INFLUENCE OF SLEEP ON OBESITY IN CHILDREN

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INFLUENCE OF SLEEP ON OBESITY IN CHILDREN (Abstract) Childhood obesity is a global epidemic with long term implications. The main cause of obesity is an increase in calorie intake and a decrease in physical activity, but also there is clear evidence suggesting a link between the duration and quality of sleep and obesity risk. Good sleep habits are involved in increased ability to concentrate at school, improvement of general state, immune system development, increased quality of life. On the other hand, there are several mechanisms by which chronic sleep deprivation induces weight gain: disturbance of hormones that control hunger center, increased time for meals, reduced physical activity, metabolic changes. Recently, nighttime sleep duration has declined, in contrast with the increasing prevalence of obesity. Childhood sleep habits have a long term effect on weight, with repercussions even into adulthood. This is the reason why there is increasing interest to include sleep quality on the list for childhood obesity prevention. Sleep represents an important and independent risk factor of obesity in children and adolescents and it should be taken into consideration in the management of obesity. Keywords: OBESITY, SLEEP, CHILDREN

Childhood obesity is a global epidemic with long-term implications: cardiovascular diseases (high blood pressure, dyslipidemia), endocrine dysfunctions (diabetes type 2, insulin resistance), pulmonary complications (obstructive sleep apnea, asthma, effort intolerance) (1). Recent statistical studies have shown that the prevalence of obesity increased dramatically, particularly in boys, and especially in rural areas (2). Considering all these aspects, special attention should be paid to risks factors and prevention of childhood obesity.

It is well known that the main cause of obesity is an increased calorie intake in combination with decreased physical activity (3). But it is widely accepted that other significant factors are also involved in this process. Thus, literature data show convincing evidence that shorter sleep duration and poorer sleep quality is an important and independent risk factor of obesity in children (4).

BENEFITS OF SLEEP

In order to understand the consequences of sleep deficit, we must first know the benefits of a quality sleep. Good sleep habits are involved in increased ability to concentrate at school, improvement of general state, immune system development, increased quality of life. Along with diet
and exercise, sleep plays an important role in growth, development and maturation of body functions, especially during childhood, when more sleep is needed than in adulthood. Adequate sleep also plays a key role in the regulation of homeostasis and hormonal systems involved in somatic and intellectual development, brain maturation, information processing and memory consolidation (5, 6, 7).

Insufficient sleep has been linked to emotional, social, cognitive and behavioral disturbances, such as poor concentration, depression, unsatisfactory academic results, suicidal tendency. All these negative effects improve with increased sleep duration both in childhood and adolescence (8).

**HOW SLEEP AFFECTS BODY WEIGHT**

Besides all these benefits, sleep plays a role in body weight. To better understand this mechanism a series of studies and researches have been conducted. Their conclusion was that lack of sleep increases the appetite because it influences the hormones regulating the hunger center. Among these hormones are leptin and ghrelin. Leptin is considered a marker of energy stores. Low leptin levels signal the nervous system of a depletion of energy reserves, which leads to increased appetite. On the other hand, ghrelin, the hormone released by gastric cells, is a marker of energy deficit. So, higher ghrelin levels stimulate the appetite and storage of ingested calories (9). There are studies which show that sleep deprivation increases ghrelin level and decreases the leptin level with a corresponding increase in hunger and appetite, especially for foods rich in fats and carbohydrates (10).

Another element through which sleep influences body weight is the availability of more time for meals. People who sleep less at night will consume more food than people with normal sleep duration, because they have more time available to think about food. Sleep also influences physical activity. People who do not get enough sleep are tired and therefore will reduce the exercise duration. Sleep-deprived people tend to spend more time watching television and less time in playing sports (11, 12). Laboratory experiments show that sleep deprivation lowers body temperature, which leads to lower energy consumption and finally to accumulation of extra weight (11, 13).

The reduction of sleep duration produces metabolic changes in the body. There are several hormones that fluctuate during the light/dark cycle, being affected by sleep: growth hormone, melatonin, cortisol (14). Sleep deprivation is associated with a decline in glucose tolerance and insulin sensitivity, which effectively prevents the body to metabolize sugar from food (15). It was also found that short sleep duration is associated with a pre-sleep growth hormone secretion in addition to the normal hormone secretion (6, 16). These increased growth hormone levels may induce a transient insulin resistance in muscle tissue, resulting in a significant increase of insulin resistance in other tissues (17). Also, elevated evening cortisol concentrations are likely to result in reduced insulin sensitivity on the following morning (6, 17). Other complications associated with insulin resistance and obesity in childhood and adolescence include metabolic syndrome, fatty liver and polycystic ovary disease (18).

