

# Correlation of Nutritional Status to Sleep Problems in School Going Children: A Preliminary Study

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## ABSTRACT

**Introduction:** Sleep disturbances in children are found to be increasing over the past few years and the knowledge about their risk factors is limited among the medical and dental practitioners. Nutritional status could be one of the contributing factors for sleep problems in children.

**Methodology:** 500 school going children aged 4 to 10 years were included in the study. The sleep problems were assessed using a validated sleep questionnaire which was filled by the parents of the children and simultaneously the weight of the children was recorded. The data were documented and statistically analyzed.

**Results:** Sleep problems were found significantly higher in obese children. Also, a significant association was observed between obesity and the following sleep problems, i.e. snoring, observable lapses in breathing sleeps with mouth open and bed wetting.

**Conclusion:** Obesity can be considered as one of the risk factor for sleep problems in children.

**Keywords:** Nutritional status, School going children, Sleep problem

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## INTRODUCTION

Sleep is very essential for our well-being and survival throughout the life.<sup>1</sup> It is the power source that keeps the mind alert and calm.<sup>2</sup> Children, in particular, need adequate and a good quality sleep to develop and function optimally and to meet their scholastic requirements.<sup>3</sup> Sleep also fuels physical growth.<sup>4-6</sup>

Not much is known about the sleep disturbances in children. over past few years, sleep disturbances in chil-

dren are found to be increasing. Studies have shown the rate of occurrence of sleep problems in children varying from 1 to 43% depending on the technique of survey and the age representation in the investigated cohorts.

However, the knowledge about sleep problems and their risk factors is limited among the medical practitioners and dental practitioners in particular. As there is an increase in the occurrence of sleep problems among children, there is a need for dental and medical practitioners to work in tandem to identify the risk factors and treat the cause.<sup>7</sup>

Nutritional status could be one of the contributing factors for sleep problems in children. Basal metabolic index (BMI) is the most commonly used method to assess the nutritional status in an adult. However, in children measuring BMI is complicated as it keeps changing rapidly with growth. Hence, in children, assessing the weight for particular age and sex is recommended to be an appropriate method for evaluating the nutritional status.<sup>8</sup>

Very few studies have been reported on correlation of nutritional status to sleep problems in children. Hence, the aim of study was to see if there is any significant correlation between the nutritional status and sleep problems in school children.

## METHODOLOGY

Assuming the prevalence of sleep problems to be 40% (roughly estimated 40%), precision of 4.3%, confidence level of 95%, sample size calculated was 499. Thus a total of 500 children aged 4 to 10 years of either gender were randomly selected from local schools near the institution.

## Exclusion Criteria

- Children on chronic medication
- Children with the following -
  - Psychological/neurological illness
  - Muscle weakness
  - Genetic disorders
  - Metabolic disorders

Ethical clearance for our study was obtained from the ethical committee of our institution.

A structured questionnaire was designed based on the previous studies<sup>1,9-11</sup> to assess the sleep problems. The questionnaire was validated and modified by experts in

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the subject and also by a pilot study conducted among 10 parents of randomly selected children aged 4 to 10 years in our department.

The following sleep problems were assessed using the questionnaire:

Snoring, noisy breathing, observable lapses in breathing during sleep, frequent awakening, restless sleep, daytime napping, bed wetting, night terrors, sleep talking, sleepwalking and sleeping with mouth open.

Study was explained to the school authorities and parents at parents, teachers meeting. Permission was obtained to carry out the survey from the concerned local educational authorities and parents of the children. Assent was obtained from the children participating in the study.

Parents were divided into small groups and the questionnaire was filled by them under the guidance of a trained investigator in the presence of a staff member. To maintain uniformity, only one investigator recorded all data from the parents. Simultaneously, the weight of the children was also recorded in kilograms using the Avon electronic digital weighing machine.

Nutritional status was assessed using the World Health Organization weight for age pediatric growth chart for boys and girls. The growth chart includes 5 categories of nutritional status of children namely malnourished, underweight, normal weight, overweight and obese which are divided based on the percentiles (malnourished–below 3rd percentile, underweight–3rd to 15th percentile, normal weight–15th to 85th percentile, overweight–85th to 97th percentile and obese–above 97th percentile).<sup>12</sup>

The data were analyzed on a microcomputer using the SPSS software version 22. Descriptive statistics were recorded in frequency and percentage for qualitative data. The association of BMI with sleep problems were analyzed using Chi-square test.  $p < 0.05$  was considered to be statistically significant.

## RESULTS

Parents of 500 children were interviewed and the results were recorded in our modified validated questionnaire.

Our sample comprised of 258 girls (51.6%) and 242 boys (48.4%) with a mean age of  $6.49 \pm 1.79$  (ranging from 4 to 10 years). The students in our study were distributed from pre-school (LKG) to grade 5.

Taking pediatric growth chart as reference it was found that 406 children (81.2%) had an adequate weight for their height whereas 54 children (10.8%) were underweight, 17 children (3.4%) were overweight and 23 children (4.6%) were obese.

