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EFFECTS OF SELECTED YOGIC PRACTICES ON POSTURE ASSESSMENT AMONG FEMALE COLLEGE STUDENTS COMPARED WITH THE CONTROLLED GROUP

Gowthami Dantuluri[1], Dr. Selvi vinayak[2], Dr T Ganesh Kumar[3], Dr.Shalini Balasubramani[4],Prof. Dr.Subbulakshmi Velusamy[5]

[1]Ph.D Scholar (PT), Meenakshi College of Yoga Science and Therapy, Meenakshi College of Higher Education and Research. Deemed to be University (MAHER), Chennai, Tamil Nadu, India, Email I'd: gowthami.d@gmail.com, Orcid I'd: 0009-0006-7527-7866, Pincode: 600078.
[2]Assistant professor, Department of Yoga, Ante-natal yoga, University Name: A.C.S.Medical college, Chennai, India, Email I'd: vinayakselvi83@yahoo.com, Pincode:600030
[3]professor, physical education, and sports, training methods, University Name: Dr MGR Educational and Research Institute, Chennai, India, Email I'd: ganeshkumar.pedu@drmgrdu.ac.in, Pincode: 600095
[4]Assistant Professor,Meenakshi College of Yoga Science and Therapy, Meenakshi Academy of Higher Education and Research,Chennai, India, Email: drshalini_yoga@maher.ac.in, ORCID ID(s): 0000-0001-6663-9390, Pincode: 600052
[5]Principal, Meenakshi College of Yoga Science and Therapy, Meenakshi Academy of Higher Education and Research , Chennai, India, Email: vslakshmi321@yahoo.com, Off email principal.yoga@maher.ac.in, Orcid id 0009-0009-0504-9739, Pincode: 600078

ABSTRACT:
The students in college are mostly sedentary and under tremendous pressure in studies and have postural deviations like shoulder asymmetry, abnormal curvature of the spine, and pelvic misalignment, to name a few. While multiple dimensions of posture have been recommended as beneficial targets of yoga for musculoskeletal positioning and postural alignment, little research has been conducted examining multiple dimensions of posture within a single randomized controlled study. This study evaluated the effects of a 16-week structured yoga program on shoulder tilt, pelvic tilt, kyphosis, scoliosis, and lordosis among female college students. A randomized parallel-group experimental design included 300 participants (Yoga: n = 150; Control: n = 150). The Yoga group received supervised 60-minute sessions for 16 weeks, while the Control group participated in active-rest sessions. Posture was assessed using a visual postural grid and plumb-line methods. Pre-post changes were analyzed using paired t-tests with significance set at $p < 0.05$. The Yoga group demonstrated significant improvements across all posture variables ($p < 0.001$), whereas the Control group showed minimal changes. The overall posture score also improved substantially in the Yoga group. The results reveal that a carefully designed 16-week yoga program can lead to better multidimensional postural alignment and to favoring musculoskeletal health among female college students.

KEYWORDS: Yoga intervention, Posture assessment, Postural alignment, Female college students, Musculoskeletal health

INTRODUCTION

Yoga is a holistic modality of practice that has been widely discussed in recent decades for its ability to enhance physical, psychological and functional well-being. In particular, it has been associated with improvements in mental health, musculoskeletal performance and overall physical performance in contemporary postural yoga, thus warranting its consideration as a convenient intervention among young adults (Domingues, 2018). With the rise of digital innovations, even modern scholarship has been discussing the possibilities of assessing, correcting, and improving yoga postures with the help of advanced analytical tools, which makes postural correction a complex and multidimensional task (Verma et al., 2023). The optimal posture is crucial to the health of the spine, biomechanical efficiency, and neuromuscular balance, and therefore has increased scholarly interest in both conventional and technology-aided methods of assessing posture (Kumar et al., 2025).

New sources have revived the applicability of yoga in the formation and preservation of postural effectiveness, particularly by means of scientific monitoring and detection of structural deviations (Rajendran & Sethuraman, 2023). Regular yoga practice among female university students has also been associated with improvements in physical functioning that may support the effective performance and maintenance of postures (Sereda et al., 2020). Furthermore, yoga training has exhibited positive results in self-efficacy, functional mobility and successful performance of postures in therapeutic settings, and therefore its use is warranted as a health-boosting study area (Nicosia et al., 2020). In addition, studies among college-aged women have demonstrated the broader musculoskeletal benefits of yoga practice, supporting its relevance as a physical intervention in this population (Mitra et al., 2024).

