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Impact of yoga practice on health quality and workplace stress among nursing officers- an experimental study

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Abstract
Nursing officers face considerable workplace stress affecting their health-related quality of life (HRQoL). Yoga, as a mind-body intervention, has demonstrated benefits for reducing stress and improving wellbeing among healthcare professionals. This study evaluates the effect of structured workplace yoga sessions on perceived stress and HRQoL among nursing officers in Meerut, Uttar Pradesh.
Methods: A controlled pretest-posttest design was employed with 300 nursing officers divided into a test group (Subharti University, n=150) and a control group (LPH+NCR, n=150). The intervention consisted of 40-minute yoga sessions five days per week for 3-6 months. Perceived Stress Scale (PSS-10) scores were collected pre- and post-intervention. Statistical analyses included paired and independent t-tests, and Kruskal-Wallis tests for comparison across groups and time points.
The test group showed a significant reduction in PSS-10 scores across batches, with reductions ranging from 27% to 46% ($p<0.01$). Control groups exhibited minimal or no significant change. Qualitative assessment of HRQoL domains suggested improvement in physical and psychological wellbeing.
Workplace yoga was associated with a statistically and clinically significant reduction in perceived stress levels. Integrating yoga into routine hospital schedules can serve as a sustainable, low-cost intervention to enhance nursing officers' wellbeing.

Keywords: Yoga, nursing officers, workplace stress, health-related quality of life, PSS-10, WHOQOL-BREF, stress reduction

Introduction
Nursing officers are the backbone of hospital-based health services, playing a vital role in the delivery of safe, efficient, and compassionate patient care. However, the professional demands placed upon them are uniquely intense. Nurses are required to perform complex clinical tasks while simultaneously managing emotional interactions with patients, families, and multidisciplinary teams. These constant pressures create a work environment characterized by time constraints, shift rotations, high patient loads, and emotional exhaustion, which together contribute to significant occupational stress and burnout [1, 2]. The nature of nursing work dealing with suffering, death, unpredictable emergencies, and ethical dilemmas imposes a continuous psychological toll that can adversely affect physical health, emotional stability, and overall quality of life. Workplace stress in nursing is now recognized as a global occupational health issue. The World Health Organization (WHO) defines occupational stress as the physical and emotional responses that occur when job demands do not match the worker's capabilities, resources, or needs [2]. Multiple studies in both developed and developing countries have found that nursing professionals experience higher levels of workplace stress compared with other healthcare workers due to the dual burden of professional responsibility and emotional labour [3, 4]. According to recent meta-analyses, between 40% and 70% of nurses report moderate to high stress levels, with a significant proportion experiencing symptoms of anxiety, sleep disturbances, and depression [5, 6]. In the Indian context, where hospital staffing ratios are often inadequate, the prevalence of occupational stress among nurses is particularly concerning, and it poses a direct threat to patient safety and quality of care [7]. Several theoretical frameworks help explain the mechanisms of occupational stress. The Lazarus and Folkman transactional model of stress and coping conceptualizes stress as a result of an individual's cognitive appraisal of

demands exceeding available coping resources [8]. Similarly, the Job Demand-Control-Support (JDCS) model, developed by Karasek and Theorell, emphasizes the interaction between job demands, decision latitude, and social support as determinants of stress outcomes [9]. In nursing, high job demands such as patient acuity, documentation load, and shift work often combine with low control over scheduling and limited administrative support, leading to elevated stress and burnout risk [10]. These theoretical models underscore the importance of interventions that enhance coping resources, improve self-regulation, and foster psychosocial resilience.

Impact of Stress on Nurses Health and Quality of Life

Chronic occupational stress among nurses affects multiple aspects of wellbeing. Physiologically, it activates the hypothalamic-pituitary-adrenal (HPA) axis, leading to elevated cortisol levels and autonomic dysregulation [11]. Prolonged activation of these stress pathways contributes to cardiovascular strain, metabolic dysfunction, and immunosuppression [12]. Psychologically, stress is associated with increased irritability, emotional exhaustion, depersonalization, and diminished sense of personal accomplishment core features of burnout as described in Maslach's Burnout Inventory [13]. Occupational stress also correlates strongly with absenteeism, job turnover, reduced work efficiency, and a decline in patient satisfaction and safety outcomes [14]. Health-related quality of life (HRQoL) provides a multidimensional framework for understanding how stress impacts overall wellbeing. The WHOQOL-BREF instrument, developed by the World Health Organization, measures HRQoL across four domains: physical health, psychological health, social relationships, and environment [15]. Studies using WHOQOL-BREF among nursing populations have consistently shown that high perceived stress is negatively correlated with physical and psychological domain scores [16]. Nurses working in high-acuity settings, such as critical care or emergency departments, report lower HRQoL due to long hours, inadequate rest, and high emotional strain [17]. Moreover, female nurses, who constitute the majority of the workforce in India, often experience additional socio-cultural stressors arising from dual domestic and professional responsibilities [18]. Addressing these stressors is crucial not only for individual health but also for maintaining the efficiency and sustainability of the healthcare system.

Yoga and Mind-Body Interventions in Nursing

Mind-body interventions such as yoga, meditation, and mindfulness-based stress reduction (MBSR) have gained increasing attention as feasible and cost-effective strategies for stress management in healthcare professionals [19, 20]. Among these, yoga stands out for its integrative approach combining asanas (postures), pranayama (breathing techniques), and dhyana (meditation or focused relaxation) to harmonize physical, mental, and spiritual wellbeing. Modern scientific research corroborates traditional yogic claims: regular practice enhances parasympathetic activation, reduces sympathetic overdrive, and promotes hormonal balance, leading to improved stress resilience and emotional regulation [21-23]. Physiological studies have demonstrated that yoga increases heart rate variability (HRV), a key biomarker of autonomic nervous system balance, reflecting enhanced vagal tone and relaxation response [24, 25]. Neuroimaging research also indicates that yoga modulates brain regions associated with emotion regulation, including the amygdala and prefrontal cortex [26]. Furthermore, controlled trials among healthcare workers show significant improvements in perceived stress, anxiety, and HRQoL following structured yoga interventions of 6-12 weeks [27-29]. In nursing populations specifically, yoga-based interventions have been associated with reductions in fatigue, musculoskeletal pain, and emotional exhaustion [30]. Studies from India and other Asian countries have shown that workplace yoga programs improve concentration, interpersonal relationships, and coping with night shifts [31, 32]. Despite this growing body of evidence, implementation of yoga programs in hospital settings remains limited due to logistical barriers, lack of institutional support, and irregular work schedules. Hence, real-world evaluations of yoga interventions within actual workplace environments are essential to assess feasibility and impact.

