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The Different Level of Stress and Eating Behaviour Among Secondary School Adolescents in Rural and Urban Area in Malaysia

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The concurrent increasing prevalence of mental health and obesity among adolescents worldwide has been attributed to urbanization and changes in lifestyle. This study investigates the stress level and eating behavior among adolescents who lived in urban and rural area in Malaysia. A cohort study was conducted among 797 multi-ethnic adolescents. Baseline data were collected two weeks before the final-year national school examination. Stress level was assessed using a validated Cohen Perceived Stress Scale questionnaire. Eating behaviors were explored using a validated Child Eating Behavior questionnaire. The prevalence of high stress among the adolescents was 29.1%; highest among female (34.4%), urban (32.6%) and the obese and overweight (33.8%) adolescents. The prevalence of obesity and overweight among the adolescents was 26.4%; higher among urban (27.6%) than rural (24.4%) adolescents. A positive correlation was observed between perceived stress and emotional overeating ($r=0.30$, $p<0.01$); higher among the urban adolescents. The correlation between stress and food responsiveness was strongest among the rural adolescents ($r=0.23$, $p<0.01$). Stress and obesity are thus significant problems among adolescents and school examinations are an important stressor. Perceived stress level affects the emotional eating and food responsiveness of adolescents and therefore obesity prevention programmes should be designed taking these issues into account.

Keywords: stress; eating behaviour; obesity; adolescents

I. INTRODUCTION

Lately, stress has been associated with urbanisation and a hectic lifestyle. In addition, it has been reported recently that the global burden of mental illness has increased from earlier estimates of 21.2% to 32.4% of years lived with disability (Vigo *et al*., 2016). In Malaysia, National Health Morbidity Survey (NHMS) IV shows that there has been an upward trend in the prevalence of mental illness among children and adolescents aged 15 years and below from 13% in 1996 to 20% in 2011 (Institute for Public Health, 2011). This is concurrent with an increasing prevalence of obesity among Malaysian children and adolescents aged 18 years and below from 6.1% in 2011 to 11.9% in 2015 (Institute for Public Health, 2011; Institute for Public Health, 2015).

Interactions of individuals with environmental threats and challenges that strain or exceed their ability to adapt and threaten their well-being result in stress (Myers, 2005). Previous studies have demonstrated that stress can directly or indirectly cause or contribute to the worsening of a number of chronic diseases such as hypertension, hypercholesterolemia and cardiac diseases (Davidson *et al*., 2010; Kaur *et al*., 2014; Ahmad *et al*., 2014; Lim *et al*., 2014; Lesser and Ginsburg, 2000). This could be explained by the activation of the Hypothalamic Pituitary Axis (HPA) pathway following a stressful event (Torres and Nowson, 2007). While the cortisol hormones released in response to stress specifically affect appetite, the release of other hormones such as adrenaline through the sympathetic adrenal medullary pathway may contribute to the

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development of non-communicable diseases through elevation of blood pressure and increase heart rate (Torres and Nowson, 2007).

It has been postulated by previous studies that stress-related eating is one of the factors contributing to the increasing prevalence of overweight and obesity (Groesz *et al.*, 2012; Ortega *et al.*, 2013; Michels *et al.*, 2012). The increasing prevalence of obesity among Malaysian of all ages has triggered a sense of urgency among policy makers, stakeholders and researchers to identify the modifiable behaviours that are contributing towards obesity. However, while there clearly a need to better understand the eating behaviour patterns of adolescents, the number of studies on the relationship between stress and eating behaviour among the adolescent population is very limited (Jaaskelainen *et al.*, 2014; Martyn-Nemeth *et al.*, 2009; Groesz *et al.*, 2012; Ortega *et al.*, 2013; Gan *et al.*, 2011; Ganasegeran *et al.*, 2012; Tajik *et al.*, 2015). Indeed, numerous factors are still being unexplored such as the possible effect of urbanisation on stress and eating behaviour. Nevertheless, it is important that this group in particular remain healthy as the existence of an unhealthy future generation will have major socio-economic implications for the nation. The novel aspect of this research thus would be comparing this issue between the urban and the rural adolescents which were not explored in the previous studies.

