

Effect of Short-Term Practice of Left Nostril Breathing on Various Sleep Parameters in the Medical Students

Abstract

Background: Various recent studies have reported that exclusive right nostril breathing (RNB) and left nostril breathing (LNB) has an immediate and sustained effect under various medical conditions. In the present study, we evaluated the effect of short-term left nostril breathing on various sleep parameters in medical students. **Methods:** We hypothesized that the increase in vagal tone because of LNB can help in improving the quality of sleep. The baseline sleep quality was documented before the start of study in the case and the control group using the 'Pittsburgh Sleep Quality Index' (PSQI) questionnaire. A PSQI global score of more than 5 indicates poor sleep quality. The case group practiced LNB in a graduated manner for a period of 4 weeks. Thereafter, sleep quality was documented for both the groups using the PSQI questionnaire. **Results:** Practicing LNB significantly lowered all the seven component scores ($p < 0.05$) and the global PSQI score in the case group (p -value < 0.0001), suggesting that this practice effectively improved the sleep quality in the individuals of this group. **Conclusions:** Overall, this study suggested that exclusive LNB practice could serve as an important lifestyle modification that can be incorporated in the routine of medical students for improving their sleep quality.

Keywords: Medical students, questionnaire, sleep deprivation, sleep quality

Introduction

Proper sleep is required for mental and physical well-being of humans, and chronic deprivation of sleep has been found to be associated with impaired neurobehavioral functioning.^[1] Data suggest that nearly 22–65% of the general population suffers from sleep disorders.^[2] In addition, sleep-related issues such as inadequate sleep, poor sleep quality, and difficulty falling asleep are prevalent among college-going students.^[3,4] Among college students, a high level of stress prevails among medical students. It has been shown by a previous study that poor sleep is highly prevalent in the medical students across the globe.^[5] A cross-sectional study performed in India to study sleep disturbances showed that medical students had poorer sleep quality (72.9%) than their non-medical peers (51.9%).^[6] Medical students are more vulnerable to poor sleep, presumably because of the long duration of the course, exhaustive syllabus, night duties, and wrong lifestyle choices.^[7] Sleep is essential for memory consolidation,

learning, analytical thinking, and decision making, which translates into a better academic performance for the students.^[8] Sleep deprivation has an adverse impact not only on the overall health of the students but also on their cognitive functions and motor activity, which leads to poor academic performance. There is a crucial need for sound and adequate sleep in these students so that they can maintain their cognitive and physical well-being for not only their academic performance but also the nature of the job they perform.^[7]

Yogic breathing or pranayama reportedly helps in improvement of health along with reducing the effects of stress on the body. In this yogic breathing practice, alternative nostril breathing is the most commonly performed exercise and is considered to help in relieving mental stress along with promoting physical and mental balance.^[9] Specific nostril breathing influences autonomic functions. Various effects of right and left nostril breathing (LNB) have been evaluated. A report suggested vagal dominance in autonomic functions in groups participating in LNB and right nostril breathing (RNB)

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exercises.^[10] Another recent study suggested decreased sympathetic activity along with decreased blood pressure (BP) following LNB and vice versa with RNB.^[11] Other recent studies have reported differential physiological effects of exclusive RNB and LNB on various physiological variables of the autonomic, cardiovascular, and respiratory systems.^[12]

Herein, the present study was designed to determine the effects of the short-term practice of exclusive LNB, a yogic pranayama technique known as *chandra-nadi pranayama* on various sleep parameters in medical students. LNB was chosen as the intervention for this study because during sleep, particularly non-rapid eye movement stages, parasympathetic activity increases and sympathetic activity decreases.^[13] Recent studies have suggested that yogic breathing through the right nostril, left nostril, or both nostrils alternately produces distinct autonomic changes. Thus, we examined whether an LNB-induced increase in parasympathetic activity improves sleep quality.

Methods

Study design and ethical approval

This prospective, non-randomized, interventional study was conducted at AIIMS Nagpur (hostel) in 2019. Prior to the commencement of the study, ethical clearance was taken from the Institutional Ethics Committee (IEC) to conduct the study (AIIMS-NAG/IEC/STS/2019/0002 (dated May 16, 2019)). Informed consent was taken from all the students participating in the study. This case-control study was carried out on 149 young, apparently healthy first- and second-year Bachelor of Medicine and Bachelor of Surgery (MBBS) students. Of them, 99 were first-year MBBS students and 50 were second-year MBBS students. Students were divided into two groups, namely the case group (n = 50) and the control group (n = 99). The study was conducted for 4 weeks.

Inclusion criteria

All the consenting healthy first-year and second-year MBBS students were recruited for the study.

