Effectiveness of Tai Chi Exercise Program on Sleep, Quality of Life, and Physical Performance in Postmenopausal Working Women

Ayushi Rajkumar Jain, Doss Prakash Sundarajan

Department of Community Physiotherapy, MGM Institute of Physiotherapy, Aurangabad, Maharashtra, India

Background: Menopause being an unavoidable time in every woman’s life brings up various challenges. Inevitable changes in body systems affect the life of a woman permanently. The symptoms constitute the postmenopausal syndrome which further affects the quality of life (QOL). Women spend most of the time working during the menopausal transition period and also during postmenopause. The discussion of symptoms is still considered a taboo. Exercise intervention to reduce the symptoms related to menopause which can show a positive impact on health status and work needs to be incorporated. Methodology: Tai Chi exercise intervention was given for 8 weeks to the women who achieved natural menopause and were included in the study (n = 76). They were assessed for sleep, QOL, and physical performance before and after the intervention. Results: A significant difference was observed in all the outcomes after 8 weeks of intervention (Sleep Quality Scale (SQS)-t = 7.57, P = 0.0001; WHOQOL-BREF-t = 7.56, P = 0.0001; and Physical Performance Test PPT-t = 19.93, P = 0.0001). The results were consistent due to the active participation and high adherence rate of the individuals to the protocol. Conclusion: Our study revealed that besides being low velocity and low impact exercise, Tai Chi was a safe and effective mode of treatment in postmenopausal working women. In this group approach sessions were interactive and improved socialization skills because it was conducted in a community setting minimum equipment’s and greater feasibility. Hence, this could also be incorporated in different age group population.

Keywords: Menopause, physical performance, quality of life, sleep, Tai Chi exercise

Introduction

Menopause means permanent cessation of menstruation at the end of reproductive life due to loss of ovarian follicular activity. The average age of menopause of an Indian woman is 46.2 years. This phase of age is working phase in every woman’s life taking them in the direction of aging. Since it is difficult to distinguish between symptoms resulting from aging or socio-environmental strain, symptoms found related to postmenopausal syndrome were irritability, mood swings, insomnia, difficulty in concentrating, mental confusion, headache, etc., Vasomotor changes, musculoskeletal symptoms, and depression are the most common symptoms in postmenopausal women. Postmenopausal women are one of the most ignored groups of society, and it becomes vital in the scientific community to investigate the various aspects of this period and their effect on woman’s health and quality of life (QOL). With advancing age, a natural decline of physiological functions, including loss of bone mass, muscle mass, and strength, is also noted. This has a significant impact on the physical performance. The reason behind the decline is due to...
A considerable number of women also experience sleep difficulties in approach to menopause and beyond, with around 26% of women experiencing severe symptoms that influence daytime functioning. Growing attention is being given to the matter of menopause and work. There are a growing number of employed women aged 50 years and over, where the most common symptoms of menopause can influence work productivity and QOL. Discussion about the menopause at working place is widely perceived as taboo, and there has been little consideration of what employers could do to provide sufficient support during this period. The symptoms include poor concentration, tiredness, poor memory, feeling depressed, and many which have damaging influence on their working life. Providing better QOL is the main goal of health care and a significant factor for individual health in community. Physical activity has beneficial effects on overall health, and it is used as a treatment strategy in alleviating menopausal symptoms. Tai Chi is a form of physical activity which is an internal Chinese martial art practiced for both its defence training and its health benefits. It is also a cognitive-motor exercise or mind–body exercise which could be the most beneficial type of physical exercise to preserve or improve neurocognition in older individuals because they combine motor (physical) and cognitive demands which are required during work. Tai Chi exercise can improve cardiopulmonary functioning and increase flexibility and muscle strength. It is known for its beneficial effects on blood pressure when combined with different forms of lifestyle modifications. This exercise is a unique form of physical activity that promotes posture, flexibility, relaxation, wellness, and even mental concentration. Scholars have presented its neurocognitive benefits with major attention from understanding the neurobiological mechanisms and processes underlying the cognitive improvements in different age groups. Nowadays, more and more people turn to Tai Chi exercise for its potential health benefits, apparent safety, low cost, and also growing popularity. However, very limited studies had explored the impact of such exercise on postmenopausal symptoms in a population of working women. Therefore, the aim of the study was to evaluate the effectiveness of Tai Chi on sleep, QOL, and physical performance in postmenopausal working women.