Therefore, this study aims to investigate the difference on stress and eating behaviour of the adolescents who resides in urban and rural area. The findings will help to identify the different underlying issue experienced by the adolescents that need to be taken into careful consideration when developing the strategies and method of approach to combat unhealthy eating behaviours of the adolescents.

II. MATERIALS AND METHOD

A. Study Area and Population

This study is a cohort study conducted as part of an ongoing larger cohort study, the Malaysian Health and Adolescents Longitudinal Research Team (MyHeART) Study (Hazreen *et al.*, 2014) which investigated the risk factors of non-communicable diseases (NCD) among adolescents. The study recruited public school students in Peninsular Malaysia since 2012. This study involved participants aged 16 years old. Baseline data were collected during the 2 weeks before the final-year national school examination.

B. Sample Size Calculation

The sample size to determine the stress level and eating behaviour patterns among adolescents was calculated by using G*Power 3.1.9.2 software. The effect size was calculated based on the findings by Groesz *et al.* (2012). The minimum sample size required for the study was 518 subjects. However, a sample size of 783 subjects was selected in order to accommodate a non-response rate of 51% as encountered in the initial recruitment of the MyHeART cohort. All calculations are with an alpha of 0.05 and power of 80%.

C. Sampling

Random cluster sampling was performed on 15 schools involved in the MyHeART study. As a result, 11 schools were selected as clusters; seven schools from urban areas and four schools from rural areas. Prior to data collection, approval was obtained from respective departments and schools. Parental consent form and research information sheet were distributed to all the prospective participants and consents were obtained from both parents and participants prior to data collection process.

D. Data Collection

Data collection methods utilized in this study include a set of questionnaires and anthropometric measurement.

1. Questionnaires

Data were collected from the participants by using a set of three self-administered questionnaires: The Socio-Demographic Background Questionnaire, Cohen Perceived Stress Scale (CPSS) questionnaire and Child Eating Behaviour Questionnaire (CEBQ). The participants completed all three self-administered questionnaires without guidance from the researcher within approximately 30 minutes.

i. The socio-demographic background questionnaire

This questionnaire was developed by the researcher to obtain demographic data and possible confounding factors, including individual factors, family factors and environmental factors. The questionnaire was reviewed by an expert panel, finalized and pre-tested in both the English and Malay language on 56 adolescents visiting the Adolescent Centre at the National Population and Family Development Board Headquarters in Kuala Lumpur prior to usage.

ii. CPSS questionnaire

The CPSS questionnaire contains 10 items and has been validated for use among Malaysian adolescents (Al-Dubai *et al.*, 2011). The participants respond to each question by giving a score on a five-point Likert scale ranging from 0 (never) to 4 (very often) to indicate how often they have experienced a stressful event within the past 1 month. Higher scores indicate greater perceived stress. Permission was obtained from the author of the questionnaire. The CPSS score was used to classify the participants into three stress level categories: (1) low: score of 13 and below, (2) moderate: score between 14 to 26 and (3) high: score of 27 and above. (Khalili *et al.*, 2017).

iii. CEBQ questionnaire

The original CEBQ consisted of 35 items (Wardle, 2007) and was used to measure eating behaviour among children below 12 years old. The self-reported CEBQ was later validated among Malaysian adolescents (Loh *et al.*, 2013). Permission to use the Malaysian validated version of the questionnaire was obtained from the authors. The CEBQ used in this study consisted of eight eating behaviour items representing three eating patterns: (I) Emotional Eating [two items: (i) emotional overeating (EOE); (ii) emotional undereating (EUE)]; (II) Externally Induced Eating [three items: (i) food responsiveness (FR); (ii) enjoyment of food (EOF); (iii) desire to drink (DD)]; and (III) Restrained Eating [three items: (i) satiety responsiveness (SR); (ii) slowness in eating (SE); (iii) food fussiness (FF)]. The response options in this questionnaire are based on a five-point Likert scale and range from 1 (never) to 5 (always) (Wardle, 2007).

2. Anthropometric measurement

The body composition measurements of each participant were taken by trained researchers using calibrated equipment. The height of the participants was taken without socks and shoes and without hair ornaments and recorded to the nearest 0.1 cm by using a vertical portable stadiometer (Seca 217, UK). Their weight was measured with students barefoot and wearing either school uniform or t-shirts and tracksuits and recorded to the nearest 0.1 kg by using a digital electronic scale, the portable body composition analyser (Tanita SC-240, Netherlands).