Exclusion criteria

Students with any critical illness (any disease requiring regular medication) were excluded from the study.

Questionnaire used

Pittsburgh Sleep Quality Index (PSQI) was used for evaluation of effects of LNB on the sleep quality of recruited medical students. It is a self-rated questionnaire that assesses sleep quality and disturbances over a 1-month time interval. Nineteen individual items generate seven “component” scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The sum of scores for these seven components yields one

global score.^[14] A total score of 5 or more is indicative of poor sleep quality.

Procedure

The PSQI questionnaire was administered to both groups before initiation of the study. The case group students were taught LNB by demonstrating them the procedure and showing them related videos. Exclusive LNB involves inspiration and expiration, both through the left nostril only. The right thumb is used to close the right nostril with gentle pressure. The breathing is then performed through the unblocked left nostril in a slow and regular manner for both inspiration and expiration.^[12] One set of LNB comprises nine rounds of LNB. Each LNB set was followed by the relaxation posture called as *shavasana* for a couple of minutes. In the first week, the students were instructed to perform one set of LNB, that is, nine rounds at the rate of 6 breaths/minute, which takes around one and a half minutes approximately. In each consecutive week, the number of sets of LNB was increased by one set as depicted in Table 1.^[15]

The students performed LNB before bedtime for a period of 4 weeks in a graduated manner. Regular reminders were given to them via WhatsApp and personal contact to ensure their compliance.^[15] The students were asked to avoid using any electronic gadgets after completion of the requisite sets of LNB. After 4 weeks, the PSQI questionnaire was administered again to both the groups. Figure 1 depicts the participant flow chart.

Statistical analysis

SPSS version 26.0 was used for conducting statistical analyses, and Microsoft Excel was used for graphics.

Results

Demographic and anthropometric parameters

The mean age of students in the case group was 19.77 ± 0.99 years, and that in the control group was 18.82 ± 1.29 years. The difference in mean age ($p = 0.948$) and gender distribution ($p = 0.999$) in both groups was statistically insignificant. Also, no significant difference was found in the mean height of students in the case group (1.69 ± 0.08 m) and the control group (1.67 ± 0.09 m) ($p = 0.175$). The mean weight of students in the case group (62.52 ± 10.57 kg) was insignificantly different from that in the control group (62.60 ± 13.31 kg) ($p = 0.970$). The mean difference

Table 1: Schedule of LNB for 4 weeks

Weeks	Schedule	Time (in minutes)
1 st week	LNB (9 rounds×1 set)	1.5
2 nd week	LNB (9 rounds×2 sets)	3
3 rd week	LNB (9 rounds×3 sets)	4.5
4 th week	LNB (9 rounds×4 sets)	6

