

Effect of Hand Exercise Programme on Pain and Grip Strength Amongst Post-Menopausal Women with Hand Osteoarthritis - A Randomized Clinical Trial

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DOI: <https://doi.org/10.52403/ijshr.20241037>

ABSTRACT

Background: Hand osteoarthritis is heterogenous condition in which there is multiple joint involvement of the hands. Due to that functional ability of hand gets affected. In post-menopausal women, there are several complications occurs such as osteoarthritis, insomnia, cardio-vascular diseases, etc. The purpose of the study is to determine whether hand exercises can help postmenopausal patients with osteoarthritis in their hands. The main focus of the study was hand pain and grip strength which was directly affect the functionality of hand. The study was done for 2 months in which the exercises were divided in 3 stages on the basis of progression and weeks. The findings showed that after the treatment there is significant pain reduction and improvement in grip strength.

Aim: To study the effect of hand exercise programme on pain and grip strength amongst post-menopausal women in hand osteoarthritis.

Methodology: Total 50 post-menopausal female participants were selected from the community of Sangli-Miraj-Kupwad. Those participants were selected according to the inclusion criteria as Hand Pain, Morning Stiffness, weak grip.

Outcome Measures:

McGill's Questionnaire

Hand Dynamometer

American/Canadian Osteoarthritic Hand Index

Result: The Result shows that in Hand Pain, Grip Strength and Hand Function there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. $0.001 < 0.05$).

Conclusion: The present study concluded that there is significant improvement in Grip strength and lowers the pain which simultaneously improved the patients Hand Function

Keywords: Hand Osteoarthritis, Grip strength, Hand Dynamometer, Therapy putty

INTRODUCTION

Osteoarthritis is a degenerative joint condition which affects joint and structures

involved in joint. It can occur at any joint but knee, hand and hip OA are mostly found in population. Between 1990 and 2019, the

prevalence of OA was systematically greater in women than in males [women: 5,710 (95%UI: 5,1506,362) and men: 4,144 (95%UI: 3,7224,603) for per 100,000 individuals and 2019 [6,113 women] (5,5186,800) and 4,487 (4,0394,969) men for every 100,000 people.¹

Hand OA is heterogenous condition in which there is multiple joint involvement of the hands. Radiographic Hand OA shows characteristics like joint space narrowing (JSN), osteophyte formation (which is pathognomonic of radiographic OA for any joint), subchondral sclerosis, and subchondral cyst formation. In symptomatic Hand OA there will be pain, aching or stiffness with presence of radiographic changes.²

In symptomatic Hand OA, the majority of OA patients only have a few affected joints, occasionally in an additive manner, and their symptoms usually go away on their own after one to two years. Due to the significant incidence of the condition, a minority (yet a sizable portion) experience more severe and long-lasting joint swelling, discomfort, and deformity, which are linked to worsening hand function, lower quality of life, and decreased participation in work-related activities.³

Elderly people frequently have symptomatic hand OA, which significantly impairs their ability to function. Due to that patients with symptomatic hand OA have limitations in numerous functional activities of daily living. The number of affected joints, severity of alterations in each individual joint, and pattern of joint involvement are all more prominent in females than in males. In the form of Heberden's nodes, a high frequency of OA in the DIP joints in females has long been known, and there is a definite correlation between these nodes.⁴

The condition known as "arthritis of the menopause" was first described by Cecil and Archer in 1925. It affected women's hands and occasionally resulted in generalized OA. Among young women aged 25 to 45, those who had gone through menopause were more likely to have hand

OA. Many women experience a range of musculoskeletal problems with estrogen deprivation, ranging from arthralgia to osteoarthritis.³ Significant correlations have been found between hand OA and advanced age, increased bone mineral density, and decreased testosterone levels.⁵

