Original Article

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Sleep Quality and Psychological Parameters: A Cross-sectional Study on Medical Students during Second Wave of COVID-19 Pandemic

Physiology Section

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ABSTRACT

Introduction: Stressors are defined as any event or conditions in the surroundings that may trigger stress. Medical students have immense stress of academics already and to this, second wave of Coronavirus Disease 2019 (COVID-19) pandemic worsened the scenario by having deleterious effect on the sleep quality, sleep duration and psychological parameters.

Aim: To investigate the association between mental health and sleep health among medical students during second wave of COVID-19 pandemic.

Materials and Methods: The present study was a cross-sectional study, done on 180 medical students during first week of April 2021 within 10 days, after the Institutional Ethical clearance. The survey form was given in six groups of 30 students each with first description of the study and getting the informed consent. The study was done by using three widely used and validated tools, Pittsburgh Sleep Quality Index (PSQI), Perceived Stress Scale (PSS) and General Anxiety Disorder-7 (GAD-7). All the students voluntarily participated in the survey. Descriptive statistics and correlation test were applied using Statistical Package for the Social Sciences (SPSS) version 26.0. The Correlation coefficient between three parameters was assessed using r-value.

Results: The study results show that 72.22% of the students were having moderate stress and 29.44% of the students were having poor quality of sleep. An 18.89% of participants were moderately anxious for several days during this second wave of pandemic.

Conclusion: Increased level of stress and anxiety had a direct impact on the quality of sleep due to second wave of COVID-19 pandemic.

Keywords: General anxiety disorder-7, Perceived stress scale, Pittsburg sleep quality index

INTRODUCTION

Epidemics/Pandemics have impacted the mental health of the individuals worldwide. Fear or worry of losing loved ones or oneself, lack of socialisation and constraints on physical movement due to certain restrictions and sudden and radical lifestyle changes occur due to the emergence of epidemics [1]. Second wave beginning in March 2021 was much larger than the first, with shortages of vaccines, hospital beds, oxygen cylinders and other medicines in parts of the country [2,3]. By late April, India led the world in new and active cases. On 30th April 2021, it became the first country to report over 400,000 new cases in a 24-hour period [3]. This wave of pandemic acted as a stressor for the whole community which triggered various psychological parameters.

Medical education in India is stressful affair which starts with higher competitiveness in selection process. As compared to other professional students, medical students have reported to experience a significantly higher level of stress which may be because of the larger duration and vastness of course [4]. Stress can be favourable and unfavourable, the one which stimulates learning and motivation is favourable and unfavourable stress causes hindrance in the learning mode. COVID-19 waves were unfavourable stress affecting the psychological state of medical students. Studies have shown that due to fear of COVID-19, students are at increased risk of psychological issues affecting the sleep quality [5]. As mental illness can affect students motivation, concentration and group discussions which are the crucial factors for students to succeed in higher education [6].

Stress, is a non apparent response to environmental stressors, which affects the individuals' life, relationships with people and can cause problems in physical, social and mental areas [7,8]. So long term stress can precipitate various symptoms such as sleep disturbance, irritability, concentration difficulties, anger, fatigue, palpitations, diarrhoea, constipation, frequent urination, and headache [9]. Sleep is a physiological event closely associated with psychological disorders such as stress and anxiety. Sleep is a very important life activity essential for memory consolidation, learning, strengthening of immune system, removal of cellular toxins and also in cardiovascular and metabolic regulation [9,10].

Majority of the studies have focused on mental health issues of healthcare workers and general population [11,12]. However, there is little evidence of the psychological effects of the current pandemic on mental health of medical students, who are known to be a vulnerable population which is the primary focus. Hence, this study aims to assess the association between mental health and sleep health among medical students.

MATERIALS AND METHODS

This was a cross-sectional study done on the students of 1st year MBBS (Bachelor of Medicine and Bachelor of Surgery), BNYS (Bachelor of Naturopathy and Yogic Sciences) and MSc Medical at SGT Medical College, Gurgaon, Haryana, India. The college research committee reviewed and approved the study protocol vide letter no. (SEC/FMHS/F/19/4/2021/40). The study was conducted during the first week of April 2021 when the second wave of pandemic had hit India.

Inclusion criteria: Medical students with no H/O depression, between the age group 18-20 years and who provided written informed consent were enrolled in the study.

Exclusion criteria: Students with chronic illness, panic disorders and depression were excluded from the study.

Sample size: All the 1st year students who were present at the time of data collection were taken which was a total of 180 students.