Analysis of sleep problems showed that up to 232 children (46.4%) displayed at least one sleep problem, out of which snoring was reported in 21 children (4.2%), noisy breathing in 8 children (1.6%), observable lapses in breathing during sleep in 5 children (1%), frequent awakening in 42 children (8.4%), restless sleep in 57 children (11.4%), daytime napping in 38 children (7.6%), bed wetting in 85 children (17%), night terrors in 43 children (8.6%), sleep talking in 62 children (12.4%), sleepwalking in 8 children (1.6%) and 47 children (9.4%) sleep with their mouth open.

Out of 54 children who were underweight, 20 (37%) had sleep problems; out of 406 children with normal weight 189 (46.6%) had sleep problems; out of 17 children with overweight, only 3 (17.6%) had sleep problems and out of 23 obese children, 20 (87%) had sleep problems. Thus sleep problems were significantly higher in obese children ( $p < 0.001$ ) (Table 1).

We also observed a significant association ( $p < 0.05$ ) between obesity and the following sleep problems i.e. snoring, observable lapses in breathing, sleeps with mouth open and bed wetting (Tables 2 to 5).

## DISCUSSION

Sleep problems have been found to be increasing in children during the past few years.<sup>7</sup> However, there is a lacuna about the role of nutritional status and occurrence of sleep problems in children.

In our study, sleep problems were found significantly higher in obese children. In particular, sleep problems such as snoring, observable lapses in breathing, sleeping with mouth open and bed wetting were strongly associ-

**Table 1:** Association of nutritional status of the child to sleep problems

Nutrition status			Sleep Problems		Total
			Yes	No	
Underweight	Count		20	34	54
	% within BMI		37.0	63.0	100.0
Normal	Count		189	217	406
	% within BMI		46.6	53.4	100.0
Overweight	Count		3	14	17
	% within BMI		17.6	82.4	100.0
Obese	Count		20	3	23
	% within BMI		87.0	13.0	100.0

Chi-Square = 22.77  $p < 0.001$  (significant)

**Table 2:** Association of nutritional status of the child to snoring

			Snoring		Total
			Yes	No	
Nutrition status	Underweight	Count	2	52	54
		% within BMI	3.7	96.3	100.0
	Normal	Count	15	391	406
		% within BMI	3.7	96.3	100.0
	Overweight	Count	0	17	17
		% within BMI	0.0	100.0	100.0
	Obese	Count	4	19	23
		% within BMI	17.4	82.6	100.0

Chi-square = 10.983 p = 0.012 (significant)

**Table 3:** Association of nutritional status of the child to observable lapses in breathing

			Observable lapses in breathing		Total
			Yes	No	
Nutrition status	Underweight	Count	1	53	54
		% within BMI	1.9	98.1	100.0
	Normal	Count	2	404	406
		% within BMI	0.5	99.5	100.0
	Overweight	Count	0	17	17
		% within BMI	0.0	100.0	100.0
	Obese	Count	2	21	23
		% within BMI	8.7	91.3	100.0

Chi-square = 15.382 p = 0.002 (significant)

**Table 4:** Association of nutritional status of the child to sleeping with mouth open

			Sleeping with mouth open		Total
			Yes	No	
Nutrition status	Underweight	Count	3	51	54
		% within BMI	5.6	94.4	100.0
	Normal	Count	36	370	406
		% within BMI	8.9	91.1	100.0
	Overweight	Count	0	17	17
		% within BMI	0.0	100.0	100.0
	Obese	Count	8	15	23
		% within BMI	34.8	65.2	100.0

Chi-square = 20.236 p &lt; 0.001 (significant)

**Table 5:** Association of nutritional status of the child to bed wetting

			Bed wetting		Total
			Yes	No	
Nutrition status	Underweight	Count	3	51	54
		% within BMI	5.6	94.4	100.0
	Normal	Count	69	337	406
		% within BMI	17.0	83.0	100.0
	Overweight	Count	0	17	17
		% within BMI	0.0	100.0	100.0
	Obese	Count	13	10	23
		% within BMI	56.5	43.5	100.0

Chi-square=33.955 p &lt; 0.001 (significant)

ated with obese children. These findings are supported by Susan Redline et al.<sup>13</sup> who demonstrated obesity as a risk factor for sleep-disordered breathing in children. This could be because when a child gains weight, the adequacy of the airway is compromised because of the

deposition of extra adipose tissue. The degree of obesity varies inversely with the degree of intrinsic inadequacy of the pharyngeal anatomy.<sup>14</sup>

However, our study has certain limitations that need to be acknowledged. Firstly, sleep problems were

recorded based on the information given by the parents which was based on their level of understanding the question; awareness about their child's sleeping pattern and also their willingness to reveal the appropriate information. However, this is a common bias in most of the questionnaire based studies and as ours was a preliminary study, which we felt it necessary as an initial step to see if any significant correlation exists between nutritional status and sleep problems.

Secondly, the number of obese children in our study sample was very small. Thus further research needs to be carried out on screening large number of children followed by an appropriate examination, diagnosis, and intervention.

## CONCLUSION

We found sleep problems in children belonging to all categories of nutritional status. However, significantly higher frequency of sleep problems were seen in obese children. In particular, sleep problems such as snoring, observable lapses in breathing, sleeping with mouth open and bed wetting were strongly associated with obese children.

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