Original Article

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Effect of Yoga Nidra on Perceived Stress in Individuals with High Blood Pressure: A Quasi-experimental Study

Physiotherapy Section

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ABSTRACT

Introduction: A persistently high level of stress can lead to a variety of diseases, such as anxiety, depression, sleeplessness, muscle discomfort, high Blood Pressure (BP) and a compromised immune system. Although 15% of adults in India suffer from hypertension, significant progress has been made in preventing and managing this condition. One alternative form of treatment that may help with stress management and BP regulation is Yoga Nidra.

Aim: To assess the effect of Yoga Nidra on perceived stress in Individuals with High Blood Pressure.

Materials and Methods: The present quasi-experimental study was conducted at various medical and physiotherapy Outpatient Departments (OPDs) in Veraval, Gujarat, India, from June 2021 to September 2022. A total of 49 individuals diagnosed with high BP, including both prehypertensive and hypertensive individuals (with BP >120/80 mmHg), were selected. Essential demographic information was gathered from the participants, who were also asked to complete the Perceived Stress Scale (PSS) questionnaire. Participants were introduced to the concept of Yoga Nidra and provided with instructions on how to perform the Yoga Nidra technique. They engaged in 12 sessions of this technique. After completing these 12 sessions, participants once again completed the PSS questionnaire. Since the collected data did not exhibit a normal distribution, a paired t-test was conducted at a significance level of 95%.

Results: Out of 49 study participants, 22 (45%) were females and 27 (55%) were males, and mean±Standard Deviation (SD) age was 47.86±10.62 years. The analysis revealed a significant reduction in PSS scores following the Yoga Nidra sessions (p-value=0.0001). Additionally, both Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP) showed decrease with a p-value of 0.0001.

Conclusion: Yoga Nidra has a significant effect on reducing perceived stress in individuals with high blood pressure, along with a reduction in blood pressure. This research provides valuable findings regarding the potential of Yoga Nidra as an additional relaxation therapy to help manage hypertension and enhance overall well-being.

Keywords: Cardiovascular disease, Hypertension, Perceived stress scale, Stress management

INTRODUCTION

Stress can be characterised as a psychophysiological process that often manifests as a negative emotional state. It typically occurs as a response to a physical threat or psychological discomfort, resulting in a series of chemical and hormonal reactions in the body. If not diagnosed early, it could have significant health repercussions. A persistently high level of stress can lead to various diseases, including anxiety, depression, insomnia, muscle discomfort, high blood pressure and a compromised immune system [1].

Although 15% of adults in India suffer from hypertension, significant progress has been made in preventing and managing the condition. Hypertension is more prevalent in urban areas than in rural areas. Indoasians are among the groups in the world with the highest rates of Cardiovascular Disease (CVD). International medical guidelines recommend lifestyle changes for patients with arterial hypertension, such as increased physical exercise, adopting a healthier lifestyle, and stress reduction [2].

One alternative form of treatment that may help with stress management and blood pressure regulation is yoga. While yoga is generally described as an age-old tradition involving postures, breath control, meditation and specific ethical practices, there is no universally accepted definition of yoga practice [3]. One of the most effective yogic interventions for stress management is Yoga Nidra, which increases parasympathetic activity while decreasing sympathetic activity, bringing the body into a state of homeostasis [4]. Yoga Nidra is widely recognised as the most effective method for achieving complete physical, mental and emotional relaxation. It is a state of consciousness that is neither sleep nor wakefulness, concentration nor hypnosis. In simple terms, it is an altered state of awareness. Credit for the discovery of Yoga Nidra, which combines relaxation and meditation, is given to Swami Satyananda Saraswati [3].

Stress, along with lifestyle-related issues like hypertension, has become ingrained in our lives due to our hectic modern lifestyles. A significant number of individuals with hypertension are prescribed lifelong medication regimens. The drawbacks of pharmacological treatment primarily include the costs of medications and their associated side effects. Apart from relying on antihypertensive drugs, lifestyle adjustments have been suggested as an equally pivotal approach to managing hypertension. By effectively addressing a critical factor-stress-over an extended period, there is the potential to slow down age-related changes in the cardiovascular system. This paves the way for advocating the adoption of this straightforward and convenient technique with the goal of reducing the occurrence of health issues and fatalities linked to CVD. Given the rapid pace of modern lifestyles, stress and disorders related to our way of life, such as hypertension, are becoming increasingly prevalent.

