Sleep Difficulties and Obesity Among Preadolescents

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ABSTRACT

Objective: To determine if sleep difficulties are associated with overweight/obesity status among preadolescents.

Methods: A total of 606 (288 males, 318 females) students, ages 11-13 years from southern Ontario, Canada, were included in this analysis. Overweight/obesity status was determined using age- and gender-specific criteria. Sleep difficulty status was determined if the parents reported children 'sometimes' or 'often' experiencing waking up at night, snoring or breathing loudly, and restlessness while sleeping. Logistic regression analysis was used to examine the association of childhood overweight status and sleep difficulties adjusting for age, gender, total physical activity score, total calories intake, maternal education level, and total hours of sleep.

Results: In this sample, 28% of children (76 boys and 95 girls) were identified as being overweight or obese. Relative to their normal-weight peers, overweight and obese individuals reported a higher prevalence of sleep difficulties (10.3% vs. 26.3%, $p<0.0001$), reduced hours of sleep (9.4 vs. 9.2 hrs, $p<0.001$), and a lower physical activity score (17.2 vs. 19.1, $p<0.01$). Using a multiple logistic regression model, in comparison to children reporting none of the three sleep behaviour problems, the odds ratios (95% CI) of being overweight or obese for those having any one, two, or all three sleep behaviour problems were 1.04 (0.46-2.36), 1.35 (0.58-2.10), and 3.52 (1.42-8.74), respectively.

Conclusions: The results suggest that the risk of overweight/obesity is associated with sleep difficulties among preadolescents. Further study is needed to determine the direction of this relationship.

Key words: Sleep difficulty; preadolescents; obesity

La traduction du résumé se trouve à la fin de l'article.

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Overweight and obesity (OW/OB) are pandemic. The accelerated increase of OW/OB in children and adolescents is alarming as several studies suggested that approximately 80% of childhood OW/OB tracks into adulthood.[1,2] In 1978, approximately 15% of the Canadian population between ages 2 to 17 years were considered OW/OB; in 2005, that figure was nearly doubled.[3] Unlike mortality or life expectancy, for which there is a clear disadvantage for those with lower income, the relationship between income and obesity is not clear.[4] This suggests that OW/OB affects the entire population. As OW/OB in adults is a well-known risk factor for a number of chronic diseases including cardiovascular disease, type 2 diabetes and certain cancers,[5-7] there is a clear need to address the development of obesity in childhood. The root cause of OW/OB is an imbalance between energy intake and expenditure, but the underlying causes of OW/OB are much more complex and numerous. Environmental, behavioural, social, cultural and genetic factors all contribute to its development.[8-10] Emerging evidence suggests that sleep may play a role in the development of OW/OB. A number of studies have identified a negative association between the duration of sleep and the risk of obesity in both child and adult populations.[11-13] However, research in the area of sleep behaviours and the risk of obesity is limited. Therefore, in this study, as part of an ongoing cohort study conducted in southern Ontario, Canada, we examined whether sleep difficulties, as reported by parents and reflected by certain sleep behaviours, are associated with OW/OB status among a preadolescent population.

METHODS

Data are from the PHAST (Physical Health Activity Study Team) study conducted among preadolescents in Niagara Region. This study has been reviewed and approved by the Ethics Research Boards of both Brock University and District School Board of Niagara (DSBN). There are a total of 97 public schools within DSBN. In 2004, approximately 2,200 students in grade four, aged 8-9 years, from 75 schools were involved in a longitudinal cohort study to examine the relationship between developmental coordination disorder and its risk factors.[14] The students' height, weight and waist girth were assessed biannually for the first three years and annually thereafter. Height and weight were measured using a Seca portable stadiometer and Tanita electronic weight scale, respectively. Waist girth was measured using standard protocols. Height and waist girth were measured to 0.1 cm and weight was measured to 0.1 kg. Weight and height were used to calculate body mass index (BMI). Students were categorized into either OW/OB or nor-

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Table 1. Characteristics of the Participants and Distribution of Reported Sleep Behaviours by Obesity Status