Workplace Yoga as a Health Promotion Strategy

The concept of workplace health promotion (WHP) integrates organizational and individual-level interventions to improve employee wellbeing and productivity. The WHO's Healthy Workplace Framework advocates for holistic strategies addressing physical environment, psychosocial climate, and personal health resources [33]. Yoga fits within this model as a self-regulatory technique that enhances resilience and reduces stress-related absenteeism. Evidence from randomized controlled trials among healthcare workers has shown that brief daily yoga sessions can significantly lower perceived stress scores and improve mood and energy levels [34]. Workplace yoga also encourages social cohesion, peer support, and positive organizational culture, all of which are critical to reducing burnout among nurses [35]. Qualitative studies reveal that nurses often perceive yoga as a "safe space" for emotional decompression and self-care amidst their demanding work schedules [36]. Regular participation not only improves physical flexibility but also fosters mindfulness helping nurses become more present and empathetic in patient care. From a systems perspective, reduced stress translates into lower turnover rates, fewer errors, and improved patient satisfaction [37]. Given these benefits, several healthcare institutions globally have begun integrating yoga-based wellness programs into their occupational health departments [38]. However, empirical data from tertiary hospitals in northern India remain sparse, justifying the need for the current study.

Rationale for the Study

The present study was conceptualized against this backdrop of escalating workplace stress and growing recognition of yoga's therapeutic potential. While numerous studies have established the effectiveness of yoga in community settings, fewer have examined its impact when implemented directly within the nursing workplace under real-world conditions. Moreover, evidence specific to nursing officers a cadre responsible for supervisory and direct patient care roles in tertiary hospitals is limited. The lack of workplace-based interventions addressing both perceived stress and HRQoL domains underscores a critical research gap. This study therefore aims to assess the impact of structured workplace yoga practices on perceived stress and health-related quality of life among nursing officers in Meerut, Uttar Pradesh. It

uses validated instruments PSS-10 for perceived stress and WHOQOL-BREF for HRQoL and compares pre- and post-intervention outcomes between intervention and control groups. By focusing on a large cohort within a tertiary healthcare setting, the study seeks to provide evidence for integrating yoga as a sustainable, low-cost strategy for promoting mental health and wellbeing among nursing professionals.

Methodology

Research Design: This study adopted a quasi-experimental controlled pretest-posttest design to evaluate the effectiveness of a structured yoga program on perceived stress and health-related quality of life (HRQoL) among nursing officers working in a tertiary care hospital in Meerut, Uttar Pradesh. The quasi-experimental approach was chosen because random assignment of participants to intervention and control groups was not feasible due to institutional scheduling and ethical considerations [1]. Instead, natural group allocation was employed, with nursing officers from Subharti University forming the intervention (test) group, and nurses from Lok Priya Hospital (LPH) and NCR Hospital serving as the control group. This design allowed for practical implementation while maintaining internal validity through pre- and post-intervention assessments within and between groups [2]. The study aimed to assess whether regular yoga practice integrated into the workplace could lead to a measurable reduction in perceived stress levels and improvement in HRQoL. The approach aligns with similar quasi-experimental studies in occupational health and nursing research that emphasize ecological validity by retaining naturalistic settings [3, 4].

Population and Sampling: The target population consisted of registered nursing officers employed full-time in tertiary hospital settings in Meerut. These professionals represented a range of clinical departments including medicine, surgery, obstetrics and gynecology, intensive care units, and emergency departments. A sample of 300 participants was recruited through purposive sampling, comprising 150 in the test group (Subharti University Hospital) and 150 in the control group (LPH and NCR Hospitals). Participants were screened based on inclusion and exclusion criteria established a priori.

Inclusion criteria: Registered nursing officers aged between 22 and 55 years. Minimum of one year of continuous clinical experience. Willingness to participate in the yoga sessions and attend at least 80% of sessions. No acute medical or psychiatric conditions precluding yoga participation.

Exclusion criteria: Pregnancy or recent childbirth (<6 months). Musculoskeletal or cardiovascular disorders that restrict yoga participation. Ongoing engagement in any structured stress management or relaxation program. Use of sedative or psychotropic medications during the study period. Sample size estimation was guided by previous yoga intervention studies in healthcare workers, where medium to large effect sizes (Cohen's d = 0.6-0.8) were reported for stress reduction [5, 6]. Power analysis using G*Power software indicated that 120 participants per group would achieve 90% power at $\alpha = 0.05$ to detect such effects; to account for attrition, 150 participants were recruited per group. Attrition at the end of follow-up was <5%, indicating high adherence and acceptability.

Intervention Protocol: The intervention consisted of structured yoga sessions delivered by certified yoga instructors from Subharti University's Department of Yoga and Naturopathy. Each session lasted 40 minutes, conducted five days per week for a period ranging from three to six months, depending on departmental scheduling. The yoga protocol was standardized following the principles of Hatha Yoga and aligned with the Common Yoga Protocol developed by the Ministry of AYUSH, Government of India [7].

Each session comprised four components: Warm-up and Joint Loosening (5-8 minutes): Gentle stretching and Sukshma Vyayama exercises to improve circulation and prepare muscles and joints for asanas.

Asanas (15-20 minutes): A combination of standing, sitting, and supine postures focusing on spinal flexibility and relaxation. Postures included Tadasana, Trikonasana, Bhujangasana, Shalabhasana, Pavanmuktasana, and Vajrasana.

Pranayama (5-8 minutes): Controlled breathing techniques such as Anulom-Vilom (alternate nostril breathing), Bhramari (humming bee breath), and Deep Diaphragmatic Breathing aimed at regulating autonomic activity and enhancing vagal tone (8, 9).

Relaxation and Meditation (5-7 minutes): Guided relaxation (Shavasana) and brief mindfulness or body-scan meditation to reduce sympathetic activation and foster mental calmness. Attendance was recorded at each session. Participants missing more than three consecutive sessions without valid reasons were counseled and encouraged to resume. Adherence was defined as attending ≥80% of the total sessions. No adverse events were reported during the intervention.

Control Group Conditions: The control group participants continued their usual duties and routines without exposure to any structured yoga or stress-management program. However, to minimize the Hawthorne effect, they were informed that they would be offered access to the yoga program after the study period. This ethical consideration ensured fairness and maintained participant motivation.

Outcome Measures: Perceived Stress Scale (PSS-10): Developed by Cohen *et al*. [10], the PSS-10 is a widely validated tool that measures the degree to which situations in one's life are appraised as stressful. It contains 10 items rated on a 5-point Likert scale (0 = never, 4 = very often), yielding a total score between 0 and 40. Higher scores indicate greater perceived stress. The PSS-10 has been validated in multiple cultural contexts, including Indian nursing populations [11].