Stress and lifestyle-related conditions, such as hypertension, are increasingly common due to our busy lives. Relaxation techniques, including Yoga Nidra and Biofeedback (BF), have emerged as effective options for reducing stress and managing hypertension. Larger study by authors examines the impact of relaxation techniques like Yoga Nidra and BF. Review studies support the effectiveness of relaxation techniques in managing essential hypertension, especially in mild to moderate cases, potentially reducing the reliance on medication [5]. Review studies have shown their success in managing essential hypertension, particularly in mild to moderate cases, potentially reducing the need for medication. The present

study, which is part of the larger study, focuses on assessing the effect of Yoga Nidra on perceived stress.

Yoga Nidra primarily aims to address a spectrum of health concerns, with a focus on stress reduction, blood pressure management, and the potential reduction of reliance on medications. The hypothesis, based on the effectiveness of Yoga Nidra, centers around its capability to alleviate perceived stress in individuals with elevated blood pressure. Therefore, the present research deeply focuses on investigating the specific influence of Yoga Nidra on perceived levels of stress in the study group. Recognising the complex interplay between stress, cardiovascular health, and their potential confounding effects. The authors meticulously tracked and analysed cardiovascular measures throughout the study. This comprehensive approach was adopted to minimise any factors that could blur our understanding of how Yoga Nidra impacts both stress perception and cardiovascular health in individuals dealing with high blood pressure. The aim of the present study was to assess the effect of Yoga Nidra on perceived stress.

MATERIALS AND METHODS

A quasi-experimental study was conducted at various medical and physiotherapy OPDs in Veraval, Gujarat, India, from June 2021 to September 2022. Oral consent was obtained after providing information about the study, and simple demographic information such as age and gender was collected from the participants. Prior to commencing the study, approval was obtained from the Institutional Ethics Committee (IEC no. NCP/213B/2020) following the appropriate ethical procedures.

Inclusion criteria: Individuals aged 18 years or older, of both genders, who were patients with blood pressure equal to or greater than 120/80 mmHg (pre-hypertensives and hypertensives), had a history of hypertension, or were newly diagnosed with hypertension were included in the study.

Exclusion criteria: Participants with specific conditions, such as infections, severe psychiatric co-morbidities, recent heart-related issues, peripheral arterial occlusive disease, patient refusal, or any other hindering factors, were excluded from the study.

Sample size calculation: The sample size of the study was determined to have 90% power using the formula [6]: Sample size $(n)=2\ SD^2\ (Z\alpha/2+Z\beta)^2/d^2$, where SD (Standard deviation) was obtained from previous studies or a pilot study, $Z\alpha/2=Z0.05/2=Z0.025=1.96$ (from the Z table) at a type 1 error of 5%, $Z\beta=Z0.20=1.282$ (from the Z table) at 90% power, and d=effect size (difference between mean values). This calculation was based on the SD of a similar previous study (where the SD value was 5.57) [7]. A total of 49 participants were involved in the study. Using a convenience sampling technique, participants who met the inclusion and exclusion criteria were selected. Participation in the study was voluntary.

Study Procedure

All the participants were involved in the study and received Yoga Nidra training. The intervention protocol included 12 sessions (six days/week for two weeks). Initially, blood pressure (both systolic and diastolic) was assessed while the participants were in a seated position, and the average of 2-3 measurements was recorded. To measure perceived stress, the PSS-10 questionnaire was administered. Participants were instructed to relax in a seated position with their hands at their sides and palms facing upward.

The PSS is the most commonly used psychological tool to evaluate stress perception. It serves as a measure of how stressed an individual perceives their life to be at the present moment. Participants were asked to respond to 10 questions on a scale from 0 to 4, with 0 representing "never," 1 representing "almost never," 2 representing "sometimes," 3 representing "fairly often," and 4 representing "often." The individual scores range from 0 to 40, with higher scores indicating higher perceived stress levels [8].