Study Procedure

Structured questionnaire proforma was designed which included four sections; demographic details, The PSQI [13], PSS-10 [14] and GAD-7 [15].The survey included, three validated and widely used screening tools:

Pittsburgh Sleep Quality Index (PSQI): The sleep quality has been assessed by using a validated questionnaire categorised into seven components which includes sleep quality, latency, duration, efficiency, sleep disturbances, use of medications and day time dysfunction. The PSQI consists of 21 questions. The global score of PSQI ranges between 0-21 where "0" indicates no difficulty and the total score greater than 5 indicates poor sleep quality. The PSQI has been widely used in various studies with high reliability and validity and the Cronbach's alpha of this index is 0.811 [16,17].

Perceived Stress Scale (PSS): PSS is a psychological instrument most widely used for measuring the perception of stress. Each question is scored from 0 (never) to 4 (very often) with a total possible score range of 0-40. A higher score indicates a high level of stress [14].

- Scores ranging from 0-13 is considered as low stress.
- Scores ranging from 14-26 is considered as moderate stress.
- Scores ranging from 27-40 is considered as high perceived stress.

General Anxiety Disorder-7 (GAD-7): The GAD-7 is a 7-item self-report scale developed to assess the defining symptoms of anxiety. The various items are graded on a 4-point Likert-type scale (0=not at all to 3=nearly every day). Scores range from 0-21 with higher scores indicating more severe GAD symptoms [15].

Socio-demographic: Four items were included to measure demographic variables among participants. Participants were asked to report their age (in years), gender (male or female), education status and status of living.

Method of data collection: The study was done on physical mode. Students were reporting to the college in batches for practical sessions due to COVID-19 protocol. Didactic lectures were taken online and students were divided in batches for practical sessions and reporting to college on specified days. So, six batches were made according to their day of reporting and study was done in one week's duration. The survey began with a brief description of the study itself, followed by a detailed informed consent and the measures taken by the investigators to keep their personal information confidential. All the students filled the form under supervision and it took around 10-15 minutes to fill out the survey.

STATISTICAL ANALYSIS

The collected data was compiled systematically in an Excel sheet. All the statistical tests were done using SPSS version 26.0. The distribution of the data was done by Shapiro-Wilk test. Descriptive statistics (frequencies, percentages) were calculated for socio-demographic characteristics, anxiety and depression according to sleep health outcomes (e.g., poor sleep quality, short sleep duration, sleep latency and experiencing sleep problems). Continuous data was summarised as Mean±SD (Standard Deviation) and discrete data in number and %. The Correlation coefficient between three parameters was assessed using r-value.

RESULTS

Socio-demographic characteristics: A total of 180 students participated in the study. Out of 180 students, female students (107) constituted 59.44% of the sample and male (73) students 40.56% of the sample. The mean age was 19.5±0.7 years. Among those 180 students, students 46.7% (84) were staying in the hostel and 53.3% (96) were staying along with their families. The mean scores and standard deviation of the three validated scales are shown in [Table/Fig-1].

Tools	Mean score	Standard Deviation (95% CI)
PSQI	6.31	3.17
PSS-10	19.24	5.39
GAD-7	7.37	5.20

[Table/Fig-1]: Mean score and standard deviation of PSQI, PSS-10 and GAD-7.

Sleep quality: The mean PSQI global score was 6.31±3.17, ranging between 0-21. Among 180 students 81 students were falling in the range between 0-5 and 99 students were in the range between 6-21. The percentage distribution of global score according to gender shows that 57.53% males were having poor sleep quality as compared to females which was 53.27%. The median amount of sleep latency was 30 minutes i.e., 32.22% had sleep latency score 1, 28.89% had sleep latency score 2. Among the males and females, 31.5% of males were having sleep latency score of 2 which was more compared to females. According to this study, only 29.44% (53) of the students specifically stated that their sleep quality was fairly bad and 6.67% (12) very bad. The sleep disturbance component shows that only 21.11% had fairly disturbed sleep and 2.22% had quite disturbed sleep as shown in [Table/Fig-2].

