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Original Research Article

Effect of core stabilization exercises on balance, physical performance and quality of life in post-menopausal women

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ABSTRACT

Background: The study aimed to evaluate the effect of core stabilization exercises on balance, physical performance and quality of life in postmenopausal women.
Methods: An interventional study was conducted in 30 postmenopausal women. Participants were randomly assigned to two treatment groups. Group 1 (N=15) received core stabilization exercises along with conventional therapy and Group 2 (N=15) conventional therapy alone. The assessments were made using one leg stance test, Y balance test, short physical performance battery and menopause specific quality of life questionnaire at baseline and after 4 weeks of intervention.
Results: In Group 1 and Group 2, there was a statistically significant difference seen in one leg stance test, Y balance test, short physical performance battery and menopause specific quality of life questionnaire pre and post intervention ($p<0.05$). A significant difference was seen in dynamic balance in Group 1 ($p<0.05$). However, there was no significant difference seen in one leg stance test, short physical performance battery and menopause specific quality of life questionnaire scores between the two groups ($p>0.05$).
Conclusions: Core stabilisation exercises have proven to be more effective than conventional exercises alone for improving dynamic balance in post-menopausal women. However, both are equally effective in improving static balance, physical performance and quality of life in postmenopausal women.

Keywords: Balance, Core, Physical function, Post-menopausal women, Quality of life

INTRODUCTION

Menopause is the permanent cessation of menstruation due to loss of ovarian follicular function.[1] Concurrent reduction in basal metabolic rate and lean muscle mass is experienced by women as they transition to menopause. In addition, if no concomitant change in physical activity or total body weight occurs, the decrease in oestrogen is associated with increased abdominal and visceral fat. As a result, the total body fat in women increases and there is transition to android pattern of fat distribution, which is a major risk factor associated with the development of type 2 diabetes and is also associated with the development of an adverse lipid profile which can lead to potentially life-threatening metabolic syndrome.[1] Exercise reverses or attenuates each of the above effects of aging and menopause, where in the core muscles plays the key role.[2] By definition, core is considered as a corset providing stability to the spine. It comprises of abdominals in front, paraspinals and gluteals in back, the diaphragm as the roof, obliques as the sides, and the pelvic girdle serving as the floor.[3] Stability of lumbar spine is enhanced due to the contraction of abdominal muscle that helps to create a rigid cylinder. The activation of rectus abdominis and oblique occurs in direction-specific pattern with respect to limb movement, thus they provide postural support before limb

movement. The centre of the functional kinetic chain is core which provides the proximal stability for the distal mobility.[4] It has been reported that the fatigue in core muscle decreases dynamic stability of the trunk, leading to loss of balance control.[5,6] Studies have shown that core stabilization exercises decrease pain, disability and risk of injury in females with low back pain. Also, it improved muscular endurance, strength, and segmental stability in the population.[7,8] However, there is dearth of literature investigating the effect of core stabilization exercises as compared to conventional protocol in improving physical strength and quality of life in postmenopausal women.

METHODS

An interventional study using purposive sampling was conducted in thirty-two post-menopausal women, residing in the community. The study duration was of six months from December 2021 to May 2022 including data collection and analysis. The study population was selected on the basis of STRAW criteria which included women under the age of 60 years having menstrual status of amenorrhea for at least 12 months or complete hysterectomy (uterus plus both ovaries) or bilateral oophorectomy performed 6 or more months previously. Women with any musculoskeletal injuries, involving upper and lower extremities, cardiovascular, respiratory or neurological disorders, any clinically diagnosed psychiatric problem, using any kind of walking aids, any history of surgery in the past one year, any back pain and/or knee pain, undergoing Hormone Replacement Therapy and females diagnosed with cancer were excluded. Participants were assigned in two groups viz Group 1 (experimental group) and Group 2 (control group) using SNOSE (Sequentially Numbered Opaque Sealed Envelopes) allocation method. All the participants were explained about the study procedure and written informed consent was obtained from the participants.

A preassessment of both groups was done using one leg stance test, Y balance test, short physical performance battery and Menopause specific quality of life questionnaire. One leg stance test is usually performed with eyes open and both the hands over the hip with one leg in contact with the floor and the other leg flexed off the floor. The ability to stand without losing balance, without touching the foot on the ground is measured in seconds. The test has good reliability in the target age group.[9] The dynamic balance test was done with Y balance test which checks the balance as well as lower limb strength in three different directions viz anterior, posteromedial and posterolateral.[10] The short physical performance battery consists of three tests to detect mobility which included balance test, four-meters walk test (FMWT) and five times-sit-to-stand test (FTSST). It has shown good reliability as a discriminator tool for identifying the quality of life in post-menopausal women.[11] The Menopause specific quality of life questionnaire is a 30-item questionnaire with domains including vasomotor, physical, psychosocial and sexual, and a global quality of life.[12] The exercise protocol was designed three days a week, for six weeks, after which the post assessment of same parameters was done for both the groups. Group 1 were given core stabilization with conventional exercises whereas Group B was given conventional exercises. Group 1 was given prone glute squeezes, abdominal hollowing, heel slides, pelvic bridging, superman, modified plank, modified crunches and double knee to chest stretching exercises. Group 2 was given cobra pose, cat and camel exercises, trunk mobility exercises, bird dog exercises, squats and lunges in a week wise progression.