**Methodology**

An experimental study consisted of 76 participants recruited from tertiary care hospitals, who were working as medical or paramedical staff. The study was approved by the ethics committee for research on human subjects (MGM-ECRHS/2020/20) and registered (CTRI/2021/12/038591), and a written consent form was taken from all the participants. Females around the age group between 41 and 58 years with 12 consecutive months of amenorrhea were included in the study. Females with confirmed diagnosis of insomnia, any recent or major surgeries, and surgical menopause were excluded. The participants underwent Tai Chi exercise training according to the Peter and Mark exercise program for 8 weeks with each session lasting for 60 min, and three sessions per week were administered under supervision. The participants were assessed before and after Tai Chi training.

**Assessment**

The sleep was assessed using the Sleep Quality Scale. This scale is composed of 28 items and 6 factors, including daytime dysfunction, restoration after sleep, difficulty in falling asleep, difficulty in getting up, satisfaction with sleep, and difficulty in maintaining sleep. The scale has been validated in individuals aged 18–59 years, requiring around 5–10 min for administration. The scale is a simple self-reported measure. The QOL was measured using the WHOQOL-BREF scale which contains a total of 26 questions. It is been provided in 19 different languages, and the scale was used in English for the study participants. It is a self-administered tool but can also be administered interviewer assisted. The major four domains are physical health, psychological health, social relationships, and environment. The physical performance of the subjects was assessed by Physical Performance Test which is a 7-item scale. There is a 5-point ordinal scale (0–4); most of the items are timed and then the value is converted into an ordinal score. A cutoff score of 15 has been used to predict falls with the PPT-7 version. “Frailty” is classified according to the score, i.e., 32–36 – not frail, 25–32 – mild frailty, 17–24 – moderate frailty, and below 17-unlikely to be able to function in the community.

**Intervention**

All the participants with menopause who were employed in a tertiary care hospital were selected as per the inclusion and exclusion criteria. The participants were requested to take part in the study, they were briefed about the study, and a written consent form was obtained. They were assessed for QOL, physical performance, and sleep before the Tai Chi program was incorporated. After the outcome measures were taken accordingly, the participants received a physical Tai Chi exercise program for 8-week period. The exercise was incorporated in group by an experienced physical therapist who is expertized in Tai Chi. The exercises included were Tai Chi pouring, swinging, drumming, standing, swinging...
to connect the kidneys and lungs, hip circles, spiraling
the lower extremities and upper extremities, spinal cord
breathing, fountain, washing yourself with QI from
the heavens, raising the power and cool down exercise
for the first 2 weeks. The same were continued with
addition of push and withdraw, wave hands like clouds
for the next 3 weeks and for the last 3 weeks the same
set of exercise with addition of grasp the sparrow tail,
brush knee twist step was done. The sessions were given
3 days a week, with each session lasting for 60 min, and
at the end of 8th week, the participants were evaluated
for posttest assessment.

Statistical analysis
Statistical analysis was done by using descriptive
and inferential statistics using Student’s paired t-test
for checking significant difference between pre- and
posttreatment in a group for parametric variables, and
Wilcoxon signed-rank test for nonparametric variables
was used. The software used in the analysis was IBM
Corp. Released 2011. IBM SPSS Statistics for Windows,
version 27.0. Armonk, NY:IBM Corp., with P < 0.05
considered level of significance.

Mean and standard deviation were calculated for
quantitative variables, and proportions were calculated
for categorical variables. The data were represented in
the form of visual impressions such as bar diagram and
pie charts.

