"Mindfulness AND Its Association WITH Stress, Sleep, AND Dietary Changes Among Post-Covid Medical Students: A Cross-Sectional Study Using THE Maas Scale"

Aakash Srivastava*, Manjinder Kaur** and Umer Jalalie***

Principal investigator, Department of Physiology, Pandit JN Govt. Medical College & Hospital, Chamba.
*** Professor & Head, Department of Physiology, Geetanjali Medical College & Hospital, Udaipur-313001, Rajasthan, India.*
****Associate Professor, Department of General Medicine, Pandit JN Govt. Medical College & Hospital, Chamba 176310, H.P., India.*
** Email: akki0987@yahoo.com*

Background: Medical students recovering from COVID-19 may experience persistent psychological and behavioural disturbances. Mindfulness, which reflects present-moment awareness, may be influenced by stress, altered sleep, and lifestyle changes. This study aimed to assess mindfulness using the Mindful Attention Awareness Scale (MAAS) and its relationship with sleep and dietary patterns in post-COVID medical students.

Materials and Method: A cross-sectional study was conducted among 109 post-COVID medical students from Pt. Jawahar Lal Nehru Government Medical College and Hospital, Chamba, Himachal Pradesh. Data were collected using the MAAS questionnaire along with a structured survey on COVID symptoms, sleep disturbance, diet alteration, and substance use. Descriptive statistics (mean ± SD) were calculated. The mean MAAS score was analysed across sleep and dietary groups.

Results: The mean MAAS score was 4.23 ± 0.46. Among participants, 41.28% reported altered sleep, and 41.28% had dietary changes post-COVID. Fever (79.82%), cough (68.81%), and cold (64.22%) were the most common symptoms during COVID infection. The majority had normal BMI (78.90%), were non-smokers (82.57%), and non-alcoholic (84.40%). Sleep disturbances were likely influenced by post-infection anxiety, academic stress, and autonomic dysregulation affecting circadian rhythms. Dietary disturbances were linked to psychological stress, fatigue, gastrointestinal symptoms, reduced activity, sensory deficits, and medication use.

Conclusion: Post-COVID medical students demonstrated moderate levels of mindfulness. Disturbances in sleep and diet appeared associated with reduced mindfulness levels. These were attributed to multifactorial causes, emphasizing the need for mindfulness-based and behavioural interventions in post-COVID rehabilitation.

Introduction

The coronavirus disease 2019 (COVID-19) pandemic has not only posed a major threat to physical health but also triggered widespread psychological disturbances, particularly among medical students. These students, being frontline trainees, encountered unique stressors such as academic disruptions, isolation, infection anxiety, and excessive workload during the pandemic. Those who tested positive for COVID-19 reported amplified challenges related to physical fatigue, altered circadian rhythms, and prolonged stress responses [1,2].

Mindfulness, defined as the awareness that arises through paying attention to the present moment non-judgmentally, is a critical psychological trait for emotional regulation and resilience. The Mindful Attention Awareness Scale (MAAS) is a widely validated tool used to measure dispositional mindfulness, particularly focusing on attention and awareness in daily life [3]. Reduced mindfulness has been linked with higher stress, anxiety, emotional dysregulation, and burnout, especially in demanding professions such as medicine [4].

Emerging evidence suggests that lifestyle factors such as poor sleep quality, chronic psychological tension, and suboptimal dietary habits can significantly diminish mindfulness and mental well-being [5,6]. Sleep disturbance, which was widely reported during the pandemic, particularly affects cognitive processing and self-regulation capacities, both of which are integral to mindfulness[7]. Similarly, stress and poor diet have been associated with inflammatory and hormonal changes that reduce one's capacity to maintain mindful awareness [8].

Despite increasing interest in mindfulness-based interventions, limited literature exists on how post-COVID recovery and lifestyle disruptions affect mindfulness in medical students. There is a pressing need to explore how stress, tension, altered sleep, and dietary patterns impact mindfulness in this vulnerable population. Such insights can guide institutional well-being initiatives and preventive mental health strategies in academic health settings.