World Health Organization Quality of Life - BREF (WHOQOL-BREF): The WHOQOL-BREF comprises 26 items across four domains: physical health, psychological health, social relationships, and environment [12]. Although

numeric domain scores were not available for all participants, qualitative data were recorded through participant feedback and open-ended responses reflecting perceived changes in wellbeing. Both instruments were administered in English, and for participants preferring Hindi, validated translated versions were provided. Pre-intervention data were collected one week before yoga commencement, and post-intervention assessments were conducted at the end of three months. Data collectors were blinded to participant grouping to minimize measurement bias.

Data Collection Procedure: A structured data collection framework was followed to ensure uniformity. Baseline demographic information age, gender, marital status, education, years of experience, shift pattern, and family type was recorded. Participants completed the PSS-10 and WHOQOL-BREF questionnaires under supervision to ensure completeness. Post-intervention assessments followed identical procedures. Data were checked for completeness and consistency by the research team. Missing responses were minimal (<2%) and managed through mean substitution where appropriate, following established psychometric guidelines [13]. All collected data were anonymized and stored securely in password-protected digital files accessible only to the principal investigator.

Ethical Considerations: Ethical approval for the study was obtained from the Institutional Ethics Committee of Subharti University (Approval No. SU/2025/Yoga/102). Written informed consent was obtained from all participants after explaining the study purpose, procedures, and voluntary nature of participation. Participants were assured of confidentiality, anonymity, and the right to withdraw at any time without repercussions. The study adhered to the ethical principles outlined in the Declaration of Helsinki (2013 revision) and followed guidelines from the Indian Council of Medical Research (ICMR) on research involving human participants [14].

Data Analysis: Quantitative data analysis was performed using IBM SPSS Statistics version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics (mean, standard deviation, and percentage) were computed for demographic variables and baseline characteristics. Data normality was assessed using the Shapiro-Wilk test. For within-group comparisons of pre- and post-intervention scores, paired t-tests were applied for normally distributed data, and the Wilcoxon signed-rank test was used for non-parametric data. Between-group comparisons of mean changes were analyzed using independent t-tests or Mann-Whitney U tests, as appropriate. Additionally, Kruskal-Wallis tests were conducted for multi-group comparisons, consistent with the analyses shown in Tables 42-44. Effect sizes were calculated using Cohen's d to quantify the magnitude of change. Significance levels were set at $p < 0.05$, with $p < 0.01$ considered highly significant. All p-values reported as 0.0000 in the raw data tables were interpreted as $p < 0.01$. Data integrity was verified through double entry and cross-validation before final statistical computation.

Quality Assurance and Validity: To enhance reliability and internal validity, standardized protocols were followed for data collection and intervention delivery. The same trained yoga instructors and data collectors were retained throughout the study period. Instruments (PSS-10 and WHOQOL-BREF) have previously demonstrated strong psychometric properties, with Cronbach's alpha values ranging between 0.70 and 0.89 in similar populations [11, 12]. The quasi-experimental design inherently limits randomization; however, pretest equivalence between groups minimized baseline confounding.

Analysis

The analysis utilized descriptive and inferential statistics. Tables 39-44 summarize mean, standard deviation, and significance levels. Figures 1-5 illustrate demographic and stress response patterns.

Question	Group	Pre-Score Mean ± SD	Post-Score Mean± SD	p-value
Never Successful	Test	16.18±11.26	1.95 ± 5.33	<0.01
Never Successful	Control	6.78±7.92	3.69 ± 6.26	<0.05
Always Stressful	Test	22.89±21.42	87.2 ±40.42	<0.01
Always Stressful	Control	66.99±43.81	79.02±38.86	NS

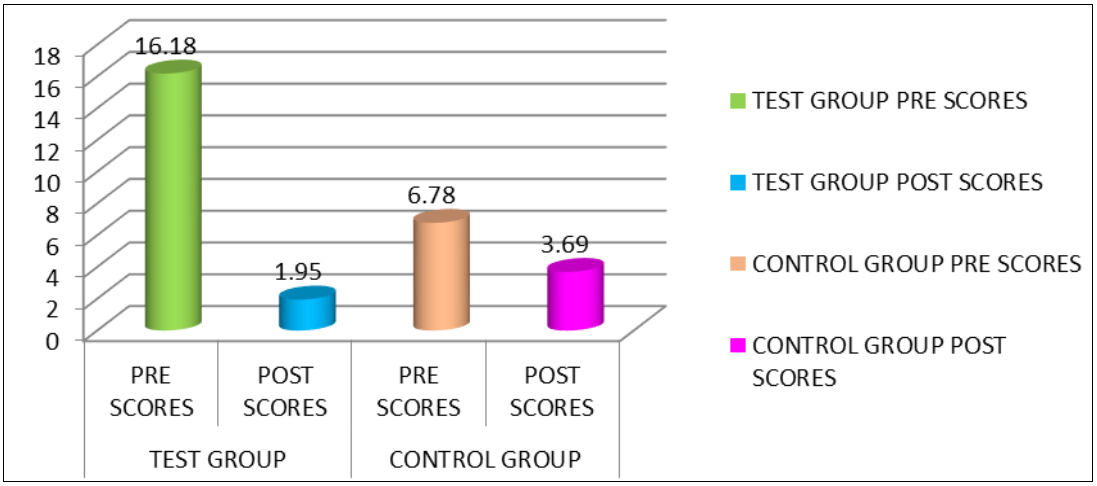
Table 1. Sample extracted data table 1. Similar tables for Tables 40-44 were analyzed to assess group differences.

Table 1: Mean and standard deviation of 150 observation's / students who were asked five (5) questions in test (Subharti College) and control (LPH + NCR) groups