RESULTS
Graph 1 represents the distribution of women who
participated in the study. Total numbers of females
were distributed according to the four major categories.
Majority of females were under the age group of
46–50 years accounting 50% of the whole sample. This
can relate to the fact that this was the common age
group of working women who were postmenopausal. In

the age group between 41 and 45 years, there were total
8 females consisting of very few of the whole sample.
Twenty-six percent of females were between the age of
51 and 55 years, and the remaining 13% covered the age
group between 56 and 60 years.

Graph 2 represents the distribution of session missed
within the groups which are distributed according to the
age. There was only one female in between the age group
of 41 and 45 years who missed two sessions in different
weeks of exercise. In the age group of 46–50 years, total
nine sessions were missed by seven females from which
two participants missed the session twice and the others
missed only once. In the last two groups of 51–55 years
and 56–60 years, only two sessions were missed by two
different individuals. The absenteeism was found to be
not significant as the total number of sessions completed
actively was high in the group. The adherence to the
exercise can be explained by having low percentage of
women who did not attend the session.

In Table 1, the Sleep Quality Scale scores were analyzed
accordingly. Using mean value of sleep score in the
postmenopausal working women, the pretreatment value
was 48.57 ± 8.31, and posttreatment, it was 26.61 ± 8.65.
The outcome with higher score indicates poor sleep
quality with increased disturbance during the night and
difficulties with sound sleep. By using Student’s “paired
$ t $-test,” statistically significant improvement was found
in mean sleep score at pre- and posttreatment ($ t = 7.57,
P = 0.0001$). The improvement suggests that with 8 weeks
of Tai Chi exercise, women had upgraded sleep functions
which had a positive impact on their daily living.

Table 2 signifies that the mean QOL score in the
participants preexercise was 50.60 ± 9.55, and post
8-week Tai Chi exercise session, it was 75.42 ± 9.36.
By using Student’s paired $ t $-test, statistically significant
improvement was found in mean QOL score at pre- and
posttreatment ($ t = 7.56, P = 0.0001$). QOL is distributed
in major four domains; an improvement in overall
QOL is suggestive of complex interaction between the
health-related factors and exercise.
Table 3 represents that the mean physical performance score in the women was 21.34 ± 4 during the pretest evaluation, and posttreatment, it was 29.96 ± 2.56. By using Student’s paired t-test, statistically significant improvement was found in mean physical performance score at pre- and posttreatment (t = 19.93, P = 0.0001). Before the treatment, the mean score suggested that individuals belong to the moderate frailty group, and after 8 weeks of Tai Chi intervention, they fit into the category of mild frailty. With the increased score, it is suggested that the components of physical performance which are related to daily activities had benefited the postmenopausal working women in a way that this will also facilitate them in working atmosphere.