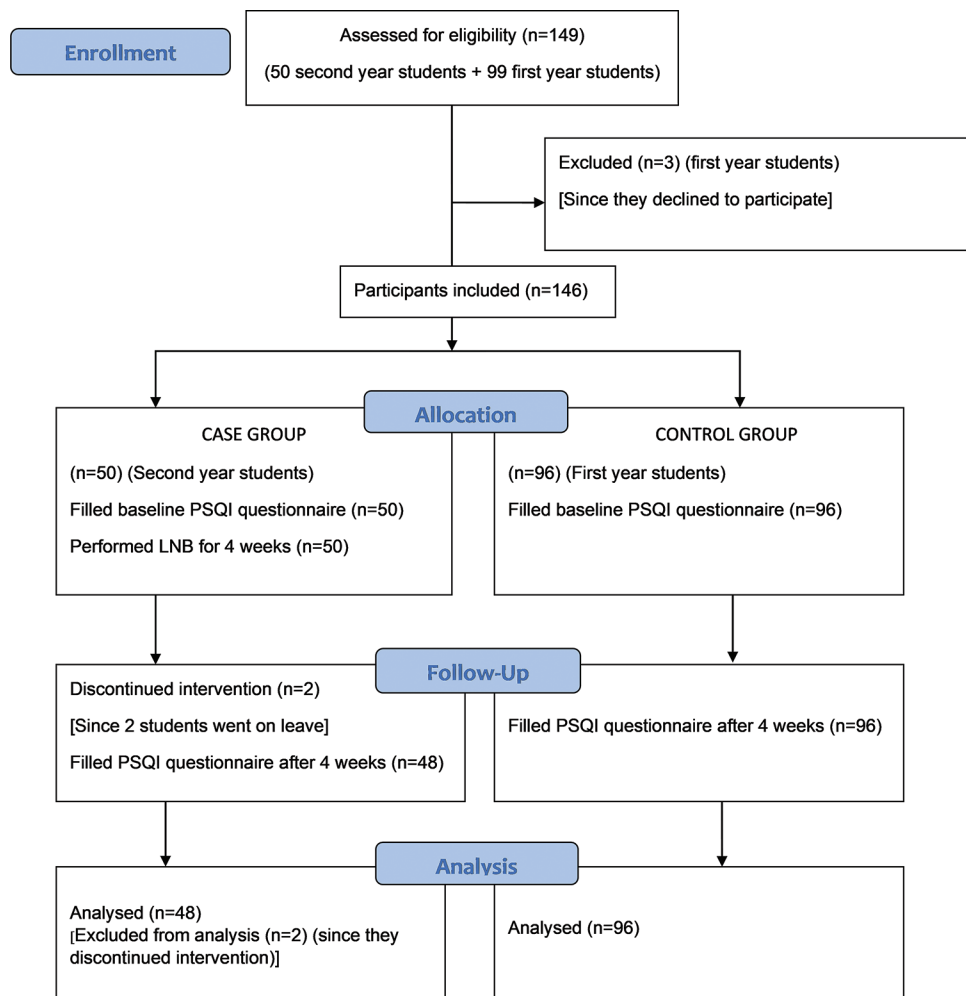


Figure 1: Participant flow chart

in the body mass index between the two groups was also insignificant ($p = 0.415$).

The sleep component scores and the global PSQI score

Table 2 shows that in the case group, all seven components of PSQI showed a statistically significant lowering of scores after the intervention. The global PSQI scores significantly reduced after intervention (p -value < 0.0001). In the control group, the sleep quality, latency, duration, and disturbance showed a statistically significant difference after 4 weeks ($p < 0.05$), whereas other parameters did not show any significant difference ($p > 0.05$). Figure 2 depicts the radar chart showing mean scores for seven components before and after intervention in two groups.

The comparison of seven component scores before the intervention between both groups showed that the sleep quality, latency, and daytime dysfunction had significantly different distributions in the two groups ($p < 0.05$). The global PSQI scores were also significantly lower in the control group as compared to the case group (p -value = 0.007). Figure 3 shows the radar chart showing mean scores for the seven components in the

case and control groups at the pre- and post-intervention times.

Discussion

The global PSQI scores before intervention were significantly lower in the control group, indicating that the control group had better sleep quality at the beginning of the study. This could be because the case and control groups were from different academic years. The control group students had just joined the first year of MBBS, whereas the case group had just joined the second year of their course after their results for the first year were declared. Because the PSQI scores reflect the quality of sleep in the past 1 month, it can be assumed that the control group had relatively less academic stress as compared to the case group.

All seven components of PSQI and the global PSQI scores in our case group showed a statistically significant lowering of scores after the practice of LNB for 4 weeks, indicating that the short-term practice of LNB improved sleep quality in the case group. Similarly, studies have shown that practicing yoga exercises helps in lowering

Table 2: Descriptive statistics for the seven components and the global PSQI score at two times in the case and control groups

Component Scores	Case [Mean±SD] (n=48)			Control [Mean±SD] (n=96)			P	
	Pre	Post	P [‡]	Pre	Post	P [‡]	Pre*	Post*
Subjective sleep quality	1.15±0.6	0.54±0.5	< 0.0001	0.77±0.6	0.95±0.6	0.017	0.001	< 0.0001
Sleep latency	1.48±1.0	0.58±0.7	< 0.0001	0.93±0.9	0.71±0.8	0.026	0.002	0.395
Sleep duration	0.96±0.9	0.60±0.6	0.018	0.86±0.7	1.49±0.8	< 0.0001	0.806	< 0.0001
Sleep efficiency	0.54±1.0	0.08±0.2	0.004	0.29±0.6	0.26±0.6	0.617	0.313	0.092
Sleep disturbance	1.15±0.5	0.60±0.5	< 0.0001	0.99±0.5	0.71±0.5	< 0.0001	0.086	0.313
Sleep medication	0	0	-	0.04±0.2	0.09±0.4	0.236	-	-
Daytime dysfunction	1.35±0.8	0.85±0.7	0.001	1.08±0.6	1.08±0.8	0.995	0.03	0.112
Global PSQI Score	6.63±3.6	3.46±2.1	< 0.0001	4.90±2.3	5.28±2.5	0.304	0.007	< 0.0001

[‡]Obtained using the Wilcoxon signed-rank test; *Obtained using the Mann–Whitney U test; Bold P values indicate statistical significance [Pre* - Pre-intervention (Case vs. Control); Post* - Post-intervention (Case vs. Control)]

