ORIGINAL ARTICLE

Effect of Stress on Sleep Hygiene Among 15-18 years Students of a School in an Urban Area of Burdwan, West Bengal: A Cross-Sectional Study

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ABSTRACT

Introduction: Stress, a natural response to difficult situations is causally linked to morbidity leading to cognitive decline. A good sleep, required for somatic well-being and memory consolidation, is very essential. Hence this study proposed to study the effect of stress on sleep hygiene among 15 to 18 years students of a school in an urban area of Burdwan, West Bengal. **Objectives:** This study aimed to estimate the burden of perceived stress, determine sleep hygiene by assessment of excessive daytime sleepiness and find out effect of stress on sleep hygiene. **Methodology:** A cross-sectional study conducted in a school, chosen by purposive sampling among 99 students aged 15 to 18 years from December, 2022 to February, 2023. Information was collected by using self-administered structured questionnaire. Stress was assessed using Perceived Stress Scale and sleep hygiene was assessed using Epworth Sleepiness Scale for Children and Adolescents and association between them was determined. **Results:** Out of 99 students, 53.5% were males and 46.4% were females. The mean age was 16. As per PSS scale 67.9% of male and 67.4% of female adolescent students were found to be moderate to severely stressed. Around 71% of students below class 10 were moderate to severely stressed. Prevalence of poor sleep hygiene was around 19.2% in total. Although association between PSS and ESS-CHAD was not of statistical significance which might be due to the small sample size, a positive correlation between stress and sleep disturbances was established from the findings. **Conclusion:** Prevalence of stress was quite high among the participants. Poor sleep hygiene was prevalent and it increased with increase in stress. Early identification and management of stress through school-based health programs is required for adolescents for better academic performance and overall wellbeing.

KEYWORDS

Stress, Sleep Hygiene, School, Adolescents, Excessive Daytime Sleepiness

INTRODUCTION

Adolescence, acting as a bridge between childhood and adulthood, is a critical phase in human life where a huge physical, psychological, emotional and social changes take place. WHO has defined adolescence as “period between 10-19 years of life”.[1] Adolescents are always exposed to various psycho-physiological changes both of body and mind which act as stressors. Adolescence often involves a number of stressful changes, including the transition to high school. [2,3] Well-established adolescent stressors include rapid hormonal changes in their bodies, sexual awakenings, establishing social networks, and a multitude of others, all of which pose threats to stable development and mental well-being.[4]

This makes them vulnerable especially to stress, which is a natural human response to address to challenges and threats in our lives in ways which vary from person to person. Stress can be defined as a state of worry or mental tension caused by a difficult situation,[5] that affects both the mind and the body.

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Additionally in current era of life, adolescents are constantly exposed to evolving lifestyle changes, increased academic pressure, peer pressure, cut-throat competition to be successful in life and pressures from other sources of family and society. This may hamper daily functioning and performance at work, school or play. Prolonged stress level repeatedly activates the Hypothalamo-pituitary axis and increases the level of stress hormones and other inflammatory mediators.[6] Increased circulation of stress hormones over a period of time increases the risk of developing lifestyle disorders such as Type 2 Diabetes Mellitus, Hypertension, Dyslipidaemia, Early Coronary artery disease and sleep disorders.[7]

Stress makes it difficult to relax and concentrate in any work or play. One may experience headaches or other body pains, an upset stomach or trouble sleeping, loss of appetite or eat more than usual. Chronic stress may also worsen pre-existing health issues Stressful situations are reasons of causation or exacerbation of mental health conditions, most commonly anxiety and depression, which require seeking professional medical help. Experimental stress induction studies have shown that stressful anticipation leads to poor sleep quality and reduced total sleep time.[8]
Adolescence, associated with decreased sleep quality, have been found in studies [9,10], due in part to increased academic and social responsibilities, late-night screen use, and the mismatch between work and school schedules and circadian rhythm delay [11,12] coupled with early school start times.