Variable	Normal Mean (SD) n=435	Overweight/obese Mean (SD) n=171	p-value
Age (y)	11.3 (0.5)	11.3 (0.5)	0.6075
Male (%)	48.7	44.4	0.3411
Total physical activity score	19.1 (7.0)	17.2 (7.1)	0.0035
Total calories intake (kcal/day)	2167.5 (1035.2)	2020.1 (1044.1)	0.1317
Body mass index (kg/m^2)	17.8 (1.8)	24.5 (3.4)	<0.0001
Waist circumference (cm)	65.7 (6.2)	84.0 (9.6)	<0.0001
Mother's education = less than college* (%)	42.7	49.1	0.0957
Sleep behaviour problems (%)			
Wake up at night	44.5	55.6	0.0141
Snore when asleep	31.9	49.7	<0.0001
Restless when asleep	52.8	63.2	0.0203
Jerk legs	26.2	29.2	0.4401
Resist going to bed	55.3	50.9	0.3281
Trouble falling asleep	66.1	60.8	0.2250
Have nightmares	28.4	33.3	0.2359
Awaken screaming and inconsolable	1.2	1.2	0.9811
Sleepy or tired during the day	59.6	66.1	0.1420
Trouble waking up in the morning	66.3	65.5	0.8538
Scared to sleep without parents nearby	15.8	18.7	0.3902
Total sleep behaviour problem score	16.2 (2.8)	16.8 (3.2)	0.0475
Sleep duration (hrs)	9.4 (0.7)	9.2 (0.7)	0.0002

* only 353 students had such information. SD = standard deviation.

mal-weight (NW) groups using gender- and age-specific BMI cut-offs.[15] A high prevalence of OW/OB (approximately 30% of boys and 36% of girls) was found in this cohort. In 2008, we conducted another survey among these students (n=2,205) when they were in grade seven, ages 11-13, to examine risk factors of childhood OW/OB status. Parents of these students were sent a package that included a short Sleep Behaviour Questionnaire (SBQ).[16] The SBQ was used to collect sleep-related information during the previous six months and was completed by the child's principal caregiver. A total of 854 parents of the students surveyed returned the SBQ. After removing incomplete questoinnaires, a total of 606 (288 boys and 318 girls) remained for this analysis. Four questions in the SBQ asked the usual wake-up and bed-times during school days and weekends. The information from these four questions was used to calculate sleep duration. Another 11 questions in the SBQ asked if the child had any related sleep disturbances. These were: "Resist or object going to bed?" "Have trouble falling asleep?" "Wake up at night?" "Have nightmares?" "Awaken screaming and inconsolable?" "Snore or breathe loudly when asleep?" "Move a lot or is he/she restless when asleep?" "Frequently twitch or jerk his/her legs when asleep?" "Seem sleepy or tired during the day?" "Have trouble waking up in the morning?" and "Seem scared to sleep without parents nearby?" Responses (their score) were: never (0), sometimes (1), or often (2). A total sleep behaviour score (TSBS) was calculated by adding all response scores, with a higher value representing a poorer sleep quality.

