International Journal on Science and Technology (IJSAT)
E-ISSN: 2229-7677 ● Website: www.ijsat.org ● Email: editor@ijsat.org

A Study to Assess the Effectiveness of Bone strengthening Exercise on Osteoarthritic Index among Vv Diagnosed with Osteoarthritis In selected Hospital at Tiruvannamalai

Mrs K. Guna
M.Sc., (N) II Year Student
Vignesh Nursing College
Manalurpet Road, Kizhanaikarai,
Tiruvannamalai – 606 603, Tamilnadu

Dr. (Mrs). S. Vijayalakshmi
R.N., R.M., M.Sc. (N), M.A., Ph.D. (N),
Principal & Professor in Nursing
Vignesh Nursing College
Manalurpet Road, Kizhanaikarai,
Tiruvannamalai – 606 603, Tamilnadu.

ABSTRACT
A study to assess the effectiveness of bone strengthening exercise on osteoarthritic index among patients diagnosed with osteoarthritis in selected hospital at tiruvannamalai.

INTRODUCTION
Osteoarthritis (OA) is degenerative joint disease or degenerative arthritis; it is the most common chronic condition of the joints. OA can affect any joint, but it occurs most often in knees, hip, lower back and neck, small joints of the fingers and the bases of the thumb and big toe.

The western Ontario and Mc-master universities osteoarthritis index (WOMAC) is a widely used, proprietary set of standardized questionnaires used by health professionals to evaluate the condition of patients with of osteoarthritis, including pain, stiffness and physical functioning of the joints.

Non – pharmacological treatment for osteoarthritis include bed rest, exercise, application of therapeutic exercise and alternative treatment like yoga and acupressure which had no side effects. Bone strengthening exercise it's reduced pain, stiffness and promotes physical function.

OBJECTIVE
To assess the effectiveness of bone strengthening exercise on osteoarthritic index among patients diagnosed with osteoarthritis in selected hospital at tiruvannamalai.

DESIGN
The research design adapted for this study is quasi-experimental pre-test and post –test only design.

SETTING

Mother orthopedic speciality hospital,40 beded hospital, bybass road at Tiruvannamalai district.

SAMPLING TECHNIQUE

Non probability convinence sampling technique was used to select the patients diagnosed with osteoarthritis(30 were assigned to experimental group and 30 to control group).

SAMPLE

60 patients diagnosed with Osteoarthritis (30 in experimental group and 30 in control group)between the age of 40 – 55 years, who fulfilled the sample selection criteria.

INTERVENTION:

Bone strengthening exercise demonstrated through video teaching for 15-20 minutes for 21 days.

MEASUREMENT OF THE TOOL:

Osteoarthritis index is assessed by using modified WOMAC index scale comprised of 24 items with 3 substances as, pain (5 items), joint stiffness (2 items) and physical function (17 items).

The comparison of pre-test and post test score of osteoarthritic index among patients diagnosed with osteoarthritis within experimental group, revealed that the calculated paired value -13.62 was found to be statistically significant at $p<0.001$. This clearly shows that the implementation of bone strengthening exercise had shown a significant reduction in osteoarthritic index among patients diagnosed with osteoarthritis in experimental group than the control group.

The comparison of pre-test and post test score of osteoarthritic index among patients diagnosed with osteoarthritis between experimental group and control group revealed that the calculated unpaired value t-13.58 was found to be statistically significant at $p<.0.001$ which indicates that there was difference in the post test score of osteoarthritic index between the groups, this clearly shows that the practice of bone strengthening exercise had reduction in osteoarthritic index among patients diagnosed with osteoarthritis.

CONCLUSION:

The study findings concluded that there was a statistically highly significant difference in the score of osteoarthritic index after implementation of bone strengthening exercise demonstration and this proved to be an effective alternative therapy and non-pharmacological therapy for reduction of osteoarthritic index.

IMPLICATIONS FOR CLINICAL PRACTICE:

The significant reduction of osteoarthritic index among patients diagnosed with osteoarthritis after the bone strengthening exercise suggested that the researcher play an important role in creating awareness about bone strengthening exercise for the reduction of osteoarthritic index and also educate, reinforce the public about the health benefits of bone strengthening exercise. Further, researches have suggested evaluating the effectiveness of bone strengthening exercise among patients diagnosed with osteoarthritis in different settings.

CHAPTER-I
INTRODUCTION

"Being able to walk pain – free is a blessing.
Being able to walk without showing the pain is a skill".

- Kylie McPherson

1.1 BACKGROUND OF THE STUDY

Aging is a normal process of time related to change, begins with birth and continuous through the life. A man man's life normally divided into five main stages namely infancy, childhood, adolescence, adulthood and old age. In each stages an individual has to find himself in different situations and face different problems. In aging is physical strength deteriorates, mental stability diminishes: money power becomes bleak coupled with negligence from younger generation

Aging is a process that converts healthy adults into frail ones, with diminished reserve in most psychological system and an exponentially increasing vulnerability to disease and death. **Homnath chalise, (2019)**

Aging is normal process of becoming 40 to 55 years; aging affects both the body and the mind. Some age related changes starts early as the 20s; others may not appear until people are in their 70s. Although aging is inevitable, people age at different rates. Age related changes eventually lead to the increased probability of the death as people grow older. Age is strong predictor of the disease and therefore increasing age and extended life expectancy will results in a greater occurrence of disease. **Joao pedro de megalhaes., (2017).**

The 2016 Global burden of disease study reports that the burden of musculoskeletal disorders is much larger than estimated in previous assessments and accounts for 6.8% DALYs worldwide. The most common and disabling musculoskeletal disorders for older age adults are osteoarthritis, back and neck pain, injuries an systemic inflammatory conditions such as rheumatoid arthritis, Psoriatic arthritis, gout, ankylosing spondylitis, osteoporosis, osteopenia and associated bone fragility fractures, muscles such as sarcopenia. An estimated 10% to 15% of all older age adults have some degree of osteoarthritis. Osteoarthritis is the second most common rheumatological problem and it is the most frequent joint disease with prevalence of 22% to 39% in India. Nearly, 45% of women over the age of 45 years have symptoms while 70% of those over 45 years show radiological evidence of OA. **Pal CP, (2016)**

Dillon et al., (2017) It has been estimated that over 27 million persons in the united- states have osteoarthritis in one or both joints. Symptomatic osteoarthritis along affects 12% of American adults, making it one of the most frequent causes of physical disability and pain among older persons. Such persons offer report difficulty with daily activities such as walking, climbing stairs, shopping and standing up from a seated position due to joint pain, stiffness and disability.

Worldwide prevalence of osteoarthritis was 20% for men and 41% for women and it causes pain and dysfunction in 20% of the elderly. In India osteoarthritis is the 2nd most common disorder and has a

prevalence rate of 22 to 39%. Osteoarthritis of the knee typically affects women more than men and prevalence rate between 10-15% at age 35 and 35-45% at age above 55 years. **Ganapathi swami, (2016)**

Osteoarthritis (OA) is a chronic degenerative disorder of multifactorial etiology characterised by the loss of articular cartilage, hypertrophy of bone at the margins, subchondral sclerosis and range of biochemical and morphological alterations of the synovial membrane and joint capsule. Osteoarthritis may develop in any joint but most commonly affects the knees, hip, hands, face joints and feet. Osteoarthritis of the knee is a major cause of mobility impairment, particularly among female. There is no cure, but treatments are available to manage symptoms. Long-term management of the disease will include several factors and managing symptoms, such as pain, stiffness and swelling, improving joint mobility and flexibility, maintaining a healthy weight, getting enough of exercise**. Chandra prakash pal,(2016)**

Epidemiology of knee osteoarthritis in India and related factors is a community based cross sectional study was done to find out the prevalence of primary knee OA in India which has a population of 1.252 billion. The study was done across five states in India. Each state was further divided into big city, small city, town, and village. The total sample size was 5000 subjects. Tools consisted of a structured questionnaire and plain ski grams for confirmation of Osteoarthritis. Diagnosis was done using Kellgren and Lawrence scale for osteoarthritis. Overall prevalence of knee Osteoarthritis was found to be 28.7%. The associated factors were found to be female gender (prevalence of 31.6%), obesity, age and sedentary work**. Indian journal of orthopedics, (2016)**

The major symptoms present in osteoarthritis are pain and functional disability. The knee is most common site for osteoarthritis with characteristic sign like pain, stiffness, tenderness, swelling, crepitus and loss of movement, valgus deformity, locking of the knee, on auscultation of joint – scratching, crepitus and later on loud crackling sound. In addition, they have a lot of functional limitation when sitting and standing or going up and down stairs. **Sumathi.g, Ramamurthy,(2019)**

Osteoarthritis is one of the major causes of impaired function that reduce quality of life. More than 50% of people over 45 years of age have evidence of osteoarthritis. The pain and disability associated with osteoarthritis affects approximately 10% of men and 18% of women over60 years of age have evidence of osteoarthritis. The incidence and prevalence of osteoarthritis was continued to rise as the population ages unless measures are taken to improve disease prevention. **Zhangand Ashraf (2015)**

Exercise is one of the most non pharmacological management strategies for osteoarthritis of the knee. Health care providers and Patients share varied and often pseudoscientific beliefs regarding the effects of exercise on knee osteoarthritis formulated on outdated notion of the etiology, pathophysiology, and progression of the condition. Based on the literature, regular exercise should moderate physical activity have both preventive and therapeutic benefits for individuals with knee osteoarthritis Exercise regimens with strong evidence of benefit include those that focus on aerobic/cardiovascular conditioning and lower extremity strength training. Through the isometric exercise the functional immobility will reduce. So that, the old age people can does their daily activities normally.