This study was conducted to evaluate the impact of stress, tension, altered sleep, and diet on the levels of mindfulness among post-COVID medical students using the Mindful Attention Awareness Scale (MAAS).

Objectives

Primary Objective
- To assess the level of dispositional mindfulness among post-COVID medical students using the Mindful Attention Awareness Scale (MAAS).

Secondary Objectives
1. To evaluate the association between mindfulness levels and sleep disturbances in post-COVID medical students.

2. To analyse the relationship between mindfulness and dietary changes following COVID-19 infection.

3. To identify lifestyle and behavioural factors (e.g., stress, academic pressure, quarantine, autonomic symptoms) contributing to altered mindfulness.

4. To examine the prevalence of COVID-19 symptoms and correlate them with psychological and lifestyle outcomes.

5. To explore the need for mindfulness-based interventions as part of post-COVID psychological rehabilitation in medical students.

MATERIALS AND METHODS

Study Design and Area
A cross-sectional observational study was conducted in the Department of Physiology and the Darbar Hall at Pt. Jawahar Lal Nehru Government Medical College and Hospital (Pt. JLNGMCH), Chamba, Himachal Pradesh. These facilities were adequately equipped to support the teaching, training, and research activities involved in the study.

Study Population
The study population comprised post-COVID medical students enrolled at Pt. JLNGMCH, Chamba. Students from first-year MBBS till internship who met the inclusion criteria were considered for participation.

Sample Size
All eligible and consenting post-COVID medical students available during the study period were included, ensuring a comprehensive and representative sample of the target population. A total of 109 post covid medical students were included in the study.

Tools Used:
1. **Mindful Attention Awareness Scale (MAAS):** A validated 15-item self-report questionnaire designed to assess dispositional mindfulness. Responses are recorded on a 6-point Likert scale.

2. **Structured Questionnaire:** Developed to record demographic details, COVID-related symptoms, smoking and alcohol use, dietary alterations, and sleep disturbances post-COVID.

Data Collection: Students were asked to complete the MAAS and the structured lifestyle and symptom questionnaire during a supervised data collection session. Sleep and diet changes were self-reported as either "altered" or "normal" based on personal perception with reasons during the recovery period.

Statistical Analysis: Data were entered into Microsoft Excel and analysed using SPSS version SPSS version 25 [9]. Descriptive statistics were calculated (mean, standard deviation, frequencies, and percentages). Group-wise comparisons of MAAS scores were planned using independent sample t-tests. Associations between categorical variables were explored using

Chi-square tests, and Pearson's correlation coefficient was applied to determine associations between MAAS scores and continuous lifestyle parameters.

Ethical considerations
The study received ethical clearance from the Institutional Ethics Committee (IEC) via letter no. IEC/2023/Sept/34(h) dated 25-09-2023. Written informed consent and detailed COVID medical history was obtained from all participants. Confidentiality was ensured through anonymization and secure data storage, in accordance with the Declaration of Helsinki [10].

Results and Discussion
The results of the study have been presented in Tables 1-4 and Figs. 1-4. This cross-sectional study included 109 post-COVID medical students from Pt. Jawahar Lal Nehru Government Medical College, Chamba, Himachal Pradesh. The majority (63.30%) were aged 21–22 years, and 59.63% were female. The average height and weight were 1.65 ± 0.07 m and 61.83 ± 10.14 kg, respectively. Most students (78.90%) had a normal BMI, with a mean BMI of 22.74 ± 2.30. Lifestyle analysis revealed that 17.43% of students were smokers and 15.60% consumed alcohol, with the majority being non-smokers (82.57%) and non-alcoholic (84.40%).

A total of 89.91% of participants reported experiencing symptomatic COVID-19. The most common symptoms included fever (79.82%), cough (68.81%), cold (64.22%), and body aches (56.88%), while others reported headache (30.28%), sputum production (22.02%), anosmia (7.34%), and breathlessness (4.59%).