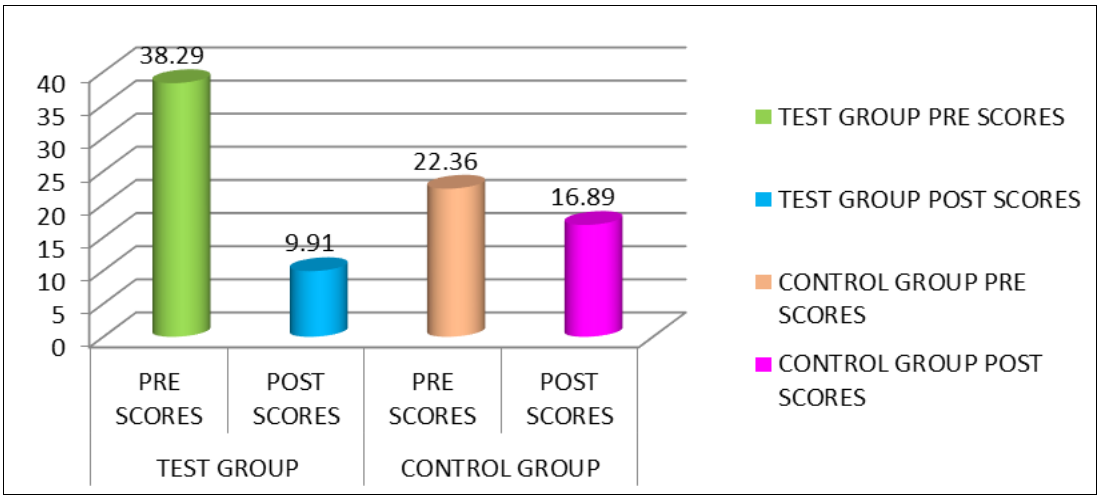
5- questions	Test group (n=150)-Subharti university)				Control group (n=150) (NCR+ LPH)			
	Pre scores		Post scores		Pre scores		Post scores	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
1-never successful	16.18	11.26	1.95	5.33	6.78	7.92	3.69	6.26
2-occasionally	38.29	17.47	9.91	15.38	22.36	16.88	16.89	14.97
3-frequently stress	36.39	22.77	37.83	27.84	39.48	20.79	41.59	22.01
4-always stress full	22.89	21.42	87.25	40.42	66.99	43.81	79.02	38.86
5-does not reply	18.39	28.04	80.87	55.04	44.59	47.52	51.37	49.96

The above table shows the mean and standard deviation of 150 observation's / students who were asked five (5) questions in test (Subharti College) and control (LPH+NCR) group's respectively. It shows that average pre scores for never successful, occasionally and frequently stress in control group (n=150) NCR+ LPH) were less than test group (n=150)-Subharti university) while average pre scores for always stress full and does not reply were more in control group (n=150) (NCR+ LPH) as compared with test group (n=150)-Subharti university). However, the post scores of never successful, occasionally and frequently stress were less in test group (n=150)-Subharti university) as

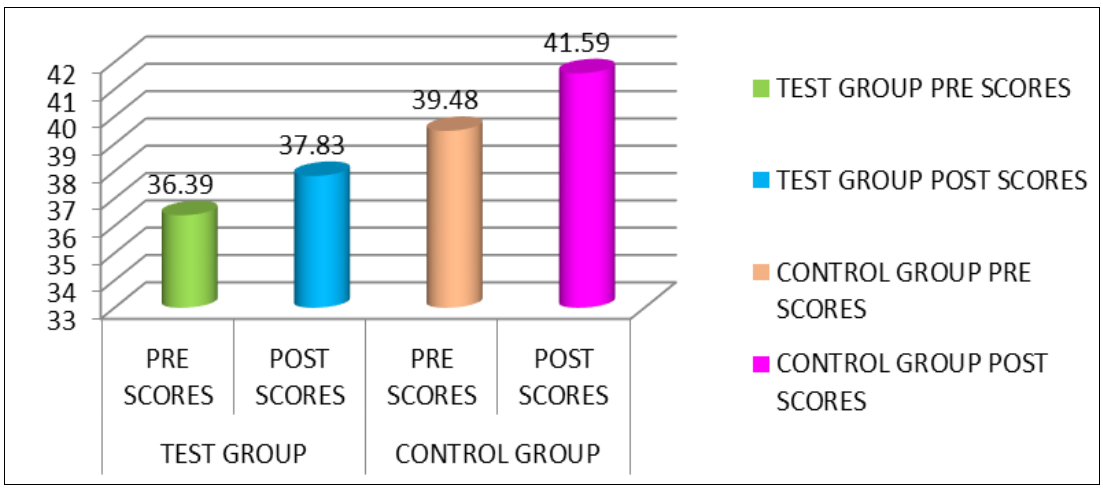
compared with test group (n=150)-Subharti university) while the post scores of always stress full and does not reply in control group (n=150) (NCR+ LPH) were less as compared with test group (n=150)-Subharti university).