E. Statistical Analysis Tool

Data were analysed using IBM SPSS Statistics 24.0 (US). Descriptive statistics using univariate approaches were used to describe the study population and measure the variance in the participants' socio-demographic data. The Shapiro–Wilk test of normality was used to test the normality of the data distribution. An independent-sample T-Test and Chi-square test were used to analyse the variations in the continuous and categorical variables, respectively. Multiple linear regressions and Pearson's correlation analyses were used to determine the relationships between groups of selected variables. The analysis was stratified to explore the difference between the rural and urban adolescents. Analysis of variance was used to determine differences in eating behaviour and stress level across the demographic, obesity and stress level categories. The results analysis used an alpha level of 0.05 and a 95% CI and a p-value. A p-value of less than 0.05 was considered statistically significant.

III. RESULT

Of the 802 respondents, 797 were included in the final analysis as 5 were removed following incomplete questionnaires and no anthropometric measurement. The socio-demographic characteristics of the participants are shown in Table 1. The individual, environmental and family factors investigated in this study are presented in Table 2; by school location.

Table 1. Demographic characteristics of participants at baseline

Characteristics		**n (%)**
		797(100)
Gender	Male	317 (39.8)
	Female	480 (60.2)
School Location	Urban	482 (60.5)
	Rural	315 (39.5)
Ethnicity	Malay	597 (74.9)
	Chinese	93 (11.7)
	Indian	69 (8.7)
	Others	38 (4.8)

*Malaysia (Sept-Oct 2015)

Table 2. Individual, Family and Environmental Factors of Participants according to School Location

		Urban n (%)	**Rural n (%)**	**Total n (%)**
Individual Factors				
BMI Category	Overweight & Obese	133(27.6)	77(24.4)	210(26.3)
	Normal weight	226(46.9)	129(41.0)	355(44.5)
	Underweight	123(25.5)	109(34.6)	232(29.1)
Academic Achievement	Good	31 (6.5)	10 (3.2)	41 (5.2)
	Average	114 (23.9)	62 19.9)	176 (22.3)
	Below Average	332 (69.6)	240 (76.9)	572 (72.5)
Pocket Money	High	290 (60.5)	68 (21.8)	358 (45.2)
	Medium	175 (36.5)	238 (76.0)	413 (52.1)
	Low	14 (2.9)	7 (2.2)	21 (2.7)
Attempts to reduce weight	Yes	283 (59.2)	173 (56)	456 (57.9)
	No	195 (40.8)	136 (44)	331 (42.1)
Eat to Cope with Stress	Yes	161 (33.6)	117 (37.9)	278 (35.3)
	No	318 (66.4)	192 (62.1)	510 (64.7)
Family Factors				
Father's Education	Not Known	108 (22.4)	166 (20.8)	58 (18.4)
	Tertiary	120 (24.9)	153 (19.2)	33 (10.5)
	Secondary	210 (43.6)	401 (50.3)	191 (60.6)
	Primary and below	44 (9.2)	77 (9.7)	33 (10.5)
Mother's Education	Not Known	99 (20.5)	156 (19.6)	57 (18.1)
	Tertiary	109 (22.6)	132 (16.6)	23 (7.3)
	Secondary	229 (47.5)	425 (53.3)	196 (62.2)
	Primary and below	45 (9.3)	84 (10.5)	39 (12.4)
Parents' Marital Status	Married	413(85.7)	687(86.2)	274(87.0)
	Single Parent	69(14.3)	110(13.8)	41(13.0)
Regard Parents as Role Model	Yes	384(80.7)	652(83.1)	268(86.7)
	No	92(19.3)	133(16.9)	41(13.3)
Meal with Family	Frequently	206 (43.2)	321 (40.5)	115 (36.5)
	Sometimes	265 (55.6)	461 (58.2)	196 (62.2)
	Never	6 (1.3)	10 (1.3)	4 (1.3)
Environmental Factors				
Opinion on Canteen Food	Nutritious	36 (7.5)	14 (4.4)	50 (6.3)
	Not Nutritious	246 (51.0)	138 (43.8)	384 (48.2)
	Not Sure	200 (41.5)	163 (51.7)	363 (45.5)