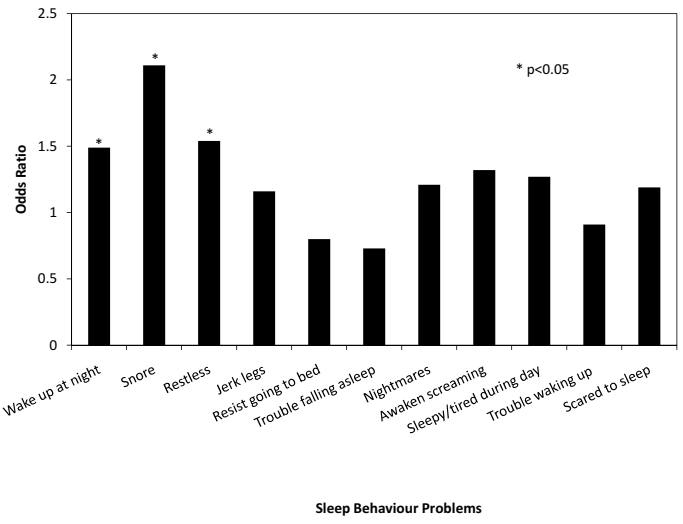
Covariates included in this analysis were age (years), gender (male vs. female), total calories intake (kcal/day), total physical activity score (TPAS), sleep duration (hrs), and maternal education level (college or higher vs. less than college). Age was calculated using birth date. Gender was self-reported. Total calories intake was derived from a food frequency questionnaire (FFQ)[17] (C-02-1, validated for children by the Harvard Medical School to determine past-year nutrition status). TPAS was calculated from a validated physical activity participant questionnaire (PQ),[18] in which there are 63 items to evaluate children's physical activity levels in free-time activities, organized sports, and inactive pursuits. The TPAS in "activity units" – an activity unit being defined as a single active choice – was used to indicate the student's physical activity level, with a higher score indicating more active. Both the FFQ and the PQ were surveyed among students in the school classroom. Maternal education information was collected using parent questionnaire that was surveyed in 2004 when the cohort study started; only approximately 353 students in this analysis had such information.

Table 2. Adjusted Odds Ratios* of Overweight/Obese by the Combinations of Sleep Behaviour Problems

	Sample Size (%)	OR	95% CI	p-value
None	117 (19.7)	1.00		
Wake up	76 (12.8)	0.93	0.45, 1.94	0.8459
Snore	45 (7.6)	1.12	0.48, 2.65	0.7895
Restless	83 (14.0)	0.85	0.40, 1.80	0.6673
Wake up & Snore	21 (3.5)	1.86	0.61, 5.66	0.4380
Wake up & Restless	98 (16.5)	1.30	0.68, 2.55	0.2756
Snore & Restless	65 (10.9)	2.06	1.00, 4.22	0.0490
Wake up, Snore, & Restless	90 (15.1)	3.43	1.80, 6.51	0.0002

* Adjusted for age, gender, total physical activity, total calories intake, and sleep duration.
OR = odds ratio; CI = confidence interval.

Figure 1. Odds ratio* of overweight/obese for sleep behaviour problems from logistic regression models



Note: *Adjusted for age, gender, and sleep duration

Table 3. Adjusted Odds Ratios* of Overweight/Obese by the Number of Sleep Behaviour Problems

	Any One Sleep Behaviour Problem		Any Two Sleep Behaviour Problems		All Three Sleep Behaviour Problems		p-value for Trends
	OR	95% CI	OR	95% CI	OR	95% CI	
Model 1	0.97	0.51, 1.74	1.54	0.86, 2.76	3.53	1.87, 6.66	<0.0001
Model 2	0.94	0.52, 1.69	1.58	0.88, 2.84	3.43	1.80, 6.52	<0.0001
Model 3	1.04	0.46, 2.36	1.35	0.58, 2.10	3.52	1.42, 8.74	0.0043

Note: *Model 1, adjusted for age, gender, total physical activity, calorie intake; Model 2, further adjusted for sleep duration; Model 3, further adjusted for mother's education status.
OR = odds ratio; CI = confidence interval.

Table 4. Adjusted* Means of BMI, Waist Girth, and Prevalence of Overweight/Obese by Sleep Behaviour Problems

	No Sleep Behaviour Problem	Any 1 Sleep Behaviour Problem	Any 2 Sleep Behaviour Problems	All 3 Sleep Behaviour Problems	p-values for Trend
BMI (kg/m^2)	19.3	19.0	19.9	20.8	0.0008
Waist girth (cm)	69.7	69.0	71.1	74.6	0.0004
Overweight/Obese (%)	17.0	21.5	22.8	54.7	<0.0001

Note: *Adjusted for age, gender, total physical activity, caloric intake, and sleep duration.
BMI = body mass index.

T-test and chi-square test were used to compare the basic characteristics of the participants by OW/OB status. Logistic regression models were used to estimate the risk association of OW/OB with sleep difficulties. Multivariate analyses were used to obtain the adjusted mean levels of BMI and waist girth. All analyses were conducted using SAS 9.13.[19] A p-value from two-sided test of less than 0.05 was considered significant.