In the present study, Yoga Nidra practice was identified as a simple and effective relaxation method. It involves lying flat on one's back in a shavasana position and following verbal instructions from a yoga instructor for approximately 15-20 minutes in a language understood by the patient (Gujarati, Hindi, or English). Using a Yoga Nidra tape is a practical option to avoid any bias and maintain consistent instructions and pace for all participants. The practice includes several steps, such as preparedness, resolution, body part awareness, breath awareness, visualisation, and completion. In Yoga Nidra, the emphasis is not on concentration but rather on allowing the mind to move from point to point and being aware of every experience. The intervention typically lasts for 15-20 minutes.

Participants lay down on their backs on the floor and assumed the shavasana pose. In this position, their bodies were kept straight from head to toe, legs slightly apart, and arms extended away from the body with palms facing upwards, fingers semi-flexed, and eyes closed. Taking deep breaths, they exhaled, letting go of the cares and worries of the day. They were instructed to relax, prepare their minds for the practice of Yoga Nidra, and follow the instructions given by the instructor and in the tape recording.

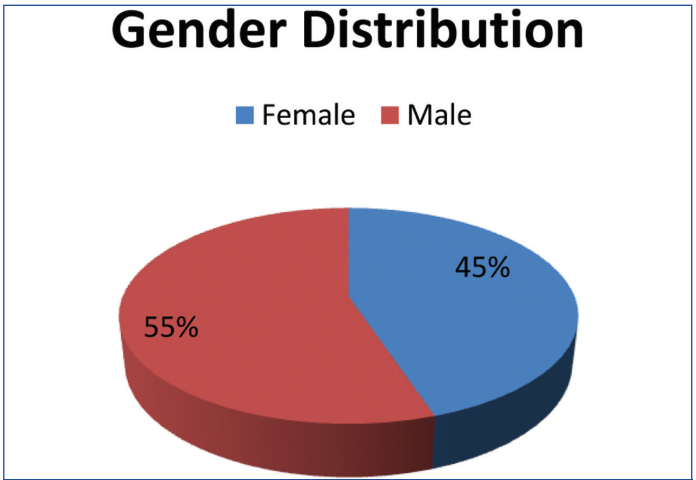
During the preparatory stage, participants lay down, closed their eyes, and relaxed while remaining conscious. In the resolve stage, they repeated their desires three times using simple and positive terms. During the rotation of consciousness stage, the instructor guided them to shift their awareness from head to toe and from right to left. In the awareness of breath stage, participants focused on taking 10 deep breaths and tracked their breathing rate. In the feeling and sensation stage, participants were encouraged to imagine contrasting sensations in their bodies, such as feeling light as a bird or heavy as rocks. In the image visualisation stage, they thought of specific phrases related to experiences indicated by the instructor and evoked corresponding emotions. The resolve step involved consciously reaffirming their desires. At the end of the practice, participants gradually returned to reality, as guided by the instructor, by moving their bodies slowly. Outcome measures such as PSS, SBP and DBP were assessed before the first session and after the twelfth session.

STATISTICAL ANALYSIS

Statistical analysis was performed using IBM Statistical Package for the Social Sciences (SPSS) software version 25.0. Since the data were not normally distributed, a t-test was conducted to examine the effect of Yoga Nidra on perceived stress (p-value <0.05).

RESULTS

The study included 49 individuals, of whom 22 (45%) were females and 27 (55%) were males [Table/Fig-1]. The baseline data of the participants are presented in [Table/Fig-2].



[Table/Fig-1]: Gender distribution.

Parameters	Mean±SD	Range	
		Minimum	Maximum
Age (years)	47.86±10.62	30	70
SBP (mmHg)	137.76±11.25	118	168
DBP (mmHg)	87.92±7.67	74	114
PSS	25.57±4.81	11	32

[Table/Fig-2]: Baseline general and clinical characteristics.