Although exercise is recommended for anyone, osteoarthritis exercise is intended to maintain and build muscle strength without aggravating the body in those suffering from the disease. Physiotherapy involves a safe, gradual programme designed to increase mobility while, at the same time reducing pain. Osteoarthritis physical therapy can be extremely beneficial and with increased endurance and the build-up of muscle tissue, and activities of the older adult age people. Regular physical activity

is crucial when dealing with osteoarthritis as it was help to increase both muscle and strength while increasing flexibility and decreasing fatigue, another common symptoms osteoarthritis. Both isotonic and isometrics are considered to be strengthening exercise those who are affecting with knee pain with osteoarthritis especially in old age adult people. **Chaitow (2015)**

Therapeutic strengthening exercises are recommended as part of the standard interventional programme for the patient with Osteoarthritis in an effort to control pain and improve functional and health status. Strengthening exercise alone has some effects on improving pain and functional outcomes in client with OA. However in order to maximize the effectiveness of strengthening exercise with a more complete exercise program including ROM, stretching, functional balance exercises. **Chandra prakashpal., (2016)**

Non pharmacological treatment for osteoarthritis includes bed rest, exercise, application of heat packs, mustard plaster, mud therapy and alternative treatment like yoga and acupressure which had no side effects. Demonstration of bone strengthening exercise in our daily is it reduces the pain, stiffness, increase physical function and strengthens to the bones and cartilages. **Kapsta H (2007).**

1.2 NEED FOR THE STUDY

Osteoarthritis is a common, chronic condition that affects older adults. Age is the greatest risk factors for osteoarthritis. It begins in the third decade of life and peaks between the 5^{th} and 6^{th} decades. Prevalence of osteoarthritis is about 70% in the people between the ages of 40 -55 years, 90% of the population have degenerative joint changes in their weight bearing joints, even though clinical symptoms are usually absent. Osteoarthritis is a major cause of disability in both the developed and developing world. With the population aging, the prevalence of osteoarthritis is increasing and its consequences are having an impact on society. This is one of the reasons why osteoarthritis has been adopted as a major focus.

MK Reza, (2021) Efficacy of specified manual therapies in combination with supervised exercise protocol for managing pain, stiffness and functional disability in patients diagnosed with OA. The study was based on a two arm parallel-group randomized controlled trial design, including a total of 32 participants with OA randomly divided into group A and B. Group A received a supervised exercise protocol; however , group B received specified manual therapies in combination with a supervised exercise protocol. Pain, stiffness and functional disability were measured with the numeric pain rating scale (NPRS) and WOMAC respectively. Data were collected at baseline, pre intervention 2 weeks and 4 weeks post intervention. To evaluate the efficacy of specific manual therapies with supervised exercise compared to supervised exercise alone, an unpaired t-test and repeated measures ANOVA were used to analyze the data, keeping the level of significance at $p<0.05$. Study conducted that the specified manual therapies, in combination with a supervised exercise protocol more effective than a supervised exercise protocol along for improving pain, stiffness and physical difficulty**.**

Narges Jahantigh Akbar., (2019). The effects of strengthening and balance exercise on static stability in women with knee OA. In this single-blind randomized controlled study, 13 patients were determined through available sampling method and randomly assigned to strengthening exercise and balance exercise groups. Strengthening exercise were based on quadriceps strengthening and in the

balance exercise group, it include balance exercises. The treatment was performed 15 sessions for 3 weeks. The analyzed by paired t-test and independent t-test. In strengthening groups, at the static status, overall reduce 1.26+ 0.82 to 0.76+0.48(p=0.01). In the balance exercise group, in the static status, overall 8.23+3.32 to 6.77+2.95(p=0.001), respectively. However, strengthening exercise caused improvement in the greater number of stability indices to those in the balance exercise group.

Omer Gezginaslan.,(2018). Effects of isokinetic muscle strengthening exercise. This study aims to assess the effects of isokinetic quadriceps and hamstring strengthening exercise for 6 weeks balance, proprioception and physical function in patients diagnosed with OA. A total 39 participants (30 females and 9 males) range of 40-60 years patients diagnosed with OA. All participants received isokinetic quadriceps and hamstring exercise for 6 weeks. The WOMAC subscale scores and VAS scores and physical function tests significantly improved compared to the pre -treatment result ($p<0.01$). Statistically significant correlation were found between score changes and pre- and post-treatment VAS ($p=0.017$), WOMAC ($P=0.005$). Result, this exercise program improves the quality of life.

Sanket k parekh., (2017) Effect of taping and exercise in physical performance of osteoarthritis. In this study, total 50 participant were recruited, 25 participants in each group. In the present study, we found that there was a statistically significant improvement in WOMAC with $p<0.001$ in group taping and exercise, while in only exercise group $p=0.05$.

Yananli.,(2015) The effect of resistance exercises in patients with osteoarthritis. The meta-analysis results suggested that resistance exercise trained relieved pain, stiffness and promote physical function. Standard mean difference 95% confidence , alleviated stiffness 95% and improved physical function 95% in $p<0.01$. The researcher was interested in using bone strengthening exercise in her intervention to reduce the osteoarthritic index among Patients diagnosed with osteoarthritis improving the quality of life.

Hemavathy.v (2015) conducted a pre-experimental study among 30 osteoarthritis patients at Sivananda Gurukulam old age home at chennai. In pre-test, out of 30 samples majority of them 15(50%) had severe knee pain, 10(33%) had moderate knee pain and 5(17%) had mild pain and none of them no pain. In post-test, out of 30 samples majority of them got relieved from knee joint pain 8(27%), 18(60%) had mid knee pain, 4(13%) had moderate pain and none of them have severe and extreme pain. The overall paired 't' test value is 20.3. It is hypothesized that there is significant in effectiveness of mustard plaster application. It was inferred that experimental group who received mustard plaster application were found to be effective at the level of $p<0.001$.

From above this study it is quite evident that bone strengthening exercise plays a major role in the management of OA. This demonstration of bone strengthening exercise emphasizes the importance of stretching all muscles that cross the given joint affected by OA. Bone strengthening exercises improve the functional mobility of the joints in patients diagnosed with osteoarthritis. When the mobility increases joint pain decrease. And these bone strengthening exercise does not take much time, requires no special equipment's except comfortable place to do. Hence the researchers interested is observing the effect of a regular bone strengthening exercise t the population aging, theherapy is reducing pain, stiffness and improved physical function.

1.3 STATEMENT OF THE PROBLEM

A study to assess the effectiveness of bone strengthening exercise on osteoarthritic index among patients diagnosed with osteoarthritis in selected hospital at tiruvannamalai.

1.4 OBJECTIVES

1. To assess the pre and post-test level of osteoarthritic index in experimental and control group among patients diagnosed with osteoarthritis

2. To compare the osteoarthritic index within experimental and control group among patients diagnosed with osteoarthritis.

3. To compare the osteoarthritic index between experimental and control group among patients diagnosed with osteoarthritis.

4. To correlate the osteoarthritic index between experimental and control group among patients diagnosed with osteoarthritis

5. To associate the mean difference of osteoarthritic index in experimental and control group among diagnosed with osteoarthritis with their selected demographic variables.

1.5 OPERATIONAL DEFINTIONs

EFFECTIVENESS

It refers to expect outcome of bone strengthening exercise to reduce the pain, stiffness and improvement of physical function among patients diagnosed with osteoarthritis which is assessed by using modified WOMAC index scale

BONE STRENGTHENING EXERCISE

It refers to set of exercise provide by researcher through video teaching 15 - 20 min exercise should perform daily at morning for 21 days.

OSTEOARTHRITIC INDEX

It refers to assess the osteoarthritis; it includes pain, stiffness and physical functioning of joints by using modified WOMAC index scale which comprised of 24 items with 3 substances such as pain – 5 items, stiffness – 2 and physical function – 17 items.

1. PAIN

Pain in the joints. It can originate in any of the bony structures compromising the elbow, hip, knee and ankle joints. In this study unpleasant bodily sensation experienced by osteoarthritis patients which is self – reported and measured by using WOMAC pain subscale.

2. STIFFNESS

It is inability to move joints easily.

3. PHYSICAL FUNCTION

Physical describe osteoarthritis patient's inability to move around in his or her environment. In this study the patients diagnosed with osteoarthritis can able to move freely and do the daily activities are.(E.g. walking, sitting on the floor and standing from the floor, lifting, bending, and climbing etc. Which are measurable and reportable). In this study the physical function is assessing by using modified WOMAC index scale.

OSTEOARTHRTIS

Osteoarthritis symptom includes pain, stiffness of joint and difficulty in performing physical function among patients diagnosed with osteoarthritis, which is measured by modified WOMAC index scale.

1.6 ASSUMPTIONS:

- Osteoarthritis patients may have joint pain, stiffness and altered physical function.
- Bone strengthening exercise may be effective in reducing osteoarthritic index with Osteoarthritis patient.
- Osteoarthritis patients may share their knowledge and benefit of bone strengthening exercise to their neighbors and relatives.
- Bone strengthening exercise may not have any side effects.

1.7 NULL HYPOTHESIS

- N_{H1}-There is no significant difference in osteoarthritic index within the experimental and control group of patients diagnosed with osteoarthritis at $p<0.05$ level.
- N_{H2}-There is no significant difference in osteoarthritic index between the experimental and control group of patients diagnosed with osteoarthritis at $p<0.05$ level.
- N_{H3}-There is no significance correlation of osteoarthritic index between experimental and control group among patients diagnosed with osteoarthritis at $p<0.05$ level.

➢ NH_4-There is no significant association of mean difference score of osteoarthritic index in experimental and control group among patients diagnosed with osteoarthritis with their selected demographic variables at $p < 0.05$ level.

1.8 DELIMITATION:

❖ The data collection period is delimited to 4 weeks.

❖ The study is delimited to patients diagnosed with osteoarthritis who were admitted(OP and IP) in selected mother orthopedic specialty hospital.

❖ The study is limited to severe joint pain patients diagnosed with osteoarthritis.

CONCEPTUAL FRAMEWORK:

Conceptual framework of study is based on **General System Theory.** It is focus on interaction and on relationship between parts in order to understand an entity's organization, functioning and outcomes.

