

Association of sleep quality with general health: an Indian college students study

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Abstract

Background: Poor sleep quality impacts the quality of life and general health. However, there is a dearth of research in this area. The college student population has lifestyles and habits that deteriorate the quality of sleep and impact their health.

Objective: To ascertain the association between the sleep quality and general health of the college students.

Materials and Methods: This was a self-administered, questionnaire-based study conducted among 1,215 undergraduate students using Pittsburg Sleep Quality Index and General Health Index.

Result: Highly significant association was observed between the sleep quality and the general health quality of college students.

Conclusion: The quality of sleep significantly affects the quality of health in college students.

KEY WORDS: Sleep quality, Pittsburg Sleep Quality Index, General Health Index, physical health, mental health

Introduction

Epidemiological evidences are now establishing associations of poor sleep health with premature mortality and morbidity. Cardiovascular diseases, hypertension, glucose impairment, metabolic syndromes, endocrine disorders, and immunological and psychiatric illnesses are associated with sleep disorders. Sleep disorders precipitate endothelial dysfunction, impair glucose metabolism and other metabolic dysfunctions. Sleep disorders and poor sleep health is one of the risk factors for mental health problems

Sleep problems are related to well-being, fatigue, daytime sleepiness, and daytime dysfunction at individual level. Sleep

deprivation is associated with error in judgment, poor concentration, bad mood, and poor cognition the next day. Emotional regulation becomes difficult because of sleep problems especially sleep deprivation; it affects the emotional functioning resulting in poor social life. Thus, poor sleep health adversely affects general health, well-being, and quality of life.

One of the important aspects of sleep health is the quality of sleep. Sleep quality measures both objective and subjective outcomes of the sleep such as depth, restfulness of sleep, and feelings after awakening.^[1] Problem of poor sleep quality is not uncommon these days because of deviation in natural sleep pattern. This deviation is due to changing habits and practices related to sleep in modern society. Burden of sleep problems and poor sleep quality is an upcoming problem in public health.

Many studies are showing association of sleep quality with quality of life in clinical population. Changes in health state impact self-reported health; even poor self-reported health is associated with many diseases. Studies have shown the association of sleep duration with self-rated quality of health and quality of general health and well-being.^[2-8] However, research on association of sleep quality and health quality in general population is scanty. A study by Zeithofer et al.^[9] in

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Austrian population observed that good sleep quality is associated with better quality of life.

India is a country of youth and the lifestyle changes at a very fast pace since the last few decades. Habits and behaviors related to sleep are changing the pattern of sleep and affecting the health of college students. College students are more prone to adopt and practice maladaptive sleep hygiene practices. Maladaptive sleep hygiene practices such as irregular bedtime, academic pressure, Internet addiction, electronic media exposure, alcohol consumption, and smoking are some of the factors that are affecting quality of sleep of the young college students.^[10–13]

Sleep quality in college students is significantly associated with academic performance, cognition, emotional intelligence, and physical and psychological health.^[14,15] Poor sleep quality is one of the significant causes of poor academic performance, emotional dysfunction, and error in judgment. The consequences of effects of poor sleep quality on the quality of life are too high in the college students. Thus, poor sleep quality is detrimental to well-being of the college students.

However, research in this area is limited especially in Indian college population. There are no studies available on the effect of sleep quality on the health and well-being of college students. Objective of this study was to ascertain the association between sleep quality and the general health of the study population.

Materials and Methods

This was a cross-sectional study conducted in the college students in Chandigarh, India from November 2013 to December 2014. A total of 1,215 students pursuing graduation (BA, BCom, BSc, BTech, BDS, and MBBS) from different colleges were included in this study. Ethical clearance was taken from ethical committee of Panjab University. Informed consent was taken from all the participants of this cross-sectional, interview-based, noninterventional study. After taking permission from college authorities, a self-administered questionnaire that included sociodemographic pro forma, Pittsburgh Sleep Quality Index (PSQI), and General Health Index (GHI) was given to the students. Those who were ill for the last 1 month or who were not willing to participate were excluded from the study.