During the first and last sessions, the PSS had a mean and SD of 25.57±4.813 and 20.55±3.916, respectively. According to the study's findings, the PSS significantly decreased, with a total mean difference of 5.02 points lower than the baseline mean. The t-test indicates that Yoga Nidra significantly reduces subjective stress among individuals with high blood pressure, with a p-value of less than 0.05 (p-value=0.0001) [Table/Fig-3].

PSS	Mean±SD	Total mean difference	Standard error mean	95 % CI of the difference		t-test	p-value
				Lower	Upper		
Before Yoga Nidra	25.57±4.813	5.02	0.232	4.553	5.488	21.607	**0.0001**
After Yoga Nidra	20.55±3.916						

[Table/Fig-3]: Mean values for PSS of the study population.
CI: Confidence interval; The p-value in bold font indicates statistically significant values

The mean difference in SBP and DBP from the first session to the last session was found to be 10.13 and 4.74, respectively. SBP had a mean±SD of 137.76±11.252 mmHg and 127.63±7.817 mmHg, while DBP had a mean±SD of 87.92±7.670 mmHg and 83.18±5.290 mmHg at the 1st and 12th sessions, respectively. Additionally, Yoga Nidra demonstrated a significant difference in both SBP and DBP, with a p-value of less than 0.05 (p-value=0.0001) [Table/Fig-4,5].

SBP	Mean±SD	Total mean difference	Standard error mean	95 % CI of the difference		t-test	p-value
				Lower	Upper		
Before Yoga Nidra	137.76±11.252	10.13	0.838	8.438	11.807	12.081	**0.0001**
After Yoga Nidra	127.63±7.817						

[Table/Fig-4]: Mean values for SBP of the study population.

DBP	Mean±SD	Total mean difference	Standard error mean	95 % CI of the difference		t-test	p-value
				Lower	Upper		
Before Yoga Nidra	87.92±7.670	4.74	0.890	2.946	6.523	5.322	**0.0001**
After Yoga Nidra	83.18±5.290						

[Table/Fig-5]: Mean values for DBP of the study population.

DISCUSSION

Stress is defined as a state in which an organism's ability to adapt is strained, leading to psychological and biological changes that may increase the risk of illness. The relationship between stress and hypertension has long been suggested due to the blood pressure elevation caused by stress [9]. Yoga Nidra has the ability to calm the nervous system, creating a balance between the sympathetic and parasympathetic systems, which in turn reduces stress and induces complete relaxation. Regular practice of Yoga Nidra promotes overall physical, emotional, and mental well-being, allowing the brain to achieve a state of deep tranquility and serenity [10]. The primary objective of the present research was to examine the impact of Yoga Nidra training on the perception of stress in individuals diagnosed with high blood pressure. To investigate this impact, the authors conducted a study involving participants who underwent 12 sessions of Yoga Nidra.

The findings of the study are particularly noteworthy. A significant reduction in perceived stress levels was observed among participants who completed the 12 sessions of Yoga Nidra. Therefore, the hypothesis was accepted. This reduction is evident from the change in mean and standard deviation of PSS scores. Initially, participants had a mean PSS score of 25.57 with a standard deviation of 4.813. However, after completing the Yoga Nidra training, the mean PSS score decreased to 20.55 with a standard deviation of 3.916. This outcome is particularly significant as it aligns with the hypothesis proposed at the beginning of the study. The hypothesis suggested that participation in Yoga Nidra sessions would lead to a reduction in perceived stress levels among individuals with high blood pressure. The observed decrease in PSS scores confirms the anticipated effects of Yoga Nidra and supports the initial hypothesis.

In the current research, potential confounding factors such as medication use, dietary habits, physical activity, age, gender, psychological factors, prior Yoga Nidra experience, compliance and time of day were considered. To minimise their influence, cardiovascular parameters were consistently measured, inclusion and exclusion criteria were applied for participant selection and even distribution of factors, medication changes were tracked, participants maintained consistent diets and lifestyles, and psychological variables were taken into account. Standardised measurement times were used to control for daily variations, thereby enhancing the reliability of attributing changes to the effect of Yoga Nidra.