RESULTS

The characteristics of participants and distribution of the reported sleep behaviours by OW/OB status are presented in Table 1. Overall, 28% of students were identified as OW/OB. Mean level of age and proportions of boys were similar between NW and OW/OB groups. Mean levels of TPAS and total calories intake were higher in the NW group, but only the difference of TPAS was statistically significant. As expected, the OW/OB group had much higher averages of BMI and waist girth than the NW group. Among those who had information with regard to maternal education, the OW/OB group had a slightly higher percentage of mothers whose highest degree was less than college (49.1 vs. 42.7%, p=0.1). The reported sleep difficulties ('sometimes' or 'often') were similar between these two groups except for 'wake up at night', 'snore when asleep', and 'restless when asleep'; the OW/OB group reported much higher percentages of these problems than the NW group (p<0.05). Compared to the NW group, the OW/OB group had slightly shorter sleep duration (9.2 vs. 9.4 hrs, p<0.01) and higher TSBS (16.8 vs. 16.2, p<0.05).

Using a logistic regression model, we examined the OW/OB risk association with TSBS as a continuous variable. When age and gender were adjusted, the odds ratio (OR) of OW/OB for TSBS was 1.06 (95% CI, 1.00-1.13, p=0.05). When further adjusting for sleep duration, the OR dropped to 1.05 (0.99-1.12, p=0.1). The ORs of OW/OB for each sleep behaviour (yes = 'sometimes' or 'often' vs. no = 'never') are shown in Figure 1. Among those sleep behaviours, only 'wake up at night', 'snore when asleep' and 'restless when asleep' were significantly associated with the increased odds of OW/OB after adjusting for age, gender and sleep duration.

The adjusted ORs of OW/OB for different combinations of those three sleep behaviours are presented in Table 2. Approximately 15% of children had all three reported problems, 20% of them did not have any and the remaining children had either one or two behaviours with the percentages varying from about 4% to 16%. When all of these combinations were simultaneously put into the model with further adjustment for TPAS and total calories intake, in comparing to those who did not have the three sleep behaviours, two combinations reached statistical significance: those who had all three reported behaviours (OR [95% CI]; 3.43 [1.80-6.51], p<0.01) and those who had reported 'snore when asleep' and 'restless when asleep' (2.06 [1.00-4.22], p<0.05).

Table 3 shows the adjusted ORs of OW/OB for four categories of sleep behaviours: 1) those without any of the three behaviours (these were the referent in the analysis); 2) those with just one of the three behaviours; 3) those with two of the three behaviours; and 4) those with all three behaviours. Three models were used to examine the relationship between odds of OW/OB and sleep difficulty. After adjustment for age, gender, total physical activity, and total calories intake (model one), the ORs (95% CI) of OW/OB for those who had one, two, or three of the reported behaviours were 0.97 (0.51-1.74), 1.54 (0.86-2.76) and 3.53 (1.87-6.66), respectively. The ORs were similar when further adjusting for sleep duration (model two) and sleep duration and maternal education level (model three). The p-values for trends were all significant (p<0.01).

To examine the impact of the three sleep problems on variables related to obesity, we calculated the adjusted means of BMI, waist girth and the adjusted prevalence rates of OW/OB (from logistic model) based on the number of reported sleep behaviours (Table 4). After adjusting for age, gender, TPAS, total calories intake and sleep duration, the mean levels of BMI and waist girth increased with more reported sleep behaviours. The prevalence of OW/OB followed the same pattern. The p-values for trends were all significant (p<0.01).

DISCUSSION

It appears that sleep difficulties are positively associated with OW/OB among preadolescents in this cohort and the association with OW/OB is independent of sleep duration and other known risk factors. The results from this study – i.e., that sleep duration is negatively associated with the odds of OW/OB – are consistent with the findings from other studies.[12,13] However, a unique finding in this study is that sleep difficulties are significantly associated with the risk of OW/OB and this risk association is not affected by sleep duration and other known risk factors. Although sleep duration in this study is also significantly and negatively associated with the odds of OW/OB, the time difference between OW/OB and NW

groups is trivial. The TSBS appears not to reflect well the relationship between sleep difficulty and childhood obesity status. The mean level of TSBS was higher among children with OW/OB and every one-unit increase in TSBS was associated with an approximately 6% increase in the odds of OW/OB when adjusting for age and gender, however this relationship was no longer significant when further adjusting for sleep duration.