Components	Score	Males, (73) n (%)	Females, (107) n (%)	Total n=180
Subjective sleep quality	0 (very good)	Nil	Nil	Nil
	1 (Fairly good)	45 (61.64)	70 (65.42)	115 (63.89)
	2 (Fairly bad)	22 (30.14)	31 (28.97)	53 (29.44)
	3 (Very bad)	6 (8.22)	6 (5.61)	12 (6.67)
Sleep latency	0	18 (24.65)	32 (29.91)	50 (27.78)
	1	22 (30.13)	36 (33.64)	58 (32.22)
	2	23 (31.50)	29 (27.10)	52 (28.89)
	3	10 (13.69)	10 (9.35)	20 (11.11)
Sleep disturbance	0	11 (15.06)	14 (13.08)	25 (13.89)
	1	47 (64.38)	66 (61.68)	113 (62.78)
	2	12 (16.43)	26 (24.30)	38 (21.11)
	3	3 (4.10)	1 (0.94)	4 (2.22)
Sleep duration	0	17 (23.29)	36 (33.64)	53 (29.44)
	1	36 (49.31)	47 (43.93)	83 (46.11)
	2	16 (21.92)	18 (16.82)	34 (18.89)
	3	04 (5.48)	06 (5.61)	10 (5.56%)
Sleep efficiency	0	48 (65.75)	74 (69.16)	122 (67.78)
	1	18 (24.66)	25 (23.37)	43 (23.89)
	2	06 (8.22)	03 (2.80)	09 (5)
	3	01 (1.37)	05 (4.67)	06 (3.33)
Sleep day dysfunction	0	23 (31.51)	33 (30.84)	56 (31.11)
	1	30 (41.09)	46 (43)	76 (42.22)
	2	14 (19.18)	21 (19.62)	35 (19.45)
	3	06 (8.22)	07 (6.54)	13 (7.22)
Sleep medication	0	71 (97.26)	99 (92.53)	170 (94.44)
	1	0	6 (5.60)	6 (3.33)
	2	1 (1.37)	0	1 (0.56)
	3	1 (1.37)	2 (1.87)	3 (1.67)
PSQI global score	0-5	31 (42.47)	50 (46.73)	81 (45)
	>5	42 (57.53)	57 (53.27)	99 (55)

[Table/Fig-2]: PSQI component scores among medical students.

PSS-10: The mean score of PSS is 19.24±5.39 as shown in [Table/Fig-1]. A 71.23% male students were falling in the category of moderate stress in comparison to 72.90% of the female students as depicted in [Table/Fig-3].

GAD-7: The mean score of GAD-7 is 7.37±5.20 as shown in [Table/Fig-1]. [Table/Fig-4] depicts the anxiety scores assessed by GAD-7

PSS score range	Males (n=73)	Females (n=107)	Total (n=180)
0-13 (Low stress)	12 (16.44%)	16 (14.95%)	28 (15.56%)
14-26 (Moderate stress)	52 (71.23%)	78 (72.90%)	130 (72.22%)
27-40 (High stress)	9 (12.33%)	13 (12.15%)	22 (12.22%)

[Table/Fig-3]: PSS 10 score comparison between males and females in % age.

between males and females. Accordingly, it is seen that 19.17% male students were severely anxious as compared to 7.48% females. On statistical analysis, it was found that there is a positive correlation between PSQI and PSS between PSQI and GAD-7 and GAD-7 and PSS scores as shown in [Table/Fig-5].

GAD score range	Males (n=73)	Females (n=107)	Total (n=180)
0-4 (Minimal anxiety)	28 (38.36%)	30 (28.04%)	58 (32.22%)
5-9 (Mild anxiety)	23 (31.51%)	43 (40.19%)	66 (36.67%)
10-14 (Moderate anxiety)	8 (10.96%)	26 (24.29%)	34 (18.89%)
15-21 (Severe anxiety)	14 (19.17%)	8 (7.48%)	22 (12.22%)

[Table/Fig-4]: GAD Score comparison between males and females.

Components	r-value
PSQI Vs PSS-10	0.54
PSQI Vs GAD-7	0.59
GAD-7 Vs PSS-10	0.51

[Table/Fig-5]: Correlation between three scales.

DISCUSSION

The primary objective of the research was to assess the impact of second wave of COVID-19 on the mental health of medical students and its correlation with the sleep quality and sleep parameters. As second wave of pandemic hit our country all of a sudden that created panic, anxiety, stress among the general population as well as among the health workers. The student community of the age group 18-20 were also affected due to the turmoil created by this wave. The medical students were affected the most as they were in total dilemma, uncertainty, loss of confidence. Even though their online classes/e-learning started with an intention to remain in continuous touch with the students, to increase the confidence and faith of the students in their faculty during COVID-19 pandemic but still the touch, bonding with the peers and teachers were a lacking factor which led to anxiety and stress which was seen in a study done on 983 medical students during first wave of pandemic. In that study, it was seen that though online classes were started during the first wave but around 39.6% students were anxious as to the learning methodology [18]. A 72.22% of the students were having moderate stress i.e., 14-26 according to present study. The results of this study were in accordance with another study in which it was observed that mental health problems in relation to COVID-19 were mostly associated with university students pursuing higher studies [19].

