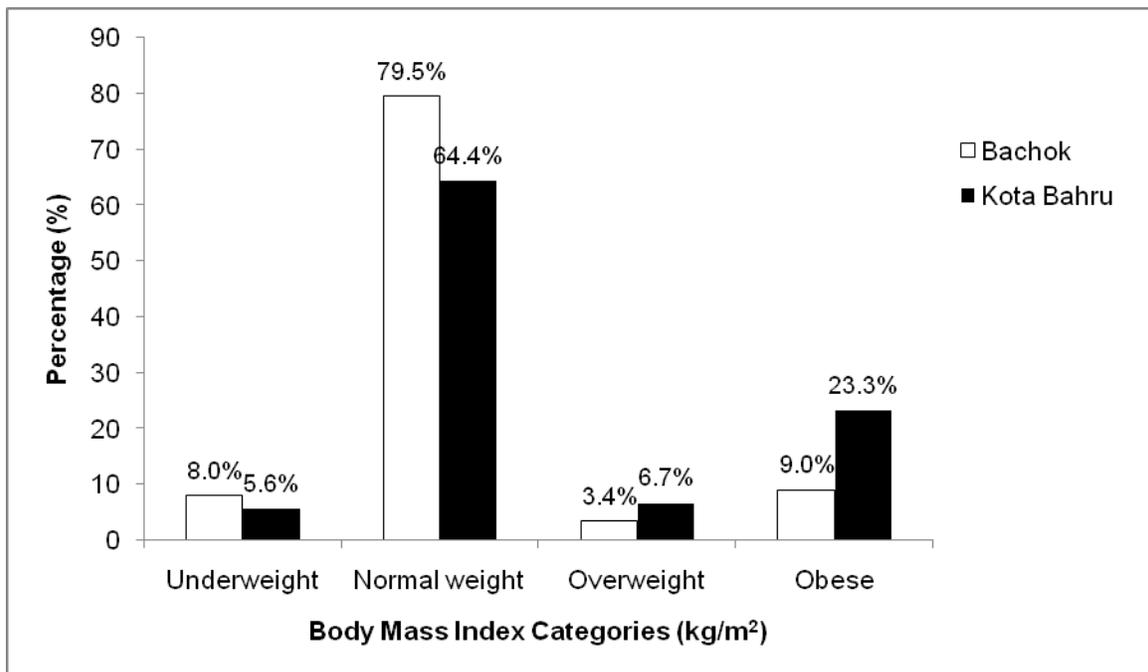


FIGURE 2- Prevalence of malnutrition according to BMI categories and residence

TABLE 2- Association between socio-demographic characteristics, dietary habits and physical activity with BMI status [presented as number (%), chi-square value (χ^2) and p]

Risk factors	N	BMI Status				χ^2	p-value
		Underweight (<18.5 kg/m ²)	Normal weight (18.5-24.9 kg/m ²)	Overweight (25.0-29.9 kg/m ²)	Obese (\geq 30 kg/m ²)		
Residence						8.12	0.004
Bachok	88	7(8.0)	70(79.5)	3(3.4)	8(9.1)		
Kota Bahru	90	5(5.6)	58(64.4)	6(6.7)	21(23.3)		
Household income						7.89	0.005
Below poverty line	25	4(16.0)	21(84.0)	0(0.0)	0(0.0)		
Above poverty line	153	8(5.2)	107(69.9)	9(5.9)	29(19.0)		
Frequency							
Fast food consumption						11.36	0.001
Always	88	5(5.7)	55(62.5)	5(5.7)	23(26.1)		
Occasionally/ none	90	7(7.8)	73(81.1)	4(4.4)	6(6.7)		
Breakfast consumption						10.66	0.001
Daily	74	6(8.1)	61(82.4)	3(4.1)	4(5.4)		
Occasionally/ none	104	6(5.8)	67(64.4)	6(5.8)	25(24.0)		
Physical activity						11.15	0.001
Daily/ 3 times per week	80	6(7.5)	66(82.5)	2(2.5)	6(7.5)		
Once a week/ none	98	6(6.1)	62(63.3)	7(7.1)	23(23.5)		

p<0.05, Pearson Chi-square test

BMI: Body mass index

Discussion

In this study, almost equal number of respondents was selected from both the urban and rural areas of Kelantan State, represented by Kota Bahru (51%) district and Bachok (49%) district, for the purpose of examining the association between residence factor and obesity among adolescents. Secondary school children of form one, form two and form four were selected as they were free from national examinations of PMR and SPM. Data collection from these students would not coincide with their academic schedule. Significant result showed that 30% of respondents from Kota Bahru district were overweight and obese as compared to only 12.4% observed in Bachok district. This finding is supported by Bridevaux *et al.* (2006) and Mohd Ismail (2002) that people living in urban areas are more likely to be overweight than those living in rural areas. Probably due to the fact that people in urban areas have better socio-economic status and the adolescents are more readily accessible to all kinds of unhealthy foods. It is inevitable that greater number of fast food outlets, shopping complex, convenient shops like 7-11, Kwik Stop, D-LiMA, cafes, *mamak* and *nasi kandar* stalls which operate twenty-four hours a day are available and accessible in Kota Bahru district. The people in cities can choose to eat at any time they wish.