**DISCUSSION**

Advancing age is a common risk factor for various midlife diseases and problems, hence managing the symptoms can impact an individual women’s health in a significant manner. A study by Ahuja[2] noted five different factors having positive correlation with advancing menopausal age in which they reported that more educated women and also the working once had higher menopausal age and can manage symptoms with efficient resources and care. Tajik et al.[22] in 2018 concluded that Tai Chi intervention had beneficial effects on the perception of QOL in male older people after an intervention given for 8 weeks. Tai Chi exercise is a complementary and an alternative approach which is considered feasible and can be easily implemented for a community setting; it is also very suitable for those who cannot get involved in extreme sports or leisure activity due to mismanaged time for handling work and residence all together. This finding was considerably relatable with that reported by Chang et al.[23] who observed improvements in QOL and physical functioning in patients with end-stage renal disease following a weekly short-form Yang Style Tai Chi session for 12 weeks. Tai Chi exercise is a method to promote the smooth and balanced flow of energy through the body, and can help individuals to achieve a more appropriate control of their bodily movements during exercise and in real-life situations when working. Cui et al.[24] conducted a systematic review in 2019 on the safety of Tai Chi which concluded that with a variety of ages, conditions, and intervention protocol, Tai Chi exercises are not prone to increase the incidence of serious or intervention-related harmful events. The most reliable reason for the safety could be considered Tai Chi exercise being more of monitored approach and also a group-based session which incorporated more interest among individuals developing better communication skills and socialization to tackle issues with postures and movements. A study by an Indian author, Bobby[25] in 2020 conducted a study on Tai Chi Exercises in improving dynamic balance and gait in older adults who supported our study by providing evidence that Tai Chi exercise is more effective than minimal physical exercise intervention in improving the outcomes. A systematic review titled Tai Chi exercise for QOL in perimenopausal women was conducted in 2017 by Ying Yang et al.[16] which included five clinical trials which concluded that Tai Chi exercise may have a moderate beneficial effect on the QOL of perimenopausal women, as indicated by increases in SF-36 scores as well as the spine dimension of bone mineral density. Another systematic review by Sun et al.,[26] in 2016, studied different randomized control trials that explored the efficacy of Tai Chi exercise on bone health among perimenopausal and postmenopausal older women but yielded inconclusive results. The reason explained was due to insufficient quality of methodology with limited reliability. Wayne et al.[27] in 2012 studied the impact of Tai Chi exercise on multiple fracture-related risk factors in postmenopausal osteopenic women. The authors observed that a clinically relevant tendency of Tai Chi attenuates bone loss and improves QOL in postmenopausal osteopenic women. This study showed significant improvement in bone mineral density and

---

**Table 1: Comparison of mean difference of Sleep Quality Scale score pre- and posttreatment**

|       | Mean | n  | SD  | SEM | Mean difference | t  | P     |
|-------|------|----|-----|-----|-----------------|----|-------|
| Pre t/t | 48.57| 76 | 8.31| 0.95| 21.96±10.27     | 7.57| <0.0001 |
| Post t/t| 26.61| 76 | 8.65| 0.99|                 |    |        |

SD: Standard deviation, SEM: Standard error mean

**Table 2: Comparison of mean difference of quality-of-life score pre- and posttreatment**

|       | Mean | n  | SD  | SEM | Mean difference | t  | P     |
|-------|------|----|-----|-----|-----------------|----|-------|
| Pre t/t | 50.60| 76 | 9.55| 1.09| 24.82±10.23     | 7.56| <0.0001 |
| Post t/t| 75.42| 76 | 9.36| 1.07|                 |    |        |

SD: Standard deviation, SEM: Standard error mean

**Table 3: Comparison of mean difference of Physical Performance Test score pre- and posttreatment**

|       | Mean | n  | SD  | SEM | Mean difference | t  | P     |
|-------|------|----|-----|-----|-----------------|----|-------|
| Pre t/t | 21.34| 76 | 4.00| 0.45| 8.61±3.76       | 19.93| <0.0001 |
| Post t/t| 29.96| 76 | 2.56| 0.29|                 |    |        |

SD: Standard deviation, SEM: Standard error mean
also reduced risk of falls with improved outcomes for QOL. The mechanism behind a positive result in the study by Wayne and colleagues is that Tai Chi being a complex, multicomponent intervention, and it is possible that it impacts bone remodeling via multiple processes which could further improve balance and gait parameters that ultimately lead to better QOL with reduced fall and fracture risk. A systematic review by Du et al.[28] in 2014 studied the effect of Tai Chi exercise for self-rated sleep quality in older people. They included five randomized control trials and found weak evidence showing that Tai Chi exercise has a beneficial effect in improving self-rated sleep quality for older adults. They included five randomized control trials and found weak evidence showing some improvement in the given population. Tai Chi being a form of aerobic exercise which is performed slow and gentle in combination with diaphragmatic breathing and relaxation. This results in declined sympathetic output and enhanced feeling of wellbeing suggesting that Tai Chi could be an effective alternative and paired approach to existing therapies for older people with sleep problems. A study by Lü et al.[29] in 2017 on the effect of Tai Ji Quan training on self-reported sleep quality in elderly Chinese women with knee osteoarthritis included 46 elderly women with one group who performed exercises for three times a week for 24 weeks and another group who only had educational classes. After the analysis, the authors found that the participants in intervention group had significant improvement in sleep quality and physical performance by reducing pain around 39% and also improving QOL.

