International
Journal of
**Health
Science**

ASSOCIATION BETWEEN QUALITY OF SLEEP AND OVERWEIGHT/OBESITY IN A POPULATION OF ADOLESCENT STUDENTS

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ABSTRACT: Framework: Sleep is a vital necessity for our physical, emotional and cognitive health. However, teens face many changing challenges and this is reflected in sleep patterns, including sleep timing and sleep duration and quality. Sleep is often delayed and of short duration. Inadequate sleep is associated with deficits in adolescent functioning. In addition to endogenous and exogenous factors, environmental conditions also exert a decisive influence. Among these, overweight/obesity is often correlated with poor sleep quality. **Methodology:** Quantitative, descriptive-correlational study, in which 138 participated with a non-probabilistic sample of 138 adolescents. A sociodemographic questionnaire and the Pittsburgh Sleep Quality Index were selected and applied as measurement instruments. **Results:** Most adolescents (61.6%) had poor sleep quality, which was contradicted by their perception of it. Their perception seems very misleading, with 81.2% considering that they have good quality sleep. The average daily hours was 7.8h, below the recommended value for this age group. A relationship between sleep quality and overweight and obesity was not found. We can consider that this finding can be at least partially explained by the low percentage of overweight/obese adolescents found, which is not in line with most studies or with the perception of the phenomenon in clinical practice. **Conclusions:** Most teenagers have poor sleep quality without realizing it. Although we did not verify an association between sleep quality and overweight/obesity due to factors that are yet to be identified, this poor sleep quality forces us to devise strategies to mitigate this serious problem in this population.

Keywords: Sleep quality; teenagers; overweight; obesity.

INTRODUCTION

Sleep is a fundamental neuropsychophysiological need that is recognized as conditioning the quality of life, health and well-being of individuals. Hence, regardless of the stage of the life cycle, sleep problems are associated with less physical, mental and social health.

In adolescence, profound changes occur at a biological, psycho-affective and socio-cultural level, with increased autonomy, assumption of new roles, thus combining intrinsic and extrinsic factors that motivate changes, namely in sleep patterns. These changes include a delay in bedtime, which increases with age, a result of biological regulation mechanisms inherent to this phase, and a direct conflict with social issues, namely academic obligations that dictate the need to wake up early, decreasing from this so the opportunity to sleep.

In general, between 8 and 10 hours of sleep are recommended, at regular times, for this age group, in order to promote better health outcomes, namely, better quality of life, physical and mental health, emotional regulation, better levels of attention and learning (Paruthi et al., 2016).

Sleeping less than the recommended amount of time is associated with attention deficit, learning problems, greater susceptibility to accidents, behavior problems, mood disorders, physical and mental illnesses (hypertension, diabetes, obesity and depression), substance abuse, behavioral risk and suicidal ideation.

In today's society, characterized by an accelerated pace of life, there is often a need to perform multiple activities on a daily basis, to the detriment of periods of sleep and rest. Technological advances, particularly in terms of the development of the means of communication and the internet, also offer permanent connectivity, which, on the one

hand, benefits us by making accessible a whole set of information favorable to personal development, constitute high risk factors for a good sleep quality.

Several studies such as that by Gohil and Hannon (2018) have been demonstrating the harmful effect that electronic devices represent for the quality of sleep, especially their use in the afternoon and at night, mainly related to exposure to artificial blue light that interferes with sleep. with the circadian regulation of sleep and therefore in the production of melatonin. Teenagers are increasingly using different types of electronic devices at an earlier age, at home, at school and on the move, with easy access to the internet, free of charge, in different places.

Other studies also associate poor sleep quality with an increased risk factor for the development of overweight and obesity, which constitutes a serious public health problem on a global scale, and specifically in the context of our country, where overweight has been increasing. to increase in recent years, both in the adult and pediatric population, and it is estimated that it affects even more than a quarter of Portuguese children and adolescents (DGS, 2017).

Inadequate sleep duration is associated with poor diet quality, decreased insulin sensitivity, hyperglycemia, and prevalent cardiometabolic risk factors. Evidence suggests that poor sleep quality and altered circadian timing, characterized by a preferred late sleep onset, known as the "adolescent chronotype", contribute to reduced sleep duration.