Sleep disturbances were reported by 41.28% of students, primarily attributed to anxiety, quarantine-related stress, academic pressure, and circadian rhythm dysregulation, likely due to autonomic imbalance. Similarly, 41.28% of students experienced dietary changes, which were linked to psychological stress, fatigue, gastrointestinal symptoms, reduced physical activity, loss of taste or smell, and medication side effects. The mean Mindful Attention Awareness Scale (MAAS) score was 4.23 ± 0.46. Preliminary trends suggested lower mindfulness scores among those with altered sleep and diet, indicating a possible inverse relationship between lifestyle disruption and mindfulness.

These findings align with those of Saraswathi et al., who reported high stress levels and reduced emotional regulation in Indian medical students during the pandemic due to academic uncertainty and social disconnection [11]. Our observed MAAS scores suggest that even after clinical recovery, post-COVID students continue to experience cognitive and emotional strain, which may impair mindfulness.

Sleep disturbances observed in over 40% of the sample are consistent with findings by Xiao et al., who demonstrated poor sleep quality among healthcare workers and students during pandemic-related isolation [12]. Given that mindfulness is closely associated with attentional regulation and emotional stability, impaired sleep likely disrupts these processes. This view is reinforced by Pizarro-Ruiz et al., who found that students with higher mindfulness traits experienced fewer sleep-related problems [13]. Our findings, however, support the reverse direction—that sleep disturbances themselves may erode dispositional mindfulness through cognitive fatigue and autonomic imbalance.

Dietary disruptions also mirrored those observed in previous research. Ingram et al. and Aktas reported irregular eating habits and altered appetite among students during lockdown, citing stress and emotional exhaustion as contributing factors [14,15]. These behaviours, which were also present in our participants, may interfere with serotonin and dopamine production, which are critical to mood and focus. Gastrointestinal symptoms further contributed to reduced dietary consistency. This is supported by Tariq et al., who emphasized the role of post-COVID GI symptoms in reducing appetite and disrupting normal nutrition in young adults [16].

The sensory impairments of anosmia and ageusia (7.34%) reported by our participants echo findings by Parma et al., who linked these symptoms to reduced emotional well-being and disrupted eating behaviours [17]. These sensory losses may diminish body awareness and satisfaction, thereby interfering with mindfulness.

Autonomic dysfunction, particularly circadian misalignment and fatigue, was a recurrent theme in our cohort and can be contextualized within long COVID pathology. Dani et al. described these symptoms as manifestations of autonomic instability, which reduces vagal tone and impairs self-regulation and internal awareness—both essential to mindfulness [18].

Our results suggest that reduced mindfulness may not only be a consequence of stress and physiological changes but also a valuable psychological indicator of recovery. This supports findings from Khoury et al., who demonstrated that mindfulness-based interventions (MBIs) significantly reduce stress and improve sleep quality in healthy individuals [19]. Thus, integrating MBIs into post-COVID care strategies could offer both preventive and restorative benefits for medical students recovering from infection.

In summary, our study highlights a strong interrelationship between stress, disrupted sleep and diet, physiological symptoms, and diminished mindfulness in post-COVID medical students. It reinforces the need to monitor psychological well-being alongside physical recovery and supports the inclusion of structured mindfulness interventions in medical education settings. Future research should incorporate objective stress markers and adopt longitudinal designs to explore the recovery trajectory of mindfulness post-infection.

Conclusion

This study found that post-COVID medical students exhibited moderate levels of mindfulness, with lower MAAS scores notably associated with altered sleep and dietary patterns. These lifestyle disruptions were influenced by psychological stress, academic pressure, and various post-COVID problems. Such multifactorial challenges appear to reduce present-moment awareness and emotional regulation. The findings emphasize the need for integrating mindfulness-based interventions into post-COVID rehabilitation strategies to enhance mental well-being, lifestyle stability, and academic functioning among medical students.