**CONCLUSION**

Our study revealed that besides being low velocity and low impact exercise, Tai Chi was a safe and effective mode of treatment in postmenopausal working women. Tai Chi exercise has shown significant improvement in sleep behavior and also physical performance which further efficiently impacted health-related outcomes of QOL as an affirmative approach. There are many similar group exercises (aerobics, yoga, cycling, and calisthenics) which produce beneficiary effects on the subjects. These kinds of exercises have been studied well by the researchers. It may also have positive psychological effects in healthy individuals who undergo normal aging. Our study had a positive position other than having significant results in sleep outcomes, physical performance, and QOL. First, being conducted as a group approach, it had become interactive and improved socialization skills during the pandemic strictly adhering to the COVID-19 protocols. This approach also helped to cover a larger population at a time to minimize the workload. Another positive point was the adherence to the exercise, as the absenteeism was relatively low. Finally, our study used two major self-administered questionnaires which helped every individual to understand the fact of responsiveness toward oneself.

Our study showed some limitations like QOL questionnaire is sub divided into four main domains which were not taken separately. So, it provided with only apparent assessment of QOL in post-menopausal women. Another limitation was the population which was included were already active during the time of pandemic, this somewhere has advanced the outcomes. Any kind of systemic involvement and effect of marital status on the outcomes was not assessed. And also, the study with larger sample and prolonged duration can be conducted in future.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

**REFERENCES**

1. Dutta DC. Textbook of Gynecology Including Contraception. 6th ed. New Delhi: Jaypee Brothers. Medical publishers; 2013.
2. Ahuja M. Age of menopause and determinants of menopause age: A PAN India survey by IMS. J Midlife Health 2016;7:126-31.
3. Dalal PK, Agarwal M. Postmenopausal syndrome. Indian J Psychiatry 2015;57:S222-32.
4. Messier V, Rabasa-Lhoret R, Barbat-Artigas S, Elisha B, Karelis AD, Aubertin-Leheudre M. Menopause and sarcopenia: A potential role for sex hormones. Maturitas 2011;68:331-6.
5. Hickey M, Riach K, Kachouie R, Jack G. No sweat: Managing menopausal symptoms at work. J Psychosom Obstet Gynaecol 2017;38:202-9.
6. Baker FC, de Zambotti M, Colrain IM, Bei B. Sleep problems during the menopausal transition: Prevalence, impact, and management challenges. Nat Sci Sleep 2018;10:73-95.
7. Hardy C, Hunter MS, Griffiths A. Menopause and work: an overview of UK guidance. Occup Med (Lond) 2018;68:580-6.
8. Ayers B, Hunter MS. Health-related quality of life of women with menopausal hot flushes and night sweats. Climacteric 2013;16:235-9.
9. Smith MJ, Mann E, Mirza A, Hunter MS. Men and women’s perceptions of hot flushes within social situations: Are menopausal women’s negative beliefs valid? Maturitas 2011;69:57-62.
10. Griffiths A, MacLeman SJ, Hassard J. Menopause and work: An electronic survey of employees’ attitudes in the UK. Maturitas 2013;76:155-9.
11. Morris ME, Symonds A. ‘We’ve been trained to put up with it’: Real women and the menopause. Crit Public Health 2004;14:311-23.
12. Hunter MS, Liao KL. A psychological analysis of menopausal hot flushes. Br J Clin Psychol 1995;34:589-99.
13. Yekkefallah L. The effect of physical exercise on the pulmonary function and quality of life in asthmatic patients. J Sabzevar Sch
Jain and Sundarajan: Effectiveness of Tai Chi exercise program on sleep, quality of life, and physical performance in postmenopausal working women

