

Sleep Behaviour and Academic Grade In School-Going Adolescent Children In A Rural Area

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Abstract: Background: Sleep is essential for forming and consolidating memories and it plays a key role in the formation of new neuronal connections and pruning of old ones. As there is limited research on the sleep behaviour of children and its impact on academic grade, this study was planned to obtain some information from a rural population of children.

Objectives; To study the association between sleep behaviour and academic grade in school going adolescent children from a rural area.

Methodology; The study covered 328 school-going adolescent children of 13-15 years in a rural area. 2 self-administered questionnaires were used: Child's Sleep Habits Questionnaire (CSHQ) was filled by parents of children and Paediatrics Daytime Sleepiness Scale (PDSS) was filled by children themselves. The average of academic grade of all 5 subjects was obtained. Univariate and multivariate analysis were performed with academic as the dependant variable.

Results; Single unit increase in CSHQ Total Score result in .18 unit reduction in academic grade and single unit increase in PDSS Score result in .505 unit reduction in academic grade, both associations being statistically significant. 3 significant predictors for academic grade; Parasomnias, Sleep Disordered Breathing and Daytime Sleepiness were identified.

Conclusion; Sleep behaviour is related to educational achievement in children. Parasomnias, Sleep Disordered Breathing and Daytime Sleepiness independently effect to reduce the academic grade in children.

Keywords; sleep behaviour, academic grade, cshq, pdss

I. Introduction

Every living creature needs to sleep and with respect to the young, it involves a major portion of lives of children¹. Sleep is essential for healthy brain function. While sleeping, the brain is preparing for the next day. It is now scientifically proved that, "Sleep is essential for forming and consolidating memories and that it plays a key role in the formation of new neuronal connections and pruning of old ones"². The disturbances in sleep behaviour are bedtime resistance, sleep anxiety, sleep onset delay, sleep duration, night waking's, sleep disordered breathing, parasomnias and daytime sleepiness. Children who have disturbed sleep behaviour may have problems getting along with others. They may feel angry and impulsive, have mood swings, feel sad or depressed, or lack motivation. They may have problems paying attention, and may feel stressed. They may be less productive at work and school, takes longer to finish tasks, have a slower reaction time, and make more mistakes. In the event of children having disturbed sleep behaviour, it would be their academic grade in the examination that would be probably affected. These aspects form the key basics of this research. As there is limited research on the sleep behaviour of children and its impact on academic grade, this study was planned to obtain some information from a rural population of children. Also, a study on sleep behaviour of children and its impact on academic grade may emphasise the importance of understanding sleep behaviour and disturbances in children and also would help in advocating the importance of sleep for children in order that they have greater opportunity for healthy development and academic success.

II. Materials and Methods

2 self-administered questionnaires to measure the quantity and quality of sleep were used³: Child's Sleep Habits Questionnaire (CSHQ) and Paediatrics Daytime Sleepiness Scale (PDSS). CSHQ identifies objectively the sleep related problems in school-going children by allowing parents to recall the night time sleep behaviour of children occurring over a typical recent week⁴. As this 33 items questionnaire is standardised for Indian school children, it was considered a useful tool for this study. The CSHQ includes 33 items relating to a number of key sleep domains that encompass the major presenting clinical sleep complaints in this age group: bedtime resistance, sleep onset delay, inadequate sleep duration, sleep anxiety, night waking's, sleep disordered breathing, parasomnias, and daytime sleepiness. Each item of CSHQ is scored on a 3 point scale.