Sampling Methods

There were four study groups, with 300 students in each study group. Sample size is calculated taking into account $\alpha = 0.05$, $\beta = 0.20$, $P = 0.25$ (from the review of literature), and $Q = 1 - P = 0.75$. Sample size = $4PQ/r^2 = 4 \times 25 \times 75/5 \times 5 = 300$ each group. Sample size is approximated to take in to account the number of dropouts.

Statistical Analysis

SPSS statistical package 10.00; percentage, mean (M), standard deviation (SD), χ^2 test, analysis of variance (ANOVA), and stepwise linear regression were used.

Study Tools

PSQI: This was used to score the level of sleep quality in study participants. It is a 19-item questionnaire (Cronbach's $\alpha = 0.83$) and a validated tool to measure sleep quality based on the sleep habits of the last 1 month; it produces scores in the range of 0–21. It has seven subcomponents subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, daytime dysfunction, and sleep medicine. Scores less than or equal to 5 were associated with good sleep quality and score more than 5 were considered as poor sleep quality.

GHI: It was formulated to score the level of general health in the study population. Scores between 0 and 1 were considered good health, 2 and 3 were average, and greater than or equal to 4 were considered as poor.

Result

Data were collected from 1,215 participants. Age range of study participants was from 16 to 28 years. Mean age was 19.50 years; 24.20% of the participants were of 16–18 years, 69.10% were of 18–21 years, and 6.40% were in the age group of above 21 years. Male participants were 51.40%.

Mean PSQI score of study participants was 4.77 ± 2.518 . Subcomponents scores for subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, daytime dysfunction, and sleep medicine were 0.89 ± 0.750 , 1.14 ± 0.888 , 0.34 ± 0.699 , 0.32 ± 0.681 , 1.20 ± 0.569 , 0.82 ± 0.719 , and 0.05 ± 0.333 , respectively [Table 1]. Poor sleep quality was recorded in 33.7% of students. PSQI score was normal in 66.3% of students [Table 2].

Mean GHI score was 2.91 ± 1.162 [Table 3]. General health score was good in 11.9% of the participants, average in 59.42%, and poor in 29.38% [Table 4].

A Pearson's correlation coefficient was also conducted to evaluate the null hypothesis that there was no relationship between PSQI and GHI scores ($N = 1,215$). Preliminary analysis shows that there was no violation in the assumption of normality. These was a significant evidence to reject the null hypothesis and conclude that there is a strong positive association between PSQI ($M = 4.77$, $SD = 2.518$) and GHI ($M = 2.91$, $SD = 1.162$), $r = 0.325$, $P = 0.01$. High PSQI score was associated with high GHI scores.

Chi-square test of independence was performed to examine the relation between the general health and the sleep quality. The association between these variables was highly significant at $\chi^2 = 65.355$, $P < 0.001$ [Table 5]. The mean PSQI score for 136 participants with good general health was 3.29 ± 3.29 and with average general health was 4.55 ± 2.272 and that for poor general health was 5.79 ± 2.79 . Differences in mean PSQI score in good, average, and poor general health categories were statistically significant (ANOVA $P = 0.000$, $F = 61.221$) [Table 6].

Table 7 shows the results from a stepwise linear regression model of the sleep quality variables with general health scores. Overall model was statistically significant at $P < 0.001$,

Table 1: Component-wise score analysis of PSQI

PSQI component	Mean	SD
Subjective sleep quality	0.89	0.750
Sleep latency	1.14	0.888
Sleep duration	0.34	0.699
Sleep efficiency	0.32	0.681
Sleep disturbance	1.20	0.569
Daytime dysfunction	0.82	0.719
Sleep medicine	0.05	0.330
Total sleep quality index	4.77	2.518

PSQI, Pittsburg Sleep Quality Index; SD, standard deviation.

Table 2: PSQI among study participants

Categories	Frequency (%)
Normal sleep quality (≤ 5)	804 (66.2)
Poor sleep quality (>5)	411 (33.8)

PSQI, Pittsburg Sleep Quality Index.