Statistical analysis

The data obtained was compared, coded, tabulated, analysed and data entry was done using Statistical Package for Social Science 24 (SPSS). The data was not normally distributed as per the Shapiro Wilks test hence non parametric Wilcoxon Signed Rank Test was applied to compare the findings pre and post the intervention of 6 weeks. The intergroup analysis of the post finding was done using the Mann Whitney U test.

RESULTS

The demographics of the study population is described in (Table 1).

Table 1: Demographic data of all the participants.

Variables	Core stabilization group (group 1)		Conventional group (group 2)	
	Mean	SD	Mean	SD
Age (years)	50.5	2.75	50	3.49
Height (meters)	1.57	4.00	1.56	5.00
Weight (kg)	65.56	8.19	59	6.4
BMI (kg/m^2)	26.29	3.04	24	2.7

Table 2: Intra group analysis for core stabilization group using Wilcoxon ranked test.

Variable	Pre		Post		Z value	P value
	Median	Interquartile range	Median	Interquartile range		
One leg stance test (seconds)	30.00	25.75-42.50	43.00	40.00-45.00	-3.069	0.02
Y balance test anterior (cm)	54.00	51.25-59.75	67.00	64.00-79.00	-3.519	0.00

Continued.

Variable	Pre		Post		Z value	P value
	Median	Interquartile range	Median	Interquartile range		
Y balance test posteromedial (cm)	50.00	46.25-58.75	63.00	58.25-68.50	-3.410	0.01
Y balance test posterolateral (cm)	49.00	46.00-50.75	62.00	59.00-69.75	-3.519	0.00
Short physical performance battery	10.00	9.25-11.00	12.00	12.00-12.00	-3.360	0.01
Menopause specific quality of life questionnaire	54.00	39.50-59.75	26.00	26.50-35.50	-3.517	0.00

Table 3: Intra group analysis for conventional group using Wilcoxon ranked test.

Variable	Pre		Post		Z value	P value
	Median	Interquartile range	Median	Interquartile Range		
One leg stance test (seconds)	29.00	20.00-40.00	42.00	38.25-45.00	-3.184	0.00
Y balance test anterior (cm)	53.00	49.25-57.75	65.00	60.00-70.00	-3.520	0.00
Y balance test posteromedial (cm)	50.00	45.5-55.75	59.00	55.25-61.50	-3.521	0.00
Y balance test posterolateral (cm)	48.00	43.75-54.5	57.00	56.00-60.75	-3.520	0.00
Short physical performance battery	10.00	9.00-10.75	12.00	12.00-12.00	-3.334	0.00
Menopause specific quality of life questionnaire	53.00	30.50-61.25	27.00	18.75-32.50	-3.409	0.00

Table 4: Intergroup analysis using Mann Whitney U test.

Variable	Median difference		Z value	P value
	Group A	Group B		
One leg stance test (seconds)	13	13	-0.32	0.747
Y balance test anterior	12	13	-0.795	0.427
Y balance test posteromedial	9	13	-0.908	0.364
Y balance test posterolateral	9	13	-2.69	0.007
Short physical performance battery	2	2	-1.49	0.134
Menopause specific quality of life questionnaire	-26	-28	-0.24	0.806

The results are displayed in (Table 2-4). There was statistically significant difference seen in all parameters in pre and post scores in both core stabilisation and conventional group. An intergroup analysis was done, using the Mann Whitney U test, which showed statistical significance of Group B over Group A only in Y balance test in the posterolateral direction of the Y balance test (0.007). Other parameters were not statistically significant (>0.05) as shown in (Table 4).

DISCUSSION

The study finding shows statistically significant improvement in Group A as well as B after the 6 weeks protocol. The core stabilizing exercises are known to be useful for strengthening muscles as well as to improve balance and flexibility.[13]

As also explained by Thabet et al there are adaptive changes in the core muscles determined by the exercise, since the metabolic capabilities of the muscles were continuously overloaded, especially in core stabilization group which included exercises of core in addition to conventional exercises. As per the overload principle this causes hypertrophy of the muscle fibers thereby facilitating increase in the recruitment of its motor units which causes the muscle to strengthen. In addition, it profusely affects the metabolic demand associated with producing a given muscle force which leads to an increase in muscular power.[14]

The pre and post comparison in the Group A as well as Group B was statistically significant for improving the parameters of Y balance test anterior-posteromedial-posterolateral. This is in consensus with the study done by Kahle et al where it was found the post improvement in reach distance verifies that conventional as well as core strengthening does have an effect on balance testing.[15] As further stated by Kibler et al the greater moment of inertia was produced by the large muscles of the core that creates a rigid cylinder against body perturbations allowing a stable base of mobility. The contraction of abdominal muscles consisting of the transverse abdominus, internal and external obliques and rectus abdominus provide stabilization for the spine and therefore a stronger base of support for lower extremity movement.[3]