Child's sleep habits questionnaire(CSHQ)			
	Usually (5-7 times/week)	Sometimes (2-4 times/week)	Rarely (0-1 times/week)
1. Child goes to bed at the same time at night.	1	2	3
2. Child falls asleep alone in own bed.	1	2	3
3. Child falls asleep within 20 minutes after going to bed.	1	2	3
4. Child sleeps the right amount.	1	2	3
5. Child sleeps about the same amount each day.	1	2	3
6. Child wakes up by him/herself.	1	2	3
Child has appeared very sleepy or fallen asleep during the following:			
7. Watching TV.	1 (Not sleepy)	2 (Very sleepy)	3 (Falls asleep)
8. Riding in a car.	1 (Not sleepy)	2 (Very sleepy)	3 (Falls asleep)
9. Child falls asleep in parent's or sibling's bed.	3	2	1
10. Child struggles at bedtime (cries, refuses to stay in bed, etc.).	3	2	1
11. Child need parent in the room to fall asleep.	3	2	1
12. Child is afraid of sleeping alone.	3	2	1
13. Child sleeps too little.	3	2	1
14. Child is afraid of sleeping in the dark.	3	2	1
15. Child has trouble sleeping away from home (visiting relatives, vacation).	3	2	1
16. Child moves to someone else's bed during the night (parent, sibling etc.).	3	2	1
17. Child awakens once during the night.	3	2	1
18. Child awakens more than once during the night.	3	2	1
19. Child talks during sleep.	3	2	1
20. Child is restless and moves a lot during sleep.	3	2	1
21. Child sleepwalks during the night.	3	2	1
22. Child wets the bed at night.	3	2	1
23. Child grind teeth during sleep (your dentist may have told you this).	3	2	1
24. Child awakens alarmed by a frightening dream.	3	2	1
25. Child awakens during night screaming, sweating, and inconsolable.	3	2	1
26. Child snores loudly.	3	2	1
27. Child seems to stop breathing during night.	3	2	1
28. Child snorts and/or gasps during sleep.	3	2	1
29. Child wakes up in a negative mood.	3	2	1
30. Adults or siblings wake up child.	3	2	1
31. Child has difficulty getting out of bed in the morning.	3	2	1
32. Child takes a long time to become alert.	3	2	1
33. Child seems tired in the morning.	3	2	1

Higher is the CSHQ score, more disturbed is the sleep behaviour of the child.

CSHQ Subscales								
Subscales	Bedtime Resistance	Sleep Onset Delay	Sleep Duration	Sleep Anxiety	Night Waking's	Parasomnias	Sleep disordered Breathing	Daytime Sleepiness
Questions	1,2,9,11,10,12	3	4,5,13	11,12,14,15	16,17,18	19,20,21,22,23,24,25	26,27,28	6,7,8,29,30,31,32,33

All the factors, except daytime sleepiness, would be correctly marked by the parents. As parents do not observe their child for most time during the day when they are at school, a separate tool for assessing daytime sleepiness was chosen. The Paediatrics Daytime Sleepiness Scale (PDSS)⁵, a validated 8-item questionnaire, which was filled by children, indicated their state of sleepiness during a typical day. While no time reference is specifically identified by the questionnaire, items query feelings of drowsiness in a variety of settings over the course of a typical day and is scored on a 5 point scale.

The Paediatric Daytime Sleepiness Scale(PDSS)					
	Always	Frequently	Sometimes	Seldom	Never
1. How often do you fall asleep or get drowsy during class periods?	5	4	3	2	1
2. How often do you get sleepy or drowsy while doing your homework?	5	4	3	2	1
3. Are you usually alert most of the day?	1	2	3	4	5
4. How often are you tired and grumpy during the day?	5	4	3	2	1
5. How often do you have trouble getting out of bed in the morning?	5	4	3	2	1
6. How often do you fall back to sleep after being awakened in the morning?	5	4	3	2	1
7. How often do you need someone to awaken in the morning?	5	4	3	2	1
8. How often do you think that you need more sleep?	5	4	3	2	1

Higher is the PDSS score, higher is the daytime sleepiness.

Obtaining their grades in the school examination around the time of this study helped in looking for any association between sleep behaviour and academic grade. The academic grade of all 5 subjects were obtained from the teachers and its average was calculated.

Study population:The study covered 328 school-going adolescent children of 13-15 years belonging to St. Peter’s Senior Secondary School, Kadayiruppu, Kolenchery, Ernakulum, Kerala chosen by random sampling from a cluster of schools based on the following parameters: The school consented with the study, it had adequate sample size(323), and it was located within three-kilometre radius, satisfying the rural diameter.

Study procedure:All children in the age group of 13-15 years, whose parents offered the informed consent for the study, provided children also gave the consent were recruited for the study.Children or parents not giving consent or children on treatment for epilepsy, psychiatric disorders or any chronic illness or on any regular medication were excluded from the study.The children then took the translated version of CSHQ questionnaire in the local language to their parents with a hand out which explained how to fill the questionnaire. Parents sent back the filled questionnaire with their children in a sealed envelope within 3 days of receiving it. Following this, the translated version of the PDSS questionnaire in local language were distributed among participating children in the classroom. The investigator personally collected the completed questionnaire on the same day. The investigator noted the grades scored by each student in the recent examination, from the class teacher.