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Table 1. Demographic data including personal habits

Age group (years)	Number	Percentage

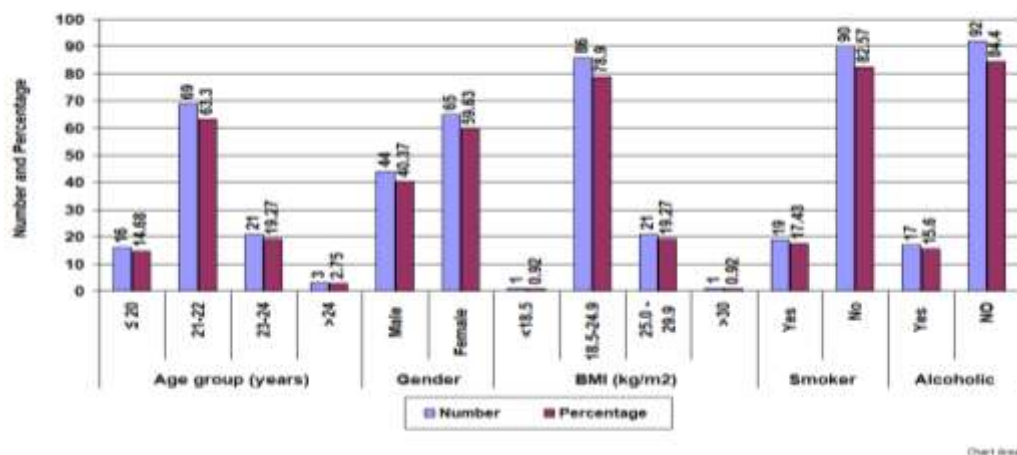|		
≤ 20	16	14.68
21-22	69	63.30
23-24	21	19.27
>24	3	2.75
Gender		
Male	44	40.37
Female	65	59.63
BMI (kg/m^2)		
<18.5	1	0.92
18.5-24.9	86	78.90
25.0 - 29.9	21	19.27
>30	1	0.92
Smoker		
Yes	19	17.43
No	90	82.57
Alcoholic		
Yes	17	15.60
NO	92	84.40

Fig. 1. Demographic data including personal habits

Table 2. Post- covid status and altered sleep and diet patterns

| Parameter	Condition	Number	Percentage
Post covid status	Asymptomatic	11	10.09
	Symptomatic	98	89.91
Sleep	Altered	45	41.28
	Normal	64	58.72
Diet	Altered	45	41.28
	Normal	64	58.72
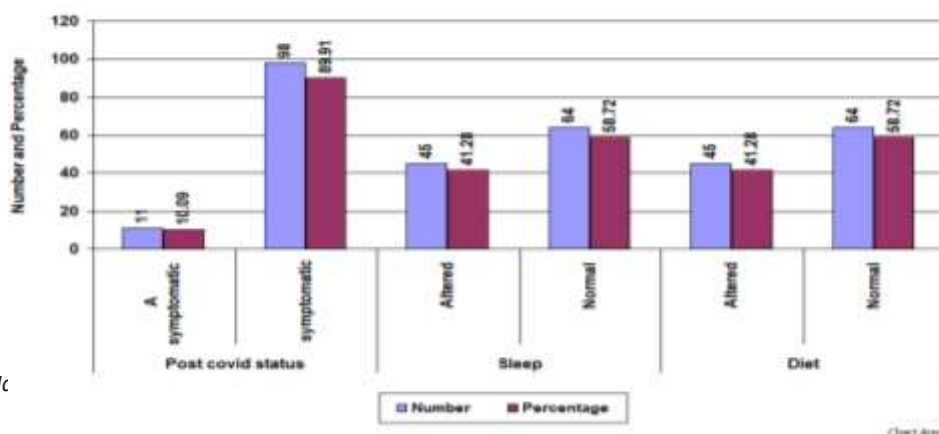
Fig. 2. Post- covid status and altered sleep and diet patterns

