Research article

Effect of chair yoga on heart rate variability, perceived stress, and sleep quality among nursing professionals from a tertiary care hospital

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ABSTRACT

Introduction and Aim: Health care professionals that provide treatment to individuals most prone to experience sadness and anxiety are experiencing public health difficulties due to the linked elevated death rate brought on by the COVID epidemic. The purpose of this study was to determine how chair yoga affected nursing professionals' Heart Rate Variability (HRV), a measure of autonomic functioning, stress level, and sleep quality index.

Materials and Methods: The randomized controlled trial was conducted among 60 Nursing professionals in a tertiary care hospital aged >=23 years for a period of 2 months and they were divided into two groups: control (n=30) and intervention (n=30) groups. A set of chair yoga sessions was taught by a professional yoga trainer to the intervention group for a duration of 20 minutes, 5 days a week for two months. Both groups' sleep quality and HRV were measured using the PHYSIOPAC-PP4 (MEDICAID SYSTEMS, Chandigarh) software, as well as their levels of stress using the Perceived Stress Scale.

Results: After training of chair yoga for 2 months, a significant decrease in HR, MAP and a significant increase in Mean RR, SDNN and PNN50 and a significant increase in TP and HFnu and a significant decrease in LFnu and LF/HF ratio in the intervention group was found. After doing chair yoga at work, the intervention group's stress levels dropped and their quality of sleep increased.

Conclusion: The findings of the study concluded that the chair yoga practice in Nursing professionals led to the improvement in parasympathetic activity. It is also beneficial for stress reduction and improvement of sleep quality in nursing professionals.

Keywords: Autonomic balance; chair yoga; heart rate variability; sleep; stress.

INTRODUCTION

The COVID has raised the death rate, which has resulted in public health concerns (1) that need health care demands, inflated patient mortality, and physical and mental stress among healthcare professionals (2). Additionally, the significant danger of passing the disease to their own family members and the rising number of COVID positive cases have contributed to their psychological misery. (3). The impact of the pandemic on healthcare professionals must thus be taken into account. They are more susceptible to sadness and anxiety during pandemics. (4,5). According to research on COVID-19 pandemics, the psychological impacts of COVID outbreaks can linger for a long time and be harmful to an individual's well-being (6). They can also make healthcare personnel depressed and anxious. (7,8). In the midst of the pandemic crisis, they deal with patients' traumatic experiences as well as the unexpected death of friends and family members, which causes psychological discomfort, namely sadness, worry, and stress. (9).

Chair yoga is one of the gentlest and safest forms of yoga available. The chair Yoga poses are generally practiced in a chair or wheelchair and include some standing postures where subjects use their chairs as props while yoga is done. The benefits of chair yoga have been found to help patients with symptoms of hypertension, anxiety, carpal tunnel syndrome, arthritis, clinical depression, and chronic pain. It can build strength, increase circulation and quiet the mind. An earlier study reported that the chair Based Exercise interventions improved the cognitive and physical functions and health in nursing home residents (10).

The period between subsequent heartbeats is measured in milliseconds by the heart rate variability (HRV) (11). Traditional spectral analysis of HRV data distinguishes between sympathetic and parasympathetic activity. (12). Melatonin, a hormone that aids in regulating the sleep-wake cycle, is produced less often in the brain as a result of stress. (13). A Pittsburgh Sleep Quality Index (PSQI) can be used to quantitatively evaluate the self-reported sleep quality. (14). Using the Perceived Stress Scale (15), a tool that gauges how stressful people perceive themselves to be, the stress level was determined. Since there is little research on the effects of chair

yoga on healthcare workers during the COVID epidemic, this study was selected to examine how it affects autonomic functions, sleep quality, and stress levels in both control and intervention groups.

MATERIALS AND METHODS

The randomized controlled trial was conducted among 60 Nursing professionals in a tertiary care hospital aged >=23 years for a period of 2 months.