High BMI was also a risk factor for development of hand OA. It impacts more than 66% of women between the ages of 50 and 60, making it a very common illness. The symptoms make it difficult for the women to carry out some tasks associated with daily living, like opening jars, turning keys in locks, opening food packets, and wringing out towels. The group of severe HOA includes all individuals with multiple erosive HOA joints. Compared to men, women had a higher prevalence of erosive HOA. When compared to non-severe HOA, severe HOA was substantially associated with hand pain and a low grip strength. Based on the KL grade and the presence of erosive HOA, the erosive HOA group had a significantly higher prevalence of hand pain than the other groups. Low grip strength has been associated to hand pain.⁶

Hand pain was observed to have a significant correlation with the DIP and first CMC joints in patients with severe OA. 89.9% of men and 92.3% of women had radiographic HOA, which is significantly higher than the rates found in earlier research conducted in the US, Europe, and Asia. The multivariate logistic model showed a significant association between severe hand pain, grip strength, or HOA. When it comes to hand pain or weak grip strength, the severity of HOA may be significant. A substantial correlation between hand pain and erosive HOA, suggesting that hand pain was more closely correlated with erosion than with the severity of HOA.⁶

Grip strength and hand pain had a significant association with severe HOA, which was characterized as KL grade 3. Furthermore, there was a correlation between severe HOA and hand pain, especially in the DIP and first CMC joints.⁶

Hand exercise program is used to enhance the range of motion and grip strength. In the exercise program 6 exercises are given for which therapy putty is necessary to carry out the exercise program. The exercise program including exercise will be performed for the 6 days per week for 8 weeks.⁷

The aim of the study to find out the effect of hand exercise program on pain and grip strength in post-menopausal women with hand OA.

The objectives are to assess the effect of hand exercise on pain and grip strength using in post- menopausal women with hand osteoarthritis.

MATERIALS & METHODS

MATERIALS

1. Consent form
2. Scale sheets
3. Therapy putty
4. Hand dynamometer

METHODOLOGY

- Study Type – Experimental study
- Study duration – 6 months
- Type of sampling – Purposive sampling
- Sample size – 50
- Study setting – Tertiary care and community in Sangli-Miraj-Kupwad

PROCEDURE

Ethical committee clearance will be obtained. Total 50 Participants will be selected from Sangli-Miraj-Kupwad according to the inclusion and exclusion criteria. From the participants written consent will be taken. Entire study will be explained to the participants in their language. Pre intervention assessment using McGill's Questionnaire for pain and hand dynamometer for grip strength and AUSCAN for hand function. The Exercise

programme will be done for the 2 months. Post intervention assessment using McGill's questionnaire for pain and HAND DYNAMOMETER for grip strength and AUSCAN for hand function.