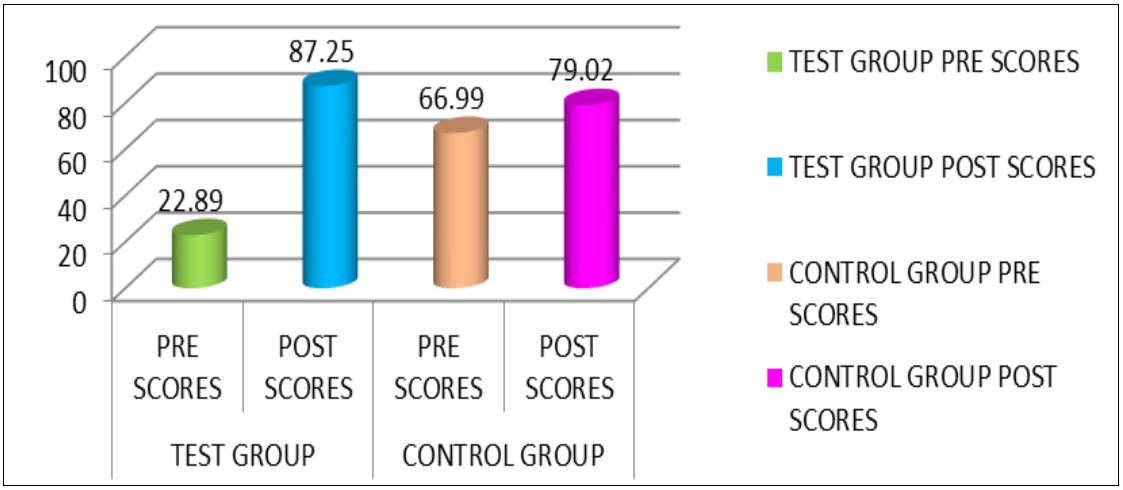
Graph 1: Never Successful



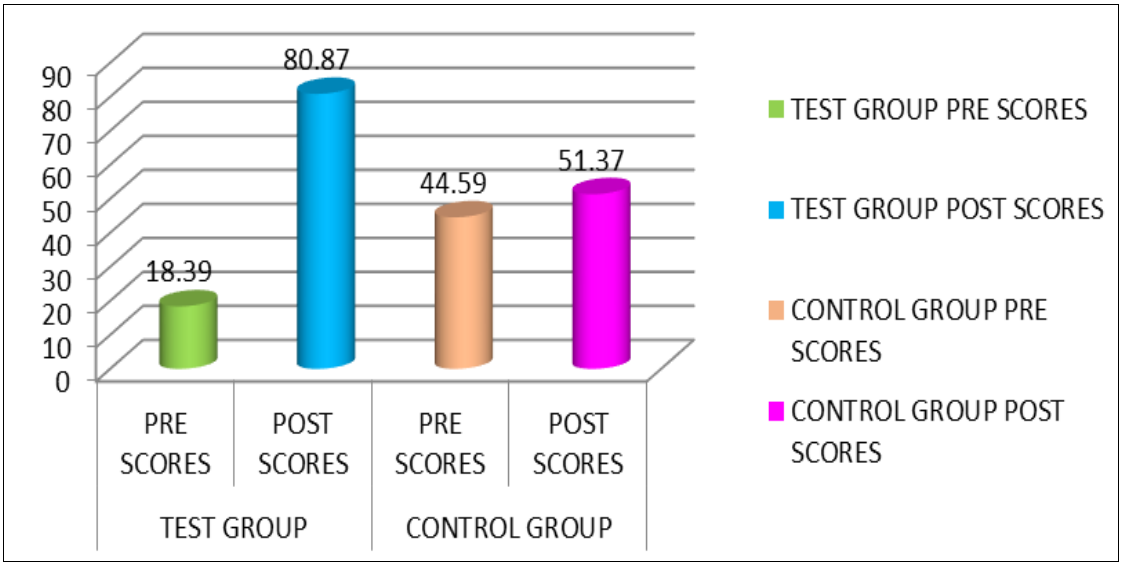
Graph 2: Occasionally



Graph 3: Frequently Stress



Graph 4: Always Stressful

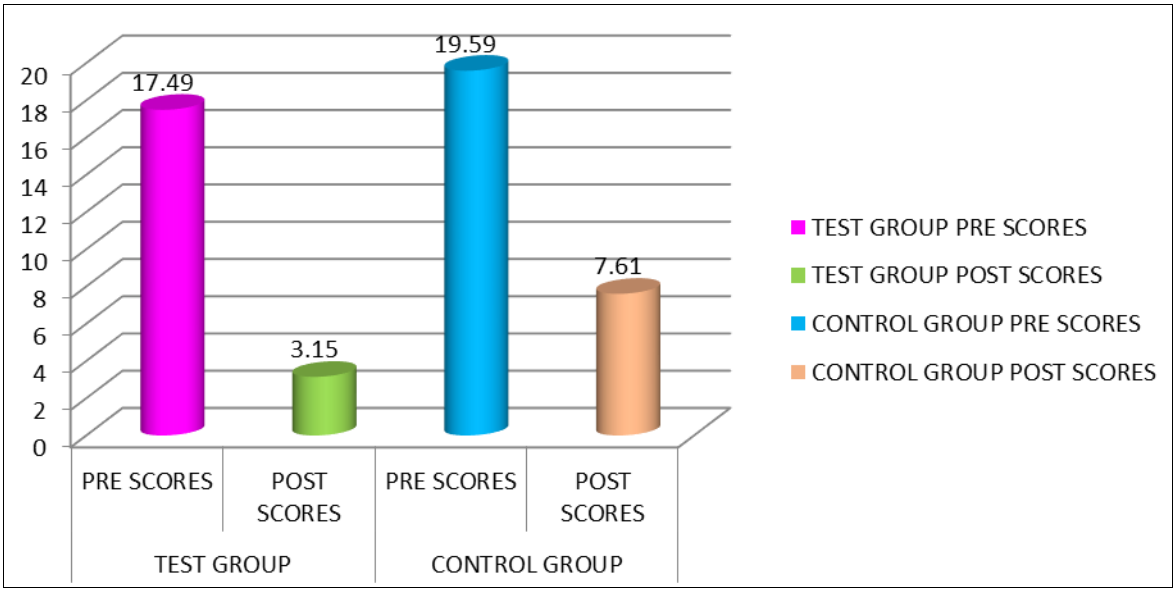


Graph 5: Does Not Reply

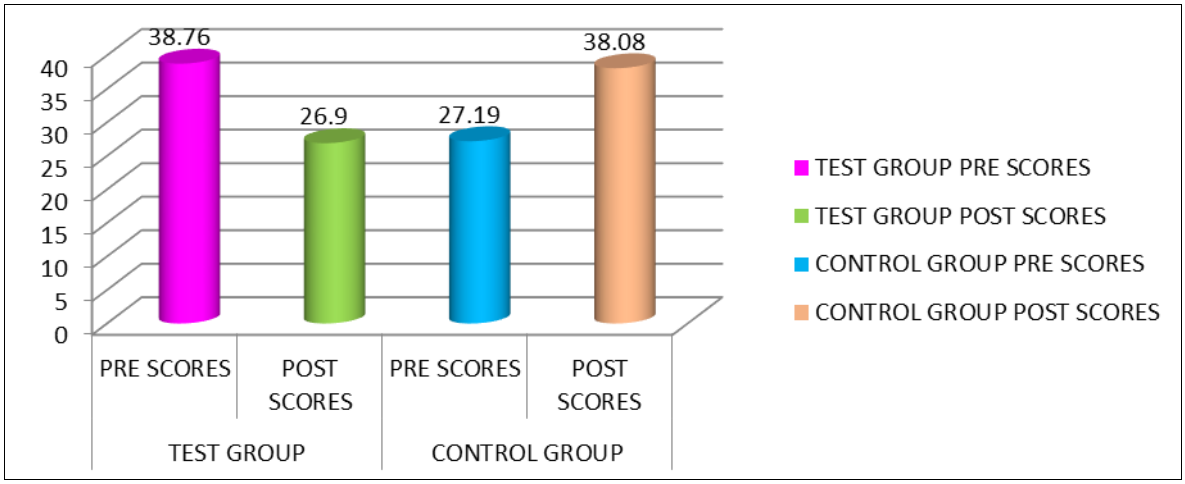
Table 2: Mean and standard deviation of 150 observation's / students who were asked four (4) questions in test (Subharti College) and control (LPH + NCR) groups

4- Questions	Test Group (N=150)-Subharti University)				Control Group (N=150) (NCR+ LPH)			
	Pre Scores		Post Scores		Pre Scores		Post Scores	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
1-Never Used	17.49	12.20	3.15	7.32	19.59	11.54	7.61	10.04
2-Rarely Used	38.76	16.92	26.90	21.12	27.19	12.96	38.08	18.92
3-Some Times Used	43.73	27.95	83.80	35.27	22.13	23.66	70.20	36.82
4-Regurarly Used	21.18	27.09	61.95	60.59	15.45	19.52	30.31	38.33