Sleep duration has been associated with obesogenic behaviors and obesity prevalence in adult and youth populations. A study of 240 children from low-income families demonstrated that a decrease in mean sleep duration from 9.2 to 8.5 h was significantly associated with obesity (Hager, Calamaro, Bentley, Hurley, Wang & Black, 2016). Whether or not these two increasingly prevalent pediatric problems are physiologically linked is a topic of investigation, and the associations between sleep characteristics and obesity are beginning to be better understood. Interventions to improve sleep duration and quality and obesity in adolescents are scarce and more evidence is needed to determine whether these interventions can improve obesity-related health outcomes.

Moderate to vigorous physical activity, measured with an attical accelerometer, was positively related to sleep duration. Although sleep characteristics such as co-sleeping, room-sharing, delayed sleep onset time, increased sleep latency, and nocturnal awakenings did not correlate with obesity, they were associated with decreased sleep duration and obesogenic behaviors, including less physical activity and worse diet quality.

The precise mechanisms linking REM sleep and obesity are not completely understood, but may include decreased sleep metabolic rate and endocrine changes associated with decreased leptin levels and increased ghrelin levels, promoting increased food consumption (Liu, Forbes, Ryan, Rofey, Hannon, Dahl, 2008).

Sleep deprivation is associated with decreased insulin sensitivity through changes in the hormonal milieu, including cortisol, ghrelin, leptin, growth hormone and glucose tolerance (Felso, Lohner, Hollódy, Erhardt & Molnár, 2017).

These hormonal changes influence energy regulation, unhealthy food choices, increased food consumption, decreased physical activity, and likely a reduction in non-exercise thermogenesis activity.

Knowing that a large part of the behaviors and habits developed during adolescence remain in adult life, greatly influencing the present and future health of individuals, it is

imperative to look at adolescence as a distinct segment of our population, to understand and deal with their problems and lifestyles. life, early implementing measures capable of mitigating damage to present and future health, with nurses being in the ideal position to play this role of education in society, with adolescents, families and the community in general.

Recently, in order to improve the quality of sleep, a set of behavioral measures were established that aim to promote an environment conducive to sleep and avoid activities that disturb it, commonly known as *sleep hygiene*. These measures generally include establishing a welcoming environment, avoiding physiological barriers to sleep, and establishing appropriate sleep routines.

Taking into account the repercussions that poor sleep quality implies for health and specifically in the context of adolescent growth and development, we defined the general objective of evaluating the quality of sleep of adolescents in the school context, constituting specific objectives, to verify its association with excess weight, measured by BMI.

The results of this study must constitute an information base that motivates the establishment of articulation between health professionals, schools, adolescents and families, in order to improve habits and the quality of sleep of adolescents, stimulating the creation of programs and projects in this area. area, which contribute to the well-being, growth and healthy development of children and young people in our country.

METHODOLOGY
TYPE OF STUDY

The study is part of the type of quantitative investigation, of a descriptive-correlational nature

SAMPLE

The non-probabilistic, accidental sampling method was used. One class was selected from each year between the 9th and 12th grade of two secondary schools, in a total of 138 adolescents, from the Alentejo region. The selection of the sample was based on ease of access and availability and authorization from the executive boards to carry out the study, thus fulfilling the required ethical formalities. Informed consent was also obtained from the adolescents' parents.

Data were collected using a self-administered questionnaire, distributed in the classroom and answered at home. All adolescents who attended between the 9th and 12th grade and aged between 12 and 18 were considered eligible to participate in the study.

DATA COLLECTION INSTRUMENTS

As a data collection instrument, a questionnaire consisting of two parts was applied: The first a sociodemographic and lifestyle questionnaire, the second, the Pittsburgh Sleep Quality Index (PSQI).

SOCIODEMOGRAPHIC AND LIFE HABITS QUESTIONNAIRE

A socio-demographic and lifestyle questionnaire was created, where relevant questions were asked to characterize the sample. With regard to the characterization of the adolescents, the aim was to collect data relating to: date of birth, gender, anthropometric data (weight and height), constitution of the household, number and ages of siblings, number of rooms in the house they live in, parents' marital status, your age, profession and academic qualifications.

Regarding the characterization of the adolescents' life habits, questions were asked about: school performance, consumption of substances (coffee, alcohol, tobacco and

drugs), social habits such as going out at night, playing sports, hours of use of technologies, type of activities and food consumed before going to bed, consumption of sleep-inducing medication and a question related to their subjective state of happiness.