HAND EXERCISE PROGRAM

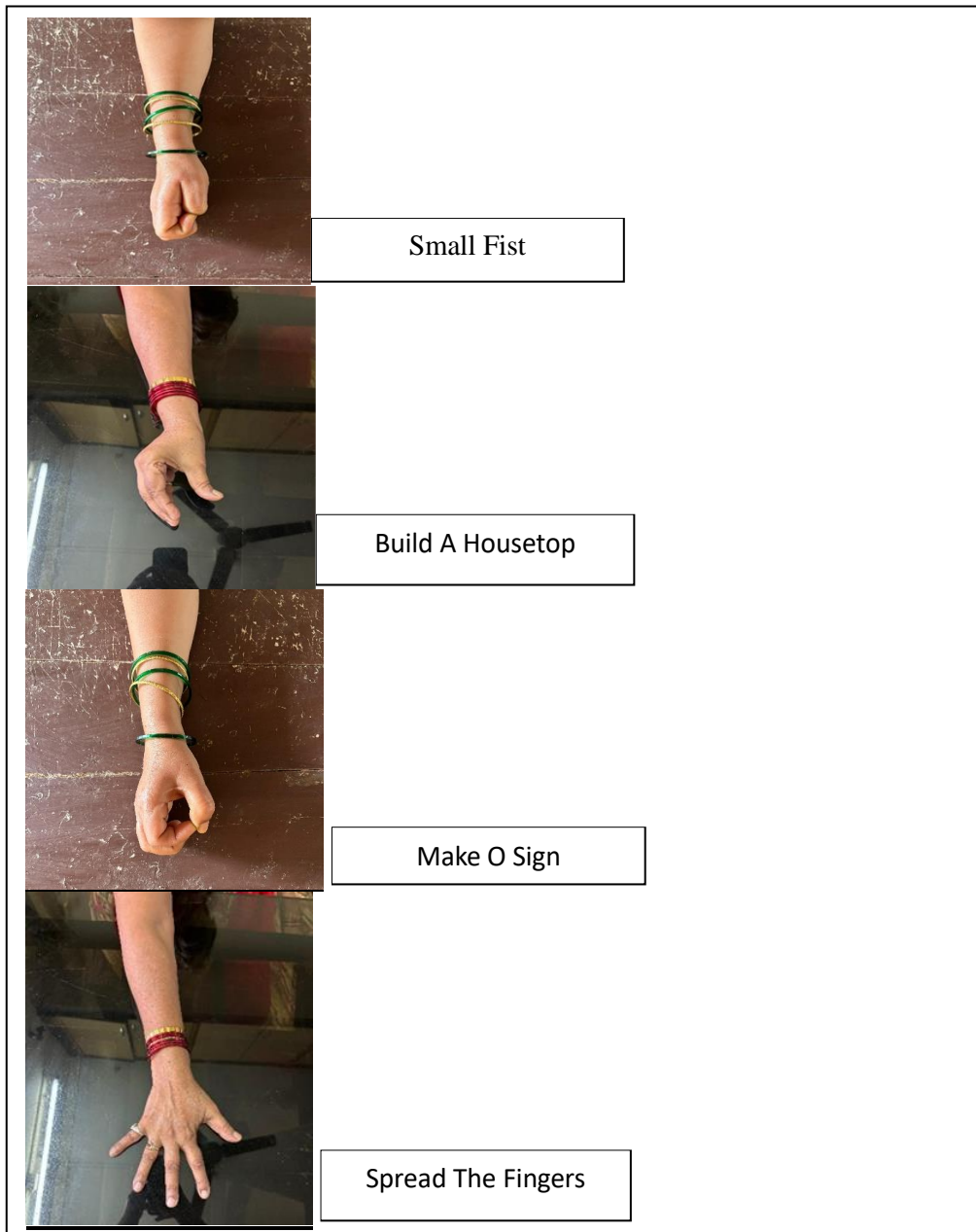
This program will be used to improve the grip strength and reduce the pain which will eventually improve the hand functions. Therapy putty will be required for exercise training.

- Small fist
- Build the Housetop
- Make O sign
- Spread Fingers
- Lateral Pinch
- Exercise with Therapy putty

Each exercise has to be performed for the 8 weeks. Repetitions will be progressed as 10 repetitions for week 1-2, 12 repetitions in 3-4 week and 15 repetitions in 5-8 weeks. Participants have to perform the program for 6 days in which the repetitions will be progressed.

STATISTICAL ANALYSIS

Statistical analysis was performed by using SPSS 23, and as the sample size is less than 2000 so Shapiro-Wilk test used to identify the normality and found data do not follow normal distribution by ($P < 0.05$). Data set is not normally distributed as all the variables have not indicated p-value greater than 0.05 in the observation. The researcher shall use non-parametric test for data analysis purpose in the following sections. As the collected data is not normally distributed, to find out the effect within the group, paired sample Wilcoxon test is used. $P < 0.05$ considered as statistically significant in the study (CI 95%).



