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Prevalence of overweight in Hong Kong Chinese children: Its associations with family, early-life development and behaviors-related factors

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A B S T R A C T

Background: Childhood overweight is a crucial public health concern. Recognizing its associated factors can facilitate the establishment of effective prevention strategies. The aim of the present study was to examine the prevalence of overweight in Hong Kong Chinese children and explore its influential factors in relation to family, early-life development and behavior-related issues.
Methods: A cross-sectional study was conducted in 894 primary school students aged 9-12 years (50.4% boys). Self-reported information on family background (parental body weight, education, employment status, household income, living space, and bedroom situation), early-life developmental variables (birth weight, gestational age and feeding pattern), and children's lifestyle factors (sleep, various eating behaviors and physical activity) were collected with a questionnaire. A logistic regression was performed to test the associations.
Results: The overweight prevalence in Hong Kong children was 19.9%. Compared to the girls, the boys were more overweight (23.5% vs. 16.3%). Overweight was linked to paternal overweight, maternal overweight, lower maternal education, less monthly household income, and shorter sleep duration. Compared to the breast-fed children, those who were not breast-fed were more likely to become overweight, with marginal significance.
Conclusion: The present study revealed a high prevalence of overweight in Hong Kong pediatric population and demonstrated the family resemblance in weight status. Further interventions and promotions should involve parents and consider the family as a unit to tackle childhood overweight.

Introduction

Childhood overweight and obesity have important consequences for health and well-being, both in the short[1] and the long terms.[2] Overweight during adolescence was associated with an 8.5-fold increase in hypertension, a 2.4-fold increase in the prevalence of high total serum cholesterol levels, a 3-fold increase in high low-density lipoprotein cholesterol levels, and an 8-fold increase in low high-density lipoprotein cholesterol levels in adults from 27 to 31 years of age.[3] There is strong evidence that childhood obesity track into their adulthood and suffer related health problems as a result.[4]

An increase in the prevalence of childhood overweight has been demonstrated around the world.[5] By 2005, the overall prevalence of childhood overweight was 17.8% in Hong Kong, which represents an approximate increase of 1.5-fold over 10 years.[6] The overweight and obesity rate of Hong Kong primary students was reported to be 18.7% in 2014/2015.[7] The rising prevalence of childhood overweight and obesity poses a major public health challenge by increasing the burden of chronic, non-communicable diseases.

Overweight and obesity among children are likely to be the results of complex interactions between genetic and environmental factors.[8] Family factors, early life development, and children's lifestyles are the important environmental factors that can be modified. Recognizing the associations between these modifiable factors

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and children's weight status is a basic step to designing further effective interventions to tackle the prevalence of childhood overweight and obesity. Previous studies in Hong Kong Chinese children examined associations between family factors (e.g., maternal education level),[9] developmental factors (e.g., birth weight and feeding pattern[10]), and behavioral factors (e.g., sugar-sweetened beverage intake,[11] physical activity,[12] and sleep duration[13]). However, many have primarily focused on one or two aspects of these factors[9–18] and the results are mixed. The studies taking family, early life development and behavior-related factors into consideration would provide an update on their associations with childhood overweight. Therefore, we preformed this study to measure 1) the prevalence of overweight in a study sample of Hong Kong children, and 2) the associations between family factors, early life development and behaviors with childhood overweight.

Methods

Design and sample

The present cross-sectional study was conducted from May to September 2015 in two geographic regions of Hong Kong. Five Hong Kong primary schools that consented to participate in the study were recruited. Students with any physical disease (e.g., heart, lung, liver, kidney, other vital organ, and endocrine disease) who may have been receiving medication and experiencing drug side-effects were excluded. Three classes from Grade three to five in each school were randomly selected; hence, students in 15 classes from five schools were recruited. The study information was delivered to these students by their physical education teachers. A total of 945 students returned the consent forms with their parent's consent and the overall response rate was 74.9%. The study obtained ethical approval from institutional Committee on the Use of Human and Animal Subjects in Teaching and Research.