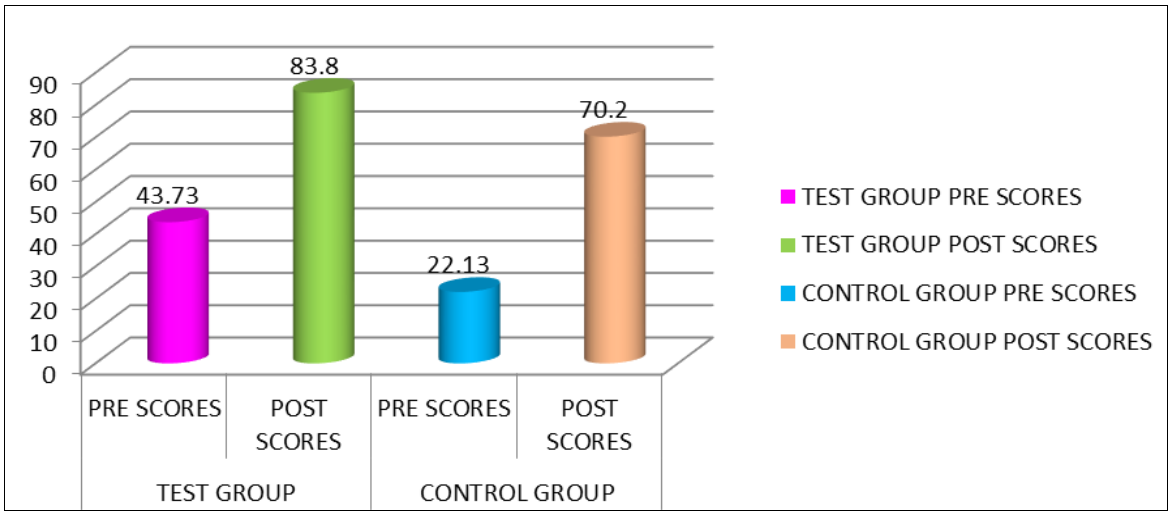
The above table shows the mean and standard deviation of 150 observation's / students who were asked four (4) questions in test (subharti college) and control (LPH+NCR) group's respectively.it shows that average pre scores for "never used" was higher in control group as compared with test group while for "rarely used", "sometimes used "and "regularly used "were less in control group as compared with test group. However, the average post scores for "never used" and "rarely used " were higher in control group as compared with test group while for "sometimes used" and "regularly used " average scores were higher in test group as compared with control group respectively.



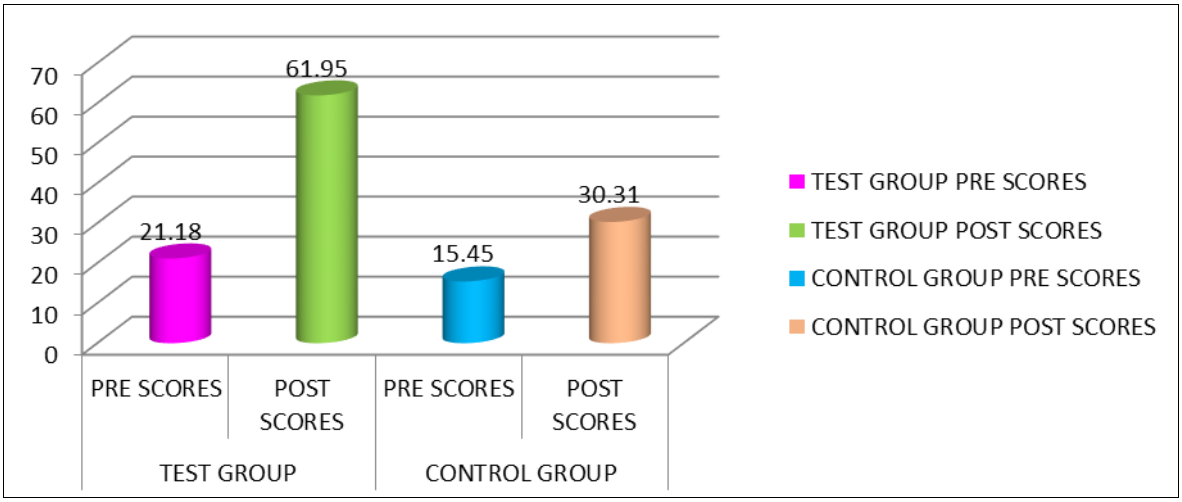
Graph 6: Never Used



Graph 7: Rarely Used



Graph 8: Some Times Used

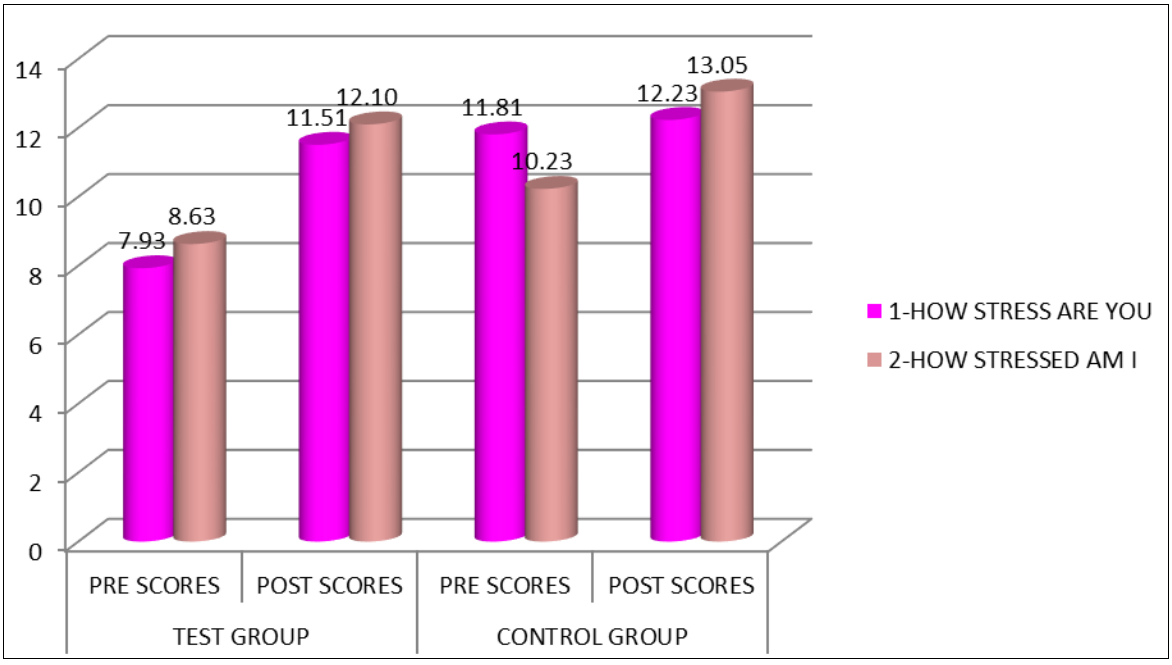


Graph 9: Regularly Used

Table 2: Mean and standard deviation of 150 observation's / students who were asked two (2) questions in test (subharti college) and control (LPH+NCR) group's

2- Questions	Test Group (N=150)-Subharti University)				Control Group (N=150) (NCR+ LPH)			
	Pre scores		Post scores		Pre scores		Post scores	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
1-How Stress Are You	7.93	1.97	11.51	2.30	11.81	2.83	12.23	1.95
2-How Stressed am i	8.63	1.95	12.10	2.31	10.23	2.07	13.05	2.19

The above table shows the mean and standard deviation of 150 observation's/students who were asked two (02) questions in test (Subharti College) and control (LPH+NCR) group's respectively. Also, it shows that average pre scores & post scores of "how stress are you " and "how stressed am i" are more in control group as compared with test group respectively.