Presence of Junk Food Vendor	Yes	338 (70.1)	141 (45.0)	479 (60.3)
Outside School Compound	No	84 (17.4)	85 (27.2)	169 (21.3)
	Not Sure	60 (12.4)	87 (27.8)	147 (18.5)
Bought Junk Food from Vendor	Frequently	13 (2.7)	4 (1.3)	17 (2.1)
	Sometimes	288 (59.8)	184 (58.8)	472 (59.4)
	Never	181 (37.6)	125 (39.9)	306 (38.5)
Fast Food Consumption	Frequently	35 (7.3)	8 (2.5)	43 (5.4)
	Sometimes	439 (91.1)	298 (94.6)	737 (92.5)
	Never	8 (1.7)	9 (2.9)	17 (2.1)

A. Stress Among Malaysian Adolescents

The prevalence and distribution of stress among the adolescents according to the abovementioned perceived stress level categories is shown in Table 3. The prevalence of high perceived stress among the adolescents was 29.1% and was significantly higher among female (34.4%) and urban (32.6%) adolescents.

Table 3. Prevalence and Distribution of Stress among the Adolescents Based on Cohen Perceived Stress Scale Score according to Stress Level Categories

		Stress Level Category			Pearson Chi-Square
	Total [n (%)}	Low	Mod	High	
Overall	797(100)	72(9.0)	493(61.9)	232(29.1)	
Gender					
Male	317(39.8)	38(12)	212(66.9)	67(21.1)	χ^2=18.72
Female	480(60.2)	34(7.1)	281(58.5)	165(34.4)	p=<0.01*
School Location					
Urban	482(60.5)	38(7.9)	287(59.5)	157(32.6)	χ^2=7.87
Rural	315(39.5)	34(10.8)	206(65.4)	75(23.8)	p=0.02*
Ethnicity					
Malay	597(74.9)	53(8.9)	366(61.3)	178(29.8)	χ^2 =7.83
Chinese	93(11.7)	7(7.5)	54(58.1)	32(34.4)	p=0.25
Indian	69(8.7)	9(13.0)	49(71.0)	11(15.9)	
Others	38(4.8)	3(7.9)	24(63.2)	11(28.9)	
BMI Category					
Obese &	210(26.3)	19(9.0)	120(57.1)	71(33.8)	χ^2=3.30
Overweight	355(44.5)	33(9.3)	224(63.1)	98(27.6)	p=0.51
Normal Weight	232(29.1)	20(8.6)	149(64.2)	63(27.2)	
Under weight					

*BMI, body mass index; *p<0.05, ** p<0.01

*Malaysia (Sept-Oct 2015)

Table 4. Correlation between Stress and Eating Behaviour of the Adolescents according to gender, location, ethnicity and BMI Category at baseline

Stress		Eating Behavior Score at Baseline							
		Emotional Eating		Restrained Eating			Externally Induced Eating		
	n	EOE	EUE	SR	SE	FF	DD	EOF	FR
CPSS Score	592	0.30**	0.16**	0.19**	0.12**	0.07	0.09*	0.12**	0.22**
Gender									
Male	200	0.22**	0.27**	0.21**	0.17*	0.07	0.08	0.08	0.24**
Female	392	0.31**	0.08	0.15**	0.10*	0.05	0.10*	0.10*	0.20**
Location									
Urban	334	0.32**	0.12*	0.20**	0.09	0.10	0.11*	0.17**	0.21**
Rural	258	0.28**	0.20**	0.17**	0.15*	0.01	0.05	0.05	0.23**
Ethnicity									
Malay	439	0.29**	0.17**	0.18**	0.11*	0.07	0.13**	0.13**	0.23**
Chinese	69	0.31**	0.14	0.13	0.22	-0.08	-0.09	-0.01	0.08
Indian	56	0.28*	0.09	0.33*	0.09	0.15	-0.05	0.09	0.10
Others	28	0.10	-0.02	0.15	0.38*	0.16	-0.15	-0.07	0.26
BMI Category									
Overweight &	151	0.31**	0.16	0.28**	-0.00	0.09	-0.01	0.09	0.17*
Obese	267	0.28**	0.06	0.13*	0.21**	0.08	0.08	0.13*	0.20**
Normal Weight	174	0.34**	0.28**	0.19*	0.10	0.04	0.17*	0.16*	0.30**
Underweight									
Stress Category									
High	167	0.18*	0.05	0.13	0.06	-0.01	0.03	0.10	0.24**
Moderate	374	0.24**	0.11*	0.13*	0.14**	0.16**	0.10	0.12*	0.11*
Low	51	0.09	0.20	0.24	0.16	0.00	0.07	-0.03	0.15