RESULT

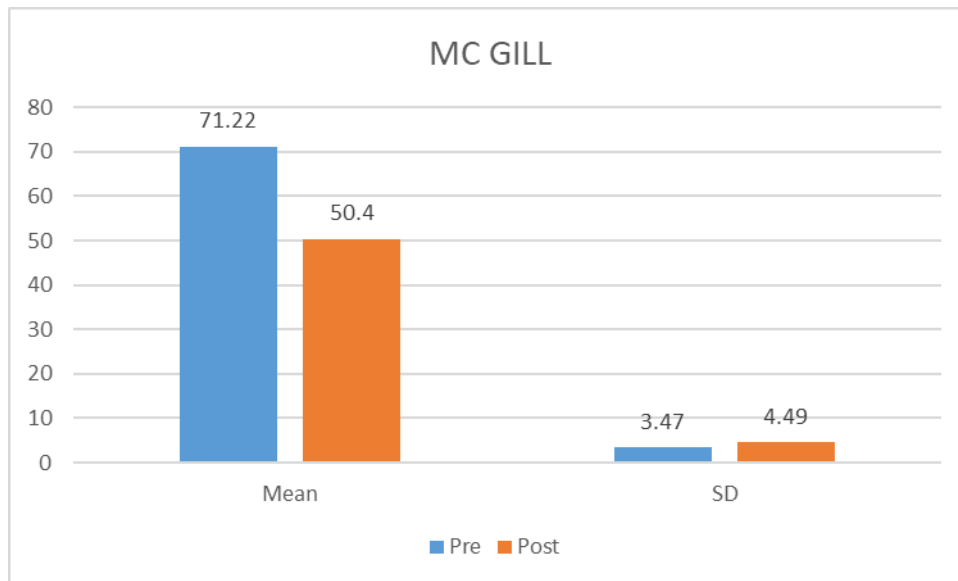
Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is

less than the 5% significance level (i.e. $0.001 < 0.05$) in the study and therefore it justifies the improvements in health outcome post intervention.

Comparison of pre-test and post-test scores of MC GILL by paired sample Wilcoxon test

Table no 2

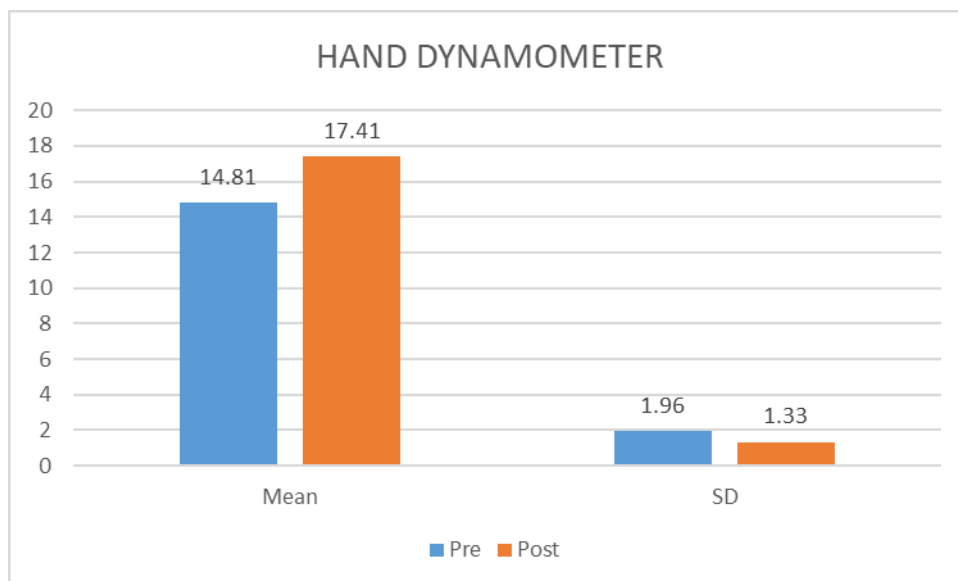
Times	Mean	SD	Mean Diff.	SD Diff.	Effect size	z-value	p-value
Pre	71.22	3.47	20.82	4.58	4.55	6.160	0.001*
Post	50.40	4.49					