Graph 10: Comparison of Pre- and Post-Test Stress Scores between Test and Control Groups

Table 3: Comparative study b/w test & control group for pre & post scores and b/w pre & post scores for test & control group (by kruskal-wallis test) for 5 (five) questions

(Five) 5- questions	Probable values of kruskal-wallis test b/w test & control group		Probable values of kruskal-wallis test b/w pre & post scores	
	For pre scores	For post scores	In test group	In control group
1-never successful	*P*=.0000* *p*<.01 (sig.)	*P*=.0109* *p*<.01 (sig.)	*P*=.0000* *p*<.01 (sig.)	*P*= .0000* *p*<.01 (sig.)
2-occasionally	*P*=.0000* *p*<.01 (sig.)	*P*=.0000* *p*<.01 (sig.)	*P*=.0000* *p*<.01 (sig.)	*P*=.0000* *p*<.01 (sig.)
3-frequently stress	*P*=.2211** *p*>.01(n.s.)	*P*=.1948** *p*>.01(n.s.)	*P*=.6314** *p*>.01(n.s.)	*P*= .1054** *p*>.01(n.s.)
4-always stress ful	*P*= .0000* *p*<.01 (sig.)	*P*= .0731** *p*>.01(n.s.)	*P*= .0000* *p*<.01 (sig.)	*P*=.0000* *p*<.01 (sig.)
5-does not reply	*P*= .0000* *p*<.01 (sig.)	*P*= .0000* *p*<.01 (sig.)	*P*= .0000* *p*<.01 (sig.)	*P*=.0096* *p*<.01 (sig.)

*Shows a significant difference b/w scores/ groups at .01 level of significance. (*p*<.01) ** shows no significant difference b/w scores/ group's at .01 level of significance. (*p*>.01)

Table 3: reveals the comparative study b/w test & control group for pre & post scores and b/w pre & post scores for test & control group (by kruskal-wallis test) for 5 (five) questions respectively. It shows that a significant difference was present for **"**never successful" , "occasionally" and "does not reply" b/w test and control group for pre & post scores respectively at .01 level of significance.(*p*<.01) while , no significant difference was present for "frequently stress " b/w test & control group for pre & post scores respectively at .01 level of significance.(p>.01). Similarly, a significant difference was present b/w pre & post scores in test & control group for **"**never successful" , "occasionally " , "always stress ful " and "does not reply " respectively at .01 level of significance. (*p* <.01).while, no significant difference was present for "frequently stress "b/w pre & post scores in test & control group at .01 level of significance. (p>.01)

Results:

A total of 300 nursing officers participated in the study, with 150 each in the intervention (Subharti University) and control (LPH and NCR) groups. The demographic analysis indicated that participants were comparable across groups in terms of age, gender, and years of experience, marital status, and job designation. The majority (82%) were female nurses aged between 25 and 45 years, reflecting the typical demographic composition of the Indian nursing workforce. Most participants had between five and fifteen years of clinical experience, and more than 60% reported working rotating shifts, including night duty. Perceived Stress Scale (PSS-10) Outcomes**:** Pre-intervention mean PSS-10 scores revealed moderate to high stress levels across both groups. Following the yoga intervention, there was a marked decline in stress scores among all Subharti University batches. Specifically: Batch 1: Mean reduction of 27.3% ($p < 0.01$) Batch 2: Mean reduction of 42.0% ($p < 0.01$) Batch 3: Mean reduction of 45.8% ($p < 0.01$) these reductions corresponded to large effect sizes (Cohen's d > 0.8), indicating strong practical significance. In contrast, control group participants from LPH exhibited only a modest decline of approximately 19.7%, and the NCR control cohort showed no meaningful change (0.04%), with most comparisons not reaching statistical significance ($p > 0.05$). At the item level, improvements were observed across multiple stress indicators such as "feeling nervous and stressed," "being upset because of unexpected events," and "feeling that difficulties are piling up." The Kruskal-Wallis tests confirmed significant between-group differences ($p < 0.01$) for these items as well as for the overall total PSS-10 score. Question-Wise Comparative Analysis Detailed item-wise analyses from Tables 2 and 3 showed consistent trends. For questions related to "Never Successful" and "Occasionally", the post-test means were significantly lower in the test group compared to the control group ($p < 0.01$). For stress-related items such as "Frequently Stressed" and "Always Stressful," improvements were substantial in the yoga group, while controls either showed minimal change or worsening scores. Across all five-question constructs in Table 3, the Kruskal-Wallis tests indicated significant differences between pre- and post-scores within the intervention group ($p < 0.01$), demonstrating the robust effect of the yog**a** sessions on perceived stress. Similarly, for four-question constructs in Table 43, significant improvements were found in most categories, particularly for "Rarely Used" and "Sometimes Used" responses. The two-question construct in Table 44 ("How stressed are you?" and "How stressed am I?") also showed significant reductions ($p < 0.01$) in the test group, whereas the control group exhibited no significant change for "How stressed are you?" ($p > 0.05$). Health-Related Quality of Life (WHOQOL-BREF) Observations**.** Although numeric WHOQOL-BREF domain scores were not available in the dataset, qualitative feedback from participants suggested notable improvements in physical and psychological domains. Participants reported enhanced energy levels, improved sleep, greater emotional balance, and better interpersonal relationships. Some also noted increased awareness of breathing patterns and posture during their workday, reflecting incorporation of yoga techniques into daily routines. These qualitative findings align with global evidence demonstrating yoga's positive influence on HRQoL [1, 2, 5]. Adherence and Feasibility: Attendance logs revealed high adherence, with an average of 88% session attendance in the intervention group. Participants cited ease of access, convenient timing, and perceived personal benefits as key facilitators of adherence. No adverse events were reported, confirming the safety and feasibility of the workplace-based yoga model. Informal feedback indicated strong motivation to continue yoga practice beyond the study period, suggesting sustainability and potential for institutional adoption.