Conceptual frame work is a device that helps to stimulate researcher and extension of knowledge by providing both direction and impetus **(Polit &Hungler, 1999).**

A theory is a group of related concepts that propose action that guide practice. General system theory describes " how to break whole things into parts and then to learn how to parts work together in systems". General system theory is known as different names – system theory, theory of open systems, system model and family system theory.

The basic elements are,

- Input
- Throughput
- Output
- Process
- Feedback

Conceptual framework serves as a guide (or) map to systematically identify a logical, precisely defined nursing relations between parts that connect them to a whole . The conceptual work based on General system theory of the nursing relations is used of the present study. The researcher compared the effectiveness of bone strengthening exercise on osteoarthritic index among patients diagnosed with osteoarthritis in selected hospital at tiruvannamalai.

1) Input:

- Maintenance inputs (energic imports that sustain system)
- Production inputs (energic imports which are processed to yield a productive outcome)

2)Throughput:

- Work done on those resources used to produce a product

3) Output:

- Exit or change exiting the system

- System returns the product to the environment

4) Process:

- Provides a series of mechanical or chemical operations on something in order to change or preserve it.

5) Feedback:

- Information about a reaction to a product
- Used as basis for improvement.

i)Positive feedback - move from status quo

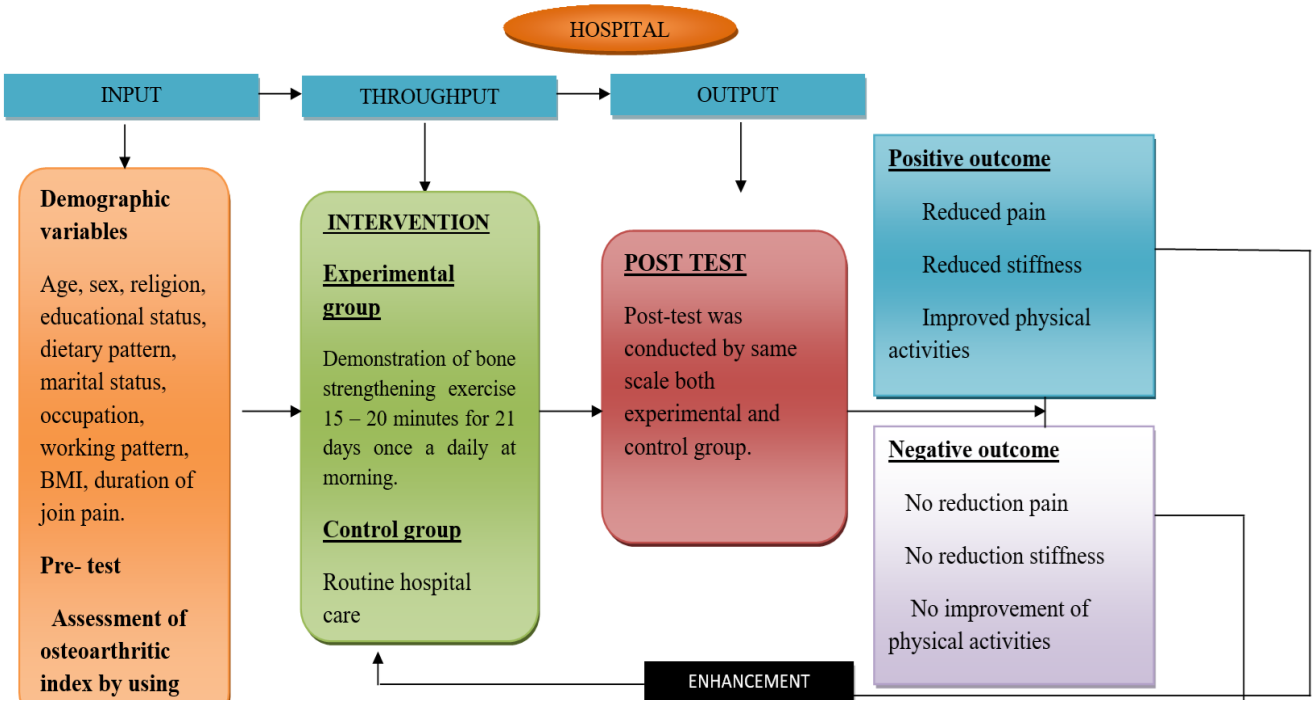
ii)Negative feedback – return to status quo

Delibrative action

It means exploring the meaning and relevance of an action to the patient, these actions are evaluated for effectiveness immediately after completion.

In this present study activity is assess effectiveness of bone strengthening exercise on osteoarthritic index among patients diagnosed with osteoarthritis.. In experimental group will be conducted demonstration of bone strengthening exercise 15 – 20 min once daily for 21 days at morning to osteoarthritic index among patients diagnosed with osteoarthritis by using WOMAC index scale which contains 24 items (pain subscale- 5 items),(stiffness subscale-2 items),(physical subscale – 17 items) through demonstration of bone strengthening exercise 15- 20 minutes once a daily for 21 days at morning. In control group followed routine practice.

CONCEPTUAL FRAMEWORK BASED ON GENERAL SYSTEM MODEL (VON BERTALANFFY THEORY 1968



CHAPTER II
REVIEW OF LITERATUE

The review of literature is an essential aspect of scientific research. Its entails the identification the systematic identification, reflection, critical analysis and reporting of exiting information relation to the problem of interest. The purpose of review about the effectiveness of bone strengthening exercise among patients diagnosed with osteoarthritis.

Review of literature is a systemic study of a number of previous studies which helps to support the research work done. It gives an idea of how the study can be conducted and what is to be done for it. It is help for the investigator.

The review of literature is organized under the following section

SECTION 2.1: Studies related to prevalence of osteoarthritis.

SECTION 2.2: Studies related to pain, stiffness and physical function of osteoarthritis.

SECTION 2.3: Studies related to bone strengthening exercise on osteoarthritic index among patients diagnosed with osteoarthritis.

SECTION 2.4: Studies related to other non-pharmacological measures (newly exercise) on osteoarthritic index among patients diagnosed with osteoarthritis

Section 2.1: Studies related to prevalence of osteoarthritis.

Kiran Bala (2021) Conducted a community based cross sectional study to estimate the prevalence, incidence and risk factors of the osteoarthritis among adult population in rural Jammu. This study - to find out the prevalence and determinants of OA among the adult population. A community based, cross sectional study was conducted among 232 adults living in rural area in village kirpind of R.S Pura block, Jammu. Descriptive statistics, OA with 95% CI, and Chi-square test were used for the purpose of analysis. The Overall prevalence of knee OA was 35.7% (females: 44.5% Males: 23.1%). Age more than 40 years, female gender, history of trauma, BMI >30 were found to be significantly associated with higher odds of knee ($p < 0.05$). Descriptive statistics, OR with 95% CI and Chi- square test were used for the purpose of analysis. This Strategies' concluded on creating awareness among the rural elderly regarding the role of a balance diet, exercise and weight management along sensitization of primary health care providers concerning benefits of early screening, diagnosis and referral should be undertaken to minimize this burden**.**

Ronald Plotnikoff, (2020) Conducted a Prospective study on prevalence of osteoarthritis among elderly population study. This study objective were to investigate the prevalence of self-reported knee and hip osteoarthritis stratified by age and sex and to examine the association of modifiable factors with knee and hip OA prevalence. The study was conducted using randomly sample data gathered from communities. A large adult population sample (N=4733) of individuals >40 yrs. selected. Health related information was collected through telephone interviews and community measurements clinics for which a sub-sample (N=1808) attended. Participant's self- reported OA during telephone interviews. Clinical interviews further assessed if the diagnosis was made by a health care professional. Statistical analyses compared prevalence of OA between sexes and across age categories. Association between modifiable factors for OA and prevalence of knee and hip OA were assessed using binary logistic regression modeling. The result showed Overall prevalence of self- reported OA in the total sample was 14.8%, where 10.5% of individuals reported having knee OA and 8.5% reported having hip OA. Differences in prevalence were found for males and females across age categories for both knee and hip OA. In terms of modifiable factors, being obese (BMI>30 kg/m2) was significantly associated with prevalence of knee (OR; 4.37; 95% CI: 2.08, 9.20) and hip (OR: 2.52; 95% CI: 1.17, 5.43) OA. The prevalence of knee and hip OA concluded in this study in comparable to other studies. Females have greater than proportion of women have mobility limitations as well as hip and knee pain; it is important to target this sub-group.

Kloppenburg., (2019) Conducted an observation study to examine the prevalence and risk factors for osteoarthritis among adult population. The objectives of this study identification of risk factor were involved among the age group 40-55 years This review is based on systematic literature review covering 205 musculoskeletal disorder patients including OA, randomly selected a pub-Med search for articles published between May 1st,2018 to April ,2019. The result showed is highly prevalent and are expected to increase. Musculoskeletal disorders due to OA especially high at 40-55 years. They include 31 placebo- and active- controlled randomized controlled trial with 12 months of follow-up in patients with OA. The primary outcome was pain, stiffness and physical function, as assessed with a WOMAC or VAS. Statistically significant increase in comparison of 31.4% (95% confidence interval) (CI) 30.7 to 32.1). All these studies underline the impact OA and other musculoskeletal disorders have on individual and society. This study concluded results are crucial for health professionals and policy makers in order to plan the healthcare system of the future.

Indian journal of public health.,(2018) Conducted a cross sectional study , Prevalence of osteoarthritis of knee joint among adult population in a rural area of kanchipuram district. The objectives

of this study to assess the burden and determinants of OA knee among adult population. Data collection was done by the postgraduates, trained health workers under the supervision of principal investigator. Written and informed consent was obtained before data collection. OA was diagnosed using the criteria laid down by American College of Rheumatology and it was validated and tested in the study area. The result showed, a total of 1986 adult respondents were interviewed by the use of WOMAC questionnaires out of which 27.1% had OA of knee. Age more than 40 years, female gender, tobacco usage, illiteracy , lower socioeconomic class, positive family history of OA, diabetes and hypertension were found to be associated with OA ($p < 0.05$). This study concluded who significant improvement in both groups with regard to WOMAC and at the end of 15-30 days treatment compare to the control, experiment group had more significant improvement ($p < 0.05$).