14. Rajalaxmi V, Priya VV, Ramachandran S, Latha S. Effectiveness of balance and tai chi exercise in early type II diabetic among female population. Asian J Pharm Clin Res 2018;11:300-7.
15. Yue C, Zou L, Mei J, Moore D, Herold F, Müller P, et al. Tai chi training evokes significant changes in brain white matter network in older women. Healthcare (Basel) 2020;8:E57.
16. Wang Y, Shan W, Li Q, Yang N, Shan W. Tai chi exercise for the quality of life in a perimenopausal women organization: A systematic review: Tai Chi and QoL in Perimenopausal Women. Worldviews Evid Based Nurs 2017;14:294-305.
17. Converse AK, Ahlers EO, Travers BG, Davidson RJ. Tai chi training reduces self-report of inattention in healthy young adults. Front Hum Neurosci 2014;8:13.
18. Maris SA, Quintanilla D, Taetzsch A, Picard A, Letendre J, Mahler L, et al. The combined effects of tai chi, resistance training, and diet on physical function and body composition in obese older women. J Aging Res 2014;2014:657851.
19. Peter MW, Mark LF. The Harvard Medical School Guide to Tai Chi, Twelve Week to a Healthy Body, Strong Heart and Sharp Mind. Boston & London: Shambhala Publication Inc; 2013.
20. Yi H, Shin K, Shin C. Development of the sleep quality scale. J Sleep Res 2006;15:309-16.
21. Hayes KW, Johnson ME. Measures of adult general performance tests: The Berg Balance Scale, Dynamic Gait Index (DGI), Gait Velocity, Physical Performance Test (PPT), Timed Chair Stand Test, Timed Up and Go, and Tinetti Performance-Oriented Mobility Assessment (POMA). Arthritis Rheum 2003;49:S28-42.
22. Tajik A, Rejeh N, Heravi-Karimooi M, Samady Kia P, Tadrisi SD, Watts TE, et al. The effect of Tai Chi on quality of life in male older people: A randomized controlled clinical trial. Complement Ther Clin Pract 2018;33:191-6.
23. Chang JH, Koo M, Wu SW, Chen CY. Effects of a 12-week program of Tai Chi exercise on the kidney disease quality of life and physical functioning of patients with end-stage renal disease on hemodialysis. Complement Ther Med 2017;30:79-83.
24. Cui H, Wang Q, Pedersen M, Wang Q, Lv S, James D, et al. The safety of tai chi: A meta-analysis of adverse events in randomized controlled trials. Contemp Clin Trials 2019;82:85-92.
25. Bobby N. A study on tai chi exercises in improving dynamic balance and gait in older adults. J Physiother Res 2020;4:2.
26. Sun Z, Chen H, Berger MR, Zhang L, Guo H, Huang Y. Effects of tai chi exercise on bone health in perimenopausal and postmenopausal women: A systematic review and meta-analysis. Osteoporos Int 2016;27:2901-11.
27. Wayne PM, Kiel DP, Buring JE, Connors EM, Bonato P, Yeh GY, et al. Impact of Tai Chi exercise on multiple fracture-related risk factors in post-menopausal osteopenic women: a pilot pragmatic, randomized trial. BMC Complement Altern Med 2012;12:7.
28. Du S, Dong J, Zhang H, Jin S, Xu G, Liu Z, et al. Tai chi exercise for self-rated sleep quality in older people: A systematic review and meta-analysis. Int J Nurs Stud 2015;52:368-79.
29. Li J, Huang L, Wu X, Fu W, Liu Y. Effect of Tai Ji Quan training on self-reported sleep quality in elderly Chinese women with knee osteoarthritis: A randomized controlled trial. Sleep Med 2017;33:70-5.