Data collection

By using a straightforward random sample approach, the nursing professionals were chosen based on the following factors:

Inclusion criteria

1. Willing to participate in the study.
2. Nursing professionals with minimum 1 year of work experience.

Exclusion criteria

1. Who practiced yoga techniques, meditation, and athletes in the past year.
2. With history of previous or current organic diseases (likely to reduce cognition), acute illness or any surgeries in the recent past.
3. With a history of chronic respiratory disease.

Procedure

The Institutional Research and Ethics committees' clearance was acquired before the study. The study was conducted in the Physiology department, Sri Venkateshwaraa Medical College Hospital and Research Centre, Ariyur, Puducherry. Prior to the study, the nursing professionals were selected from our institution, and their written informed permission was obtained.

A total of 60 nursing professionals with age group (>=23 years) were recruited and they were divided into two groups of 30 each. Group allocation was done by Simple random sampling [Random number allocation in a sealed envelope cover]. A set of chair yoga sessions was taught by a professional yoga trainer to the intervention group for a duration of 20 minutes, 5 days a week for two months.

Heart rate variability

Heart rate (HR), blood pressure, and time and frequency domain parameters of HRV were assessed using frequency analysis of subsequent RR intervals of ECG collected from 5-min recordings using PHYSIOPAC SYSTEM, MEDICAID SYSTEMS, Chandigarh. The RR time interval series were extracted from ECG recordings and analyzed in accordance with International Guidelines (16) for HRV analysis using Kubios HRV analysis software.

A common tool for measuring perceived stress is the PSS scale. The individuals must respond to 10 questions about the emotions and ideas they have had during the last month as a result of being under a lot of stress. The scores for each item ranges from 0 = Never, 1 = Almost Never, 2 = Sometimes, 3 = Fairly Often, 4 = Very Often. The objects with numbers 4,5, 7 and 8 are reverse coded. Between 0 and 40 make up the entire score. It is assumed that the participants with higher PSS scores are stressed. In all groups, the Pittsburgh Sleep Quality Index (PSQI) was used to do a quantitative analysis of the self-reported sleep quality.

Statistical methods

SPSS version 23.0 was used to analyze the data after being loaded into Excel. The mean and standard deviation were used to express the quantitative variables such as age, baseline cardiovascular parameters, HRV parameters, perceived stress, and sleep quality. To examine the difference in significance between the groups, the Student's unpaired 't' test was utilized. P values of 0.05 or below were regarded as statistically significant.

RESULTS

The baseline characteristics of both the groups are depicted in Table 1, from which it is evident that both the groups did not differ much (except age) across their demographics indicating an effective randomization.

Table 1: Age, BMI and basal cardiovascular parameters of both the groups expressed in mean ± SD

Demographic Variables	Control Group (n=30)	Intervention Group (n=30)	P value
Age (years)	23.4 ± 0.70	25.5± 1.23	**0.0001**
BMI (kg/m^2)	21.43 ± 3.47	20.35 ± 2.87	0.1941
HR (bpm)	68.20±7.12	70.28±10.54	0.3741
SBP (mmHg)	120±8.5	122±4.7	0.2640
DBP (mmHg)	76±3.2	78±5.3	0.0821
RPP	81.6±12.6	85.4±11.6	0.2292

BMI: Body mass index; **HR:** Heart rate; **SBP:** Systolic blood pressure; **DBP:** Diastolic blood pressure; **RPP:** Rate pressure product. Unpaired 't' tests were used by students to do statistical analysis. P values under 0.05 were regarded as statistically significant.

Table 2: The cardiovascular parameters and time and frequency domain parameters of HRV in both the groups expressed in mean ± SD.