Getting adequate or enough sleep is essential for a healthy body and healthy mind Sleep deprivation triggers a set of bidirectional changes in brain activity and connectivity, depending on the specific cognitive or affective behaviours engaged.[13] Sleep helps in repairing, relaxing and rejuvenating our body and mind and can also help in reversing the bad effects of stress. Changes in brain activity are observed during on-task performance, wherein marked brain network instability seems to be a neural hallmark of sleep deprivation.[13] Cross-sectional studies have showed that higher levels of stress, negative affect, and anxiety are associated with a lower percentage of the night spent asleep [14], longer time to fall asleep, shorter total sleep time, and worse sleep quality.[15]
Good sleep habits, also known as sleep hygiene is defined as a set of behavioural and environmental recommendations intended to promote healthy sleep, and was originally developed for use in the treatment of mild to moderate insomnia [16]. Sleep hygiene includes certain healthy practices such as being consistent in going to bed at the same time each night and getting up at the same time each morning, including on the weekends; making the sleeping area quiet, dark, relaxing and at a comfortable temperature; limiting the use of electronic devices, such as television, computers, tablets and smart phones, before sleeping; avoiding large meals, smoking cigarettes, caffeine intake and alcohol consumption before bedtime; and doing some physical activity during the daytime can also help in quick initiation of good sleep.[17]

A good sleep along with maintenance of good sleep habits i.e., sleep hygiene is required both for somatic well-being, stress reduction and memory consolidation. Hence the current cross-sectional study proposed to study the effect of stress on sleep hygiene among 15 to 18 years students of a school in Burdwan, West Bengal.

MATERIAL & METHODS

An institution based cross-sectional study was conducted in a co-educational private school with prior permission from school authority among 99 apparently healthy students aged 15 to 18 years comprising classes 9 to 12. Complete enumeration of all consenting students fulfilling study criteria was done. From a previous study conducted in Chennai in 2019 on “Effect of stress on sleep hygiene among school going adolescents in Chennai”, the prevalence of sleep disturbances was found to be 23.5%.[18] So, sample size for this study was calculated taking p=0.235, confidence interval=95%, z-value=1.96 and absolute error of precision 10%, using the standard Cochran’s formula. Taking 10% non-response rate, final sample size came to be 78. Now, as the total registered school students fulfilling the inclusion and exclusion criteria, i.e., students, both male and female, aged 15 to 18 years studying in classes 9 to 12 and attending the school during the period of data collection was 99. So, complete enumeration of all the 99 students was done in this study.

The study-period was from December,2022 to February,2023. Pre-designed pre-tested self-administered structured questionnaire, comprising socio-demographic, general and academic stress-related questions, was used. Stress was assessed using Perceived Stress Scale (PSS).[19] PSS is a self-report measure of an individual's stress; which is a 10-item questionnaire which contains questions asking feelings and thoughts of the individual in the last month.[18] The questions have options like never, almost never, sometimes, fairly often and very often and the participants should choose their relevant option for the questions. For few questions, reverse scoring pattern is used. And then the total score is calculated. If the total score ranges from 0 to13, it indicates "mild stress"; if score is from 14 to 26, it indicates "moderate stress"; and if score is from 27 to 40 it indicates "high stress". Sleep hygiene was assessed using Epworth Sleepiness Scale (ESS) for children and adolescents or ESS-CHAD scale.[20] ESS assesses Excessive Daytime Sleepiness (EDS) of an individual. EDS is defined as a condition where an 'individual would be asleep during daytime when expected to be awake'. EDS remains as common symptom for most of the sleep disorders and assessment of EDS reveals sleep hygiene of an individual.[18] ESS is an 8-item questionnaire where the student has to score how likely it is for the adolescent to fall asleep or doze off while doing the things that are described in the scale. Scoring is done on a scale of 0-3 where 0 indicates "no chances of dozing", 1 indicates "slight chances of dozing", 2 indicates "moderate chances of dozing" and 3 indicates "severe chances of dozing". The scores for each of the questions have to be added to yield a total score ranging from 0-24. A total score of >10 indicates EDS indicating compromised sleep hygiene.

The study procedure was explained to the school authority of the concerning adolescent students before obtaining written permission. The study procedure was also explained to the students and informed consent was obtained from their parents and assent was obtained from the participants. Questionnaires were distributed to the students on the data collection day. PSS and ESS were explained to the participants and they were asked to fill it individually without consulting among themselves.