PITTSBURGH SLEEP QUALITY INDEX

The Pittsburgh Sleep Quality Index (PSQI) was developed by Buysse et al. in 1988 and constitutes a practical and reliable instrument, simple to apply not only in the clinical area, but in general, adapted to a wide range of situations and contexts. It provides a reliable, valid and standardized measure of sleep quality that is easy to interpret for clinicians, researchers and other users (Buysse, Reynolds, Monk, Berman & Kupfer, 1989).

The translation of the IQSP into Portuguese was carried out by Bertolazi (2008). The IQSP is a valid and adequate instrument to assess the quality of sleep in different age groups, between 6 and 90 years of age (Seixas, 2009).

The IQSP gives us information about the quality of sleep in the period of 1 month prior to its application. It consists of 19 self-assessment questions and 5 questions to be answered by a roommate. These last 5 questions are not quoted for the score, so they were not included in this study.

WEIGHT AND HEIGHT

Weight and height are independent, continuous quantitative variables, corresponding respectively to questions nº 4 and nº 5. In the questionnaire, the adolescents were asked to indicate their weight in kilograms and height in meters.

The weight and height variables were operationalized in the Body Mass Index (BMI), calculated by the ratio between weight, in kilograms, and the square of height, in meters (Kg/m2). In the present study, as these were

adolescents aged between 14 and 18 years, the values used were those proposed by the WHO (2006), classified as: malnutrition if BMI < 3rd percentile, eutrophic if 3rd percentile ≤ BMI < 3rd percentile 85, overweight if BMI between the 85th and 97th percentiles, and obesity above the 97th percentile

DATA COLLECTION PROCEDURE AND ETHICAL CONSIDERATIONS

For the collection of information, authorizations were requested from the Executive Councils of Secondary Schools in two districts in the south of Portugal. After a favorable opinion, there was a commitment to present the results to the respective schools, contributing to the promotion and education for health in the school context, integrating this study in the educational project of the schools in terms of health.

The application of the instrument took place in the month between 2016 and 2017 at the School and either that or the selection of adolescents was at the discretion of the school, with the requirement that the age of the participants be between 12 and 18 years old.

As already mentioned, the final sample consisted of 138 adolescents, 91 (65.9%) female and 47 (34.1%) male.

Regarding distribution by age, the minimum age of participants was 14 years and the maximum age 18 years. About 26.8% of respondents were 14 years old, 23.2% 15 years old, 21% 16 years old, 23.9% 17 years old and 5.1% 18 years old (table 1).

DATA PRESENTATION AND ANALYSIS
ADOLESCENTS' SLEEP QUALITY

After analysis and summation of the 7 constituent components of the IQSP, it is concluded that only 38.4% (n=53) of the respondents have good quality sleep (IQSP

Age	Feminine		Male		Total	
	n	**%**	**n**	**%**	**n**	**%**
	91	65,9	47	34,1	138	100
14	22	24,2	15	31,9	37	26,8
15	17	18,6	15	31.9	32	23,2
16	24	26,4	5	10,6	29	21
17	22	24,2	11	23,5	33	23,9
18	6	6.6	1	2,1	7	5,1

Table 1 - Distribution according to age and gender

	Frequency (=n)	Total (%)
Sleep quality (IQSP)	138	100
Good (IQSP <5)	53	38,6
Bad (IQSP ≥ 5)	85	61,6

Table 2 - Sleep quality (IQSP)

	Frequency (=n)	Total (%)
Subjective sleep quality	138	100%
Very good	26	18,8
Good	86	62,3
Bad	24	17,4
Very bad	2	1,4

Table 3 - Subjective sleep quality

	Frequency (=n)	Total (%)
Bedtime	138	100
< 22h	6	4,4
22h – 23h30	86	62,3
> 23h30	46	33,3
Minimum / **Maximum**	Average	Standard deviation
21 / 5	23h27'	1,45
Time to wake up	138	100
<07h	11	8
07h – 08h	99	71,7
> 08h	28	20,3
Minimum / **Maximum**	Average	Standard deviation
6 / 15	07h52	1,7

Table 4 - Bedtime and waking hours

<5), and 61.6% (n=85) poor quality of sleep (IQSP ≥ 5) (Table 2).

With regard to subjective sleep quality, 81.2% (n=112) classified their sleep quality as very good or good, and only 18.8% (n=26) as bad or very bad (Table 3)

ADOLESCENT SLEEP PROFILE AND CHARACTERISTICS

More than half of the surveyed adolescents reported going to bed between 10:00 pm and 11:30 pm (62.3%, n=86), 4.4% (n=6) went to bed before 10:00 pm and 33.3% (n =46) after 23:30.