Parameters	Control Group (n=30)	Intervention Group (n=30)	P value
HR (bpm)	70.6 ±13.62	59.3 ±7.21	**0.0001**
MAP (mmHg)	93.6±10.60	88.2±9.20	**0.020**
Mean RR (ms)	851.45±117.76	1310±147.89	**0.0001**
SDNN (ms)	46.76±12.03	57.35±23.89	**0.0342**
RMSSD (ms)	41.83±11.53	46.81±10.23	0.0821
PNN50 (%)	8.91±3.83	14.33±6.12	**0.0001**
TP (ms^2)	1521.9 ±348.1	1890.7 ±420.8	**0.0005**
LF (n.u)	67.4 ±2.2	56.8 ±2.0	**0.0001**
HF (n.u)	32.6 ±2.2	43.2 ±2.2	**0.0001**
LF/HF ratio	1.9 ±0.8	1.15±0.8	**0.0006**

HR: Heart rate; **MAP:** Mean arterial pressure; **Mean RR:** Mean RR interval; **SDNN:** Standard deviation of all normal RR intervals; **RMSSD:** Root mean square of differences between adjacent normal RR intervals; **PNN50:** Percentage of adjacent RR intervals with a difference of duration greater than 50 msec; **TP:** Total Power; **LF (n.u):** Low frequency in normalized units; **HF (n.u):** High frequency in normalized units; **LF/HF ratio:** Low frequency/High frequency ratio. Unpaired 't' tests were used by students to do statistical analysis. P values under 0.05 were regarded as statistically significant.

Table 2 displays heart rate, blood pressure, and temporal and frequency domain HRV indicators for the two groups, given as mean ± standard deviation. There is a statistically significant decrease in HR and MAP after 2 months of chair yoga training, as well as an increase in time domain HRV parameters like Mean RR, SDNN, and PNN50, as well as a significant increase in frequency domain HRV parameters like TP and HFnu and a significant decrease in LFnu and LF/HF ratio.

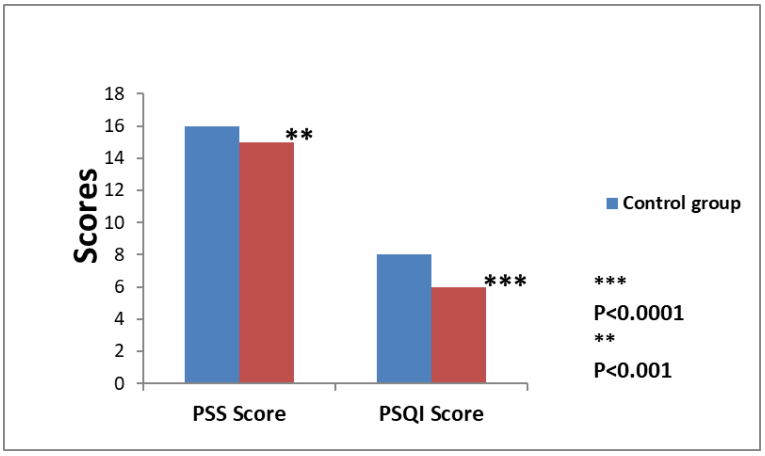

Fig. 1: The effect of chair yoga on stress level and sleep quality in both the groups. The mean stress score prior to intervention was 16.17±2.2 and after the intervention was 15.34±2.6. The difference was statistically significant (P<0.001). The mean Pittsburgh sleep quality index prior to intervention was 8.17±1.9 and after the intervention was 6.34±2.3. The difference was statistically significant (P<0.0001).

DISCUSSION

The most accurate marker of sympathetic and parasympathetic activity as well as the balance of the autonomic nervous system is heart rate variability. (17). According to our study's findings, the intervention group's heart rate and mean arterial pressure decreased statistically significantly compared to the control group after two months of chair yoga instruction.

As a result of the intervention group's chair yoga sessions, HRV time domain metrics including mean RR, SDNN, and PNN50 have increased, suggesting a potential change in the autonomic balance in favor of an improvement in vagal tone. Our conclusions are confirmed by research by Melville *et al.*, (18), which evaluated the effects of a 15-minute sitting meditation and yoga practice on several stress indicators. Both practices were done in an office setting. Additionally, they said that practicing yoga and meditating dramatically reduced blood pressure and reduced felt stress while also enhancing HRV measures including SDNN and Total Power. It is possible that the decreased plasma levels of catecholamines and cytokines after practicing chair yoga contributed to the intervention group's better parasympathetic activity.