Table 3: Item-wise score analysis of GHI

GHI	Mean	SD
Rating of health	1.88	0.927
Faced difficulty in daily life	0.07	0.257
Faced difficulty strenuous activity	0.07	0.247
Felt sadness	0.86	0.344
Participation in social activities	0.03	0.170
Total	2.91	1.162

GHI, General Health Index; SD, standard deviation.

Table 4: GHI among study participants

Categories	Frequency (%)
Good health (0–1)	136 (11.19)
Average health (2–3)	722 (59.42)
Poor health (≥ 4)	357 (29.38)

GHI, General Health Index.

Table 5: Association of sleep quality with GHI in the study population

GHI	Good health (0–1)	Average health (2–3)	Poor health (≥ 4)	χ^2	P-value
Sleep quality Good (≤ 5)	117 (14.55)	505 (62.81)	182 (22.63)	65.355	0.000
Poor (>5)	19 (4.62)	217 (52.80)	175 (42.58)		

GHI, General Health Index.

Table 6: Mean sleep quality scores in participants in general health categories groups (ANOVA table)

GHI categories	PSQI score				
	N	Mean	SD	F	P (two-tailed)
Good health (0–1)	136 (11.19)	3.29	1.91	61.221	0.000***
Average health (2–3)	722 (59.42)	4.55	2.27		
Poor health (≥ 4)	357 (29.38)	5.79	2.79		

ANOVA, analysis of variance; GHI, General Health Index; PSQI, Pittsburg Sleep Quality Index; SD, standard deviation.

***poor sleep quality is associated with poor general health.

Table 7: Stepwise linear regression of sleep quality variables with GHI score

Sleep quality variables	β	SE β	Standardized β	Pearson <i>r</i>	SR ²	Structure coefficient
Constant	2.086	0.079				
Subjective sleep quality	0.241	0.046	0.155	0.259	0.02	0.74
Daytime dysfunction	0.252	0.046	0.156	0.239	0.02	0.68
Sleep latency	0.143	0.038	0.109	0.204	0.01	0.58
Sleep disturbance	0.200	0.060	0.098	0.221	0.008	0.68

SE, standard error; GHI, General Health Index.

Dependent variable GHI, $R^2 = 0.121$, adjusted $R^2 = 0.119$, SR² is semipartial correlation.

*** $P < 0.001$, significant independent variables contributing to variance in general health.

Table 8: Stepwise linear regression of GHI variables with PSQI score

Model	β	SE β	Standardized β	Pearson <i>r</i>	SR ²	Structure coefficient
Constant	2.379	0.217				
Self-rating health	0.695	0.074	0.256	0.283	0.064	0.86
Ever felt sad	1.210	0.200	0.166	0.205	0.027	0.62
Difficulty in daily life	0.579	0.266	0.059	0.066	0.003	0.20

GHI, General Health Index; PSQI, Pittsburg Sleep Quality Index; SE, .

Dependent variable PSQI score, $R^2 = 0.110$, adjusted $R^2 = 0.109$, SR² is semipartial correlation.

* $P < 0.05$, significant independent variables contributing to variance in sleep quality.

$R^2 = 0.121$, and adjusted $R^2 = 0.119$. Sleep quality variables (subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, daytime dysfunction, and sleep medicine) were used in a stepwise multiple regression analysis to predict GHI. The prediction model contained four of the seven predictors and was reached in four steps with sleep duration, sleep latency, health sleep efficiency, sleep quality, and sleep medicine being removed. The model was statistically significant, $F(4, 1,209) = 41.497$, $P < 0.001$, and accounted for approximately 12.1% of the variance of $R^2 = 0.121$, adjusted $R^2 = 0.119$. GHI was primarily predicted by subjective sleep quality, daytime dysfunction, sleep latency, and sleep disturbance subcomponents of sleep quality. The raw and standardized regression coefficients of the predictors together with their correlations with GHI, their squared semipartial correlations, and their structure coefficients are shown in Table 7.