Section 2.2: Studies Related To Pain, Stiffness and Physical Function of osteoarthritis

Alireza., (2019) Conducted an cross sectional study among patients diagnosed with knee OA. The objectives of this study describe the relationship between pain, stiffness and physical function in adults with knee osteoarthritis. This study was undertaken to describe the relationship among pain, demographic characteristics and physical function in patients with knee OA. 81 knee OA patients referring to rheumatology clinic method. Data was collected through WOMAC questionnaires, that ordered in three subscales which included pain (5-items), stiffness (2-items), physical function (17- items). Data analyzed using SPSS software. The result showed of linear regression analysis indicate the relationship among physical function, pain, stiffness and duration of disease were significant. From perform activities of daily living patients with knee osteoarthritis. Therefore, we suggest that patients become familiar with non-pharmacological pain relief methods and muscle strengthening exercises to overcome disability from disease. The result of linear regression to examine the relationship among physical function, pain, stiffness and the participants' demographics characteristics. The mean (standard deviation) age of participants 57% (30.8), showed 69% patients were married (88.2%). This study concluded observed pain, stiffness and duration of disease were significantly associated with physical function.

P.P. Flores- Garza., (2017) conducted a effectiveness of exercise therapy among patients with OA. The objectives of the study is Exercise and physical therapy have an important role in the treatment of OA with the main objectives being to reduce pain and inflammation, increase muscle strength and finally, maintain or improve range of motion. This study was a cross sectional, observational correlational study selected totally of 33 patients of both gender with an age greater than or equal to 40 years, clinically diagnosed with osteoarthritis patients were recruited and evaluated. Participants underwent the WOMAC questionnaires and its 3 components (pain, stiffness and physical function) were recorded. Subjects chosen concluding exercise therapy for 3weeks has an impact on patients' performance of activities of daily living. Patients with poor technique when performing and who did not complete the questionnaire were eliminated. A sample of 30 patients was calculated using a simple correlation when the components were analyzed separately. The result showed a significant correlation (-0.40, 95%: -0.7; -0.08, p=0.01) was found between total flexibility and functional limitation; however, there was no correlation between pain and stiffness. This study concluded suggested to conduct a study with a larger population of patients that takes accounts physical therapy and quality of life account as variables.

Faiq I, Gorial.,(2017) Conduct a cross sectional study to assess the functional status of patient with osteoarthritis (OA) in Baghdad teaching hospital/ Rheumatology outpatient clinic from March to October 2017. Out of 150, 97 female subjects were involved in the study. Diagnosed by a rheumatologist

according to revised ACR (American College of Rheumatology) criteria for classification of OA. Patients' age, gender, body mass index (BMI), smoking history, education level, and disease duration were recorded. The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) score was used to measure functional status of patients with OA. The result showed mean of total WOMAC score was 8.05±2.10 (Range 3-12). The mean WOMAC of pain score was 3.22±0.76 (1-4), stiffness score was 2.05±1.01 and for functional disability score was 2.79±0.88. Chi square test was used for discrete variables to test the association $P<0.05$ or $P=0.05$ were consider significant. The results showed there was a positive significant correlation between age of the patients and severity of OA assessed with total WOMAC score ($P=0.26$). However, this study conclude there was a significant negative correlation between educational level and total WOMAC score ($P=0.015$).

UrwinM, etal ., (2017) Conducted a descriptive study to assess the quality of life (QOl) patients diagnosed with Osteoarthritis episodic or sporadic knee pain with one group and another group were without pain. The simple random sampling technique was adapted and the sample size was 306. A Visual Analogue Scale was used to assess global QOL. Physical as well as psychosocial disability was assessed with the Stiffness Impact Profile (SIP). Coping with problems in general was assessed with Utrecht Coping List. The result showed As expected, a significantly lower QOL was found in people with more chronic knee pain ($P=0.045$). These studies conclude the difference in QOL between the group with chronic knee pain and a reference group without pain was 10%.

Tincy Varghese, (2020) Conducted a study, effectiveness of isometric on pain perception of elderly with osteoarthritis in selected hospital. A randomized trial was conducted on (25 elderly in experimental group and 25 elderly in control group) aged 40-50 years. Non probability purposive sampling technique was used for selection of the sample. A structured interview schedule and numerical pain rating scale were used for data collection and the data was analyzed using descriptive and inferential statistics. The result showed that the elderly with OA in the experimental group had reduction in pain followed by isometric exercise assigned intervention completed 2 weeks of strength training. Compared to the elderly with OA in the control group. In the experimental group, 19(76%) used pain relief strategies and rest 6(24%) were not using any pain relief strategies. In control group, 16(64%) were not using any pain relief strategies and 9(36%) were using pain relief strategies. In control group not relief from pain. This study conclude Still the result of the study exercise was shown as reduction in pain score.

Micheal T. Hirschmann., (2020) Conducted a study Effectiveness of strengthening exercise among OA patients. The aim of the present review a symptomatic patient suffering from severe end- stage OA may benefit from referral to a physical therapist for video instruction and supervision shown to act favorably on patient adherence to home exercise programs, resulting in less pain and physical functioning. This study included participants 60 patients (30 in experimental group and 30 control group). These participants assessed by WOMAC scale by 24 items questionnaires. This selected sample under physical therapist for video instruction and supervision to do home exercise programs for 3 weeks. The result showed Meta- analysis assessed the changes regarding pain and physical function in obese patient with OA who achieved a weight loss. It demonstrated a significant reduction in disability when weight reduced> 5.1% over a 20 weeks period or at the rate of > 0.24% reduction per week. This study concludes was significantly reduced pain, stiffness and improved physical function.

Xiaoyan (2019) Conducted a study, the effects of a home based exercise intervention on elderly patients with OA. The aim of this study was to evaluate the effectiveness of a home based exercise

intervention (HBEI) to reduce the OA symptoms and improve the physical functioning of elderly patients. A total of 171 elderly patients (40-60 years) with an OA were recruited from community. Patients from two community centers were randomly assigned to the intervention group(IG) and the other two centers were randomly assigned to the control group(CG) Participants in the IG received a 12-weeks HBEI (including four2-h sessions supervised by a physiotherapist and fortnight telephone support). Data were obtained from 141 patients. At week 12, the pre-test/post-test changes 3 significant between – group differences in decrease in pain intensity (-1.60(CI, -2.75 to -0.58) and stiffness (-0.79(CI, -1.37 to – 0.21), with the IG exhibiting significantly larger improvements on both measures than the CG. The result showed significantly greater improvements on all the secondary outcomes than the CG did. A large randomized controlled trial with long term follow-up is needed to confirm these findings. Professional However, one study concludes that 44.2% of osteoarthritis patient reduces knee pain, stiffness and improved physical activity**.**

Jebakani et al. (2015)., Conducted a study was, the effects of therapeutic exercise on pain and physical disability in adults with knee OA explored in the study. The participants were randomly selected (n= 118) in our final analysis. Two groups were followed with standardized therapeutic exercise program and demonstrated that a 4 week on a 3 session's per week basis. The control group (group II) followed control a conventional physiotherapy with hot packs and static quadriceps exercise. Pre-test and 4-weeks post-test measurement taken using knee injury and OA outcome score and visual analog scale. Both strengthening and balance exercise were included in the treatment of knee osteoarthritis. The results imply that therapeutic exercise is effective in greatly reducing the pain and physical disability of adults with knee osteoarthritis. In this study, VAS was to assess pain. VAS score post-intervention in the therapeutic group reduced from 6.234 to 3,292; $p<0.001$ level. This study conclude, therapeutic exercise program that includes warm-up period, active range of motion exercise cool down period reduced pain and improved physical disability among OA.

Section 2.4: reviews related to bone strengthening exercise on osteoarthritic index among patients diagnosed with osteoarthritis.

Hongbo Chen, et al., (2019) Conducted, A study to assess the effects of strengthening exercise intervention among patients diagnosed with Osteoarthritis. This study effective for relieving pain, stiffness, and improve the physical properties. A total of 171 patients diagnosed OA was selected by non-probability sampling technique. This selected sample divided interventional group and control group. These interventional groups undergone for strengthening exercise for 8 weeks. (IG: n=84, CG: n=87) were enrolled. Data were obtained from 171 patients with an average age of 68 (range, 60-86 years) who completed the 12 week study (IG: n=71, CG: n=70). No significant group differences were found in any outcome measures at baseline. The results showed at week 8, the pretest/posttest changes 3 significant between-group differences in decreases in pain intensity (-1.60(CI, -2.75 to -0.58)) and stiffness (-0.79(CI, -1.37 to -0.21)), with the IG exhibiting significantly larger improvements on both measures than the CG. The IG also showed significantly greater improvements. This study concludes that strengthening exercise significant improvement to reduce pain, stiffness and improve physical function for patients diagnosed with OA.

Marlene Fransen, et al (2019) This study conducted to determine effectiveness of therapeutic exercise is beneficial for people with osteoarthritis was carried out in British journal of sports medicine from May 2013 to 2019. Randomly selected 205 sample. The results showed indicated that exercise significantly reduced pain (12 points/100; 95% CI 10 to 15) and improved physical function (10

points/100; 95% CI 8 to 15) to a moderate degree immediately after treatment, while evidence from 13 studies revealed that exercise significantly improved quality of life immediately after treatment with small effect (4 points/100: 95% CI 2 to 5). In addition, 12 studies provided 2-6 months post-treatment sustainability data which showed significantly reduced knee pain (6 points/100: 95% CI 3 to 9) and finally the study showed improved physical function.