In research by Galantino *et al.*, (19), a chair-based yoga program was practiced twice a week for eight weeks to evaluate the safety of yoga in an older population at risk of falling. They concluded that the modified chair yoga program is safe and effective in

increasing mobility and lowering fall-related anxiety in the aged population.

Following chair yoga instruction, there was a large rise in Total Power (TP), HFnu, and LF/HF ratio in the intervention group's frequency domain HRV indices, whereas LFnu and LF/HF ratio significantly fell. Total Power (TP), a metric for HRV's vagal power, was shown to be higher in the intervention group, indicating that both HRV and the vagal system's capacity for cardiac modulation had increased. The findings of our investigation demonstrated that the intervention group's sympathetic and parasympathetic autonomic balance had dramatically deteriorated overall. This demonstrates the autonomic balance changing in favor of the parasympathetic tone.

The findings of our study are consistent with a study by Maccaffrey *et al.,* (20) that examined if it was possible for senior adults with Alzheimer's disease to participate in a chair yoga Program for eight weeks while experiencing favorable improvements in all physical measurements.

The lower levels of stress in the intervention group, as determined by the perceived stress scale, are in line with a prior investigation by Bonura *et al.,* (21), which looked at the effects of a yoga intervention over the course of six weeks on the psychological health of older people and discovered that yoga is successful in promoting psychological health in older adults. A pilot study by Park *et al.,* (22) of elderly people with osteoarthritis found that chair yoga was helpful in lowering pain levels and boosting physical function and emotional well-being, which offered further support for it. According to a study by Furtado *et al.,* (23) on the effects of chair yoga practice on daily activities, falls, physical fitness, salivary cortisol, and alpha amylaze levels in older adults living in health care facilities, the physical fitness scores, and stress hormone levels were found to be maintained.

Additionally, there is evidence (24) from a systematic review to quantify the impact of yoga on mental health and cognition in senior individuals, which showed that yoga-based therapies had some benefit in enhancing memory, attention, and bodily functioning. A study by Marques *et al.,* (25) on the effects of chair-based yoga (CBY) practice on salivary IgA and lysozyme levels, health-related emotional status, and fitness parameters in elderly women residing in carer facilities revealed a positive outcome of CBY programme in elderly women, which has improved well-being and used as a good therapeutic co-adjuvant to conventional medication treatment.

According to studies by Ebrahimi *et al.,* (26) on the effects of 12 weeks of yoga and cardiovascular exercise on the quality of sleep-in women with Type 2 diabetes, yoga has been demonstrated to be more beneficial than the same regimen of aerobic exercise in enhancing sleep quality in these patients. The Pittsburgh Sleep Quality Index (PSQI), a measure of the average quality of sleep, was shown to have decreased in the intervention group as a result of the practice of chair yoga, indicating that these patients had better sleep. The present study supports the previously published data (Fig. 1). Furthermore, there is evidence (27), which suggests that including regular yoga sessions into an older person's daily routine may improve their general quality of life and help them sleep better.

CONCLUSION

The chair yoga practice is a facet of complementary and alternative medicine. This study throws light on the beneficial effects of chair yoga like increased flexibility, weight loss and improvement of physical and mental health in nursing professionals at their work place especially during Covid time, as most of the Health care workers often does not prioritize their personal health. The findings of the study concluded that with regular practice of chair yoga, there is improvement in cardiovascular functions due to withdrawal of sympathetic and increased parasympathetic activity. The chair yoga practice is also beneficial for stress reduction and enhancement of sleep quality in nursing professionals. This study created awareness among the nursing professionals about the relevance of chair yoga in health.

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CONFLICT OF INTEREST

There are no conflicts of interest.

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