Quantitative data was analysed using Microsoft Excel 2016 and Statistical package for Social Sciences software (version 16). Descriptive statistics was calculated for predictor variables and outcome variables and was shown by frequency, mean, median and inter-quartile range. $P < 0.05$ was taken as statistically significant. The multivariable models included the significant predictors in the respective univariate analysis. Association between the outcome variables was then seen by test of significance at 95% confidence interval in Univariate Regression Model.

RESULTS

Among the 99 adolescent students, 53.5% were males and 46.4% were females. The median age was 16 (15,17). 31.3% of them were of 15 years age while 32.3% were of 16 years age and 36.3% were of 17 years age. 42.4% students were of class 9 and 40.4% were of class 11. Around 94.9% of the adolescents belonged to Hindu religion. These findings have been shown in Table 1 below

TABLE 1: DISTRIBUTION OF STUDY PARTICIPANTS ACCORDING TO SOCIO-DEMOGRAPHIC CHARACTERISTICS (N=99)

Parameters		Findings (%)	
Age (years)	15 years	31.30%	
	16 years	32.20%	
	17 years	36.30%	
Gender	Male	53.50%	**Median age= 16 (15,17)**
	Female	46.40%	
Religion	Hindu	94.90%	
	Muslim	5.05%	
Class	Class 9	42.20%	
	Class 10	17.20%	
	Class 11	40.40%	

Majority of the participants (54.54%) felt academically overloaded while 39 out of 99 students felt stressed while studying. 53.53% of adolescent students agreed that stress caused negative effect in their study. 48 out of 99 students agreed that their parents pressurized them to score good. The responses of the study participants about their academic details are given in Table 2.

TABLE 2: RESPONSES OF THE STUDY PARTICIPANTS ON QUESTIONS ABOUT ACADEMIC DETAILS (N=99)

	Item Statements	Positive Responses	
		Frequency	Percentage (%)
1	Do you feel academically overloaded?	54	54.5
2	Do you feel stress while studying?	39	39.3
3	Does stress make negative effect in your study?	53	53.5
4	Do your parents force you to study when you are not interested?	40	40.4
5	Do your parents pressurise you to secure good marks and hold rank in class?	48	48.4
6	Do your parents compare you with academically better students or class- toppers and force you to study more?	43	43.4
7	Were you satisfied with your last exam results and class rank?	52	52.5

Majority of the students i.e., 67.9% of male adolescent students and 67.4% of female adolescent students, were found to be moderate to severely stressed which was quite concerning. First time board exam appearing students were found to be more stressed, i.e., around 71% of students below class 10 were moderate to severely stressed. Again, according to age, 63.6% of students above 16 years of age was found to have moderate to severe stress while 75.8% of students below 16 years had moderate to severe stress. These findings are demonstrated below in Table 3.

TABLE 3: FACTORS ASSOCIATED WITH MODERATE TO SEVERE PERCEIVED STRESS- A MULTIVARIABLE LOGISTIC REGRESSION ANALYSIS USING PSS (N=99)

Parameters		Frequency (%)	Perceived Stress (PSS tool) Frequency (%)		Adjusted OR (95% CI)	P-value
			LOW	MODERATE-SEVERE		
AGE	<16 yrs (Ref)	33 (31.3)	8 (24.2)	25 (75.8)	1 (reference)	
	≥ 16 yrs	66 (66.7)	24 (36.4)	42 (63.6)	0.4 (0.08 - 1.8)	0.228
GENDER	Male (Ref)	53 (53.53)	17 (32.1)	36 (67.9)	1 (reference)	
	Female	46 (46.46)	15 (32.6)	31 (67.4)	1.0 (0.4 - 2.3)	0.989
CLASS	<10 (Ref)	42(42.4)	12 (28.6)	30 (71.4)	1 (reference)	0.588
	≥ 10	57(57.6)	20 (35.1)	37 (64.9)	1.4 (0.3-6.1)	

Nagel- karke value- 0.025

Hosmer- Lemeshow- 0.344

The multivariable regression model deduced was of good fit (non-significant Hosmer-Lemeshow test, p-value > 0.05) and indicated a weak relationship between the predictors and outcome which is evident by the Nagel-karke value of less than 0.2 in the above Table no 4.