Proper identification of postural imbalances is an important issue that is well-documented, and yoga frameworks provide unique provisions on postural types, compensations, and alignment errors (Doohwa, 2023). With an increase in the popularity of yoga as a physical activity method and weight loss tool, there is an indication that trained yogic exercise can produce a substantial impact on anthropometric measures, stress, and physical fitness in young adults (Suwannakul et al., 2025). The yoga practice has been associated with posture and other physical and mental health

indicators, which reinforce the use of yoga among younger populations (Sharma & Rawat, 2023). Other studies have also shown the effect of immediate autonomic response to yogic postures, which suggests that physiological changes can be achieved after a short training on specific techniques (De & Mondal, 2019).

Investigating ancient roots of posture (asana) philosophically and technically, it is possible to trace back the classical yoga traditions and offer a theoretical foundation for the contemporary practice of stable, comfortable, and biomechanically efficient postural forms (Maas, 2018). Modern studies among female college students further support the role of yoga and core exercise in improving physical capabilities that contribute to effective postural performance (Samanta et al., 2024). Similar exercise-oriented literature identifies posture and musculoskeletal strength as important components of physical functioning and emphasizes that postural correction is not merely a cosmetic concern but also a health consideration (Kumar & Singla, 2024). Evidence concerning the physical effects of yoga also suggests that changes in body characteristics may have relevance to overall postural mechanics (Yadav & Kumar, 2025). In addition to these findings, yoga therapeutic systems emphasize musculoskeletal balance as an essential feature of lasting spinal wellness and positioning (Krentzman & Sullivan, 2021).

However, research to date is extensive, but there are no studies investigating all components of posture (shoulder tilt, pelvic tilt, kyphosis, scoliosis and lordosis) in one structured intervention. Most studies in the past focus on one or two posture outcomes, or do not have an experimental design that allows for a comprehensive evaluation of changes in posture. Further, few studies have investigated only the postures of female college students, who could be vulnerable to postural deviations due to sedentary academic activities and lifestyle.

The present study aimed to evaluate the effects of the 16-week structured yoga program on the five major parameters of postures of female college students in a randomized parallel-group design. Specific objectives were to compare and contrast the changes that occurred in the participants' postures (shoulder tilt, pelvic tilt, kyphosis, scoliosis and lordosis) before and after the intervention, and to compare the changes in the participants' posture who received yogic training with the changes in the participants' posture who received active rest.

2. METHODOLOGY

2.1 Study Design

To study the impact of the selected yogic practices on posture, including shoulder tilt, pelvic tilt, kyphosis, scoliosis, and lordosis, a randomized parallel-groups experimental design was utilized. The intervention was 16 weeks, and the assessments were done at baseline and post-intervention. The subjects were randomly selected to be placed in the Experimental Group (Yoga; n = 150), where they were experimental participants who received an organized yoga-based training protocol, or the Control Group (Active Rest; n = 150), without any form of yogic practice. The PICOT framework was used to conceptually organize the study. The Population consisted of female college students aged 18 to 22; the Intervention consisted of the yoga practices; the comparison was an active rest control condition; the Outcomes focused on changes in posture (shoulder tilt, pelvic tilt, kyphosis, scoliosis, lordosis); and the Time frame included the pre-post evaluations during the 16-week intervention period. The research that was carried out was an ethical type of research involving human beings and informed consent was given, in written format, to the subjects of the research.

2.2 Participants

A total of 300 female undergraduate students were recruited from the Madeena B. Ed. College, Vepalagadda, Bhadradri Kothagudem dist., Telangana, and were between the age 18-22 years. Inclusion criteria were that patients must not have musculoskeletal, neurological, cardiovascular, or metabolic diseases and must not have any formal yoga or athletic training in the 6-month period prior to the study. Those who had recently been injured, had chronic illness, or had contraindications to practice yoga were excluded. The allocation sequence was arbitrary, based on a computer-generated sequence. Physical and baseline demographic characteristics were obtained to use as a control between groups.