In this study it was found that Y balance test posterolateral was statistically significant in core stabilization group as compared to the conventional group, when intergroup analysis was done. This is in consensus with the study done by Motealleh et al found that reduced perturbation and

improved dynamic stability may occur due to appropriate activation of core muscles.[16] In their study of core-stability training, Kahle and Gribble reported that, as compared with a control group, maximal reach distances on the SEBT improved in healthy participants after a 6-week core-stability–training program. The improvements were related to contraction of the transverse abdominal, internal and external obliques, and rectus abdominis muscles to stabilize the spine and provide a stronger base of support for lower extremity movement.[16,18] Hence, the enhanced Posterolateral reach may be due to the increase control and dynamic balance outside the base of support in the oblique direction. There was statistically significant difference in physical performance and quality of life pre and post the intervention in both groups. However, there was no statistical significance in the intergroup analysis. A study stated that exercises have positive impact on somatic, vaso-somatic and psychological symptoms, in addition to that the recent study states, cognitive function also improved with regular exercise.[17] Since exercises are a part of both the Groups, there may have been an equivalent improvement in the quality of life and physical performance in both the groups.

Limitations

The study had limitations. The study recruited a sample of convenience. Further studies with larger sample size and longer duration of intervention can be conducted.

CONCLUSION

This study concludes that core stabilization exercises along with conventional exercises has proven be more effective in improving dynamic balance as compared to conventional exercises alone. Both the conventional exercise protocol and core stabilization exercise protocol are equally effective in improving the static balance, physical performance and quality of life.

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REFERENCES

1. Greendale GA, Lee NP, Arriola ER. The menopause. Lancet. 1999;353(9152):571-80.
2. Grindler NM, Santoro NF. Menopause and exercise. Menopause. 2015;22(12):1351-8.
3. Gottipati P. Extremities. J Str Condition Res. 2012; 26(2):373-80.
4. Kibler WB, Press J, Sciascia A. The role of core stability in athletic function. Sports medicine. 2006; 36(3):189-98.
5. Davidson BS, Madigan ML, Nussbaum MA. Effects of lumbar extensor fatigue and fatigue rate on postural sway. Eur J Appl Physiol. 2004;93:183-9.
6. Granata KP, Gottipati P. Fatigue influences the dynamic stability of the torso. Ergonomics. 2008;51: 1258-71.
7. Hicks GE, Fritz JM, Delitto A, McGill SM. Preliminary development of a clinical prediction rule for determining which patients with low back pain will respond to a stabilization exercise program. Arch Phys Med Rehabil. 2005;86:1753-62.
8. McGill S. Low Back Disorders: Evidence-Based Prevention and Rehabilitation. 2nd ed. Champaign, IL: Human Kinetics; 2007.
9. Khanal P, He L, Stebbings GK, Onambele-Pearson GL, Degens H, Williams AG, Thomis M, et al. Static one-leg standing balance test as a screening tool for low muscle mass in healthy elderly women. Aging Clin Exp Res. 2021;33(7):1831-9.
10. Lee DK, Kang MH, Lee TS, Oh JS. Relationships among the Y balance test, Berg Balance Scale, and lower limb strength in middle-aged and older females. Braz J Phys Ther. 2015;19(3):227-34.
11. Nunes S, Oliviera M. The short physical performance battery is a discriminative tool for identifying low quality of life in gynecological postmenopausal cancer survivor. Acta Fistia. 2018;25(1):27-30.
12. Hilditch J, Lewis J, Peter A, van Maris B, Ross A, Franssen E, et al. A menopause-specific quality of life questionnaire: development and psychometric properties. Maturitas. 1996;24(3):161-75.
13. Nyland LJ, Grimmer KA. Is undergraduate physiotherapy study a risk factor for low back pain? A prevalence study of LBP in physiotherapy students. BMC Musculoskel Disord. 2003;4(1):1-12.
14. Thabet AA, Alshehri MA. Efficacy of deep core stability exercise program in postpartum women with diastasis recti abdominis: a randomised controlled trial. J Musculoskelet Neuro Interact. 2019;19(1):62.
15. Kahle N. The effects of core stability training on balance testing in young, healthy adults. Available at: http://rave.ohiolink.edu/etdc/view?acc_num=uthonors1245863136. Accessed on 20 November 2022.
16. Motealleh A, Mohamadi M, Moghadam MB, Nejati N, Arjang N, Ebrahimi N. Effects of core neuromuscular training on pain, balance, and functional performance in women with patellofemoral pain syndrome: a clinical trial. J Chiropract Med. 2019; 18(1):9-18.
17. Gribble PA, Hertel J. Considerations for normalizing measures of the Star Excursion Balance Test. Measure Physic Edu Exer Sci. 2003;7(2):89-100.
18. Pines A, Berry EM. Exercise in the menopause–an update. Climacteric. 2007;10(2):42-6.

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