According to ESS-CHAD score, prevalence of poor sleep hygiene in the form of EDS value > 10, was found to be around 19.2% in total comprising 11(20.8%) out of 53 male adolescent students and 8 (17.4%) out of 46 female adolescents. 33.3% of students below age of 16 years was found to have EDS while 12.1% adolescents of age more than equal to 16 years had EDS. These findings are demonstrated below in Table 4.

TABLE 4: FACTORS ASSOCIATED WITH EDS – A MULTIVARIABLE LOGISTIC REGRESSION ANALYSIS USING ESS - CHAD TOOL (N=99)

Parameters		Frequency (%)	EDS (ESS-CHAD tool) Frequency (%)	Adjusted OR (95% CI)	P-value
AGE	<16 yrs (Ref)	33 (31.3)	11 (33.3)	1 (reference)	
	≥ 16 yrs	66 (66.7)	8 (12.1)	0.3 (0.02 – 2.3)	0.224
GENDER	Male (Ref)	53 (53.53)	11 (20.8)	1 (reference)	
	Female	46 (46.46)	8 (17.4)	0.9 (0.3 - 2.4)	0.775
CLASS	<10 (Ref)	42 (42.4)	12 (28.6)	1 (reference)	0.929
	≥ 10	57 (57.6)	7 (12.3)	1.4 (0.3-6.1)	

Nagel-karke value- 0.097 Hosmer-Lemeshow- 0.890

The multivariable regression model deduced was of good fit (non-significant Hosmer-Lemeshow test, p-value > 0.05) and indicated a weak relationship between the predictors and outcome which is evident by the Nagel- karke value of less than 0.2 in the above Table no 4.

The association of the outcomes have been shown below in Table 5, where it is found that 22.4 % of adolescent students with moderate to severe perceived stress was diagnosed with poor sleep hygiene in the form of EDS value > 10 using the ESS-CHAD tool. Another 12.5 % of the students despite having low perceived stress also reported to have high EDS value.

TABLE 5: ASSOCIATION BETWEEN PERCEIVED STRESS (PSS TOOL) AND EDS (ESS-CHAD TOOL) – A UNIVARIATE LOGISTIC REGRESSION (N = 99)

Parameter		EDS (ESS-CHAD tool) Frequency (%)	Adjusted OR (95% CI)	P-value
PERCEIVED STRESS (PSS TOOL)	LOW (Ref)	4 (12.5)	0.5 (0.2 – 1.6)	0.249
	MODERATE-SEVERE	15 (22.4)		

Nagel-karke value- 0.023

The univariate logistic regression model shows that in reference to students with low perceived stress, students with moderate to severe perceived stress have 0.5 times increased odds of having poor sleep hygiene (or higher EDS). It also indicates a weak relationship between the PSS and EDS which is evident by the Nagel-karke value of less than 0.2 in the above Table no 5.

A scatter diagram to establish the correlation between Perceived Stress and EDS resulted in a Pearson Correlation coefficient value of 0.208 (p-value < 0.05) which indicated presence of a weak positive correlation between the variables.

DISCUSSION

The current study aimed at assessing the effect of stress on sleep hygiene among among 15 to 18 years students of a school in Burdwan, West Bengal. Participants of the study belonged to an age group that is academically, psychologically, emotionally and socially a stressful phase in any adolescent's life. Moreover, majority of the study participants belonged to the board exam appearing batch, which in itself is a highly stressful period. Most of the participants (54.54%) felt academically overloaded while 39 out of 99 students felt stressed while studying which despite of not being a majority response was still concerning.