We identified three reported sleep behaviours associated with OW/OB among this preadolescent population: 'waking up at night', 'snoring when asleep', and 'restless when asleep'. Children with all of those three reported behaviours were 3.5 times more likely to be in the OW/OB group, while those with 'snore when asleep' and 'restless when asleep' or 'snore when asleep' and 'wake up at night' appeared to have approximately two times higher odds to be in the OW/OB group (though only the combination of 'snore when asleep' and 'restless when asleep' was statistically significant). This suggests that these sleep behaviours – 'snore when asleep' in particular – may reflect a poor sleep quality. 'Waking-up at night' or 'restless when asleep' may reflect sleep disturbances and 'snoring when asleep' may suggest possible apnea. It is not clear how these three sleep behaviours are related to each other. However, it has been observed in clinics that obese individuals, either children or adults, are more likely to have obstructive sleep apnea syndrome.[20,21] Sleep quality is associated with sleep duration, but sleep quality may be more related to measures of health than sleep quantity in a non-clinical population.[22] Therefore, it is interesting to observe that children in this study with more of these three reported sleep behaviours had higher values of BMI and waist girth and were more likely to be in the OW/OB group even when other known risk factors and sleep duration were taken into account.

Despite many studies highlighting the relationship between sleep and risk for overweight and obesity, the pathogenic mechanisms between the two are still unclear. It has been proposed that sleep difficulty contributing to the development of overweight and obesity may be due to 1) its having an impact on several hormones in humans that affect metabolism and endocrine functions, e.g., leptin and ghrelin;[23,24] 2) inflammation;[25] and/or 3) lifestyle change resulting in an imbalance of energy intake and expenditure.[11] Leptin is an anorexemic hormone released primarily by the adipocytes that signals satiety to the hypothalamus. Leptin has been shown to prevent lipid accumulation by increasing lipid oxidation. Ghrelin is a peptide with opposing effects to leptin that is released primarily by the stomach to affect the arcane hypothalamic nuclei. Its effects are orexigenic; experiments with mice have shown that injecting ghrelin increased their food consumption.[24] In healthy young men, sleep curtailment lowered serum leptin levels with a concomitant rise in ghrelin levels.[26] Shorter sleep may also provide an increased opportunity for eating. There is a greater propensity for those who are sleep-deprived to consume caloric-dense foods with high carbohydrate content.[27,28] In addition, sleep loss may result in daytime tiredness and possibly reduced physical activity.[28,29]

Several limitations need to be addressed when interpreting the results. First, this is a cross-sectional analysis and therefore one cannot assume that the observed relationship is causal. Second, there is no information on the validity and reliability of the Sleep Behaviour Questionnaire. The validity of the parent-reported SBQ among children is also uncertain. Since traditional self-report measures of sleep have not correlated highly with objective measures,[30] the present study can be considered as an examination of parental perceptions of sleep problems rather than sleep problems per se and, thus, it may be subject to a host of rater biases.[31] Third, less than half of the questionnaires were returned by parents. The children whose parents did return the SBQ were slightly younger (11.3 vs. 11.4 years), were more likely boys (47.5% vs. 41.3%), and had lower average BMI (19.7 vs. 20.3 kg/m^2) and waist girth (70.9 vs. 72.1 cm) than those children whose parents did not return the questionnaire. Although these differences did not reach clinical importance, we still need to be cautious when interpreting the results. Fourth, because among parents who completed the SBQ, 88% of them were mothers or female guardians, potential gender differences in reporting of sleep disturbances should also be considered. Nevertheless, the results from this study suggest that not only short sleep duration but also poor sleep quality may be associated with increased odds of childhood OW/OB. In addition, the data collected from a larger population-based cohort with accurate anthropometric measurements may strengthen this study.