2.3 Intervention Protocol

The Yoga group was administered 5 days/week supervised 60 min yoga sessions by trained yoga teachers using a structured yoga protocol. Each session incorporated a sequence of asanas, including, Sukshma Vyayama, Suryanamaskar, Tadasana, Vrukshasana, Uttkatasana, Natarajasana, Padahastasana, Parsvottanasana, Trikonasana, Adhomukha Svanasana, Anjaneyasana, Rajakapotasana, Marjariasana, Ushtrasana, Bhujangasana, Dhanurasana, Shashankasana, Setubandhasana and Shavasana, which were selected to enhance spinal alignment, core stability, and overall postural alignment. Also incorporated were breath regulation techniques (Anulom Vilom and Bhramari), the neuromuscular lock Jalandhara Bandha and the final Quick Relaxation Technique (QRT). The Control group got parallel stretching sessions of the same length and supervision but low-level stretching, sitting in silence and breath consciousness without any yogic element.

2.4 Outcome Measures

The primary outcome was the evaluation of posture, which was assessed using the visual postural grid, plumb-line analysis and checklist of the standardized posture assessment comprising five domains: shoulder tilt (shoulder level symmetry); pelvic tilt (anterior orientation or posterior orientation of the pelvis); kyphosis (thoracic curvature); scoliosis (lateral deviation of the spine); and lordosis (lumber curvature). All parameters were graded on a 5-point scale, where the higher the score, the better the structural alignment. For Visual Grid B, shoulder asymmetry was assessed according to the relative difference in shoulder levels, with the shoulder positioned higher on the visual grid recorded as the elevated side and the opposite shoulder recorded as the lowered side.

2.5 Data Collection

Data were collected at two critical time points to identify the changes that were elicited by the intervention. Week 0 (pre-test) assessment was carried out before the commencement of training, whereas Week 16 (post-test) assessment was done after the completion of the 16-week program. Data collection was standardized and two assessment sessions were used with the same assessment procedures and protocols, including evaluator instructions, to ensure consistency and reliability of data collection.

2.6 Statistical Analysis

Paired t-tests were used to compare within-group pre- and post-changes in both the Yoga and Control groups. Statistical significance was determined to be $p < 0.05$, and significant values were reported to be $p < 0.001$ where necessary. The interpretation of the degree and direction of improvements was done with descriptive statistics (mean and change scores).

3. RESULTS

3.1 Participant Flow and Baseline Characteristics

Three hundred individuals were used as participants in the study (Yoga: 150, Control: 150). The groups showed similar baseline posture scores, indicating comparable baseline postural status. Every participant completed both assessments, and no adverse occurrences were reported.

3.2 Outcome Measures

Posture was measured as the major research outcome in five domains of structures, and the changes between pre- and post-intervention were determined by a paired t-test. The Yoga group showed statistically significant improvements across all posture variables ($p < 0.001$), whereas the Control group showed only minimal changes.

3.2.1 Shoulder Tilt

The score of shoulder tilt improved significantly in the Yoga group (Pre: 3.72; Post: 4.37; $t(149) = -57.01$, $p < 0.001$). There was no significant difference in the Control group (Pre: 3.718, Post: 3.717; $p = 0.968$). Table 1 presents these results, and Figure 1 illustrates them.

Table 1. Shoulder Tilt Scores (Pre–Post by Group)

Group	Pre-test Mean	Post-test Mean	Change	Paired t-test
Yoga	3.720	4.366	+0.646	$p < 0.001$
Control	3.718	3.717	−0.001	$p = 0.968$