Stress, which is a natural response of our body and mind to difficulties and threats, is quite evident by the responses of 53.53% of adolescent students who agreed that stress caused negative effect in their study. 48 out of 99 students agreed that their parents pressurized them to score good and secure ranks in class, which again not being a majority response, was still concerning as it could act as stressor in their life. Also, results of our study suggested that 67.9% of male adolescent students and 67.4% of female adolescent students, were found to be moderate to severely stressed which was quite concerning. First time board exam appearing students were found to be more stressed, i.e., around 71% of students below class 10 were moderate to severely stressed. Again, according to age, 63.6% of students above 16 years of age was found to have moderate to severe stress while 75.8% of

students below 16 years had moderate to severe stress. Academic stress, family conflicts, performance anxiety, parental pressure, cut-throat competition, fear of failure and college admission worry have been reported as major sources of stress in school among adolescents. [18,21] All these factors trigger an increased level of cortisol and other inflammatory mediators leading to stress associated with a disturbed sleep among adolescents.[22]

A good sleep, required both for somatic well-being and memory consolidation, is very essential. Getting adequate sleep is essential for a healthy body and healthy mind. Sleep helps in repairing, relaxing and rejuvenating our body and mind and can also help in reversing the bad effects of stress. Sleep deprivation seems to be related to the elevation of cortisol, reflecting impairment of HPA axis regulation, which affects learning, memory and resulting in glucocorticoid overload, which can lead to large deleterious effects on the body.[23] The present study showed that, according to ESS-CHAD score, prevalence of poor sleep hygiene in the form of EDS value > 10, was found to be around 19.2% in total comprising 11(20.8%) out of 53 male adolescent students and 8 (17.4%) out of 46 female adolescents. Many previous studies have also stated that disturbed sleep may affect proper cognitive functioning and impair memory consolidation thus hampering the academic performance of adolescents.

A previous study by Davidson et al investigated that normal nocturnal Growth Hormone (GH) surge disappeared with sleep deprivation, and was intensified following resumed sleep [24]. It is a known fact that GH promotes physical growth in all, and adolescence being a critical phase of our life needs the normal physiology of GH to be intact. While acute responses have important adaptive functions and are vital to coping and survival, chronic stressors elicit endocrine responses that may actually contribute to morbidity and mortality.[25]

Statistical analysis done to show association between the outcome variables, i.e., PSS and EDS, using PSS tool and ESS-CHAD tool, was not of statistical significance (p-value > 0.05), which might be due to the small sample size. Logistic regression model deduced-not a good fit (significant Hosmer-Lemeshow test, p-value < 0.05) and the scatter diagram showed a Pearson Correlation coefficient value of 0.208 (p-value < 0.05) which indicated presence of a weak positive correlation between the variables.

Future health promotion activities and educational initiatives among adolescents and their guardians or teachers may be impacted by the present study findings. Early identification and management of stress through school-based health programs is required for better academic performance and overall wellbeing of students. As a student spends most of the wakeful time in a day at schools / educational institutions, it is the responsibility of the school authority and teachers to nurture their students not only academically but holistically, including both mental and social well-being. Student development counsellors can be hired to support them by raising awareness about stress and ways to deal with it. The parent-teacher meetings organised in every school can be used as a platform to educate the guardians on stress management and sleep hygiene of their offsprings. Lifestyle education and adequate health promotional activities through drills and workshops to inculcate good sleep habits, better stress management and coping skills must be included in school curriculum for improving sleep hygiene and reducing stress of school students.

CONCLUSION

The current study showed the prevalence of moderate to severe stress among the school-going adolescents of age 15 to 18 years belonging to a semi-urban population. Stress, having a negative influence on their sleep hygiene was quite evident from the results. Though stress in minimal quantity has a positive influence on students' life in keeping them steady and consistent in performing their daily routine both academically and socially; chronic stressors is required in a minimal quantity for a positive life. But chronic stress on the other hand has long-term effects such as reduced growth, increased susceptibility to diseases, prone to psycho-somatic diseases and impairs quality of life.

Students are a country's future and conditions like adolescent stress and adolescent sleep disturbances must not act as hindrances in letting them put their best performances. Although stress due to academics was always prevalent among school going adolescents,

stress management techniques and good sleep habits awareness are not yet much recognised in Indian education scenario.

The study being conducted in a single school along with a small sample size, not all findings can be generalisable. In future research work, a large sample size including a greater number of schools should be used to conclude more significant findings.

AUTHORS CONTRIBUTION

All author have contributed equally.

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