Hemavathy V, et al. (2016) Conducted a study to assess the effectiveness of stretching exercise on pain, stiffness, and performance of activity of patients diagnosed with knee osteoarthritis in selected hospitals in Chennai. Using purposive sampling technique, 30 samples were in the experimental group and another 30 samples in the control group. In order to assess the level of symptoms of knee osteoarthritis WOMAC Osteoarthritis Index (Western Ontario Mc- Master University Osteoarthritis Index) was used. The study results revealed that the stretching group showed significant improvements in level of symptoms (pain, stiffness, activity limitation) of knee osteoarthritis from 32.6 to 13.6 i.e., mean pre- test and post-test, while the control group didn't show any significant differences. The difference was found to be statistically significant at $p<0.001$. This study concludes that stretching exercises therefore have benefits in reducing the symptoms of knee osteoarthritis among patients with knee osteoarthritis**.**

Section 2.5: Review Related To Other Non-Pharmacological Measures on Osteoarthritic Index among Patients Diagnosed With Osteoarthritis

Tincy Varghese, (2020) Conducted a study, effectiveness of isometric on pain perception of elderly with osteoarthritis in selected hospital. A randomized trial was conducted on (25 elderly in experimental group and 25 elderly in control group) aged 40-50 years. Non probability purposive sampling technique was used for selection of the sample. A structured interview schedule and numerical pain rating scale were used for data collection and the data was analyzed using descriptive and inferential statistics. The result showed that the elderly with OA in the experimental group had reduction in pain followed by isometric exercise assigned intervention completed 2 weeks of strength training. Compared to the elderly with OA in the control group. In the experimental group, 19(76%) used pain relief strategies and rest 6(24%) were not using any pain relief strategies. In control group, 16(64%) were not using any pain relief strategies and 9(36%) were using pain relief strategies. In control group not relief from pain. This study conclude Still the result of the study exercise was shown as reduction in pain score.

Micheal T. Hirschmann., (2020) Conducted a study Effectiveness of strengthening exercise among OA patients. The aim of the present review a symptomatic patient suffering from severe end- stage OA may benefit from referral to a physical therapist for video instruction and supervision shown to act favorably on patient adherence to home exercise programs, resulting in less pain and physical functioning. This study included participants 60 patients (30 in experimental group and 30 control group). These participants assessed by WOMAC scale by 24 items questionnaires. This selected sample under physical therapist for video instruction and supervision to do home exercise programs for 3 weeks. The result showed Meta-analysis assessed the changes regarding pain and physical function in obese patient with OA who achieved a weight loss. It demonstrated a significant reduction in disability when weight reduced> 5.1% over a 20 weeks period or at the rate of > 0.24% reduction per week. This study concludes was significantly reduced pain, stiffness and improved physical function.

Xiaoyan (2019) Conducted a study, the effects of a home based exercise intervention on elderly patients with OA. The aim of this study was to evaluate the effectiveness of a home based exercise intervention (HBEI) to reduce the OA symptoms and improve the physical functioning of elderly patients. A total of

171 elderly patients (40-60 years) with an OA were recruited from community. Patients from two community centers were randomly assigned to the intervention group(IG) and the other two centers were randomly assigned to the control group(CG) Participants in the IG received a 12-weeks HBEI (including four2-h sessions supervised by a physiotherapist and fortnight telephone support). Data were obtained from 141 patients. At week 12, the pre-test/post-test changes 3 significant between – group differences in decrease in pain intensity (-1.60(CI, -2.75 to -0.58) and stiffness (-0.79(CI, -1.37 to – 0.21), with the IG exhibiting significantly larger improvements on both measures than the CG. The result showed significantly greater improvements on all the secondary outcomes than the CG did. A large randomized controlled trial with long term follow-up is needed to confirm these findings. Professional However, one study concludes that 44.2% of osteoarthritis patient reduces knee pain, stiffness and improved physical activity.

Ruojin Li, et al.(2020) Conducted a study to assess the effectiveness of Traditional Chinese Exercise for Symptoms of Knee Osteoarthritis. A total of 14 RCTs involving 815 patients with KOA were included. The selected sample interventional group has undergone traditional Chinese for 4weeks. The control group on observation. Compared with a control group; The results showed that the synthesized data of TCE showed a significant improvement in WOMAC/OA pain score (SMD = -0.61; 95% CI: -0.86 to -0.37; $p < 0.001$), stiffness score (SMD = -0.75; 95% CI: -1.09 to -0.41; $p < 0.001$), and physical function score (SMD = -0.67; 95% CI: -0.82 to -0.53; $p < 0.001$). This study concludes that our meta-analysis suggested that TCE may be effective in alleviating pain; relieving stiffness and improving the physical function for patients with OA**.**

Archanah T.et al., (2018) Conducted a study to assess the effect of hydrotherapy based alternate compress on osteoarthritis knee in SDM College of Naturopathy and Yogic Sciences, Ujire, Karnataka, India. A randomized controlled trial was done by using a lottery method selected 2oo participants patients diagnosed with OA.(100 in experimental group and100 in control group). The selected experimental group involved hydrotherapy for 6 weeks. Assessed by NRS (Numerical rating scale) and Knee injury and Osteoarthritis Outcome Score (KOOS). It consists of 5 subdivisions to assess a) symptoms, b) stiffness, c) pain, d) functions and daily living, e) functions, sports and recreational activities. The calculated t value is t=3.009. The study result shows that, statistical Significant at $p<0.01$level. Comparison between control and case group using unpaired t test showed significant in both NRS (Numerical rating scale) and KOOS scores. The results showed in KOOS scores like symptoms score =10.05($p<0.01$) stiffness score 7.36 ($p<0.01$), pain score 6.27 ($p<0.01$), functional score t-09($p<0.01$), sports score t=1.95 ($p<0.01$) and quality of life score 5.59 ($p<0.01$) respectively. These studies conclude significantly improvement reduces pain, stiffness and improved physical function.

Corelein J JKloek, et al., (2015) conducted a study to assess the effectiveness and cost-effectiveness of a blended exercise intervention for osteoarthritis patients. The primary goal of e-Exercise is to reduce levels of Pain and improve level physical functioning in a cost-effective manner. Randomized clinical trials used to select 31 patients diagnosed with OA. E-Exercise is a 12-week intervention, consisting of maximum five face-to-face physical therapy In addition n to our outcome measurements. The results shows e-Exercise might have several other benefits beyond the primary scope of this studies showed that exercise therapy may help to postpone joint replacement surgery [55–57%]. For example, in the study of Pisters et al. [56], a 6 month follow-up showed that 20% of the patients from the exercise therapy group underwent total hip surgery, compared to 45% of the patients from the usual care group. This study significant improvement in blended exercise for osteoarthritis patient $p<0.005$.

Hania MM (2015.) Conducted a study to assess the effectiveness of camphor oil in reduction of pain in arthritis at pathanamthitta district, Kerala. 30 samples in experimental and 30 in control group. The purposive sampling technique was adapted. The oil containing camphor is administered topically to patients thrice a day (morning, noon & evening) for 14 days. The tool used was Visual Analogue Scale and Questionnaire. The results showed mean of experimental group were compared against the mean of control group. The mean 3.5 and SD 1.36 of the experimental group reveals t value of 3.29 this study is highly significant at P<0.01level**.** This study conclude that significant improvement for osteoarthritis.

From above this study it is quite evident that bone strengthening exercise plays a major role in the management of OA. This demonstration of bone strengthening exercise emphasizes the importance of stretching all muscles that cross the given joint affected by OA. Bone strengthening exercises improve the functional mobility of the joints in patients diagnosed with osteoarthritis. When the mobility increases joint pain decrease. And these bone strengthening exercise does not take much time, requires no special equipment's except comfortable place to do. Hence the researchers interested is observing the effect of a regular bone strengthening exercise t the population aging, theherapy is reducing pain, stiffness and improved physical function.

CHAPTER –III
RESEARCH METHODOLOGY

This chapter describes the methodology adopted in this study to assess the effectiveness of bone strengthening exercise on osteoarthritic index among patients diagnosed with osteoarthritis in selected hospital at tiruvannamalai.

This study includes research approach, research design, variables, setting, population, sample, sample size, sampling technique, and criteria for sample selection, development and description of tool, scoring procedure, content validity, pilot study, and reliability, procedure for data collection and plan for data analysis.

3.1 Research Approach

The research approach used in this study was Quantitative research approach

3.2 Research Design

Research design is the researcher overall plan for obtaining answer to research question. **(Polit, 2016)**

The research design adopted for this study is quasi experimental design with non-equivalent control group pre and post-test only design.

Group	Pre test	Intervention	Post test
Experimental group	O1	X	O2
Control group	O1	-	O2

O1 - Pre-test E – Experimental group
O2 - Post-test C – Control group
X - Intervention [Bone strengthening exercise]

In this study pre-test conducted osteoarthritic index respectively in the control group was assessed by modified WOMAC index scale on 1st day to 3rd day and 4th – 6th day conducted pre- test in experimental group. On the 7th day, in experimental group researcher implements the bone strengthening exercise through video for 15 – 20 minutes daily morning for 21 days. After 21 days. Post- test was assessed by same scale.

3.3 VARIABLES

Independent variables

Bone strengthening exercise

Dependent variables

Osteoarthritic index – Pain, stiffness, and physical function.

Extraneous variable

The extraneous variables include age, sex, religion, educational status, dietary pattern, marital status, occupation, working pattern, family income per month, Body mass index and duration of pain.

3.4 SETTING OF THE STUDY

The study was conducted at Mother orthopaedic speciality hospital consists of 40 bedded hospital, bypass road at tiruvannamalai. The study strength is 60 patients diagnosed with osteoarthritis.

3.5 POPULATION

Population is the entire set of individual or objects having some common characteristics. On this study, population was patients diagnosed with osteoarthritis selected in hospital at tiruvannamalai.