Comparison of pre-test and post-test scores of hand dynamometer by paired sample Wilcoxon test

Table no 3

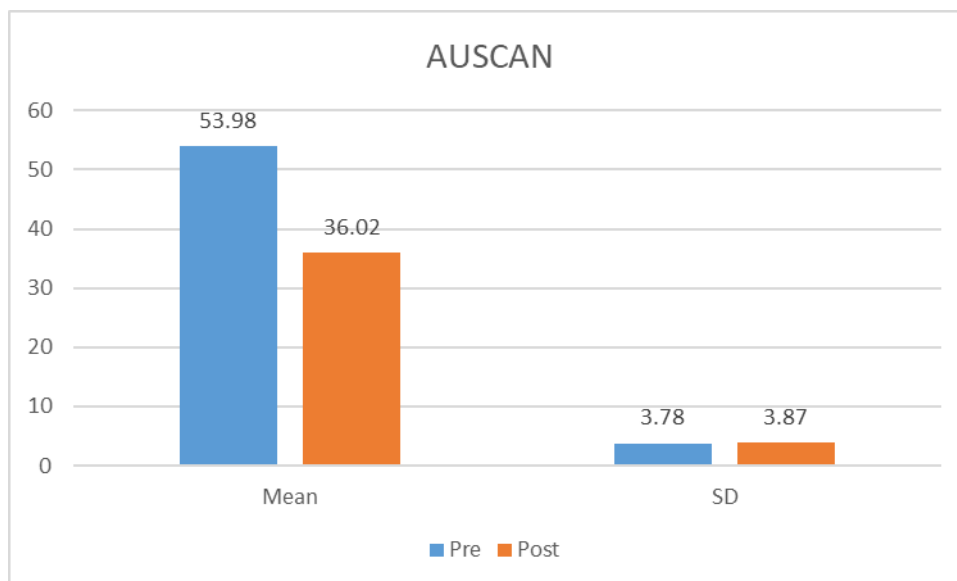
Times	Mean	SD	Mean Diff.	SD Diff.	Effect size	z-value	p-value
Pre	14.81	1.96	2.60	0.99	2.63	6.156	0.001*
Post	17.41	1.33					



Comparison of pre-test and post-test scores of AUSCAN by paired sample Wilcoxon test

Table no 4

Times	Mean	SD	Mean Diff.	SD Diff.	Effect size	z-value	p-value
Pre	53.98	3.78	17.96	4.71	3.81	6.161	0.001*
Post	36.02	3.87					



DISCUSSION

This study was done to find out the effect of Hand Exercise on Hand Osteoarthritis amongst post-menopausal women. The study includes post-menopausal women whose age differs between 50-65 years and the post-menopausal period of 4-5 years. In Hand OA, patient mainly complains about pain in hand, joint stiffness and reduced strength, which affects the daily activities of patient.

The study used three outcome measures which are McGill's Questionnaire, Hand Dynamometer and American/Canadian Osteoarthritis Hand Index. The statistical analysis showed that there is a significant statistical analysis between pre and post treatment values with p-value is less than the 5% significance level (i.e. $0.001 < 0.05$) in the study and therefore it justifies the improvements in health outcome post intervention. In this study McGill's Questionnaire used to assess the pain pre and post intervention where it shows that the pain is significantly reduced post treatment i.e. p-value is 0.001. Another study was conducted to assess the quality and intensity of pain where they found that people with hand osteoarthritis frequently express symptoms of pain that are similar to neuropathic pain.⁸ Another study was conducted to assess the effect of splints and

hand exercises in hand OA, they found out that there is decrease in pain with the use of splint and exercises, they used visual analog scale for pain and Grippit electronic instrument for the grip force where there is significant result in their study.⁹

