Childhood Obesity – Prevalence among 7 and 8 year old Primary School Students in Kota Kinabalu

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INTRODUCTION

Childhood obesity has become a serious public health problem. The prevalence of overweight and obese children is an increasing trend all over the world. Obesity can be assessed based on triceps skin fold and Body Mass Index (BMI). BMI is widely acceptable around the world because it is easily calculated based on weight and height. The National Center for Health Statistics (NCHS) in the United State (US) defined obesity as children with BMI greater than 95th centile for age and sex and these children require medical attention[1,2].

Recent data from National Center for Health Statistics (NCHS) reported that approximately 1 in 5 children in the United State (US) are now overweight. Prevalence of obesity among children and adolescents has doubled in the past 2 decades in the US[1]. In Peninsular Malaysia in 1996, Bong reported that overall prevalence of obesity among children in Selangor was 7.8%[5]. There is no published data regarding the prevalence of obesity in East Malaysia, specifically Kota Kinabalu. This study will help to determine the prevalence of childhood obesity in Kota Kinabalu, which has different race/ethnic groups and culture compared to those in Peninsular Malaysia.

The American Pediatric Association has also reported that recognizing the population at risk is important to prevent childhood obesity. The recognized risk factors are high birth weight, maternal gestational diabetes (GDM), obesity in family members and breast feeding practices. High birth weight is related to high BMI in childhood and adulthood[7]. It has been reported that being born to a mother with GDM was associated with increased risk of adolescent obesity and overweight[8]. Breast feeding was inversely related to childhood obesity regardless of maternal diabetes status. Long term follows up and advice can be given to those families who have this risk factor.

Obesity is associated with multiple problems, such as hypertension, diabetes and obstructive sleep apnea. The American Pediatric Association has reported that 1 in 4 obese children are hypertensive[1,3]. Hence, is important for us to determine the prevalence of hypertension in children who are obese.

The main objective of this study is to determine the prevalence of childhood obesity among 7 and 8 year old students in primary school in Kota Kinabalu. The risk factors which are associated with childhood obesity such as birth weight, maternal diabetes, higher total family income and breast feeding practices are assessed in this study. The secondary objective of this study is to determine the prevalence of high blood pressure among primary school students who are obese.

MATERIALS AND METHODS

This is a cross-sectional study. The cluster sampling method was used in this study. All the public primary schools(45) were divided into 5 zones- Tanjung Aru(12), Likas(10), Inanam(8), Menggatal(8) and Telipok(7). One school from each zone was selected by simple random sampling method-using cards. Once the school was selected from each zone, simple random sampling method(using cards) were used to select 3 classes each from standard 1 and 2. All the students who fulfilled the inclusion criteria were enrolled in the study.

The study period was from February to April 2008. Based on 2 previous studies done in Peninsular Malaysia, in Selangor (1991) and in Kuala Lumpur (2004)[5-6], where the prevalence of obesity among primary school children was found to be about 7-8%, the sample size calculation was made on the assumption that the above prevalence would also be applicable for Kota Kinabalu. As the population size (7 and 8 year old primary school students in Kota Kinabalu) was 9241, the required sample size was 992 (using Epi Info version 6.04a) assuming the population prevalence of obesity among primary school children in Kota Kinabalu is 7% with confidence interval of 95% and allowance of 1.5% precision of estimate.

All students age 7 or 8 years in the selected classes during the school visit were included. Students without written consent from their parents/guardian. Students who did not turn up on the day of our school visit were excluded.

Digital Philips C3(2 types of cuffs: Paed 20.5-28cm and Adult 27-35cm) was used to measure blood pressure in mmHg. Digital Soehnle Professional 2755 was used to measure height and weight in centimeters and kilograms. Both machines were calibrated everyday before used. The reading from Digital Philips C3(2 types of cuffs: Paed 20.5-28cm and Adult 27-35cm) were validated in comparison with standard equipment, which is mercury BP set before every school visit. Weight, height and blood pressure were taken based on standard operating procedure. Height and weight were measured by the same nurse every visit. Shoes were removed before the measurements were taken. Blood pressure was

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taken by a nurse and the author. Blood pressure was measured twice after the student rested for 5 min. If mean blood pressure (systolic or diastolic) was above 95th centile, third reading was taken after 6 hours. BMI was calculated based on weight in kilograms divided by the square of height in meters (kg/m^2). Weight status was classified based on US Center for Disease Control and Prevention (CDC) 2000 BMI chart. Obesity is defined as a BMI above 95th centile for age. Blood pressure was classified based on 1987 Task Force on BP control in Children systolic and diastolic blood pressure chart. Hypertension is defined as blood pressure (systolic or diastolic) above the 95th centile.