The average bedtime of the respondents in the previous month was 23h 27minutes, standard deviation of 1.45 hours, with the minimum reported being 21:00 and the maximum 05:00 (table 3).

With regard to waking up time (table 4), most respondents wake up between 07:00 and 08:00. The average wake-up time of the sample is 7:52 am, standard deviation of 1.7 hours, minimum 6:00 am and maximum 3:00 pm.

Regarding the duration of sleep, in the month prior to completing the instrument, most of the inquired adolescents reported having slept for an average of 8 hours or more (59.4%, n=82), and 40.6% (n=56) less than 8 hours.

The sample's average hours of sleep was 7.8 hours, standard deviation of 1.14 hours, with a minimum of 4 hours of sleep and a maximum of 11 hours (Table 5).

Most of the inquired adolescents reported taking an average of up to 15 minutes to fall asleep (47.1%, n=65), 32.6% (n=45) between 15-30 minutes and 20.3% (n=28) more of 30 minutes. 22.5% (n=31) indicated sleep problems related to a sleep latency greater than 30 minutes less than once a week, 29% (n=40) once or twice a week, and 20.3% (n=28) three times a week or more (Table 13).

Sleep problems related to: waking up in the middle of the night or very early in the morning, getting up to go to the bathroom, having difficulty breathing, coughing or snoring very loudly, feeling too cold or too hot, having bad dreams/ nightmares, feeling pain or other reasons, had percentages and variable expression in the sample shown in table 7.

In the group of other reasons indicated by the respondents, we found: thinking about problems (n=5), loud sound/noises (n=3), state of anxiety (n=2), discomfort (n=4), insomnia (n=1), sadness (n=1) and the presence of a pet in the room (n=1).

Regarding the consumption of sleep-inducing therapy, 16.7% of respondents (n=23) reported having already taken this type of medication, 10.9% (n=15) had used it in the last 12 months, and 5.8% (n=8) in the month prior to completing the instrument (Table 8).

Of those who reported having used sleep-inducing therapy in the last month, 3 used it less than once a week, 4 once or twice a week and 1 three times a week or more.

The most referred medicines were the commonly designated "natural" based on valerian and melatonin, easily accessible and over-the-counter. Only 1 of the respondents reported being on therapy with benzodiazepines and 2 did not indicate which medication because they did not remember the name.

With regard to the daytime dysfunction of the respondents, 39.1% (n=54) indicated problems staying awake during meals or participating in social activities, and 81.2% lack of interest in school activities, in variable proportions, shown in table 9.

	Frequency (=n)	Total (%)
No. of hours of sleep	138	100
<8 hours	42	30,4
8 hours or more	96	69,6

Minimum	Maximum	Average	Standard deviation
4	11	7,8	1,14

Table 5 - Sleep duration

	Frequency	Total
Sleep Latency	138	100
Up to 15 minutes	65	47,1
16 – 29 minutes	15	10,9
30 minutes or more	58	42
In the past month, how often did it take you more than 30 minutes to fall asleep?		
Not once	39	28,3
Less than once a week	31	22,5
Once or twice a week	40	29
Three times or more a week	28	20,3

Table 6 - Sleep latency

	Frequency (n=138)	Total (100%)
Waking up in the middle of the night or very early in the morning		
Not once	48	34,8
Less than once a week	39	28,3
Once or twice a week	32	23,2
Three times a week or more	19	13,8
Get up to go to the toilet		
Not once	84	60,9
Less than once a week	25	18,1
Once or twice a week	19	13,8
Three times a week or more	10	7,2
Having trouble breathing		
Not once	117	81,8
Less than once a week	9	6,5
Once or twice a week	8	5,8
Three times a week or more	4	2,9
Coughing or snoring very loudly		