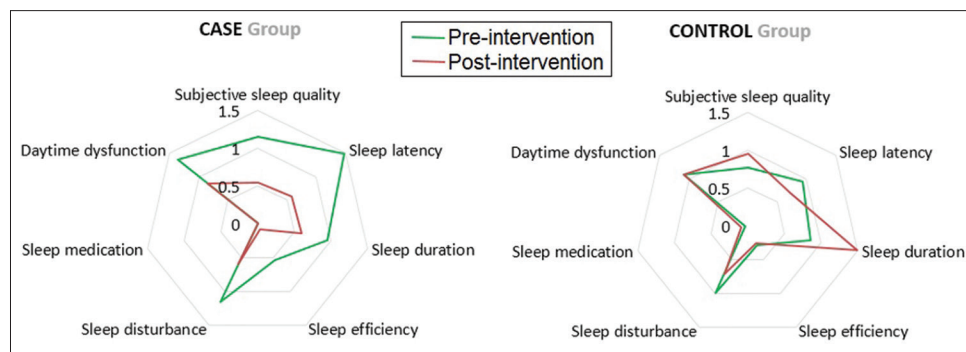


Figure 2: Radar chart showing mean scores for seven components before and after intervention in two groups

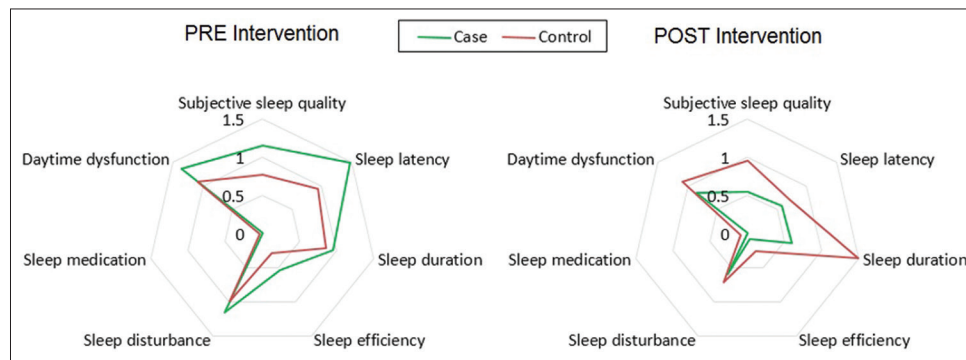


Figure 3: Radar chart showing mean scores for the seven components in the case and control groups at the pre- and post-intervention times

the PSQI score and, thereby, the sleep quality among individuals practicing these activities. A cross-sectional questionnaire-based survey showed that the global PSQI score in the yoga group of elderly people was lower than that of the control group, indicating better quality of sleep in the yoga group.^[16] The quality-of-life (QOL) scores of the yoga group were higher than those of the control group, indicating better life quality in the yoga group.

Another study showed positive effects of yoga practice on sleep quality in Type 2 diabetic women, but the time duration required was more than that in our study.^[17] Although the PSQI score improved at the end of the 6th week of yoga practice, it was still in the undesirable

sleep range (PSQI global score >6). However, after 12 weeks of yoga practice, the PSQI score reached the normal range of sleep quality.

In our study control group, few components showed a statistically significant difference after 4 weeks, whereas other parameters showed an insignificant difference. The global PSQI scores increased after 4 weeks, although not significant statistically, which can be because the control group was exposed to various stress-inducing factors after getting admission in the medical college.

Our data suggested that LNB led to improvement in sleep quality. However, exact correlation between LNB and better sleep quality remains to be elucidated. Soni

et al.^[18] reported that yoga-related breathing exercises lead to improved strength of respiratory muscles, resulting in better tissue perfusion and improved oxygen saturation. Sleep apnea is associated with reduced oxygen saturation; there is a possibility that breathing exercises such as LNB could improve oxygen saturation, which gradually improved sleep quality. Few other studies suggested that yogic practices lead to an increase in vagal tone, which causes decreased sympathetic discharge as well as decreased catecholamine levels that may cause less sleep disturbances after yoga breathing exercises.^[19]

Conclusions

In this study, we found that the group of individuals who practiced LNB had a significantly lower PSQI score, indicating improvement in sleep quality after 4 weeks of regular practice of LNB. Our results were in accordance with various other studies which involved such yoga interventions. However, considering a limited sample size, further extensive studies with bigger cohorts are needed to substantiate the findings of this study.

Criteria for inclusion in the authors'/contributors' list

Mr Himanshu A. Gajbhiye - data acquisition, manuscript editing, and manuscript review.

Dr Vinu Vij - concept, design, definition of intellectual content, literature search, manuscript preparation, manuscript editing, and manuscript review.

Dr Dhananjay Raje - data analysis, statistical analysis, manuscript editing, and manuscript review.

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Conflicts of interest

There are no conflicts of interest.

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