In addition, sleep deprivation could decrease energy expenditure by reducing the thyroid stimulating hormone (TSH), and

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this fact has as consequence a reduced rate of the basal metabolism or a disturbance of neural circuits which control body weight (14).

IMPACT OF SLEEP ON CHILDHOOD OBESITY

Recently, night time sleep duration has declined, in contrast with the increasing prevalence of obesity. It has been shown that when children aged 10-17 years were offered optimal sleep conditions for several days in a raw, they used to sleep an average of 9 hours/day. This demonstrates that the body needs at least 9 hours of rest per day. In contrast with these physiological needs, the statistics show that teenagers get 7 hours of sleep or less (5, 6, 7). Also, over the past century sleep duration decreased by 0.75 minutes per year, with a more significant decrease on school days, for older children, and especially for boys (19).

Studies aimed at illustrating the effect of sleep deprivation on body weight in children have been conducted. Thus a British study in over 8000 children measured weight, height and body mass index. Other risk factors probably involved in obesity, such as maternal education, intrauterine and perinatal factors, food habits, family and demographic characteristics were also considered. The results showed that sleep is an independent risk factor, children getting less than 10.5 hours/night of sleep at age 3 having a 45% higher risk of obesity at age 7 compared to those getting at least 12 hours/night (4). Similarly, a study in 915 US children aged 6 months, 1 year and 2 years aimed at predicting the effects of sleep duration on body mass index (BMI), subscapular and triceps skinfold thicknesses, and overweight. The conclusion was that an average daily sleep duration of less than 12 hours during the first year of life increases by 2 times the risk of obesity at age 3 (20).

Childhood sleep habits have a long term effect on weight, with consequences well into adulthood. This was demonstrated by a study on over 1000 children from New Zealand, followed from birth until age 32 using information on the hours of sleep at age 5, 7, 9 and 11 years. It has been shown that each 1 hour reduction in sleep duration during infancy is associated with a 50% higher risk of obesity at the age 32 (21). Furthermore, late bedtimes and late wake up times are associated with an unfavorable weight status profile, both in children and adults, regardless of gender (22).

GOOD SLEEP HABITS

Regarding the optimal duration of sleep to be recommended to parents for their children, the body needs change as the child grows from infancy up to childhood and adolescence. The sleeping duration recommendations of the American Sleep Foundation are: 0 – 3 months: 14 – 17 hours/day; 4 – 11 months: 12 – 15 hours/day; 1 – 2 years: 11 – 14 hours/day; 3 – 5 years: 10 – 13 hours/day; 6 – 13 years: 9 – 11 hours/day; 14 – 17 years: 8 – 10 hours/day; 18 – 25 years: 7 – 9 hours/day (23).

To effectively advise parents of overweight children, it is important to investigate aspects related to duration and quality of sleep, in order to assess whether they get enough sleep, difficulty awakening in the morning, drowsiness or excessive daytime fatigue associated with concentration difficulties at school or with homework, difficulties in putting the child to sleep at night, systematic nigh awakenings. All these elements indicate the existence of sleep
problems. In this case, it is important to correct children’s sleep issues, which can prevent both obesity and related health consequences.

Some recommendations for a better quality sleep are:

- Follow a regular sleep schedule (go to bed and wake up the same time every day);
- Relaxing activities before bedtime;
- Avoid television, computer use or video games at least 3 hours before bedtime
- Avoid before bedtime heavy food as well as foods and beverages with stimulating effect such as chocolate, caffeine containing sodas (24, 25).

**CONCLUSIONS**

In conclusion, sleep is an important and independent risk factor of obesity in children and adolescents. Even though obesity prevention is based on nutrition and physical exercise, sleep habits should be also taken into consideration for a more efficient management of obesity. A healthy sleep implies enough hours of restorative sleep, without interruptions (to be able to pass through all stages of sleep), adapted to the sleep needs of each period of childhood, and suitable to the natural biological rhythm of the child. Once learned the discipline of a quality sleep, the child has a better compliance regarding food and physical exercise discipline. Considering all the chronic medical complications that obesity can cause, we can strongly affirm that a healthy sleep is one of the keys to maintaining a normal weight, contributing to a healthier life both now and in the future.

**REFERENCES**

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