Not once	113	81,9
Less than once a week	19	13,8
Once or twice a week	4	2,9
Three times a week or more	2	1,4
Feel very cold		
Not once	75	54,3
Less than once a week	38	27,5
One to two times a week	18	13
Three times a week or more	7	5,1
Feel too hot		
Not once	55	39,9
Less than once a week	46	33,3
Once or twice a week	26	18,8
Three times a week or more	11	8
Having bad dreams/nightmares		
Not once	64	46,4
Less than once a week	51	37
Once or twice a week	14	10,1
Three times a week or more	9	6,5
Feel pains		
Not once	94	68,1
Less than once a week	25	18,1
Once or twice a week	17	12.3
Three times a week or more	2	1,4
Other Reasons		
Not once	121	87,7
Less than once a week	4	2,9
Once or twice a week	4	2,9
Three times a week or more	9	6,5

Table 7 - Factors related to poor sleep quality

	Frequency **(n=138)**	Total **(100%)**
Have you ever taken sleeping pills?		
No	115	83,3
Yes	23	16,7
In the last 12 months		
No	123	89,1
Yes	15	10,9
in the last month		

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Not once	130	94,2
Less than once a week	3	2,2
Once or twice a week	4	2,9
Three times a week or more	1	0.7
Which medicine?	8	100
Valerian and/or melatonin	5	62,5
Benzodiazepines	1	12,5
did not indicate	2	25

Table 8 - Consumption of sleep-inducing therapy

	Frequency (n=138)	Total (100%)
Problems staying awake at meals or social activities?		
Not once	84	60,9
Less than once a week	24	17,4
Once or twice a week	23	16,7
Three times a week or more	7	5,1
Disinterest in work or school activities		
Not once	26	18,8
Rarely	57	41,3
With some frequency	43	31,2
Often, almost always	12	8,7

Table 9 - Daytime dysfunction

Sleep quality	IMC		Total	Pearson Chi-Square
	Normal	Overweight/ obesity		
Good sleep quality	42	8	50	p=0,116
Poor sleep quality	76	6	82	
Total	118	14	132	

Table 10 - Sleep quality and BMI

IS THERE A RELATIONSHIP BETWEEN SLEEP QUALITY AND BODY MASS INDEX?

There was no statistically significant association between the quality of sleep and the BMI ranges of the adolescents in the sample (p=0.116). This data is relevant and will be discussed.

DISCUSSION

The study was designed with the objective of evaluating the quality of sleep and verifying the association with overweight/obesity measured via BMI and read in appropriate growth tables

The sampling method used was non-probabilistic, and a convenience sample was selected. It is not possible to generalize the results, as the sample is not sufficiently representative of the country's adolescent population.

The sample consisted of 138 adolescents, mostly female (65.9%, n=91), with a mean age of 15.6 years (SD=1.25).

The evaluation of the sleep quality of the adolescents showed that only 38.4% (n=53) had good sleep quality and 61.6% (n=85) had poor quality sleep. The data corroborate the results of another national study (Seixas, 2009) which, also through the application of the IQSP to 130 adolescents aged between 12 and 18 years, identified that 60% of the adolescents had poor sleep quality (IQSP > 5).

Comparing these results with the perception that adolescents have about their sleep quality, we found that 81.2% (n=112) classified their sleep quality as good or very good, and only 18.8% (n=26) evaluated it as bad or very bad, which leads us to believe that most teenagers do not have the adequate perception of what a good quality of sleep means, perhaps due to lack of information at this level, and our society in general is not, perfectly aware of the dimension of this problem.

Regarding the sleep profile of adolescents, we considered the following dimensions in order to make a correct characterization for our sample: bedtime and waking up time, duration of sleep time, sleep latency, factors associated with poor sleep quality and daytime dysfunction .

With regard to bedtime, more than half of the surveyed adolescents (62.3%) reported going to bed between 10:00 pm and 11:30 pm and 33.3% after 11:30 pm. it was at 11:27 pm (SD=1.45), and with regard to waking up time, 71.7% wake up between 7:00 am and 8:00 am, with the sample mean at 7:52 am (SD=1, 7). The results obtained are in line with those of the study by Pinto et al. (2016), which involved the participation of 400 students from the 9th and 11th grades, from two schools in the Lisbon region, where the average bedtime on weekdays was at 23:29 and the average waking time at 7:24.