In this study Hand Dynamometer used for the measurement of grip strength, in pre and post intervention there is significant improvement in the grip of the patients. Our study shows that there is statistical reliable difference between pre and post treatment with p-value < 0.001 . Another study was conducted to assess the improvement of hand function in hand OA with joint protection and hand exercises, to calculate the grip strength they used Martin virgorimeter. They found the significant increase in grip strength in the both hands of participants.¹⁰ For the hand function and the pain intensity AUSCAN scale is used which shows the significant difference in pre and post intervention with p-value < 0.001 . Another study was conducted to check the correlation between AUSCAN and PRWHE in patients with CMC OA, where they found strong correlation between AUSCAN and PRWHE scale.¹¹

In Hand OA, most common symptoms patient suffers are pain in joint, stiffness and reduced grip strength and grip force these all will lead to reduced hand function.

Another study was done to assess the prevalence and risk factors for hand osteoarthritis where they found that in females there are high chances of osteoarthritis than males and high prevalence of DIP joint in hand OA in females.⁴ Another study was conducted to find out the importance of hormonal changes in midlife women, where they found out that hand OA is highly correlated with older age, increased bone mineral density, and decreased testosterone levels.⁵ Another study was conducted to assess the prevalence of hand OA with pain and grip strength, where they found out that 89.9% men and 92.3% women has prevalence of radiographic hand OA and hand pain or weak grip strength may be related to the severity of hand OA.⁶

For the Hand OA, there are various managements such as medical management. As the topical NSAIDs are more effective than placebos at reducing pain and enhancing function and in local analgesia such as injecting drugs such as glucocorticoids directly into the joints provides local symptomatic relief and offers another option in addition to core treatment. In adjunctive analgesia, if topical is ineffective, paracetamol can be used.² Osteoarthritic Patients who have not responded to nonsurgical treatment are advised to consider surgical treatment. For the treatment purpose, various kinds of interventions are studied.

In the study for the intervention, hand exercise programme used in which there are 6 different exercises whose repetitions progressed as per the week. For the exercises therapy putty was required so that while performing exercises the resistance of the putty will strengthen the muscles. Each exercise is done step by step so that the patient can easily understand the exercises. The exercises are done in 3 stages which are divided as week 1-2, week 3-4 and week 5-8, in these stages the repetitions are progressed. Another study was conducted to assess the effect of functional consultation and exercises on hand osteoarthritis for the

improvement of grip strength where they used combination intervention and found that significant improvement and patient satisfaction with treatment.⁷ Another study was conducted to assess the evidence based exercise programme on patient of hand osteoarthritis where they included three exercises was focused on shoulder, arm and wrist strengthening and four exercises was focused on finger joint strengthening.¹²

CONCLUSION AND SUGGESTION

The present study concluded that there is significant improvement in Grip strength and lowers the pain which simultaneously improved the patients Hand Function. The long-term effects of Hand OA rehab need to followed up as it's a necessity to monitor the muscular strength and joint range post the onset of OA.

Declaration by Authors

Ethical Approval: Approved

Acknowledgement: None

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

REFERENCES

1. Singh A, Das S, Chopra A, Danda D, Paul BJ, March L, Mathew AJ, Shenoy P, Gotay C, Palmer AJ, Antony B. Burden of osteoarthritis in India and its states, 1990–2019: findings from the Global Burden of disease study 2019. *Osteoarthritis and Cartilage*. 2022 Aug 1;30(8):1070-8.
2. Ghosh B, Gupta M, Mandal S, Ganguly S, Ghosh A. Prevalence and risk factors for hand osteoarthritis. *Indian Journal of Rheumatology*. 2014 Dec 1;9(4):163-6.
3. Marshal M, Watt FE, Vincent TL, Dziedzic K. Hand osteoarthritis: clinical phenotypes, molecular mechanisms and disease management. *Nature Reviews Rheumatology*. 2018 Nov;14(11):641-56.
4. Watt FE. Hand osteoarthritis, menopause and menopausal hormone therapy. *Maturitas*. 2016 Jan 1; 83:13-8.
5. Dennison EM. Osteoarthritis: The importance of hormonal status in midlife women. *Maturitas*. 2022 Nov 1; 165:8-11.