In conclusion, sleep difficulties are independently associated with OW/OB status among preadolescents in southern Ontario, Canada. However, the direction of this relationship needs to be further studied.

REFERENCES

1. Freedman DS, Khan LK, Dietz WH, Srinivasan SR, Berenson GS. Relationship of childhood obesity to coronary heart disease risk factors in adulthood: The Bogalusa Heart Study. *Pediatrics* 2001;108(3):712-18.
2. Whitaker RC, Wright JA, Pepe MS, Seidel KD, Dietz WH. Predicting obesity in young adulthood from childhood and parental obesity. *N Engl J Med* 1997;337(13):869-73.
3. Shields M. Measured Obesity Overweight Canadian Children and Adolescents. Ottawa, ON: Statistics Canada, 2005.
4. Strategic Issues Management Division. Obesity in Canada - Snapshot. Ottawa: Public Health Agency of Canada, 2009.
5. Calle EE, Rodriguez C, Walker-Thurmond K, Thun MJ. Overweight, obesity, and mortality from cancer in a prospectively studied cohort of U.S. adults. *N Engl J Med* 2003;348(17):1625-38.
6. Grundy SM. Obesity, metabolic syndrome, and coronary atherosclerosis. *Circulation* 2002;105(23):2696-98.
7. Hossain P, Kawar B, El Nahas M. Obesity and diabetes in the developing world—a growing challenge. *N Engl J Med* 2007;356(3):213-15.
8. Christakis NA, Fowler JH. The spread of obesity in a large social network over 32 years. *N Engl J Med* 2007;357(4):370-79.
9. Oken E, Gillman MW. Fetal origins of obesity. *Obes Res* 2003;11(4):496-506.
10. Barlow SE, Dietz WH. Obesity evaluation and treatment: Expert Committee recommendations. The Maternal and Child Health Bureau, Health Resources and Services Administration and the Department of Health and Human Services. *Pediatrics* 1998;102(3):E29.
11. Taheri S. The link between short sleep duration and obesity: We should recommend more sleep to prevent obesity. *Arch Dis Child* 2006;91(11):881-84.
12. Anic GM, Titus-Ernstoff L, Newcomb PA, Trentham-Dietz A, Egan KM. Sleep duration and obesity in a population-based study. *Sleep Med* 2010;11(5):447-51.
13. Nielsen LS, Danielsen KV, Sorensen TI. Short sleep duration as a possible cause of obesity: Critical analysis of the epidemiological evidence. *Obes Rev* 2011;12(2):78-92.
14. Faught BE, Cairney J, Hay J, Veldhuizen S, Missiuna C, Spironello CA. Screening for motor coordination challenges in children using teacher ratings of physical ability and activity. *Hum Mov Sci* 2008;27(2):177-89.
15. Cole TJ, Bellizzi MC, Flegal KM, Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: International survey. *BMJ* 2000;320(7244):1240-43.
16. Reid GJ. Pediatric Sleep Screening Questionnaire (Unpublished). London, ON: The University of Western Ontario, 2004.
17. Rockett HR, Breitenbach M, Frazier AL, Witschi J, Wolf AM, Field AE, et al. Validation of a youth/adolescent food frequency questionnaire. *Prev Med* 1997;26(6):808-16.
18. Hay JA. Adequacy in and predilection for physical activity in children. *Clin J Sport Med* 1992;2:192-201.
19. SAS 9.1.3. Help and Documentation. Version 9.13 ed. Cary, NC: SAS Institute Inc, 2004.