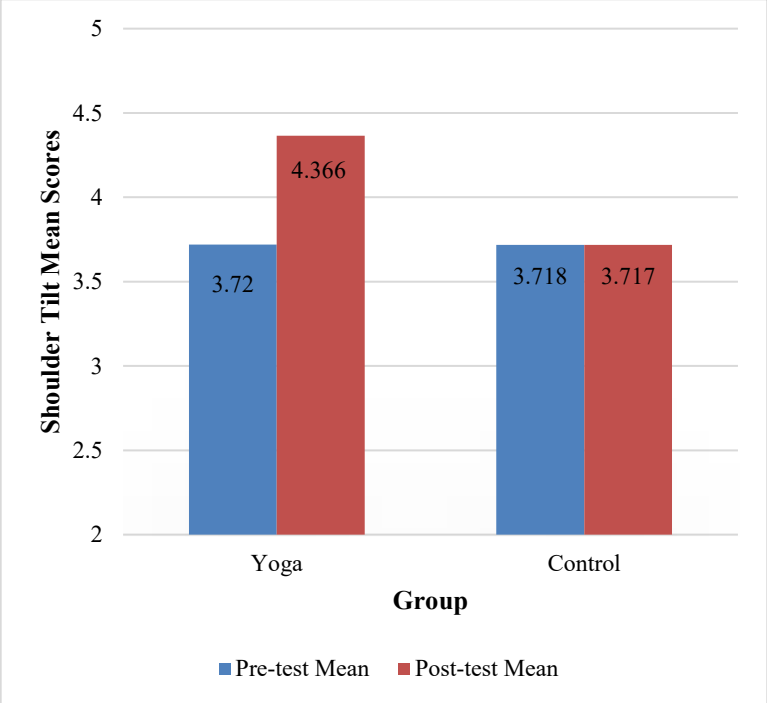

Figure 1. Shoulder Tilt Scores

3.2.2 Pelvic Tilt

Pelvic tilt, as shown in Table 2 and Figure 2, improved significantly in the Yoga group (Pre: 3.689, Post: 4.336; $p < 0.001$). The Control group showed only a small change from 3.693 to 3.714 (change = +0.021; $p = 0.045$), which was considerably smaller than the improvement observed in the Yoga group.

Table 2. Pelvic Tilt Scores (Pre–Post by Group)

Group	Pre-test Mean	Post-test Mean	Change	Paired t-test
Yoga	3.689	4.336	+0.647	$p < 0.001$
Control	3.693	3.714	+0.021	$p = 0.045$

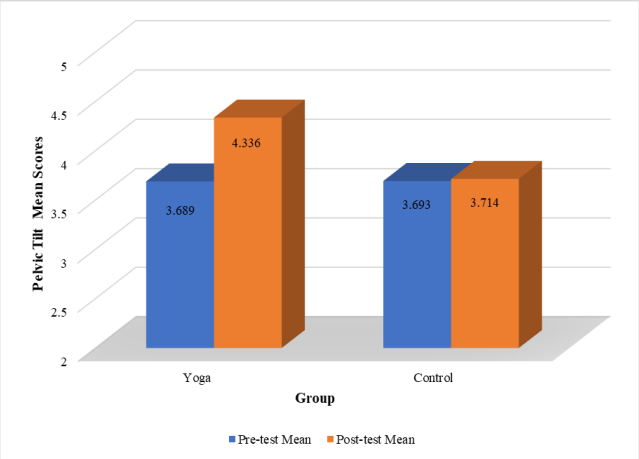

Figure 2. Pelvic Tilt Scores

3.2.3 Kyphosis

There was a great improvement in Kyphosis scores in the Yoga group (3.634 to 4.281; $p < 0.001$). There was a small change in control values (3.636 to 3.639, p=0.743). Similar data are presented in Table 3 and Figure 3.

Table 3. Kyphosis Scores (Pre–Post by Group)

Group	Pre-test Mean	Post-test Mean	Change	Paired t-test
Yoga	3.634	4.281	+0.647	$p < 0.001$
Control	3.636	3.639	+0.003	$p = 0.743$

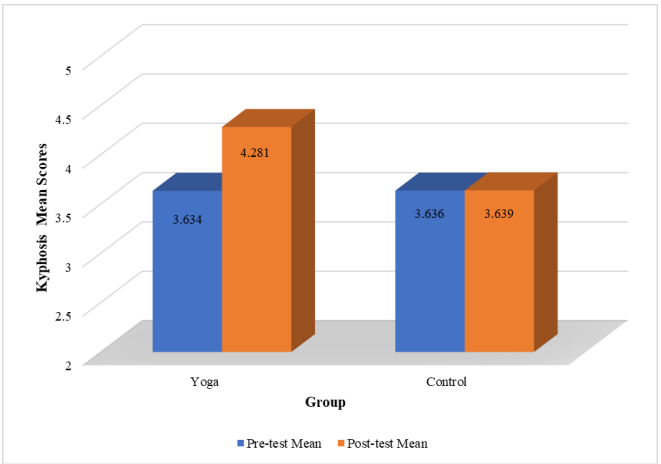

Figure 3. Kyphosis Scores

3.2.4 Scoliosis

According to Figure 4 (Table 4), scoliosis had improved significantly in the Yoga group (3.608 to 4.242; $p < 0.001$). The insignificant decrease in the Control group (3.605 to 3.594; $p = 0.113$) did not show any significant difference.