Measures

Information on the personal characteristics of the students, including their age, sex, physical activities, eating behaviors, and sleep duration and quality, was collected using the student questionnaire. Family factors and children's early-life developmental factors were collected using the parent questionnaire. A pilot study was conducted in 16 pairs of students and parents. Test-retest reliability of the questionnaire was assessed in a 2-week interval with an acceptable average Kappa of the items at 0.71.

Student demographic characteristics and behavioral factors

Dietary questions were adopted from the food frequency questionnaire.[19] It consisted of six items in a 5-point Likert scale. The frequencies with which they consumed breakfast and key food items during the last week (i.e., fruit, vegetables, milk, fried foods away from home and sugar-sweetened beverages) were evaluated. The possible responses were "never," "1-2 days per week", "3-4 days per week", "5–6 days per week," and "everyday". The responses to questions on these eating behaviors were further categorized into dichotomous variables for analysis representing having/not having the study eating behaviors (i.e., daily breakfast, fruit, vegetables, and milk intake, never/at least one day of intake for fried foods away from home and sugar-sweetened beverages).

The participants' physical activity was assessed by the valid Chinese version of the Physical Activity Questionnaire for Older Children (PAQ-C).[20] The scale in this sample presented good internal consistency ($\alpha = 0.81$). The children's PAQ-C score ranged from 1 to 5 with a higher score indicating a higher physical activity level. The students were asked to report their bedtimes and wake-up times during weekdays and weekends. Their average nocturnal sleep duration was calculated. The children's sleep quality was assessed using the statements "very good", "good", "fair", "poor", and "very poor".

Family factors and children's early-life developmental factors

Parents who agreed to participate in the study received a parent questionnaire from their child. Data on both paternal and maternal heights, weights, highest education attained, and employment status as well as monthly household income, average living space per person, and whether a single bedroom was provided for their child were collected. The parents' BMIs were calculated and classified into non-overweight and overweight groups according to the international classification of overweight in adults (≥ 25.0 kg/m^2).[21]

The children's early-life developmental information on their birth weight (kg), gestational age (premature baby or not), feeding pattern (breastfeeding or not), and breastfeeding duration (month) were also collected through the parent questionnaire.

Body weight status

Student weights and heights were measured by the physical education teachers during the study period. The heights were measured to the nearest 0.1 cm and the weights were measured to the nearest 0.1 kg. Body mass index (BMI, kg/m^2) was calculated as the weight in kilograms divided by the height in meters squared. According to international age- and sex-specific cutoff points, the body weight statuses of participating children were classified into non-overweight, overweight and obesity based on their BMI values.[22] The overweight and obesity groups were combined as overweight group for further analyses.

Questionnaire administration

To minimize expenses and classroom disruption, school physical education teachers administered the questionnaires to the students. The parent questionnaire was delivered to the parents by their child. Each student returned two sets of questionnaires upon completion, within a week. For students who did not hand in the questionnaires, the school teacher made 2 additional contacts with them. The participants who did not respond to the second contact were considered as incomplete to the study.

Statistical analysis

Chi-square analyses were performed to examine the differences in the prevalence of overweight across sex and age groups. The associations between family, early-life development and behavior-related factors and overweight were assessed using binary logistic regression models. The odd ratios (ORs) and 95% confidence intervals (CIs) were first performed in a univariate logistic regression analysis. The adjusted ORs (AOR) were subsequently calculated adjusting for the children's age and gender. Considering the progressive influences among the independent study variables (i.e., family, early-life development and behavior-related factors), an addition of family-related factors that were found to have a $p < 0.10$ for AOR were adjusted for the analysis on early-life developmental variables. Likewise, the family and early-life development-related factors with a $p < 0.10$ for AOR were adjusted for the analysis on the children's behavioral variables. A full model by using hierarchical logistic regression was subsequently conducted to estimate adjusted OR for multiple variables (ORm). Sex and age groups were forcedly entered in model. Family-related variables were forward selected in Block 2, children's early-life development-related variables were forward selected in Block 3, and children's behavioral variables were forward selected in Block 4. The model was set with $P = 0.10$ and $P = 0.15$ as entry and removal criteria respectively. The