Target population

The target population of this study is who has admitted (IP and OP) patients diagnosed with osteoarthritis who fulfil the sample selection criteria.

Accessible population

The accessible population for this study is patients diagnosed with osteoarthritis with the age group of 40-55 years at mother orthopaedic hospital at tiruvannamalai.

3.6 SAMPLE

Sample refers to a subset of a population selected to participate in a research study. The study sample comprises of patients diagnosed with osteoarthritis fulfil age between 40- 55 years the sample selection criteria.

3.7 SAMPLE SIZE

The sample size is 60. (30 in experimental group and 30 in control group)

3.8 SAMPLING TECHNIQUE

In this study, Non probability convenience sampling technique was used to select the sample. The first 30 patient were assigned to control group and next 30 patients in experimental group.

3.9 CRITERIA FOR SAMPLE SELECTION

Inclusion criteria

Patients who were,

- diagnosed with osteoarthritis.
- at the age of 40- 55 years.
- willing to participate in the study.

Exclusion criteria

Patients who were

- have extreme joint pain.
- with injured joint and fracture.
- undergone orthopaedic surgery.
- physical disabilities and bedridden.
- in mental illness.

severe neurological problems.

3.10 DEVELOPMENT AND DESCRIPTION OF THE TOOL

The tool constructed in the study has to 2 sections.

Section A: Assessment of demographic variables.

Section B: Tool to assess the osteoarthritic index.

Section-A: Assessment of demographic variables

The demographic variables are age, sex, religion, educational status, dietary pattern, marital status, occupation, working pattern, family income per month, body mass index and duration of pain.

Section-B: Tool to assess the osteoarthritic index score

The modified **WOMAC** index scale compromised of 24 items with 3 subscales such as pain-5 items, joint stiffness-2 items, and physical function-17 items which were assessed by using same scale. The measurements on the scale are set according to the following scoring system.

Osteoarthritis index	None	Mild	Moderate	Severe	Extreme
Scores	0	1	2	3	4

The Osteoarthritic index is rate interpret under the following classification

LEVEL OF INDEX						
S.No	**INDEX**	**None**	**Mild**	**Moderate**	**Severe**	**Extreme**
1	Pain	0	1-5	6-10	11-15	16-20
2	Stiffness	0	1-2	3-4	5-6	7-8
3	Physical function	0	1-17	18-34	35-51	52-68
4	Osteoarthritic index	0	1-24	25-48	49-72	73-96

3.11 CONTENT VALIDITY

Validity is the instrument measures what it is intended to measure**. (Polit, 2016).**

The content validity of the modified WOMAC index scale was established and obtained opinion from one orthopedician and five nursing experts specialized in medical surgical nursing. Based on the suggestion of the experts changes were made in the demographics variables and osteoarthritic index after consultation with research guide.

3.12 ETHICAL CONSIDERATION

The ethical principles followed in the study were,

A. Beneficence.

a) Freedom from harm and discomfort

Participants were not subjected to unnecessary risks for harm or discomfort during the study period.

b) Protection from exploitation

Participants were assumed that their participated or information provided would not be used against them in any way.

B. Respect for human dignity

The researcher followed the second ethical principles of respect for human dignity. It includes the right to self-determination and the right to self-disclosure.

a) The right to self determination

The researcher gave full freedom to the participants to decide voluntarily whether to participate in the study or to withdraw from the study and the right to ask questions.

b) The right to full disclosure

The researcher has fully described the nature of the study, the person's right to refuse participation and researcher's responsibilities based on which both oral and written informed consent was obtained from the participants.

C. Justice

The researcher adhered to the ethical principal of justice, it includes participants right to fair treatment and right to privacy.

a) Right to fair treatment

The researcher selected the study participant based on the research requirements. The investigator followed the routine for control group.

b) Right to privacy

The researcher maintained the participants privacy throughout the study.

D. Confidentiality

The researcher maintained confidentiality of the data provided by the study participants.

3.13 RELIABILITY

Reliability is defined as the extent to which the instrument yields the same result on repeated measures. It is thus concerned with consistency, accuracy, stability and homogeneity.

The Tamil version of modified WOMAC index scale was tested using the test and retest reliability method. The reliability score was r = 0.9 Hence, the tool was considered highly reliable for proceeding with the study.

3.14 PILOT STUDY

A pilot study is defined as a small scale version or a trial run designed to test the methods to be used in a large group, more rigorous study which is sometimes referred to as the parent study **(Polit, 2016).**

Pilot study is a trial for main study to test the reliability, appropriateness and feasibility of the study and the tool. The formal permission was obtained from principal of Vignesh nursing college. The researcher obtained permission from Dr.Muthu orthopaedic clinic in tiruvannamalai. The researcher selected 10 subjects by using Non probability convenience sampling technique method. 5 samples were assigned to experimental group and 5 samples to control group.

The researcher explained about the aims, purpose, advantages of the study to the experimental group and control group. After obtaining the demographic details, pre- test was done regarding the osteoarthritic index. The researcher gave intervention bone strengthening exercise through video which was followed the patients with the duration of 15 - 20 minutes daily. The post test of pilot study concludes that there is a significant reduction of osteoarthritic index in experimental group at $p<0.001$ and non-significant reduction in osteoarthritic index of control group. So it is feasible and practicable to conduct the main study for the researcher.

3.15 PROCEDURE FOR DATA COLLECTION

Data collection is the gathering of information needed to address the research problem. The word data means information that is systematically collected in the course of the study.

The study was conducted in Mother orthopaedic speciality hospital in tiruvannamalai district. The data was collected period of 4 weeks in the month of March-15 to April -15th 2021. Prior permission was sought from Dr.Sundaresan., MD., in Mother orthopaedic speciality hospital by the researcher after explaining the purpose of the study. The researcher introduced herself to the patients and established rapport. They were assured that no physical or emotional harm would be done in the course of the study.

The patients admitted diagnosed with osteoarthritis 30 in experimental group(ip) and 30 in control group(op) were selected by non -convenient sampling technique based on sample selection criteria. They were made to sit comfortably in a well-ventilated room and confidentiality regarding the data was assured. After obtaining their verbal consent for willingness to participate in the study, the study, the researcher conducted pre-test level of osteoarthritic index by using modified **WOMAC** index scale in experimental and control group.

The data collection procedure started as March-15th. The 1st day to 3rd day of data collected from control group (op) and 4th to 6th day was data collected from experimental group (ip) patients diagnosed with osteoarthritis considered for outpatient (control group) and inpatient (experimental group) .On the first day to 6th day who are patients diagnosed with osteoarthritis, the researcher explain about disease condition and benefits of exercise and also pre-test done. On the 7th day experimental group the researcher taught about bone strengthening exercises through video with comfortable position once a day with the duration of 15-20 minutes for a period of 21 days continuously in predefined period. Control group followed the routine activities. The post test was conducted on 28th day in experimental and control group with the same tools used in post- test. After the post -test same intervention was explained to the control group for a periods of 21 days.

INTERVENTION

GRIEF BALL EXERCISE

The grief ball exercise will demonstrate by researcher through video, the patient will follow as: press and relax ball techniques which will practice by both hands for 4 min.

ELASTIC BAND EXERCISE

These exercise can be demonstrated by researcher through video, the patient will follow as; in a sitting position with an elastic resistance band. The band is knotted together at the ends to form a large loop, the band is brought up over the back of hand, holding the fingers out straight while the forearm rest. The opposite hand will used expand the band hold for 30 seconds .Totally 4 minutes should repeat in both the hands.

HAMSTRING STRETCH EXERCISE

The exercise will demonstrate by the researcher through video, the patient will follow as: lie on the floor or bed with both legs bend. Slowly lift one leg, still bend, and bring your knee back toward your chest. Link your hand behind the thigh not knee with the leg straight., pull your straight leg back towards your head until feel the stretch and hold 30 sec .The patient will practice the stretch exercise to another leg, each for 4 min.

CALF STRETCH EXERCISE

The exercise demonstrated by researcher through video, the patient will follow as: stand a wall with one foot in front of the other, front knee slightly bent, keep your back knee straight, your heel on the ground and lean toward the wall, feel the stretch all along the calf of your bag leg, hold this stretch for 20 to 30 sec. Perform the stretch exercise to another leg. That exercise repetitions for 3 times totally 4 min.

3.16 PLANFOR DATA ANALYSIS:

DESCRIPTIVE STATISTICS

- Frequency and Percentage distribution will be used to describe the demographic variables among osteoarthritis patient.
- Mean and standard deviation will be used to analyze the data of pre and post level of osteoarthritic index.