Table 4. Scoliosis Scores (Pre–Post by Group)

Group	Pre-test Mean	Post-test Mean	Change	Paired t-test
Yoga	3.608	4.242	+0.634	$p < 0.001$
Control	3.605	3.594	−0.011	$p = 0.113$

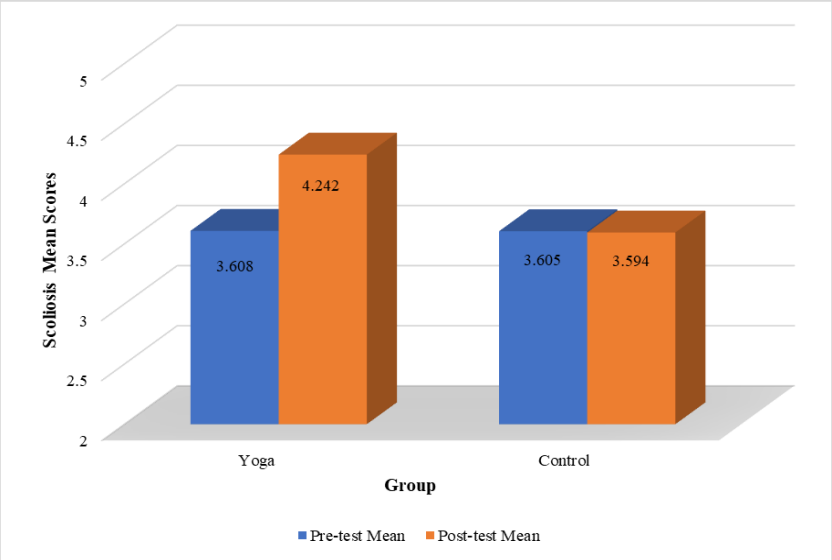

Figure 4. Scoliosis Scores

3.2.5 Lordosis

The Lordosis of the Yoga group (3.706 to 4.355; $p < 0.001$) was better than that of the Control group (3.701 to 3.705; $p = 0.534$). The results of these are provided in Table 5 and Figure 5.

Table 5. Lordosis Scores (Pre–Post by Group)

Group	Pre-test Mean	Post-test Mean	Change	Paired t-test
Yoga	3.706	4.355	+0.649	$p < 0.001$
Control	3.701	3.705	+0.004	$p = 0.534$