The results of the present study are consistent with previous research that has demonstrated the positive impact of Yoga Nidra on stress management. The study showed a significant difference in PSS, SBP, and DBP following the sessions, which is similar to a study conducted by Devi S and Kala S highlighting the preventive, promotive, and therapeutic benefits of Yoga Nidra. Yoga Nidra has been found to provide protection against stress and associated illnesses by inducing a state of calmness. It can be used as a therapeutic technique for addressing psychological issues such as anxiety and insomnia, as well as psychosomatic ailments including hypertension, asthma, coronary heart disease and coronary artery disease [11]. Engaging in yoga practices directs one's attention to posture and breathing, which in turn regulate the body's rhythms and enhance coordination between the nervous and endocrine systems. This potential benefit extends to managing stress, anxiety, and improving psychological well-being [12].

Yoga Nidra, as a specialised form of yoga, has been proven effective in reducing blood pressure and promoting relaxation. Through the practice of Yoga Nidra, individuals can develop the ability to control their physiological responses to stress, thereby minimising its adverse effects on the body. Yoga Nidra is believed to activate the parasympathetic nerves in the hypothalamus, transforming tension resulting from value conflicts during stressful situations into constructive thinking. Notably, financial issues appear to have the least impact on stress levels.

Previous research consistently demonstrates the effectiveness of Yoga Nidra in reducing perceived stress among various populations. Studies have shown significant reductions in stress levels for adolescents and college students [13,14]. Furthermore, Yoga Nidra has proven to be a valuable tool for stress reduction not only for students but also for college professors, individuals with post-traumatic stress disorder and women experiencing psychological issues during their menstrual period [15-17]. In line with these findings, the present study focusing on patients with high blood pressure revealed positive outcomes, supporting the notion that Yoga Nidra is an effective relaxation technique for reducing stress intensity.

A 2007 study by Kumar K, on college students demonstrated the effectiveness of Yoga Nidra in reducing stress and anxiety. The study included 80 participants divided into a control group and a Yoga Nidra group. The Yoga Nidra group practiced for 30 minutes daily for six weeks, resulting in significantly lower stress and anxiety levels compared to the control group. They also reported improved mood, well-being, and sleep quality. Yoga Nidra was found to benefit higher-class students in coping with stress and lower anxiety levels for both males and females [18]. Yoga Nidra enhances coping skills, awakens potentialities, and calms the entire nervous system, alleviating physical and mental tensions. Stress-related disorders progress through four stages, starting with anxiety and irritability due to sympathetic nervous system overstimulation.

According to one definition, stress is a condition in which an organism's capacity for adaptation is taxed, resulting in psychological and biological changes that may increase their risk of illness. The link between stress and hypertension has long been theorised, as stress can elevate blood pressure and serum cholesterol levels. It is widely recognised that psychosocial factors contribute to the development of hypertension by influencing mental processes, either intentionally or unintentionally. This supports the idea that sympathetic nervous system hyperactivity plays a significant role in the aetiology of hypertension. This was demonstrated in a study by Bhelkar S et al., which found that stress was a significant and independent risk factor for hypertension [19].

There is strong evidence linking individual coping strategies and ongoing stress to high blood pressure. Chronic mental stress is associated with increased levels of noradrenaline and adrenaline in the blood, as well as heightened activation of the sympathetic-adrenomedullary axis. Hypertension patients often exhibit higher sympathetic and lower parasympathetic tone compared to healthy individuals [20].

A study by Lu X et al., found a significant association between Asian Americans' perceptions of stress and their blood pressure levels [21]. Previous studies examining the relationship between stress and hypertension have yielded conflicting results, with some showing a positive association [22]. Other studies shown no correlation, and even some demonstrating a negative correlation [23]. However, only a small number of these studies included Asian Americans. In North Carolina, Logan JG et al., investigated the relationship between blood pressure and subjective stress in 102 Korean Americans and found no connection between SBP, DBP and subjective stress [24].