Ethical Considerations:Permissions were obtained from the Institutional Review Board and Ethics Committee of MOSC Medical College Hospital. Informed consent were received from participants.All information is promised to be kept confidential and would be used for scientific publication and feedback to children or parents.

Analysis of data: The scores obtained in the CSHQ and the PDSS questionnaires and the average of grades of all 5 subjects along with personal demographics of each child were entered into microsoft excel spreadsheet. Univariate and multivariate analysis with academic grade as the dependent variable were performed using statistical program for social sciences (SPSS) for windows operating system, to look for any association between sleep behaviour and academic grade.

III. Results

A total of 328 school-going adolescent children of age group 13-15 years were studied (Fig.1).

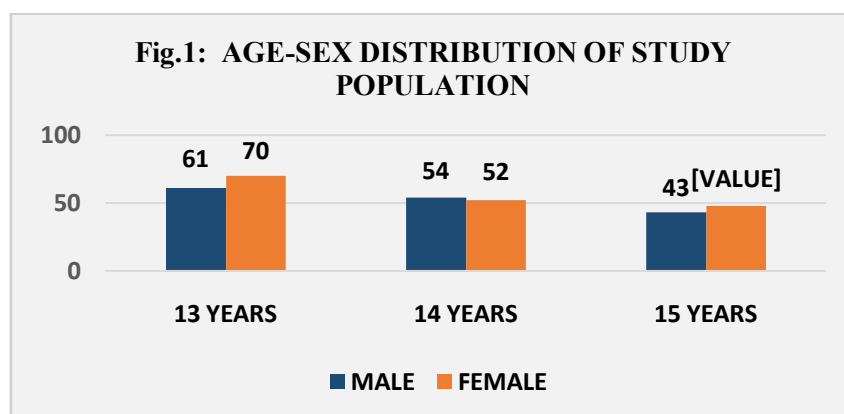


Table.1: Univariate analysis; Academic grade with CSHQ Total Score

Variable	Regression Coefficient	Significance(p value)
CSHQTotal Score	-.180	.034

Dependent Variable: ACADEMIC GRADE

There is significant association between CSHQ Total Score and Academic Grade. The univariate regression coefficient suggest that, one unit increase in CSHQ Total Score result in .18 unit reduction in academic grade.

Table.2: Univariate analysis; Academic grade with PDSS Score

Variable	Regression Coefficient	Significance(p value)
PDSS	-.505	.001

Dependent Variable: ACADEMIC GRADE

There is significant association between PDSS Score and Academic Grade. The univariate regression coefficient suggests that, one unit increase in PDSS Score result in .505 unit reduction in academic grade.

Table.3: Univariate analysis; Academic grade with CSHQ Subscales

Variable	Regression Coefficient	Significance (p value)
CHSQ- Bedtime Resistance	-.203	.423
CSHQ- Sleep Onset Delay	.412	.550
CSHQ- Sleep Duration	.086	.826
CSHQ- Sleep Anxiety	-.408	.386
CSHQ- Night Waking's	-.770	.202
CSHQ- Parasomnias	-1.023	.023
CHSQ- Sleep Disordered Breathing	-2.206	.004
CSHQ- Daytime Sleepiness	-.313	.029

Dependent Variable: ACADEMIC GRADE

Univariate analysis of CSHQ subscales show 3 significant predictors for academic grade; Parasomnias, Sleep Disordered Breathing and Daytime Sleepiness.

Table.4: Multivariate analysis with significant predictors

Variable	Regression Coefficient	Significance(p value)
CSHQ-Daytime Sleepiness	.032	.832
CHSQ-Sleep Disordered Breathing	-1.650	.027
CSHQ-Parasomnias	-.675	.138
PDSS	-.481	.001

Dependent Variable: ACADEMIC GRADE

Sleep Disordered Breathing and PDSS are significantly associated with academic grade. Single unit increase in Sleep Disordered Breathing of CSHQ result in reduction of academic grade by 1.65 units. Increase in PDSS score by one unit result in decrease of academic grade by .481 units.

IV. Discussion

The present study primarily aimed to investigate the sleep behaviour of adolescent children and its relation with academic grade. It covered a total of 328 adolescent children belonging to St. Peter's Senior Secondary School, Kadayiruppu. The study population belonged to ages 13-15 years with each age group having 39.93%, 32.3% and 27.7% of children respectively (Fig.1). It had slightly higher number of girls, 52%, as it is normally for a general rural population of Kerala. The study used 2 questionnaires, the CSHQ and PDSS, filled by parents and children respectively.