INFERENTIAL STATISTICS

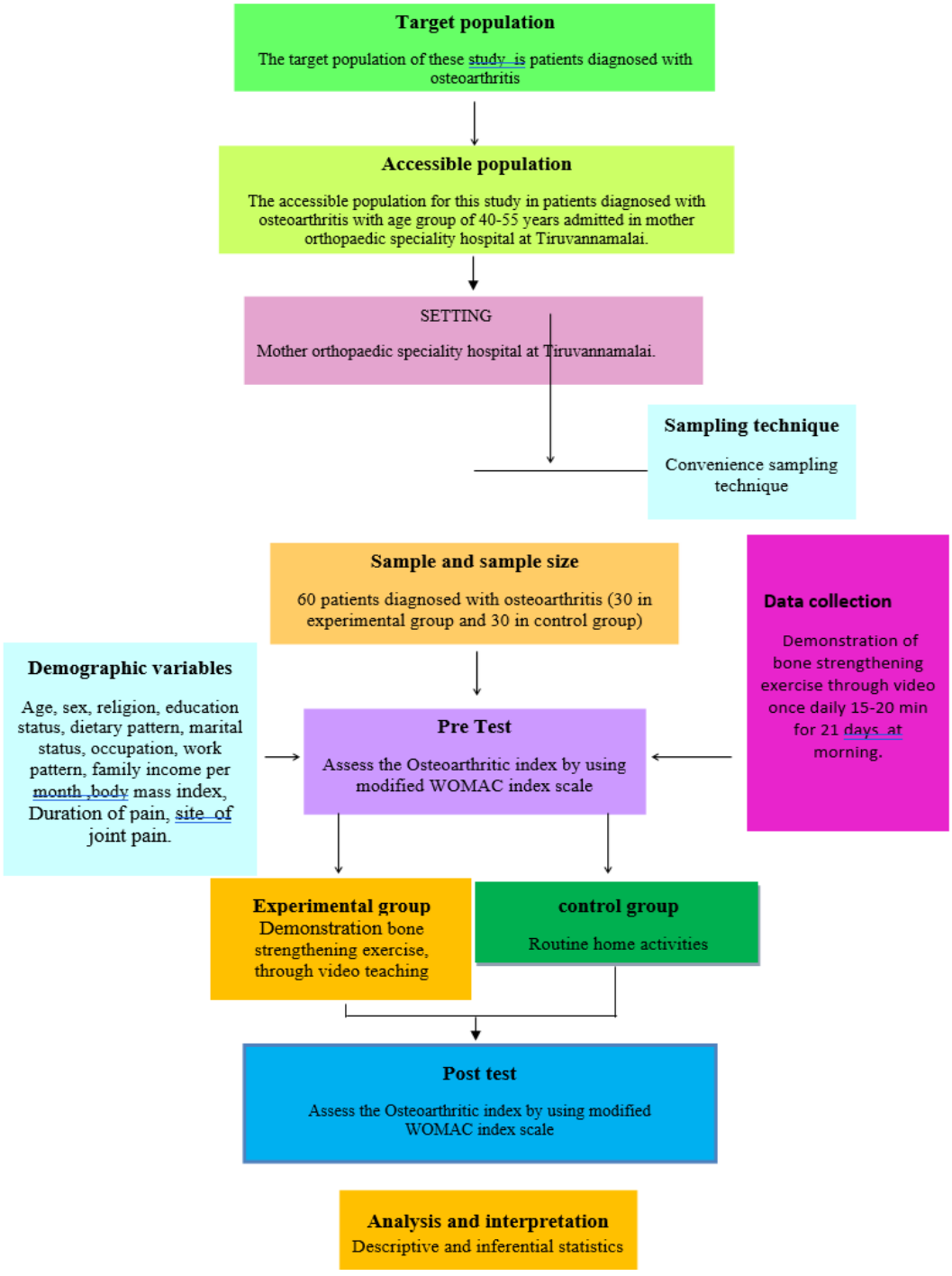
✓ Chi square test used to see the homogeneity of the osteoarthritic index with selected demographic variable.

✓ Paired “t” test used to compare pre and post-test level of osteoarthritic index among osteoarthritis patient within the experimental and control group.

✓ Unpaired “t” test used to compare the pre and post-test level oosteoarthritic index among osteoarthritis patient between the experimental and control group.

✓ Karl Pearson coefficient of correlation was used to assess the pre and post-level of osteoarthritic index among patients diagnosed with osteoarthritis between experimental and control group.

✓ ANOVA is used to associate the mean difference osteoarthritis index in experimental and control group with their selected demographics variables.


Target population
The target population of these study is patients diagnosed with osteoarthritis
Accessible population
The accessible population for this study in patients diagnosed with osteoarthritis with age group of 40-55 years admitted in mother orthopaedic speciality hospital at Tiruvannamalai.
SETTING
Mother orthopaedic speciality hospital at Tiruvannamalai.
Sampling technique
Convenience sampling technique
Sample and sample size
60 patients diagnosed with osteoarthritis (30 in experimental group and 30 in control group)
Data collection
Demonstration of bone strengthening exercise through video once daily 15-20 min for 21 days at morning.
Demographic variables
Age, sex, religion, education status, dietary pattern, marital status, occupation, work pattern, family income per month ,body mass index, Duration of pain, site of joint pain.
Pre Test
Assess the Osteoarthritic index by using modified WOMAC index scale
Experimental group
Demonstration bone strengthening exercise, through video teaching
control group
Routine home activities
Post test
Assess the Osteoarthritic index by using modified WOMAC index scale
Analysis and interpretation
Descriptive and inferential statistics

CHAPTER IV
DATA ANALYSIS AND INTERPRETATION

This chapter deals with the analysis and interpretation of the data collected from Patients diagnosed with Osteoarthritis. The collected data was organized, tabulated and analysed according to the objectives. The findings based on the descriptive and inferential statistical analysis are presented under the following sections.

ORGANIZATION OF DATA

SECTION 4.1: Description of demographic variables of osteoarthritic index with osteoarthritis in Experimental and Control group among patients diagnosed with osteoarthritis.

SECTION 4.2: Assessment of pre and post-test level of osteoarthritic index in Experimental and Control group among patients diagnosed with osteoarthritis.

SECTION 4.3: Comparison of pre and post-test level of osteoarthritic index within Experimental and Control group. among patients diagnosed with osteoarthritis.

SECTION 4.4: Comparison of pre and post-test level of osteoarthritic index between Experimental and Control group. among patients diagnosed with osteoarthritis.

SECTION 4.5: Correlate the pre and post-test level of osteoarthritic index between experimental and control group. among patients diagnosed with osteoarthritis.

SECTION 4.6: Associate the mean difference score of osteoarthritic index in experimental and control group among patients diagnosed with osteoarthritis with their selected demographics variables.

SECTION 4.1: DESCRIPTION OF DEMOGRAPHIC VARIABLES OF THE OSTEOARTHRITIC INDEX AMONG PATIENTS DIAGNOSED WITH OSTEOARTHIRITIS IN EXPERIMENTAL AND CONTROL GROUP.

Table 1: Frequency and percentage distribution of demographic variables in respect to age, sex, religion, education status, dietary pattern and marital status in experimental and control group.

N = 60

S.NO	Demographic Variables	Experimental group		Control Group		Chi-Square χ^2
		f	%	f	%	
1	**Age**					
	a) 40 - 45 years	8	26.6	9	30	χ^2=0.70 NS
	b)46 - 50 years	11	36.7	13	43.3	
	C)51 - 55 years	11	36.7	8	26.7	
2	**Sex**					

	a)Male	8	26.6	10	33.3	χ^2=0.37 NS
	b)Female	22	73.3	20	66.7	
3	**Religion**					
	a)Hindu	29	96.7	27	90	χ^2=2.07 NS
	b)Muslims	1	3.3	1	3.3	
	c)Christian	-	-	2	6	
	d)Others	-	-	-	-	
4	**Educational status**					
	a)Illiterate	5	16.7	3	10	χ^2=6.50 S**
	b)Primary school	11	36.7	6	20	
	c)High school	13	43.3	14	46.7	
	d)Graduate and above	1	3.3	7	23.3	
5	**Dietary Pattern**					
	a)Vegetarian	2	6.7	7	23.3	χ^2=3.3 NS
	b)Non vegetarian	25	83.3	20	66.7	
	c) Ova vegetarian	3	10	3	10	
6	**Marital Status**					
	a) Single	4	13.3	1	80	χ^2=4.49 NS
	b) Married	25	83.3	24	3.3	
	c) Widow	1	3.3	5	16.7	
	d) Divorced /separated	-	-	-	--	

NS-Non significant at p<0.05 level

The table 1: shows frequency and percentage distribution of demographic variables in respect to age, sex, religion, education status, dietary pattern, marital status, in experimental group and control group.

In experimental group, with regard to age in years majority of the subject 11(36.7%) were between age group of 46-50 year and 11(36.7%) were the age group of 51-55years 8(26.7%) subject were between the age group 40-45 year With regard to sex, majority of the subjects 22(73.3%) were in female 8(26.7%) were in male. With regard to religion, majority of the subjects 29(96.7%) were Hindu and 1(3.3%) were Muslims With regard to educational status, majority of the subjects 13(43.3%) were completed high school 5(16.7%) subject were in non -literate, 11(36.7%) were completed primary school and 1(3.3%) subjects were completed graduate. With regard to dietary pattern, majority of the subjects 25(83.3%) were taking non vegetarian 2(6.7%) were taking vegetarian and 3(10%) were taking ova vegetarian. With regard to marital status, majority of the subjects 25(83.3%) were married 4(13.3%) were single, and 1(3.3%) were widow.

In control group, with regard to age in years majority of the subject 13(43.3%) were between the age group of 46 - 50 years, 9(30%) were between the age group of 40- 45 years and 8(26.7%) were between the age group 51 – 55 years. With regard to sex majority 20(66.7%) were in female and 10(33.3%) were in male. With regard to religion majority 27(90%) were Hindu, 1(3.3%) were Muslims and 2(8%) were

Christian. With regard to educational status majority, 14(46.7%) subject were completed in high school, 7(23.3%) subject were completed graduated, 6(20%) subject were completed primary school and 3(10%) subject were illiterate. With regard to dietary pattern majority 20(66.7%) were taking non vegetarian, 7(23.3%) were taking vegetarian, 20(66.7%) were taking non vegetarian and 3 (10%) were taking ova vegetarian. With regard to marital status majority 24(80%) subject were in married 1(3.3%) subjects 5(16.7%) subject were in widow.

The homogeneity analysis results, there is no significant association in demographic variables between experimental and control group similar with respect to age, sex, religion, education status, dietary pattern, marital status.

Table 2: Frequency and percentage distribution of demographic variables in respect to occupation, working pattern, family income per month, body mass index in experimental and control group.

The table 2: Shows frequency and percentage distribution of demographic variables in respect to occupation, working pattern, family income, and body mass index.