Yoga Nidra induces relaxation, creating electromagnetic vibrations that relieve pain and regulate breathing and heartbeat. It stimulates the parasympathetic nervous system, leading to total bodily, emotional, and mental relaxation, reducing stress levels, and achieving mental tranquility [5]. The interaction between Yoga Nidra and relaxation techniques is significant and known to reduce perceived stress and blood pressure in patients with hypertension. It modulates the central and autonomic nervous systems, aiding in stress adaptation.

Yoga Nidra is effective in promoting relaxation and inducing vasodilation, which leads to positive physiological changes. It reduces cardiac output, workload, blood pressure, and pulse rate, while also decreasing oxygen consumption and metabolic activities. This study suggests that Yoga Nidra's ability to induce relaxation and reduce oxygen demand contributes to its effectiveness in promoting vasodilation and lowering blood pressure. Additionally, Yoga Nidra has a central effect on the brain, enhancing overall relaxation in the nervous system and increasing the resilience of physiological and physical systems. It regulates the autonomic nervous system, influencing brain rhythms, heart rate and blood pressure. Moreover, Yoga Nidra helps regulate stress hormones like adrenaline and cortisol, while also reducing sympathetic nervous system activity [25].

The consistent practice of Yoga Nidra has been shown to be effective in preventing hypertension, a condition known as the silent killer. The present study demonstrates that Yoga Nidra significantly reduces blood pressure in individuals with high blood pressure, consistent with previous research. In a study by Kumar K, 40 mildly hypertensive patients (30 males and 10 females) practiced Yoga Nidra daily for 15 days. The results showed that regular Yoga Nidra practice led to considerable reductions in blood pressure, as well as improvements in stress, anxiety and psychological well-being [3]. Another pilot study by Vanitha A et al., on women with Polycystic Ovarian Syndrome (PCOS), showed positive changes in blood pressure, heart rate, and anthropometric measures after a 12-week Yoga Nidra intervention. This suggests that Yoga Nidra may serve as a complementary therapy for enhancing overall health and well-being in women with PCOS [26].

Yoga Nidra is a highly effective technique for lowering blood pressure in individuals with hypertension. It has been shown to reduce heart rate, breathing rate, and alleviate tension, fear, and anger. Yoga Nidra creates a connection between the body and mind. Bodily relaxation relaxes the entire nervous system, while central nervous system relaxation relaxes the autonomic nervous system, leading to a slowdown in physical and mental activity. This results in a decrease in the body's metabolic rate as neural and muscular activities are reduced [5]. The study suggests using Yoga Nidra as a supplementary relaxation therapy for hypertension. These methods promote slower, deeper breathing, improve blood flow, lower blood pressure and pulse rate, and induce mental relaxation. They balance the effects of the sympathetic nervous system by stimulating the parasympathetic nervous system. This approach not only lowers blood pressure but also helps prevent target organ damage such as heart failure and stroke. Moreover, it can reduce the financial burden of hypertension treatment on communities by lowering overall direct and indirect costs. Further investigation could be conducted by employing a larger community-based sample to confirm these results and determine the most optimal stress-reduction training approach.

Limitation(s)

Because the present study takes place in a hospital setting, the participants may not fully reflect the broader population, leading to limitations in its generalisability.

CONCLUSION(S)

In conclusion, the present study highlights the significant and beneficial impact of Yoga Nidra in reducing perceived stress in individuals diagnosed with high blood pressure. By positively affecting the autonomic nervous system, Yoga Nidra enhances the parasympathetic "rest and digest" response while reducing the sympathetic "fight or flight" response, leading to a marked reduction in both the physiological and psychological aspects of stress. Beyond its role in stress reduction, the regular practice of Yoga Nidra may hold promise in managing hypertension, as chronic stress is a known contributor to high blood pressure. However, it is essential to recognise that Yoga Nidra should complement standard medical treatments for hypertension. Further research, including long-term studies and clinical trials, is needed to fully explore its potential in blood pressure management. Overall, the findings underscore the practical and valuable role of Yoga Nidra as a means for individuals with high blood pressure to experience reduced perceived stress and a heightened sense of relaxation, contributing to their overall well-being and quality of life.

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