Sleep Behaviour and Academic Grade: The present study has found significant association between sleep behaviour and academic grade in children (Table.1). Univariate regression analysis with CSHQ total score as the independent variable and academic grade as the dependent variable showed significant association between the variables with a regression coefficient of 0.18 which suggest that, 1 unit increase in CSHQ total score results in .18 unit reduction in academic grade (Table.1). That is, disturbed sleep behaviour is associated with a lower academic grade. This is supported by the study of Curcioet al.⁶, which tried to explain sleep loss, learning

capacity and academic performance in children. Their findings suggested that; sleep quality and quantity are closely related to student learning capacity and academic performance and sleep loss is frequently associated with poor declarative and procedural learning in students. The study of Fallone et al⁷, has also suggested that restricting sleep time in healthy normal children for one week could cause increased academic problems and attention deficits proving that there are long-term effects of insufficient or disturbed sleep, affecting the learning proficiency of children.

Univariate regression analysis with specific parameters of sleep behaviour as taken from the CHSQ subscales as the independent variable and academic grade as the dependent variable showed significant association of Parasomnias, Sleep disordered breathing and Daytime sleepiness with academic grade (Table.2, 3).

Parasomnias and Academic grade: Parasomnias, regarded as one of the problem sleep behaviour had a regression coefficient of -1.023 when academic grade was taken as the dependent variable (Table.3). However, parasomnias did not relate significantly to academic grade when confounders were taken into account under multivariate analysis.

Sleep Disordered Breathing and Academic grade: The least regression coefficient of -2.206 was accounted to sleep disordered breathing with academic grade as the dependent variable (Table.3). That is, a single unit rise in CHSQ score for sleep disordered breathing would cause a fall in academic grade by 2.2 units. The study of Beebeet al.⁸, concluded that sleep disordered breathing, is related to important aspects of behavioural functioning, especially inattention and learning difficulties that may result in significant functional impairment at school, thus supporting the present finding. Perez-Chada et al.⁹, also suggested that academic achievements are negatively affected by sleep disordered breathing.

Daytime Sleepiness and Academic Grade: Both CSHQ and PDSS assessed daytime sleepiness of children. A significant association between daytime sleepiness, assessed by both CSHQ and PDSS, and academic grade was found during univariate analysis. However, CSHQ daytime sleepiness (-.313) (Table.3) had a higher regression coefficient than PDSS (-.505) (Table.2). This is probably because, parents who report the CSHQ scale fail to report daytime sleepiness as they do not observe the children for most time during the day, hence appreciating the use of PDSS for assessment of daytime sleepiness, where the children themselves would give a better understanding of their daytime sleepiness. The same may be the reason for CSHQ daytime sleepiness, for not having a significance when multivariate analysis was performed. The study of Perez-Chada et al.⁹, which used the PDSS, also proved that daytime sleepiness as measured by PDSS is an independent predictor of poor academic performance.

Limitations: Even though CSHQ and PDSS were used to delineate sleep habits and identify problematic sleep domains in school-aged children, clinical assessment of sleep disturbances was not made. A clinically determined sample of children with sleep disturbances would be more precise than the sleep screening done by CSHQ and PDSS.

Suggestions: Sleep is a neglected factor of life, by children themselves as well as their parents and its importance must be emphasised. Regarding adolescents' sleep behaviour and perception of sleep, the study of Noland et al.¹⁰ indicated a need for sleep hygiene education for adolescents and their parents. Kelman BB¹¹ also advocated the need to teach adolescents about the importance of sleep. He said, 'If adolescents understand and learn to improve their sleep patterns while they are young, they may have improved sleep habits in adulthood'.

V. Conclusion

The study reveals that, sleep behaviour is related to educational achievement in children. Disturbed sleep behaviour is related to reduced educational achievement. 3 significant predictors for academic grade; parasomnias, sleep disordered breathing and daytime Sleepiness were identified. They negatively affect the academic grade in children.

The study brings forward the importance of understanding the sleep behaviour and disturbances in children and has succeeded in adding to the scientific evidence for advocating the importance of sleep for children in order that they have greater opportunity for healthy development and academic success. Sleep and academic performance must be viewed in relation to each other for research as well as clinical practice.

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