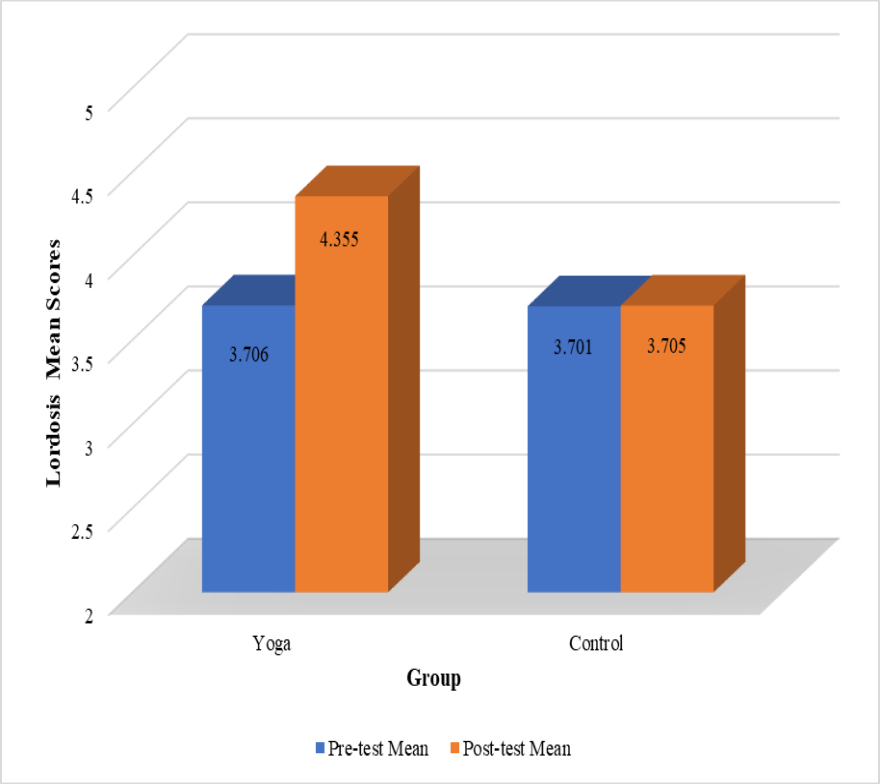

Figure 5. Lordosis Scores

3.2.6 Overall Posture Score

There was a significant increase in the overall posture index of the Yoga group (3.674 to 4.316, $p < 0.001$), with no significant change in the Control group (3.651 to 3.645, $p = 0.296$). The corresponding pre- and post-intervention changes in overall posture scores for both groups are presented in Table 6 and illustrated in Figure 6.

Table 6. Overall Posture Score (Pre–Post by Group)

Group	Pre-test Mean	Post-test Mean	Change	Paired t-test
Yoga	3.674	4.316	+0.642	$p < 0.001$
Control	3.651	3.645	−0.006	$p = 0.296$

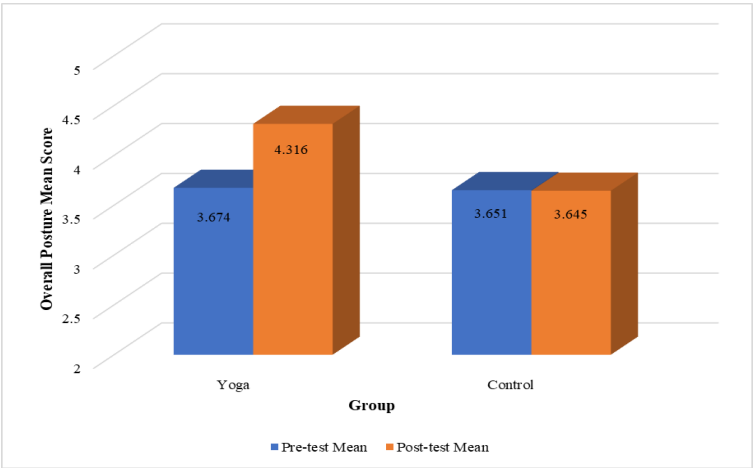

Figure 6. Overall Posture Score

In each of the domains of posture, the Yoga group showed significant changes in spinal alignment, indicating the strong impact of the intervention on shoulder symmetry, pelvic position, and thoracic and lumbar curvature. On the other hand, the Control group showed considerably less variation in the posture variables, indicating minimal changes in postural alignment without the specific yoga intervention. In general, the 16-week yoga program achieved consistent and robust gains in postural alignment in the measured areas. As further confirmed by the minimal changes seen in the Control group, yoga practice contributed to improvements in posture.

4. DISCUSSION

The present randomized trial demonstrated the ability of a guided 16-week yoga program to produce significant improvement in all five domains of posture (shoulder tilt, pelvic tilt, kyphosis, scoliosis and lordosis) in female college students. The Posture Outcomes showed only minimal changes for the Control group. These outcomes demonstrate the effectiveness of yoga in enhancing structural alignment, neuromuscular coordination and postural competence.

The substantial variations observed in the posture parameters suggest that the yogic practices have a substantial effect on musculoskeletal balance and spinal positioning. In the postures that the intervention focuses on, axial elongation, scapular stabilization, pelvic neutrality and controlled mobility mechanisms are central, meaning that they specifically counteract postural deviations. There was an increase in the overall posture score with a significant change in each of the postures, thus indicating that yoga could be beneficial in correcting multi-planar postural misalignments. The improvements observed in postural alignment could be facilitated by a combination of neuromuscular activation, breath control, and controlled movement.