Stress affects the mental wellbeing of an individual which also affects the various physiological parameters. In present study, it was found that 55% of the students were having poor quality of sleep as depicted by global score PSQI >5. The proportion of students with poor sleep quality in present study population were in accordance with data from previous studies which were also done among university or medical students. Poor sleep quality was detected in 60%, 58%, 71.6% and 54.7% of students accordingly in these studies [20-23] which is in proportion with this study. Individuals in stress suffer from various sleep disorders which not only affect the holistic wellbeing but also lead to decrease in quality of life [22]. So, stress is a common psychological reaction associated with sleep disturbances during COVID-19 pandemic. This observation was in concordance with other study reporting poor quality of sleep during COVID-19 [24]. Immune system of our body gets depressed with various stressors which has psychological, social and physiological negative consequences. So sound sleep is essential to improve individuals' physical, social and spiritual well-being and quality of life [9,10].

The findings of this study are consistent with study done on university students in Ethiopia [25] which gave us an inclination to explore the link between sleep habits and sleep problems associated with mental health among the medical students. The study results shows that 28.89% students were having long sleep latency of 2 and 11.11% were having a sleep latency of 3. As it is seen that there is a positive correlation between the perceived stress score and global sleep score in this study which could be explained by the pathway by which depression alters sleep through loss of deep, slow wave and increase in nocturnal arousal. The combination of these two effects contributes to decrease in non REM sleep which may cause reduced sleep latency [26]. Secondly, the decision to continue online education during this COVID-19 and uncertainty in the academic procedures are the triggering factors affecting the mental health leading to increase in stress and anxiety as seen in a study done by Dwivedi D et al., [4].

The GAD-7 scale shows that though only 36.67% students were having mild anxiety. From these the authors could interpret that they were anxious which was having a negative impact on their mental health. This observation of this study goes in concordance with the study conducted on representative sample of university students in China which also showed that the level of their anxiety was higher as compared to general population [27].

A study done on psychosocial parameters in healthcare workers also shows that 35.5% of 197 healthcare workers were having severe anxiety levels according to Hamilton anxiety rating scale [28]. The inclusion of medical students in this study was to enquire about their mental state of mind and toughness, readiness to be prepared about the emergency conditions such as environmental stressors, pandemics.

So according to this study, high level of stress and anxiety is a significant predictor for the poor quality of sleep, which is in line with recent studies conducted at King Saud University, and a Pakistani medical school [29,30]. The triggering factor for sleep disturbance is Psychological distress [31]. In response to various stressors, physiological changes take place to help the body in coping with the situation [32]. However, chronic activation of these stress responses, which includes the sympathetic-adrenal-medullary axis and the Hypothalamic-Pituitary-Adrenal (HPA) axis, can give rise to the persistent production of epinephrine and cortisol, which are called "stress hormones" [33-35]. Similarly, sleep deprivation can affect the circadian rhythm of cortisol secretion. Therefore, it represents a vicious cycle that has a negative effect on the mental health of the students [29].

Limitation(s)

The sample size was small as this wave came all of a sudden and so all the MBBS students could not be taken in the study. As final year students were busy in COVID duties, only first year students were free from such duties. Secondly, the sample used is from one single Medical College, so the findings cannot be generalised to all the professional students.

CONCLUSION(S)

In this study, the authors have identified the second wave of pandemic as a new stressor and highlighted its effect not only on the mental health but also on the sleep health of the students as well. As stress, anxiety leads to poor sleep and this forms a vicious cycle. Stress is detrimental affecting various physiological, neuroendocrine and behavioural responses. Sleep is a normal biological process whose regulation is controlled with the circadian process. HPA axis activity is suppressed in the early part and increased during the latter part of the sleep. Stress related insomnia starts this vicious

cycle by activating HPA axis. The students sleep quality was found to decrease, due to increased perception of stress and anxiety. In concordance with the results, it may be recommended to improve the psychosocial conditions by regular counselling and contact sessions with their mentors.

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Authors contribution: NK: Concept, design, literature search, data acquisition, manuscript writing, editing and review; DD: Design, literature search, manuscript review; ST: Data Statistical analysis; SB: Data acquisition; HJSS: Manuscript editing and manuscript review.

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