*EOE, emotional overeating; EUE, emotional undereating; SR, satiety responsiveness; SE, slowness in eating; FF, food fussiness; DD, desire to drink; EOF, enjoyment of food; FR, food responsiveness. CPSS, Cohen perceived stress scale; BMI, body mass index; *p<0.05, ** p<0.01

*Malaysia (Sept-Oct 2015)

IV. DISCUSSION

The results of this study reveal the magnitude of the stress problem among Malaysian adolescents before the school examination and the significance of the impact of stress on their eating behaviours.

A. Perceived Stress Among Malaysian Adolescents

In general, this study found that Malaysian adolescents have a moderate perceived stress level, as reflected by the CPSS score of 18.7 during the near examination period. This study also found that prior to the school examination, the prevalence of adolescent perceiving high and moderate stress level was 29.1% and 61.9% respectively. A recent study reports that 38.5% of Malaysian school students have stress symptoms (Tajik *et al.*, 2016). Another study found a high prevalence of distress among secondary school students (32.8%) and the major stressor was identified as being academic-related issues (Yusoff *et al.*, 2011). An earlier study on stress and coping on Malaysian students found that adolescents generally consider their life to be stressful (Hashim, 2007). The abovementioned studies have identified the magnitude of stress that exists in the student population and that it is as an important issue that needs to be addressed.

However, this study is the first to identify the level of stress perceived by the adolescents themselves. This information is very alarming as one out of three adolescents perceive that they are highly stressed.

This study also found that urban students perceive their level of stress to be higher as compared to rural students. It is likely that both individual and family factors have influenced this result. A greater proportion of the urban participants in this study have a higher level of academic achievement compared to the rural participants. Also, a higher number of urban parents have a higher education level than their rural counterparts. It is possible that being more educated and thus more aware of the importance of education could cause urban parents to have higher expectations regarding their children's achievement and thus place extra pressure on their children as compared to rural parents. This is in line with the findings of a survey in 2013 that identifies that high expectations of parents in regards to their children achieving a level of academic excellence is one of the significant stress risk factors for Malaysian adolescents (Ahmad *et al.*, 2014). Another Malaysian study reports that 77% students perceive academic expectations as an important stressor (Hashim, 2007). The two studies however did not compare between the urban and rural populations as this study did.

The prevalence of high perceived stress revealed in this study is also significantly higher among female students. This is in line with some earlier findings in Malaysia which reported that stress are significantly higher among female adolescents (Ahmad *et al.*, 2014; Wahab *et al.*, 2013; Yaacob *et al.*, 2009). Worldwide, sex differences in the incidence and severity of stress suggest that female tend to be more vulnerable in terms of their responses to stress (Paris *et al.*, 2010). As for the influence of BMI on perceived stress, this study did not find any significant association despite a higher CPSS score being reported among the obese and overweight adolescents. The findings of this study thus identify the segment of the target population that needs the most consideration when developing intervention programmes to promote mental health among adolescents.

B. Association between Stress and Eating Behaviour among Malaysian Adolescents

Overall, this study discovered that the strongest positive significant correlation was observed between perceived stress and emotional overeating significantly demonstrated among adolescents with both high and moderate perceived stress. These findings are similar to some western studies conducted among adolescents which report that perceived stress is associated with EOE (Nguyen-Rodriguez *et al.*, 2009; Wilson *et al.*, 2015). A cross -sectional study among Malaysian adolescents aged 18 to 25 years old also reports a strong significant correlation between stress and EOE (r=0.43) and between stress and external eating pattern (r=0.28) (Sarina and Lai, 2015). However, another study of stress and eating behaviour among Malaysian university graduates reports contradictory findings that stress does not affect uncontrolled eating and EOE (Saat *et al.*, 2013). The correlation observed between perceived stress level and EOE was also stronger among female (r=0.31), urban (r=0.32) and underweight (r=0.34) students. The finding is coherent with some studies conducted in the western countries which had reported that stress-related eating and emotional eating behaviour is more common in girls as compared to boys (Jaaskelainen *et al.*, 2014; Nguyen-Rodriguez *et al.*, 2009). However, no comparison between the urban and rural adolescents have been conducted previously.