Besides, household income among the respondents was studied as the aspect referred to socioeconomic status aspect. Household income of less than the current poverty line in Peninsular Malaysia at RM661 or RM152 per capita was considered (AIM, 2004). Respondents were grouped into below poverty line and above poverty line. One third of the secondary school students having household income above

poverty line were overweight and obese. Remarkable figure was observed for the obese group. Studies by Wake *et al.* (2002) reported that higher income families usually have more purchasing power and do less cooking at home. Therefore, they are likely to consume foods outside home which is high in calories, fat and cholesterol; and less nutrient-densed. This statement was supported by Moy *et al.* (2004). However, Koster (2007) stated that the household income factor should not be blamed solely on increasing the BMI as psychosocial factor such as parenting and neglect issues should also be considered. The character has been changed from mother to maid or day care assistants who take care or cook for the children. They would hardly make an effort to prepare and encourage healthy eating and food choices among the children due to heavy workload.

Brug (2007) pointed out that high consumption of energy-densed fast foods was the major cause for body weight problem. The significant result from this study which showed that more than one third of the respondents who frequently consumed fast food were overweight and obese, clearly supported the above statement. Fast foods preparation highly focuses on deep-frying which is high in saturated fat. The food choices in such outlets were mostly nutrient-imbalanced as they serve a large amount of carbohydrate source and limited vegetables and fruits. Moreover, the 'size-me-up' effect pose even greater risk to the obesity problem as people can enjoy a bigger serving with just addition of small amount of money. This is in agreement with Moy *et al.* (2004) that the rising number of fast food outlets and promotional activities significantly contribute to high consumption of fast food among children and adolescents.

More than half of the study group (58.4%) skipped or occasionally took breakfast before going to school. Almost 30% among this group was reported being overweight and obese. Studies showed that frequent breakfast skipping was directly linked to overweight and obesity (Lioret et al., 2008 and Ma *et al.*, 2003). According to Lannelli (2007), individual who skips one serving of breakfast, will tend to be hungrier than usual and will consume more servings on the next meal of the day. In addition, habits like frequent snacking, skipping of lunch and a sedentary lifestyle had been observed to be more common among individuals who skipped breakfast (Keski-Rahkonen *et al.*, 2003).

Physical activity is an important aspect that affects body weight (Jonides *et al.*, 2002). Our data shows that only 45% of the respondents had exercised for at least 20 minutes per session per day or three times per week. Results demonstrated that inadequate physical activity was significantly associated to overweight and obesity. Teenagers nowadays tend to have sedentary lifestyles, who would rather prefer staying at home for computer games, internet and watching television. Without regular physical activity, energy intake is not balanced up with energy expenditure, thus increasing overweight problems. Lack of physical activity would further lead to various health problems such as hypertension, diabetes mellitus, and cardiovascular disease. The above

observations highlight the importance that leisure-time physical activities play a role in the childhood and adolescent obesity. It is recommended that sports facilities, for example, playground, basketball, badminton and football court, gymnasium, aerobic classes should be better equipped in the housing areas to encourage active lifestyles among children and adolescents. In schools, exercise sessions should be emphasised to increase the students' activity level.

Conclusion

Overweight and obesity could have turned into a prolonged epidemic with significant contributing factors being urban residence, increased household income, frequent consumption of fast food and breakfast skipping and physical inactivity. Overweight and obesity phenomena involve a combination of risk factors as a whole and are not merely limited to a single risk. Health education on overweight and obesity should begin in schools or health clinics. Early health education in school can help increase the health awareness among the public on the importance of healthy eating and active lifestyle in maintaining ideal body weight. Awareness on the risk of health problems must be instilled at the early stage of adolescent and shall not be delayed allowed it to deteriorate during adulthood. Parents should be actively involved to play a greater role in the health education of adolescent.