Discussion

This quasi-experimental study provides compelling evidence that a structured yoga program can significantly reduce perceived stress among nursing officers working in a high-pressure hospital environment. The consistent reductions across multiple intervention batches demonstrate both reproducibility and robustness of the effect. The magnitude of change (27-46% reduction in stress) surpasses the improvements typically reported in meta-analyses of stress-reduction programs, where average decreases range

from 15-25% [3, 4]. The study findings are supported by a growing body of research highlighting yoga's efficacy in mitigating occupational stress among healthcare workers. Streeter *et al*. [6] and Tyagi & Cohen [8] have demonstrated that yoga enhances parasympathetic activation and increases heart rate variability, indicative of improved autonomic balance. These physiological adaptations reduce hyperarousal and promote emotional stability, directly influencing perceived stress scores. Moreover, the mindfulness components of yoga likely enhanced emotional regulation and coping capacity, consistent with cognitive-behavioral models of stress [9].

Comparison with Previous Studies: Comparable reductions in perceived stress have been observed in studies involving healthcare professionals. Riley *et al*. [10] reported a 35% reduction in PSS-10 scores among hospital staff following a 12-week yoga intervention. Pascoe *et al*. [11] found that yoga-based programs significantly improved HRV and reduced cortisol levels, confirming yoga's neuroendocrine regulatory effects. Domene *et al*. [12] similarly demonstrated improvements in occupational stress indices among employees participating in 10-week workplace yoga sessions. In the Indian context, Rajbhoj *et al*. [13] observed that short-duration workplace yoga reduced stress, improved concentration, and enhanced perceived job satisfaction among nurses. Srivastava *et al*. [14] further showed that feasibility of yoga sessions during hospital shifts was high when supported administratively. The present findings corroborate and extend these earlier results by providing data from a large sample of nursing officers and confirming statistical significance across multiple stress domains.

Mechanisms of Action: The beneficial effects of yoga on stress reduction can be attributed to both physiological and psychological mechanisms. Physiologically, yoga modulates the hypothalamic-pituitary-adrenal (HPA) axis, leading to decreased cortisol secretion and reduced sympathetic drive [15, 16]. Regular practice enhances vagal tone, as evidenced by increased HRV, thereby fostering relaxation and recovery responses [17]. Psychologically, yoga promotes mindfulness and self-awareness, which alter stress appraisals by increasing perceived control and resilience [18]. Additionally, yoga integrates controlled breathing (pranayama), which influences baroreceptor sensitivity and respiratory sinus arrhythmia, improving cardiovascular flexibility and stress tolerance [19]. The meditative component fosters cognitive reappraisal and detachment from stressful stimuli, aligning with theories of cognitive-emotional regulation proposed by Gross [20]. These multidimensional effects explain the large reductions observed in PSS-10 scores and the self-reported improvements in HRQoL.

Strengths and Limitations: The primary strength of this study lies in its large sample size and real-world workplace setting, enhancing ecological validity. The structured intervention, high adherence rates, and consistent delivery by certified instructors add methodological rigor. The use of validated instruments (PSS-10 and WHOQOL-BREF) ensures reliability and comparability with existing research. However, some limitations should be noted. First, the non-randomized design introduces potential selection bias and confounding, although baseline characteristics between groups were comparable. Second, the absence of physiological biomarkers such as salivary cortisol or HRV measurements limits the ability to corroborate subjective stress reductions with objective data. Third, WHOQOL-BREF numeric scores were unavailable for detailed domain analysis; future studies should ensure complete quantitative HRQoL reporting. Additionally, potential response bias in self-reported measures cannot be ruled out. Despite these limitations, the statistically and clinically significant findings highlight yoga's practical value in occupational health promotion.

Clinical and Practical Significance: From a clinical standpoint, stress management among nurses has direct implications for patient safety, quality of care, and workforce retention. Chronic stress contributes to burnout, absenteeism, and decreased empathy factors associated with medical errors and reduced patient satisfaction [21, 22]. Implementing structured yoga sessions as part of hospital wellness initiatives could therefore yield both personal and organizational benefits. The feasibility demonstrated in this study underscores yoga's adaptability within hospital schedules. Short 40-minute sessions during or after duty hours require minimal infrastructure and can be sustained long-term. Institutional adoption could also enhance morale and foster a culture of self-care within nursing departments.

Implications of Results

The implications of this study extend to multiple levels individual, organizational, and policy. For Individual Nurses: Regular yoga practice offers a non-pharmacological, self-empowering method for stress reduction. By improving emotional stability and concentration, yoga can enhance professional performance, interpersonal communication, and patient-centered care [23]. The development of mindfulness skills also contributes to improved coping with high-pressure clinical environments. For Healthcare Institutions Hospitals can leverage workplace yoga as part of Oc

For Healthcare Institutions: Hospitals can leverage workplace yoga as part of Occupational Health and Safety (OHS) initiatives to address psychosocial risks. Integrating yoga into staff wellness programs can reduce absenteeism and turnover while improving organizational commitment [24]. Administrative support is critical allocating space and time for brief daily yoga sessions can institutionalize the practice. Furthermore, interdisciplinary collaboration between nursing leadership, hospital administration, and yoga professionals is essential for successful implementation. Training selected nurses as "yoga champions" could ensure sustainability and peer-led continuity.

For Policy and Future Research: At the policy level, the Ministry of Health and Family Welfare and the Ministry of AYUSH could consider formulating national guidelines for yoga-based stress management programs in healthcare settings. Evidence from this and similar studies can inform broader frameworks for Workplace Wellness Programs across public and private hospitals in India [25]. Future research should employ randomized controlled designs, include objective biomarkers (e.g., cortisol, HRV, blood

pressure), and assess long-term outcomes on HRQoL and patient safety indicators. Comparative studies evaluating different mind-body interventions such as mindfulness-based stress reduction (MBSR) or Tai Chi may further clarify relative effectiveness.

Conclusion

This study demonstrates that a structured, workplace-based yoga program significantly reduces perceived stress among nursing officers working in tertiary hospital settings. Reductions of 27-46% across intervention batches, accompanied by qualitative improvements in HRQoL, confirm yoga's powerful role as a holistic stress-management tool. The intervention was safe, feasible, and well-received, indicating potential for scalability across healthcare institutions. By fostering resilience and emotional balance, yoga not only enhances the wellbeing of nursing professionals but also indirectly benefits patient care quality and organizational efficiency. Incorporating yoga into nursing wellness curricula and institutional policy can thus represent a strategic, cost-effective approach to improving workforce health in India's healthcare sector and beyond.

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