This study also found that the urban adolescents despite having a higher awareness and knowledge of healthy eating, they eat less healthily compared to rural adolescents especially when dealing with stress. This was reflected by the stronger correlation between stress and emotional overeating among the urban than the rural students. The stresses of urban life could be one of the factors that influence urban adolescents to eat unhealthily, which results in a higher prevalence of overweight and obesity among them than among rural adolescents. A higher prevalence of overweight among urban than rural adolescents has been reported in a previous study on 200 respondents from two districts in the state of Selangor in Malaysia (Dev *et al.*, 2009). However, an earlier finding derived from the MyHeARTs' cohort which have a larger sample size (n = 1361) had reported that Malaysian adolescents from rural areas are consuming more

sugar than and at higher risk of developing non-communicable diseases that is related to obesity compared to their urban counterparts (Hazreen *et al.*, 2014). The difference in the findings of the similar population could reflect the changes in the lifestyle of the adolescents as they grow older; comparing the adolescents when they were 13-year old during MyHeARTs study in 2012 and 16-year old of age in this study. Children's eating behaviours at a younger age could be influenced more by the family environment, whereas at an older age, food choice decisions could be made by the adolescents themselves.

This study also found that most urban parents have a better level of education, but it should not be assumed that such parents ensure that their children eat a healthy diet. For instance, a study found a high intake of fast food among children of mothers with a higher educational level (Adnan and Muniandy, 2012). Indeed, higher education may open opportunity to an individual to have a higher paid occupation. This assumption is supported by this study in which the urban population, which overall had a higher educational status, had higher pocket money (60.5%) than the rural population (21.8%). The amount of pocket money accompanied by food availability could further increase the consumption of unhealthy foods among the urban population. This is demonstrated in this study, where urban students, despite being high achievers and having parents with a higher education level, report more frequent fast food consumption and the purchasing of food from junk food vendors. The changing lifestyle in urban areas has also encouraged the rise of the eating out phenomenon in Malaysia, which is further aggravated by the higher financial autonomy and greater food availability in the city. Thus, higher perceived stress accompanied by higher pocket money and greater availability to unhealthy food could be factors influencing urban students to eat unhealthily as compared to rural students.

In turn, this study also found that more rural students eat to cope with stress as compared to their urban counterparts. The practice of eating to cope among rural students could be due to a lack of awareness about what constitutes a healthy lifestyle as most of the rural students and their parents in this study have a lower level of academic achievement than urban students and their parents. It has been reported that mothers with a low level of education could affect their children's intake by providing diet with not much thought of the nutrition contents and thus contributed to a higher BMI status (Rayhan and Khan, 2006). However, the eating habit of rural adolescents could be also influenced by their lower pocket money and by less food availability. Thus, a higher percentage of rural adolescents are still in the underweight category compared to urban students. Both external forces in the urban and rural environment and internal drivers at home could thus contribute to the current trend of behaviour in food taking among the adolescents.

C. Strengths and Limitations

The strength of this study lies in the large sample size. Furthermore, the sample population covered three major states in Malaysia, which gives power to the study. The main limitation of this study was that potential underreporting may have occurred because the study collected data via self-reported questionnaires. A longitudinal study on this subject would be able to better assess the effect of stress on eating behaviour and body composition among adolescents.

V. CONCLUSION

This study found that most Malaysian adolescents perceive that they have a moderate level of stress prior to school examinations with approximately one third perceiving a high stress level. Stress is common among adolescents resides in urban area. The perceived stress level affects the emotional eating and external eating patterns of adolescents. This study highlights the importance of a holistic approach involving the family, school and relevant authorities in providing an optimum environment to promote healthy eating and lifestyle to empower the student's well-being.

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