Regarding the duration of sleep, in the month prior to completing the instrument, most of the inquired adolescents (59.4%) reported having slept 8 hours or more and 40.6% less than 8 hours. The average hours of sleep in the sample was 7.8 hours (SD=1.14), which is similar to the data obtained in the national study by Matos and colleagues (2015) which involved the participation of 3164 students from the 8th and 10th grade of schooling, from 139 schools, with a daily average of 7.9 hours of sleep, which is below the recommended values for age (APS & SPP, 2016)

The interpretation of the data relative to the minimum and maximum data of the sample, with regard to the hours of going to bed and waking up, evidences a high irregularity of schedules, with the minimum bedtime reported at 9:00 pm and the maximum at 5:00 am, and in what refers to the time to wake up at a minimum of 4:00 am and a maximum of 3:00 pm, consistent with the findings in the

literature that indicate profound changes in waking up and going to bed characteristic of adolescence (Del Ciampo, 2012).

With regard to sleep latency, we found that 42% of adolescents take an average of 30 minutes or more to fall asleep, and that 20.3% report this occurrence three times or more a week. Other sleep problems were important in the study, of which we highlight: waking up in the middle of the night or very early in the morning (65.2%), feeling too hot (60.1%), feeling too cold (45.7), getting up to go to the bathroom (39.1%), having bad dreams/ nightmares (53.6%), and other problems that were indicated by the adolescents through open answers, such as: thinking about problems, sound loud/noises, state of anxiety, discomfort, insomnia and feelings of sadness.

These data are in line with the results of the study by Pinto et al. (2016) in the analysis of the causes attributed to insufficient sleep duration by adolescents, indicating aspects related to the environment (noise, room temperature, use of electronic devices) emotions (Thinking about problems, states of anxiety and sadness) and activities (sports, school work and going out with friends).

Regarding daytime dysfunction, the results obtained in our study are worrying. 39.1% of the adolescents indicated problems in staying awake during meals or participating in social activities, and 81.2% lacked interest in school activities, of which 39.9% indicated that it was with some frequency.

Regarding the relationship between sleep quality and BMI, we verified the relationship between sleep quality and BMI by applying the chi-square test.

Most adolescents (87.1%) had a eutrophic BMI, being between the 3rd and 85th percentiles. Only 10.6% were overweight or obese (above the 85th percentile) and 2.3% were malnourished (below the 3rd percentile).

There was no statistically significant association between sleep quality and BMI (p=0.116). Of the total number of overweight or obese adolescents (n=14), approximately half have poor sleep quality (42.9%, n=6) and more than half have good sleep quality (57.1% n=8). This unusual percentage of overweight/ obese children may explain the situation. In fact, it amounts to only about 10%. These numbers are contradictory with the significant majority of studies that demonstrate a percentage of overweight/obesity above 30% in this type of population.

To make a relationship between the results obtained, regarding sleep quality, average number of hours slept per night and BMI, we verified that, despite the majority (61.6%) presenting poor quality of sleep, and the average number of hours slept being lower recommended (7.8 h), most adolescents have an adequate BMI (3º<BMI≤85º), which according to the literature suggests, corroborating Calamaro (2010), that there may be an association between sleep and obesity in young children and adults, but not during adolescence, when environmental factors such as inactivity and diet may play a more important role than sleep duration.

CONCLUSION

The quality of sleep is a fundamental pillar for health in general, and its preponderant role for the growth and development of children and adolescents is now perfectly documented.

Adolescence is a critical and particularly vulnerable period with regard to issues related to sleep. The characteristic alterations in the sleep-wake pattern occur as a natural process, resulting from biological, psychological and social interaction, which puts adolescents at risk of not getting the sleep they need.

Similar to other national and international studies, we concluded that a large percentage of adolescents have poor sleep quality (61.6%) and that, on average, they sleep less hours

than recommended for their age (7.8h). Most (81.2%) do not consider having poor sleep quality, having classified it as good or very good, which may reveal that adolescents may not be aware of the real needs in terms of sleep for their age, nor do they have knowledge about the measures and criteria necessary for proper sleep hygiene.

We did not find an association between sleep quality and BMI, contrary to most of the consulted studies. Although most adolescents have poor sleep quality, their BMI is adequate.

We need additional studies in order to clarify these findings. Other variables that may be protective are certainly in interaction, even in situations of overweight and obesity.