The questionnaires were in Bahasa Malaysia and English. The questionnaires were pretested on 20 parents in Paediatric Clinic in Hospital Likas prior to their being used for this study. Questionnaires were given to parents/guardian 1 week before the day of school visit and were collected on the day of our school visit.

This study was approved by the ethics committee of Bahagian Penyelidikan Universiti Kebangsaan Malaysia. Approval was also obtained from Jabatan Pelajaran Sabah and Jabatan Kesihatan Negeri Sabah. Consent form and parents information sheet were given to parent/guardian 1 week before the day of our school visit (together with the questionnaires) and were collected on the day of school visit. There were 2 types of data-qualitative (questionnaire-risk factors) and quantitative (measurements-weight, height, BMI and blood pressure). All the data were entered into a database before analysis. Data was analysed using SPSS 13.0. Pearson's chi-square and Fisher's exact test were used for qualitative data. The significance level was taken at $p<0.05$. The degree of association between obesity and the risk factors was determined by using odds ratio with 95% confident interval(CI).

RESULTS

There were a total of 891 students included in the study from all 5 zones of Kota Kinabalu (Table I). 186 students were excluded from the study. Most of them were excluded because of they were absent on the day of the school visit and the remainder due to incomplete data.

In this study, 45.6% were 7 years old and 54.4% were 8 years old. There were 464 male students and 427 female students, giving a male to female ratio of 1:0.9. The overall prevalence of obesity in Kota Kinabalu was found to be 2.5%. Table II shows that 68% of obese students were 8 year old and 32% were 7 year old. Among those who were obese, 68% were male and 32% were female. Out of the total of 22 obese students, 50% were Bajau, 18% were Kadazan/Dusun and the remaining was Melayu, Suluk and Bugis. However, this racial distribution was statistically not significant. None of the Brunei student was obese.

Table III shows the odds ratio for risk factors associated with obesity. From this study, low birth weight (birth weight less than 2.5kg), high birth weight(birth weight 4.0kg and above) and high family income (total family income per month more than RM 5000) were not associated with obesity among 7 and 8 year old primary school students in Kota Kinabalu. Maternal gestational diabetes were associated with 6 times increase risk of obesity among 7 and 8 year old primary school students in Kota Kinabalu (odds ratio=5.69, 95%CI= 1.22 to 26.57). No breast feeding was associated with 4 times increased risk of obesity among 7 and 8 year old primary school students in Kota Kinabalu (odds ratio=4.04, 95%CI= 0.89 to 18.40). However, these risk factors were not statistically significant ($p>0.05$). Non exclusive breast feeding (infant formula started before 6 month old) was associated with doubling the risk for obesity and it was statistically significant (odds ratio=2.4 95%CI= 1.02 to 5.63, p=0.038).

125(14.0%) students were found to be hypertensive. 50% of the obese students were hypertensive. This study also demonstrated that obese students among 7 and 8 year old primary school students in Kota Kinabalu were 7 times more likely to be hypertensive (odds ratio=6.62, 95%CI= 2.8 to 15.63). This outcome was statistically significant with $p<0.05$. Beside obesity, we found that there were 3.9% of the students in this study were overweight with BMI within 85 to 95 centile; based on US Center for Disease Control and Prevention (CDC) 2000 BMI chart.

DISCUSSION

In the last 10 years, rapid socioeconomic development in Malaysia has been associated with changes in lifestyle of the community especially in physical activity and food consumption. Sedentary lifestyle has been said to have a strong impact on obesity.

In view of rapid socioeconomic development in Kota Kinabalu, we anticipated a high prevalence of obesity among 7 and 8 year old primary school students. However, the prevalence from our study was only 2.5% compared with 7.8% in Kuala Lumpur.

The most statistically significant risk factor for childhood obesity in this study was non exclusive breast feeding, which infant formula feeding started before 6 month old. Maternal gestational diabetes (GDM) was associated with increase risk of obesity, but did not reach statistically significant level. Antenatal screening for GDM is not routinely done in public maternal health clinic in Malaysia. Most mothers will consider themselves as no GDM, as long as the doctors did not mention it to them. Birth weight was not associated with childhood obesity in this study. The lack of significant of association of obesity with maternal diabetes, birth weight could be related to small numbers of obese subjects found in this study.