The present results are fully justified by the previous research, which explains the role of yoga in facilitating spinal movement and core stimulation of the nervous system in contributing to the element that is the subject of postural balance and stability of the nervous system (Clark, 2018). Our sample also demonstrates improvements in thoracic kyphosis and lumbar lordosis and is consistent with the literature that indicates more preferable spinal curvature patterns in yoga practitioners than in their non-practitioners (Grabara, 2021). The measured improvement in the shoulder tilt score is not only in line with electromyographic evidence of greater activity of scapular stabilizers in static yoga postures, which is used to correct asymmetries of the upper body (Chopp-Hurley et al., 2018).

On the same note, the gains in pelvic tilt can be compared with research showing that yoga poses can significantly influence pelvic position and anterior superior iliac spine location, leading to more efficient lumbopelvic functioning (Kim et al., 2018). The improved postural stability and postural synergy observed in our results are also supported by musculoskeletal studies showing the coordination of muscle-synergy patterns during single-leg and stability-oriented yoga poses (Menegaldo et al., 2023). The corrective effect of yoga on multi-plane deviations of the spine recorded in this study is also in line with emerging evidence that yoga, when integrated with specific postural re-education interventions, can improve spinal alignment and reduce functional imbalance (Ramkumar and Sivakumaran, 2025). The broader physical effects of yogic practices are also supported by studies reporting changes in body composition and physiological indicators following Surya Namaskar-based practices (Pal et al., 2024). Similarly, structured yogic practices have been associated with beneficial effects on mental performance (Babu, 2018), while sustained yoga interventions have also demonstrated physical benefits among young women (Nongkhai et al., 2022). Collectively, the current findings are consistent with the broader literature on yoga, while providing a more focused analysis of posture through the simultaneous assessment of several domains of postural alignment.

The findings are relevant to education, health care professionals and policy makers. Yoga, as a low-cost, practical and scalable strategy, is a great solution to address the emerging issue of poor posture and the prevention of early musculoskeletal imbalances, given the high rate of sedentary sitting, screen time and academic stress. The improvement of all posture variables suggests that yoga is a suitable remedial method to treat functional asymmetry and spinal deviations. The implementation of yoga practice in universities' wellbeing programs can enhance postural awareness, reduce the risk of chronic postural dysfunction and maintain the overall wellbeing of the students. The sustained enhancements in postural positioning also contribute to the promise of yoga in the maintenance of musculoskeletal health in women students of college.

There are some limitations that should be taken into account, although the results of the study were excellent. To begin with, the group of respondents was made up of only female college students, which reduces the applicability to males and the rest of the population. Second, although all evaluations were carried out by trained evaluators, there was some sort of visual evaluation of posture, which is subject to subtle observer bias. Third, the short-term adaptations were measured; therefore, it is not known if postural improvements are permanent or not. Lastly, the differences in attendance, though under surveillance, could have caused disparity of exposure in the Yoga group.

More studies need to be done on children (mixed gender), adolescents, and the elderly, and on more demographics. There are some biomechanical devices available that could be used objectively to determine the accuracy of posture, such as motion capture, digital posture analysis or surface electromyography. A study comparing different Yoga styles, intensity or protocol according to postures could provide more specific methods to address individual deviations like kyphosis or pelvic tilt. It is also important to do follow-up studies to determine the long-term effect of the intervention, or whether permanent changes have occurred.

5. CONCLUSION

In this randomized controlled study, yoga appears to significantly improve several aspects of postural alignment in female college students, including shoulder tilt, pelvic tilt, lordosis, kyphosis, and scoliosis. This is evident from the findings obtained from the Yoga group and the Control group, which show significant changes and minimal changes, respectively, indicating that Yoga is an effective technique for correcting postural deviations and improving the alignment of the spine. The results of the yoga programme were very significant in terms of the changes in postures and movement, the management of breath and the practice of the mind, relating to the musculoskeletal system. The results highlight the importance of yoga as a simple, affordable and effective intervention in youth, especially those at risk for postural imbalance due to sedentary academic pursuits. The study was limited to female college students and short-term results were studied, but the findings of the research suggest that yoga-based programs have the potential to be implemented in institutional fitness and preventive health programs to improve postural health. Further research with

larger samples of varied populations, with more extended follow-up and with instrumented biomechanical evaluations can build on the evidence of long-term changes in postural alignment and spinal health from yoga.

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