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ORIGINAL ARTICLE

Sleep habits, food intake, and physical activity levels in normal and overweight and obese Malaysian children

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KEYWORDS
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Summary
Objective: This study aimed to determine the association between sleep habits (including bedtime, wake up time, sleep duration, and sleep disorder score) and physical characteristics, physical activity level, and food pattern in overweight and obese versus normal weight children.
Design: Case control study.
Subjects: 164 Malaysian boys and girls aged 6—12 years.
Methods: Anthropometric measurements included weight, height, waist circumference, and body fat percentage. Subjects divided into normal weight ($n = 82$) and overweight/obese ($n = 82$) group based on World Health Organization 2007 BMI-for-age criteria and were matched one by one based on ethnicity, gender, and age plus minus one year. Questionnaires related to sleep habits, physical activity, and food frequency were proxy-reported by parents. Sleep disorder score was measured by Children Sleep Habit Questionnaire.
Results: Sleep disorder score and carbohydrate intake (%) to total energy intake were significantly higher in overweight/obese group ($p < 0.01$ and $p < 0.05$, respectively). After adjusting for age and gender, sleep disorder score was correlated with BMI ($r = 0.275$, $p < 0.001$), weight ($r = 0.253$, $p < 0.001$), and WC ($r = 0.293$, $p < 0.001$). Based on adjusted odd ratio, children with shortest sleep duration were found to

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have 4.5 times higher odds of being overweight/obese (odd ratio: 4.536, 95% CI: 1.912—8.898) compared to children with normal sleep duration. The odds of being overweight/obese in children with sleep disorder score higher than 48 were 2.17 times more than children with sleep disorder score less than 48.
Conclusion: Children who sleep lees than normal amount, had poor sleep quality, and consumed more carbohydrates were at higher risk of overweight/obesity.

Introduction

In recent years, the prevalence of obesity among children has increased dramatically worldwide [1] from 4.2% in 1990 to 6.7% in 2010 [2]. In Malaysia, there was a reported increase of prevalence in overweight and obesity among 6—12 years old from 20.7% in 2002 to 26.5% in 2008 using the WHO (2007) criteria [3]. Childhood obesity is a multi-factorial disease with both environmental and genetic factors involved [2,4,5]. Although, the basic cause of obesity has been simply attributed to positive imbalance of energy intake and energy expenditure [6,7] the relationship between physical activity and diet with respect to childhood obesity are inconsistent and reveal only modest associations [8—10]. Recently, some studies reported that habitual sleep length is prospectively and independently associated with obesity and mortality [11,12] with children who sleep less than adequate amounts more likely to be obese [13]. Other epidemiological evidence found a link between sleep duration and obesity in children [14—18], and in adolescents [19].

Information regarding sleeping habits, sleep disorders, and the outcomes of sleep disturbances in children is still limited and inconclusive [20]. To our best of knowledge, there is no study on sleep habits and its association between normal weight and overweight/obese children in Malaysia. Therefore, the aim of this study was to determine the relationship between sleeping hours and sleep quality with weight status in Malaysian children and to compare the strength of this relationship with other risk factors for being overweight and obese including physical activity, sedentary lifestyle and food intake. This will help to identify certain lifestyle parameters which play a role in childhood obesity.

Subjects and methods

A case control study was carried out on 164 Malaysian children aged 6—12 years old. Each child's age in year was calculated from birthday to the date of the data collection day and displayed rounded to one decimal places. Subjects consisted of normal weight ($n = 82$) and overweight/obese children ($n = 82$). Children with physical or mental disabilities, underweight children, or those who did not attend school in the past 7 days for any reason were excluded from the study. Ten schools were selected by simple random sampling with one school did not agree to take part in the study. From each school, 3 classes were randomly selected and data collection was done on children whose parents had agreed to sign the consent form. Based on WHO (2007) classification, there were 82 overweight/obese children and for each of them one control subject was identified from his or her classmate and were matched by sex, ethnic, and age plus minus one year. Data collection started in June 2011 and ended in December of the same year. Ethics approval was obtained from the Medical Research and Ethics Committee of Universiti Kebangsaan Malaysia prior to data collection in accordance with the Declaration of Helsinki. Written, informed parental consent was also taken prior to data collection. Verbal consent during data collection procedure was also obtained from subjects.

The anthropometry measurements including weight, height, waist circumference (WC), and also body composition for determining body fat percentage (BF%) were performed on the subjects. The body weight was measured to the nearest 0.1 kg using a Tanita Digital Bathroom Scale model HD 309 (Tanita, Japan). The standing height was measured by a SECA stadiometer (Seca 213, Germany) to the nearest 0.1 cm. Waist circumference was measured with a steel tape till the nearest 0.1 cm while BF% was determined using the Bioelectrical Impedance Analyzer (BIA) Bodystat 1500 MDD (Isle of Man-UK) with the equation for children aged 6 years and above. Anthropometry measurements were measured twice by trained research assistants and for the third time if the measurements differed from each other. Then the median of the figures was recorded as the final measurements. The BMI was then calculated based on WHO 2007 BMI-for-age growth reference [21].