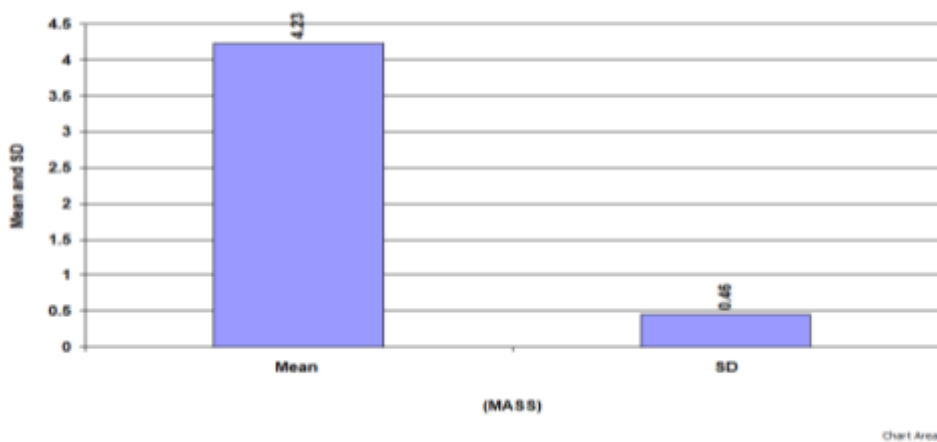**Table 3. Distribution of cases according to symptoms**

SYMPTOMS	Yes		NO	
	No.	%	No.	%
Cough	75	68.81	34	31.19
Sputum	24	22.02	85	77.98
Fever	87	79.82	22	20.18
Cold	70	64.22	39	35.78
Headache	33	30.28	76	69.72
Body ache	62	56.88	47	43.12
Anosmia	8	7.34	101	92.66
Ageusia	8	7.34	101	92.66
Breathlessness	5	4.59	104	95.41
Pallor	18	16.51	91	83.49
Icterus	5	4.59	104	95.41
Cyanosis	00	00	0	0.00
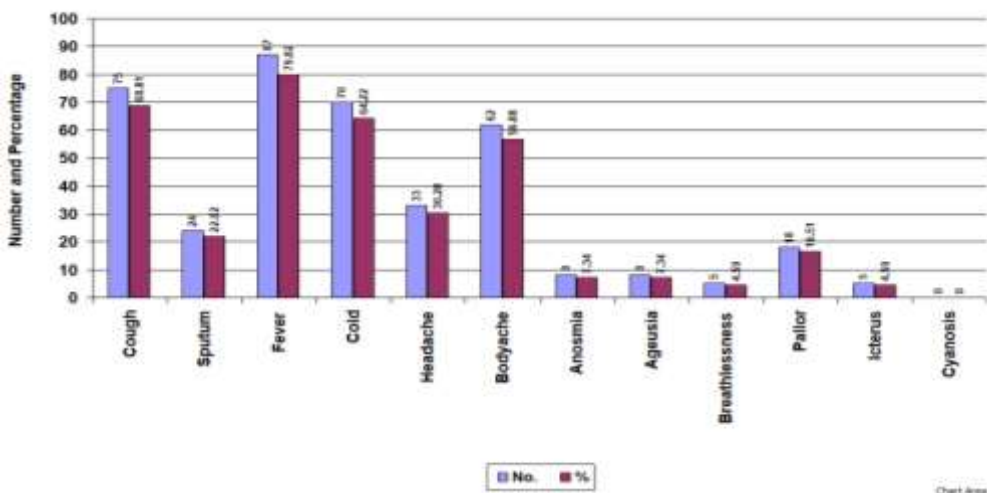
Fig.3. Distribution of cases according to symptoms

Table 4. Mean and standard deviation of MAAS

MAAS	**Mean**
Mean	4.23
SD	0.46

Fig.4. **Mean and standard deviation of MAAS**