6. Van der Oest MJ, Duraku LS, Andrinopoulou ER, Wouters RM, Bierma-Zeinstra SM, Seles RW, Zuidam JM. The prevalence of radiographic thumb base osteoarthritis: a meta-analysis. *Osteoarthritis and Cartilage*. 2021 Jun 1;29(6):785-92.
7. Kodama R, Muraki S, Oka H, Iidaka T, Teraguchi M, Kagotani R, Asai Y, Yoshida M, Morizaki Y, Tanaka S, Kawaguchi H. Prevalence of hand osteoarthritis and its relationship to hand pain and grip strength in Japan: The third survey of the ROAD study. *Modern rheumatology*. 2016 Sep 2;26(5):767-73.
8. Mulrooney E, Magnusson K, Hammer HB, Dagfinrud H, Kvien TK, Haugen IK. Assessing pain characteristics in persons with hand osteoarthritis using the McGill pain questionnaire. *Osteoarthritis and cartilage*. 2019 Apr 1;27:S407-8.
9. Huang L, Liu Y, Lin T, Hou L, Song Q, Ge N, Yue J. Reliability and validity of two hand dynamometers when used by community-dwelling adults aged over 50 years. *BMC geriatrics*. 2022 Dec;22(1):1-8.
10. McQuil an TJ, Vora MM, Kenney DE, Crisco JJ, Weiss AP, Ebert KA, Snelgrove KE, Sarnowski A, Ladd AL. The AUSCAN and PRWHE demonstrate comparable internal consistency and validity in patients with early thumb carpometacarpal osteoarthritis. *Hand*. 2018 Nov;13(6):652-8.
11. Stoffer-Marx MA, Klinger M, Luschin S, Meriaux-Kratochvila S, Zettel-Tomenendal M, Nel-Duxneuner V, Zwerina J, Kjekken I, Hackl M, Öhlinger S, Woolf A. Functional consultation and exercises improve grip strength in osteoarthritis of the hand—a randomised controlled trial. *Arthritis Research & Therapy*. 2018 Dec;20(1):1- 1.
12. Campos-Villegas C, Pérez-Alenda S, Carrasco JJ, Igual-Camacho C, Tomás-Miguel JM, Cortés-Amador S. Effectiveness of proprioceptive neuromuscular facilitation therapy and strength training among post-menopausal women with thumb carpometacarpal osteoarthritis. A randomized trial. *Journal of Hand Therapy*. 2022 Aug 7.
13. Boustedt C, Nordenskiöld U, Lundgren Nilsson Å. Effects of a hand-joint protection programme with an addition of splinting and exercise: one year follow-up. *Clinical rheumatology*. 2009 Jul; 28:793-9.
14. Stamm TA, Machold KP, Smolen JS, Fischer S, Redlich K, Graninger W, Ebner W, Erlacher L. Joint protection and home hand exercises improve hand function in patients with hand osteoarthritis: a randomized controlled trial. *Arthritis Care & Research: Official Journal of the American College of Rheumatology*. 2002Feb;47(1):44-9.
15. Kjekken I, Grotle M, Hagen KB, Østerås N. Development of an evidence-based exercise programme for people with hand osteoarthritis. *Scandinavian journal of occupational therapy*. 2015 Mar 4;22(2): 103-16.

How to cite this article: Prachi Kamble, Vrushali Bhore. Effect of hand exercise programme on pain and grip strength amongst post-menopausal women with hand osteoarthritis - a randomized clinical trial. *Int J Health Sci Res*. 2024; 14(10):355-362. DOI: <https://doi.org/10.52403/ijhsr.20241037>