Most studies done in developing countries demonstrated that high total family income was associated with increased risk of obesity. Families with higher total family income have greater buying power and consumption of nutrient dense food. However, this was not demonstrated in our study. Parents/guardian might under report their income because they might be worried that their children's school subsidies (books and uniform) may be terminated if they were found to

Table I: Number of students among 7 and 8 year old primary school students in the 5 zones of Kota Kinabalu.

Zones	Number of Students		
	Included 891 (82.7%)	Excluded 186 (17.3%)	Total 1077 (100%)
Inanam	215	34	249
Tanjung Aru	181	63	244
Likas	237	74	311
Menggatal	138	8	146
Telipok	120	7	127

Table II: Students' characteristics according to age, sex and race (n=891)

Characteristics		Weight Status	
		Obese 22 (2.5%)	Non Obese 869 (97.5%)
Age, year	7 (406)	7 (32%)	399 (45.9%)
	8 (485)	15 (68%)	470 (54.1%)
Sex	Male (464)	15 (68%)	449 (51.7%)
	Female (427)	7 (32%)	420 (48.3%)
Race	Kadazan/Dusun	4 (18.25%)	96 (11.0%)
	Melayu	1 (4.5%)	78 (9.0%)
	Bugis	1 (4.5%)	71 (8.2%)
	Suluk	1 (4.5%)	57 (6.6%)
	Bajau	11 (50.0%)	366 (42.1%)
	Brunei	0 (0.0%)	48 (5.5%)
	Others	4 (18.25%)	153 (17.6%)

Table III: Odds ratio for risk factors associated with obesity

Risk Factors	Odd Ratio			
	Value	95% Confidence Interval		p Value
		Lower	Upper	
Birth weight 4.0kg and above	1.43	0.19	11.01	0.52
Birth weight less than 2.5kg	0.22	0.29	1.64	0.15
Total family income per month more than RM5000	1.03	1.02	1.037	1.0
Maternal gestational diabetes	5.69	1.22	26.57	0.06
No breast feeding	4.04	0.89	18.40	0.11
Non exclusive breast feeding	2.4	1.02	5.63	0.04

Table IV: Risk of hypertension associated with obesity (n=891)

Weight Status	Blood Pressure Status	
	Hypertension (n=125)	No Hypertension (n=766)
Obese	11	11
Not Obese	114	755

Odds ratio=6.62, 95% confidence interval 2.80-15.63; p<0.05.

have a higher income rates. Extra income from small business and rental might not be included in their total family income per month.

14.0% of the students in the study were found to be hypertensive. This is high compared to 4.5% of the prevalence of childhood hypertension in US 2004[1,3]. However, we do not have proper data regarding the prevalence of childhood hypertension in Kota Kinabalu to compare with our study. This high prevalence is unlikely due to difference in the ethnic groups in Kota Kinabalu because the study done by Rampal showed that the prevalence of hypertension among subjects more than 15 year old in Malaysia and Sabah was 27.8% and 25.6% respectively[10]. The high prevalence of childhood hypertension in Kota Kinabalu found in our study is potentially important. All children with hypertension have been referred to the local health center for a full clinical assessment and appropriate management. It would be important to confirm whether the hypertension is sustained and the aetiology among such young children.

In summary, even though the prevalence of obesity among 7 and 8 year old primary school students in Kota Kinabalu was low, it was associated with an alarmingly high percentage of hypertension among those obese students compared to 25% from the report by American Pediatric Association1,3. The presence of this co-morbidity at such a young age 7-8 years old will make it even more compelling to embark on a vigorous life style intervention to reduce weight and later pharmacotherapy should the hypertension remained. Beside hypertension, further assessment for other complications of obesity such as diabetes mellitus and dyslipidaemia are important.

3.9% of the students in our study were overweight. This is low compared with 14.6% among school children in Kuala Selangor, reported by Sumarni in 2006[9]. However, this group of students have a higher risk to be obese in the adulthood. Intervention should be given to them before they became obese. Further analysis of this group of students is important to design strategies to reduce obesity among school children nation wide.

CONCLUSION

Childhood obesity among school children is currently not a prevalent health problem in Kota Kinabalu. However, the complication of childhood obesity is serious. Authorities should address this problem through the education of parents and children towards living a healthy lifestyle, encompassing teaching of healthy eating habits and encouragement of physical activities in school or leisure time should be promoted among all age groups. Pregnant and lactating women should be given advice on exclusive breast feeding to prevent childhood obesity. Early detection of obesity and hypertension are important. It will be useful to determine what factors in Kota Kinabalu enable a lower prevalence of obesity compared to the higher prevalence areas in the country. This could provide important information to design strategies to reduce obesity among school children nation wide.

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