REFERENCES

Associação Portuguesa do Sono, & Sociedade Portuguesa de Pediatria – APS & SPP - (2016). Higiene do Sono da Criança e do Adolescente. *Brochuras*. IP.Design gráfico. Disponível em: https://www.apsono.com/index.php/pt/centro-de-documentacao/centro-de-doc/52-higiene-do-sono-da-crianca-e-do-adolescente

Bertolazi, A.N. (2008) *Tradução, adaptação cultural e validação de dois instrumentos de avaliação do sono: Escala de sonolência de epworth e índice de qualidade de sono de pittsburgh* (Dissertação de mestrado) Universidade Federal do Rio Grande do Sul, Faculdade de Medicina, Porto Alegre. Disponível em: http://www.lume.ufrgs.br/bitstream/handle/10183/14041/000653543.pdf

Buysse, D.J., Reynolds, C.F., Monk, T.H., Berman, S,R., & Kupfer, D.J. (1989) The pittsburgh sleep quality index: A new instrument for psychiatric practice and research. *Psychiatry Research*, 28 (2), 193–213 Disponível em: http://www.sciencedirect.com/science/article/pii/0165178189900474 doi: 10.1016/0165-1781(89)90047-4

Calamaro, C.J., Park, S., Mason, T.B.A., Marcus, C.L., Weaver, T.E., Pack, A., & Ratcliffe, S.J. (2010). Shortened sleep duration does not predict obesity in Adolescents. *Journal of Sleep Research*, 19(4), 559–566. Doi: 10.1111/j.1365-2869.2010.00840.x. Disponível em: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2965312/

Del Ciampo, L.A. (2012). O sono na adolescência. *Adolescência & Saúde*, 9(2), 60-6. Disponível em: http://www.adolescenciaesaude.com/detalhe_artigo.asp?id=317

Direção-Geral da Saúde – DGS (2017). Obesidade: otimização da abordagem terapêutica no serviço nacional de saúde. Programa nacional para a promoção de uma alimentação saudável. Lisboa, Portugal: Camolas, J., Gregório, M.J., Sousa, S.M., & Graça, p. Disponível em: http://nutrimento.pt/activeapp/wp-content/uploads/2017/10/Obesidade_otimizacao-da-abordagem-terapeutica-no-servi%C3%A7o-nacional-de-saude.pdf (DGS, 2017)

Felső, R., Lohner, S., Hollódy, K., Erhardt, É., & Molnár, D. (2017). Relationship between sleep duration and childhood obesity: Systematic review including the potential underlying mechanisms. *Nutrition, metabolism, and cardiovascular diseases : NMCD*, *27*(9), 751–761. https://doi.org/10.1016/j.numecd.2017.07.008

Gohil, A., & Hannon, T. S. (2018). Poor Sleep and Obesity: Concurrent Epidemics in Adolescent Youth. *Frontiers in endocrinology*, *9*, 364. https://doi.org/10.3389/fendo.2018.00364

Hager, E. R., Calamaro, C. J., Bentley, L. M., Hurley, K. M., Wang, Y., & Black, M. M. (2016). Nighttime Sleep Duration and Sleep Behaviors among Toddlers from Low-Income Families: Associations with Obesogenic Behaviors and Obesity and the Role of Parenting. *Childhood obesity (Print)*, *12*(5), 392–400. https://doi.org/10.1089/chi.2015.0252

Liu X, Forbes EE, Ryan ND, Rofey D, Hannon TS, Dahl RE. Rapid eye movement sleep in relation to overweight in children and adolescents. Arch Gen Psychiatry (2008) 65:924–32. https://doi.org/10.1001/archpsyc.65.8.924

Paruthi, S., Brooks, L.J., D'Ambrosio, C., Hall, W.A., Kotagal, S., Lloyd, R.M., … Wise, M.S. (2016). Recommended amount of sleep for pediatric populations: A consensus statement of the american academy of sleep medicine. *Journal of Clinical Sleep Medicine : Official Publication of the American Academy of Sleep Medicine*, *12*(6), 785–786. http://doi.org/10.5664/jcsm.5866

Pinto, T.R., Pinto, J.C., Rebelo-Pinto, H., & Paiva, T. (2016). O sono em adolescentes portugueses: Proposta de um modelo tridimensional?. *Análise Psicológica*, 34(4), 339-352. doi: https://dx.doi.org/10.14417/ap.1221

Seixas, M.P. (2009). Avaliação da qualidade de sono na adolescência: implicações para a saúde física e mental. (Dissertação de mestrado). Universidade Fernando Pessoa, Porto. Disponível em: http://bdigital.ufp.pt/bitstream/10284/1256/2/dm_monicaseixas.pdf

World Health Organization Multicentre Study Group (WHO, 2006). Child Growth Standards based on length/height, weight and age. *Acta Paediatr*. Suppl 450):76–85.