Table 8 shows the results from a stepwise linear regression model of the GHI variables with PSQI score. Overall model was statistically significant at $P < 0.05$ ($R^2 = 0.110$, adjusted $R^2 = 0.109$). GHI variables (self-rating health, faced difficulty in daily life, faced difficulty in strenuous work, ever felt sadness, participation in social activities) were used in a stepwise multiple regression analysis to predict PSQI. The prediction model contained three of the five predictors and was reached in three steps with faced difficulty in strenuous work and participation in social activities being removed. The model was statistically significant, $F(3, 1,211) = 50.084$, $P < 0.001$, and accounted for approximately 11% of the variance of $R^2 = 0.110$, adjusted $R^2 = 0.109$. PSQI was primarily predicted by self-rating health, ever felt sad, and faced difficulty in daily life. The raw and standardized regression coefficients of the predictors together with their correlations with PSQI scores, their squared semipartial correlations, and their structure coefficients are shown in Table 8.

Discussion

Three out of 10 college students were suffering from poor sleep quality. Mean PSQI score of our study population was also on the higher side. It was found that subcomponent scores of sleep latency, sleep disturbance, and subjective sleep quality were comparatively higher. Minimum score was in sleep medicine subcomponent, it means that consuming medicine for sleeping is not a common behavior in college population. Similarly in other studies also minimum component score was observed in sleep medicine.^[16,17] Study observed that sleep quality scores were significantly correlated with general health scores. Significant association was observed between poor sleep quality and poor general health. Mean PSQI scores were highest in the poor general health category and lowest in the good health category.

Thus, poor sleep quality is associated with the health-related quality of life and perceived health and well-being in college students. Study in Thai college students observed significant association of poor sleep quality with poor general health scores.^[18] Sleep behaviors directly and indirectly

(via mood) affects college students' academic function, physical, and psychological health.^[15] Similar results were also found in other studies on the general population.^[9,19] Close correlation between self-assessed quality of sleep and self-assessed quality of life was reported in Austrian population.^[9] Study by Lo and Lee^[19] in Chinese older people also observed that normal sleep pattern is associated with better quality of life and strong negative association between sleep deprivation (poor quality, short duration) and health-related quality of life.

It is interesting to note that the subjective sleep quality was observed to be a significant predictor of general health quality as compared with sleep quantity/duration. As seen in stepwise linear regression, general health quality was primarily predicted by subjective sleep quality, daytime dysfunction, sleep latency, and sleep disturbance [Table 7]. It means that self-reported sleep quality, problem in daily activities because of sleep, and time taken to fall asleep and disturbances during sleep, affect the perceived quality of general health in the college students. Omitted components, that is, duration of sleep, efficiency of sleep, and using medication for sleep do not contribute significantly to general health quality. Pilcher *et al.*^[20] observed that the sleep quality is better related to measures of health, well-being than sleep quantity in nonclinical population of college students. It can further be concluded that subjective components of sleep quality was significantly associated with perceived general health.

Studies in Japanese high school students and Finnish workers reported the association of sleep disturbances, subjective sleep quality with self-reported quality of health with general and mental health.^[21,22]

Variables of GHI were also tested to see the effect on sleep quality. PSQI was primarily predicted by self-rating of health status, have you ever felt sadness, and have you faced difficulty in daily life [Table 8]. Thus, poor sleep quality was associated with the perception of health-related quality of life and perceived physical and mental health. Above findings depict that the sleep quality and general health have bidirectional relationship with each other. Sleep quality affects general health and general health may itself affect sleep quality of the students.

Strengths and Limitations of Study

One of the important strengths of our study was that the data were collected from a large sample, which reduces bias. Study also observed both strong correlation and associations between sleep quality and general health quality. PSQI scale used in study has high reliability and validity. In this study, a self-administered questionnaire was used, so respondents' bias cannot be ruled out, which is one of the limitations.

Conclusion

Quality of sleep significantly affects the quality of health of college students. Sleep quality and general health quality are associated with each other. In-depth analysis reveals that subjective sleep quality, daytime dysfunction because of

poor sleep, sleep latency, and sleep disturbances significantly affect the quality of life.

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