References

1. AIM.(2004). Amanah Ikhtiar Malaysia. Berikhtiar Menambah Rezeki. <http://www.aim.gov.my>. (Retrieved on 20 February, 2008).
2. Bridevaux, P., Faeh, D. and Eggimann, S. (2006). Prevalence of Overweight and Obesity in Rural and Urban Settings of 10 European Countries. *Prev Med*. Jan 26. 17258803.
3. Brug, J.(2007). The European charter for counteracting obesity: A late but important step towards action. Observations on the WHO – Europe ministerial conference, Istanbul. November 15–17, 2006. *Int J Behav Nutr Phys Act*. 4:11.
4. Fagot-Campagna, A., Saaddine, J.B., Flegal, K.M. and Beckles, G.L. (2001). Diabetes, Impaired Fasting Glucose, and elevated HbA1c in U.S. Adolescents: The Third National Health and Nutrition Examination Survey. *Diabetes Care*, 24:834 –837.
5. Freedman, D.S., Khan, L.K., Dietz, W.H., Berenson, G.S. and Dietz, W.H. (2001). Relationship of Childhood Obesity to Coronary Heart Disease Risk Factors in Adulthood: The Bogalusa Heart Study. *Pediatrics*, 108:712–718.
6. Jonides, L., Buschbacher, V. and Barlow S.E. (2002). Management of Child and Adolescent Obesity: Psychological, Emotional, and Behavioral Assessment. *Pediatrics*, 110: 215-221.
7. Keski-Rahkonen, A., Kaprio, J., Rissanen, A., Virkkunen, M. and Rose, R.J. (2003). Breakfast skipping and health-compromising behaviours in adolescents and adults. *Eur J Clin Nutr* 7(1A): 187-200.
8. Koster, O. (2007). Risk of obesity soars with family income. <http://www.dailymail.co.uk/pages/live/articles/health/healthmain.html>.(Retrieved on 2 March, 2008).
9. Lannallie,V. (2007).Risk factors of overweight children. http://pediatrics.about.com/od/obesity/a/obesity_risks.htm. (Retrieved on 26 July, 2007).
10. Lioret, S., Touvier, M., Lafay, L., Volatier, J.L. and Maire, B.(2008). Dietary and physical activity patterns in French children are related to overweight and socioeconomic status 1, 2. *J Nutr*. 138: 101-107.
11. Ma, Y., Bertone, E.R., Edward, J., George, W.R., James, R.H., Nancy, L.C.,Philip, A. and Mand, I.S.O. (2003). Association between Eating Patterns and Obesity in a Free-living US Adult Population. *Am J Clin Nutr*. 52(5): 800-807.
12. Matthew, W., Gillman, M.W., Shiman, S.R., Berkey, C.S., Field, A.E. and Colditz, G.A. (2003). Maternal Gestational Diabetes, Birth Weight, and Adolescent Obesity. *Pediatrics* 111:e221-e226.
13. Mohd Ismail, N. (2002). The Nutrition and Health Transition in Malaysia. <http://journals.cambridge.org>. (Retrieved on 3 August, 2007).
14. Moore, J. (2011). Socio-Ecological Model- Looking Beyond the Individual. <http://www.balancedweightmanagement.com/TheSocio-EcologicalModel.htm>. Retrieved on 29 July ,2011.

15. Moy, F.M., Gan, Y.G. and Siti Zaleha, M.K. (2004). Body Mass Status of School Children and Adolescents in Kuala Lumpur, Malaysia. *Asia Pac J Clin Nutr.* 13(4): 324-329.
16. Noor ul-Aziha, M., Norimah, A.K. and Ruzita, A.T. (2007). Prevalence of Hypertension among Primary School Children in Kelantan. 22th Scientific Conference, Nutrition Society of Malaysia. Kuala Lumpur. March 29-30, 2007: pp 92-93.
17. Phupakdi, W., Kupferman, F. and Trend, C. (2005). Obesity Care: A Quality Improvement Initiative involving Pediatrics, Family Medicine, and Internal Medicine. <http://newyorkmedicaljournal.org>. (Retrieved on 12 June, 2007).
18. Sinha, R., Fisch, G., Teague, B., Tamborlane, W.V., Banyas, B., Allen, K., Savoye, M., Rieger, V., Taksali, S., Barbetta, G., Sherwin, R.S. and Caprio, S. (2002). Prevalence of Impaired Glucose Tolerance among Children and Adolescents with marked Obesity. *N Engl J Med.* 346:802–10.
19. Wake, M., Salmon, L., Waters, E., Wright, M. and Hesketh, K. (2002). Parent-reported health status of overweight and obese Australian Primary School Children: A Cross-Sectional Population Survey. <http://szawww.nature.com/favicon.ico>. (Retrieved on February 24, 2008).
20. World Health Organization (WHO). 1984. Health Promotion: A Discussion Document on the Concept and Principles. *Health Promotion* 1:73-6.
21. World Health Organization (WHO). 2006. BMI Classification: The International Classification of adult underweight, overweight and obesity according to BMI. http://apps.who.int/bmi/index.jsp?introPage=intro_3.html. (Retrieved on December 10, 2010)