20. Arias MA, Bartolome S, Rodriguez-Padial L. Obesity, cardiovascular disease and obstructive sleep apnea. *Am J Med* 2008;121(5):e13.
21. Arens R, Muzumdar H. Childhood obesity and obstructive sleep apnea syndrome. *J Appl Physiol* 2010;108(2):436-44.
22. Pilcher JJ, Ginter DR, Sadowsky B. Sleep quality versus sleep quantity: Relationships between sleep and measures of health, well-being and sleepiness in college students. *J Psychosom Res* 1997;42(6):583-96.
23. Lee Y, Wang MY, Kakuma T, Wang ZW, Babcock E, McCorkle K, et al. Liporegulation in diet-induced obesity. The antisteatotic role of hyperleptinemia. *J Biol Chem* 2001;276(8):5629-35.
24. Kojima M, Kangawa K. Ghrelin: Structure and function. *Physiol Rev* 2005;85(2):495-522.
25. Ohga E, Tomita T, Wada H, Yamamoto H, Nagase T, Ouchi Y. Effects of obstructive sleep apnea on circulating ICAM-1, IL-8, and MCP-1. *J Appl Physiol* 2003;94(1):179-84.
26. Spiegel K, Tasali E, Penev P, Van Cauter E. Brief communication: Sleep curtailment in healthy young men is associated with decreased leptin levels, elevated ghrelin levels, and increased hunger and appetite. *Ann Intern Med* 2004;141(11):846-50.
27. Nishiura C, Noguchi J, Hashimoto H. Dietary patterns only partially explain the effect of short sleep duration on the incidence of obesity. *Sleep* 2010;33(6):753-57.
28. Stamatakis KA, Brownson RC. Sleep duration and obesity-related risk factors in the rural Midwest. *Prev Med* 2008;46(5):439-44.
29. Allen RP. Article reviewed: Sleep apnea and daytime sleepiness and fatigue: Related to visceral obesity, insulin resistance, and hypercytokinemia. *Sleep Med* 2000;1(3):249-50.
30. Rechtschaffen A. Polygraphic aspects of insomnia. Encephalography: Proceedings of the 24th European Meeting on Electroencephalography. Bologna, Italy, 1967;109-25.
31. Scher A, Epstein R, Sadeh A, Tirosh E, Lavie P. Toddlers' sleep and temperament: Reporting bias or a valid link? A research note. *J Child Psychol Psychiatry* 1992;33(7):1249-54.

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RÉSUMÉ

Objectif : Déterminer si les troubles du sommeil sont associées au surpoids/à l'obésité chez les préadolescents.

Méthode : Notre étude a porté sur 606 élèves en tout (288 garçons, 318 filles) âgés de 11 à 13 ans et habitant le Sud de l'Ontario, au Canada. Nous avons déterminé le statut de surpoids ou d'obésité selon des critères liés à l'âge et au sexe. Nous avons déterminé le statut de troubles du sommeil si les parents déclaraient que leurs enfants éprouvaient « parfois » ou « souvent » certains symptômes (se réveiller la nuit, ronfler ou respirer bruyamment, avoir un sommeil agité). Au moyen d'analyses de régression logistique, nous avons étudié l'association entre le surpoids de l'enfant et les troubles du sommeil en tenant compte de l'âge, du sexe, du score d'activité physique total, de l'apport total en calories, du niveau d'instruction maternel et du nombre total d'heures de sommeil.

Résultats : Dans notre échantillon, 28 % des enfants (76 garçons et 95 filles) ont été reconnus comme étant obèses ou en surpoids. Par rapport à leurs pairs de poids normal, les sujets en surpoids et obèses déclaraient une prévalence plus élevée de troubles du sommeil (10,3 % c. 26,3 %, p<0,0001), moins d'heures de sommeil (9,4 c. 9,2 heures, p<0,001) et un score d'activité physique inférieur (17,2 c. 19,1, p<0,01). Selon un modèle d'analyse de régression logistique multiple, à comparer à ceux des enfants qui ne déclaraient aucun des trois troubles du sommeil, les rapports de cotes (IC de 95 %) liés au statut de surpoids ou d'obésité, chez les élèves qui manifestaient un, deux ou les trois troubles du sommeil, étaient de 1,04 (0,46-2,36), 1,35 (0,58-2,10) et 3,52 (1,42-8,74), respectivement.

Conclusion : Ces résultats donnent à penser que le risque de surpoids ou d'obésité est relié aux troubles du sommeil chez les préadolescents. Il faudrait pousser la recherche pour déterminer le sens de cette relation.

Mots clés : troubles du sommeil; préadolescents; obésité