N =60

S.NO	Demographic Variables	Experimental group		Control group		Chi-Square χ^2
		F	%	f	%	
7	**Occupation**					
	a)Farmer	9	30	6	20	
	b)Daily wages	9	30	5	16.7	χ^2=4.07
	c)House wife	10	33.3	14	46.7	NS
	d)Office workers	2	6.7	4	13.3	
	e)Retired	-		1	3.3	
8	**Working Pattern**					
	a)Sedentary worker	2	6.7	5	16.7	χ^2=1.82
	b)Moderate worker	18	60	18	60	NS
	c)Heavy worker	10	33.3	7	23.3	
9	**Family Income Per Month**					
	a)Below Rs.5,000	10	33.3	3	10	χ^2=5.69
	b)Rs.5,001-10,000	17	56.7	21	70	NS
	c)Rs.10,001-15,000	3	10	5	16.7	
	d)Above 15,000	-	-	1	3.3	
10	**Body Mass Index**					
	a)<18.50 Underweight	2	6.7	3	10	
	b)18.50-24.99 Normal range	9	30	15	50	χ^2=7.55
	c)25.0-29.99 Pre Obese	18	60	8	26.7	S**
	d)30.0-34.99 Obese class I	1	3.3	3	10	
	e)35.0-39.0 Obese class II	-	-	1	3.3	
	f)>40.0 Obese class III	-	-	-	-	

**** Significant at p<0.05 level**

The table 2: Shows frequency and percentage distribution of demographic variables in respect to occupation, working pattern, family income, and body mass index.

In experimental group, with regard to occupation majority, 10(33.3%) were house wife 9(30%) were farmer, 9(30%) were daily wages, and 2(6.7%) were office workers. With regard to working pattern majority 18(60%) were in moderate worker. 2(6.7%) were in sedentary worker, and 10(33.3%) were in heavy worker. With regard to family income majority of the subjects 17(56.7%) had a family income of 5,001-10,000 rupees, 10(33.3%) had a family income of below5, 000 rupees and 3(10%) had a family income of 10,000-15,000 rupees. With regard to body mass index majority of the subjects 18(60%) were in 25.0-29.99(pre obese), 2(6.7%) were in >18.) and 1(3.3%) were in 30.0-34.99 (obese class I) and 9(30%) were in 18.50 -24.99 normal range.

In control group, with regard to occupation majority of the subjects 14(46.7%) were in house wife, 6(20%) were in farmer, 5(16.7%) were in daily wages, 4(13.3%) were in office worker and 1(3.3%) were in retired. With regard to working pattern majority of the subjects, 18(60%) were in moderate workers, 5(16.7%) were in sedentary worker, and 7(23.3%) were in heavy worker. With regard to family income majority of the subjects 21(70%) had a family income of 5,001-10,000 rupees, 5(16.7%) had a family income of 10,001-15,000, 3(10%) had a family income of below 5,000 rupees and 1(3.3%) had a family income of above 15,000 rupees. With regard to body mass index majority of the subjects 15(50%) were in 18.50-24.99 (normal range),3(10%) were in >18.50 (underweight), 8(26.7%) were in25.0-29.99(pre obese),3(10%) were in 30.0-34.99(obese class I) and 1(3.3%) were in 35.0-39.0 (obese class II).

The homogeneity analysis results, there is significant association in demographic variables between experimental and control group similar with respect to occupation, working pattern, family income, body mass index.

TABLE 3: FREQUENCY AND PERCENTAGE DISTRIBUTION OF DEMOGRAPHIC VARIABLES IN RESPECT TO DURATION OF JOINT PAIN, SITE OF JOINT PAIN, AT WHICH TIME FEEL PAIN IN EXPERIMENTAL AND CONTROL GROUP

The table 3: shows frequency and percentage distribution of demographic variables in respect to duration of joint pain, site of joint pain and at which times feel pain.

N =60

S.NO	Demographic Variables	Experimental group		Control group		Chi-Square χ^2
		f	%	f	%	
11	**Duration Of Joint Pain**					
	a)<1 years	16	53.3	8	26.7	χ^2=5.72 NS
	b)1-5 years	14	46.6	20	66.7	
	c)6-10 years	-	-	2	6.7	
	d)>11 year	-	-	-		
12	**Site of Joint pain**					
	a)Elbow	5	16.6	12	40	χ^2=5.74 NS
	b)Knee	23	76.6	14	46.7	
	c)Ankle	2	6.6	4	13.3	

13	**At which time feel pain**					
	a)Morning time	18	60	11	36.7	χ^2=10.73 S**
	b)Sleep at night time	1	3.6	6	20	
	c)Rest time	-		5	16.7	
	d)Working time	11	36.6	8	26.7	

S -Significant at p<0.05 level.**

The table 3: shows frequency and percentage distribution of demographic variables in respect to duration of joint pain, site of joint pain and at which times feel pain.
In experimental group, with regard to duration of joint pain majority of the subjects 16(53.3%) subjects had since less than 1 year, 14(46.6%) were had since 1-5 years.

In experimental group, with regard to site of pain, 5(16.6%) subject were in elbow, 23(76.6%) subject were in knee, and 2 (6.6%) subjects were in ankle. With regard to at which time feel pain, 18(60%) majority of the subjects had in at morning , 1(3.3%) subjects were in sleep at night time and 11(36.6%) subjects were in at working time.

In control group, with regard to duration of joint pain majority of the subjects 8(26.7%) subjects, 20(66.7%) subject had since 1-5 years, had since less than 1 year, 2(6.7%) subjects had since 6 years. With regard to site of joint pain, majority of the subjects 14(46.7%) subjects were in knee, 12(40%) subjects were in elbow, 4(13.3%) subjects were in ankle. With regard to at which time feel pain, majority of the subjects 11(36.7%), 6(20%) subjects were in sleep at night time, 5(16.7%) subjects were in rest time and 8(26.7) subjects were in working time.

The homogeneity analysis results, there is significant association in demographic variables between experimental and control group respect time (X^2=10.73).

SECTION 4.2: ASSESSMENT OF PRE AND POST-TEST LEVEL OF OSTEOARTHRITIC INDEX AMONG PATIENTS DIAGNOSED WITH OSTEOARTHIRITIS BETWEEN EXPERIMENTAL AND CONTROL GROUP.

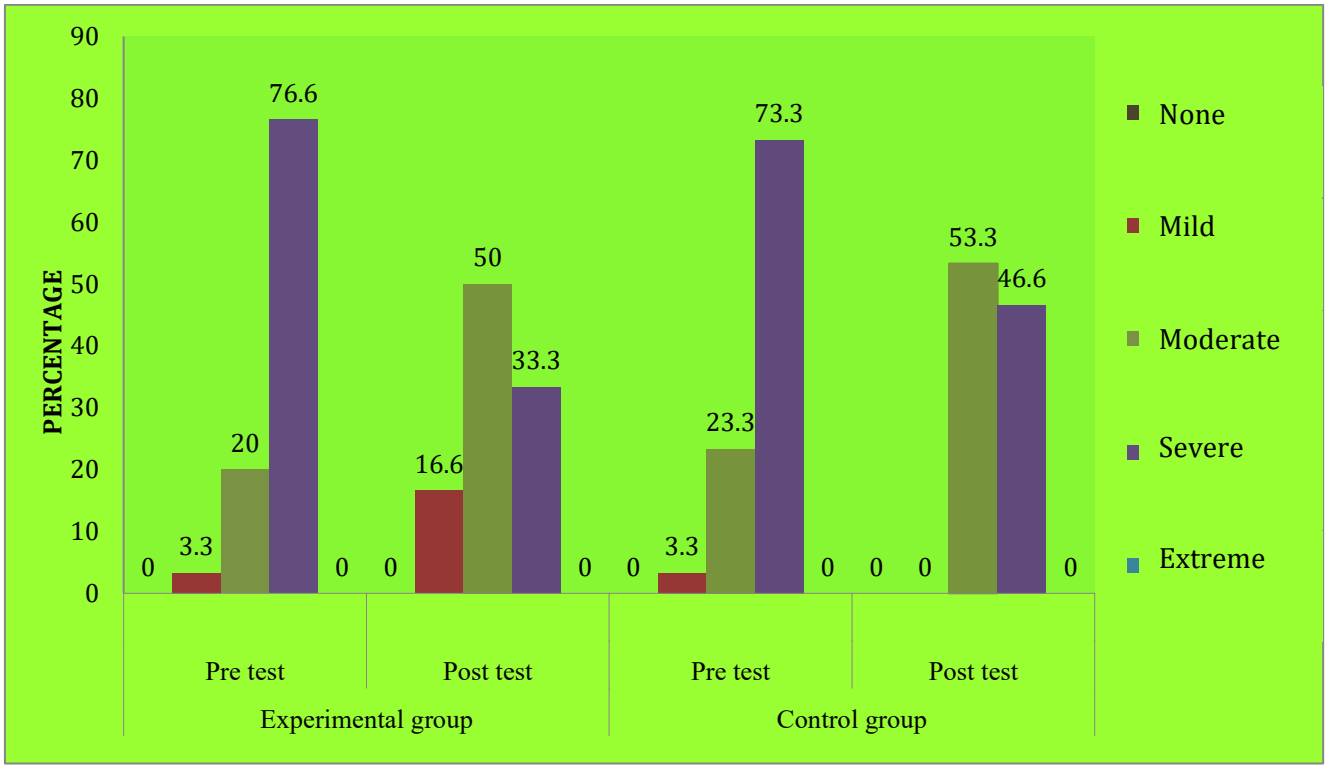


Figure 3: **Percentage distribution of pre and post-test level of pain in experimental and control group.**

Figure 3: shows the **pre-test score** of pain in experimental group, majority 23(76.66%) subjects had severe pain, 6(20%) had a moderate pain and 1(3.3%) had a mild pain, where as in control group majority 23(76.3%) had severe, 6(20%) had moderate pain and 1(3.3%) had mild pain.

The analysis on the **post-test score** of pain in experimental group, majority 15(50%) subjects had moderate pain ,5(16.6%) had mild pain and 10(33.3%) had severe pain, whereas in control group majority 16(53.3%) had moderate pain and 14(46.66%) had a severe pain.

N = 60

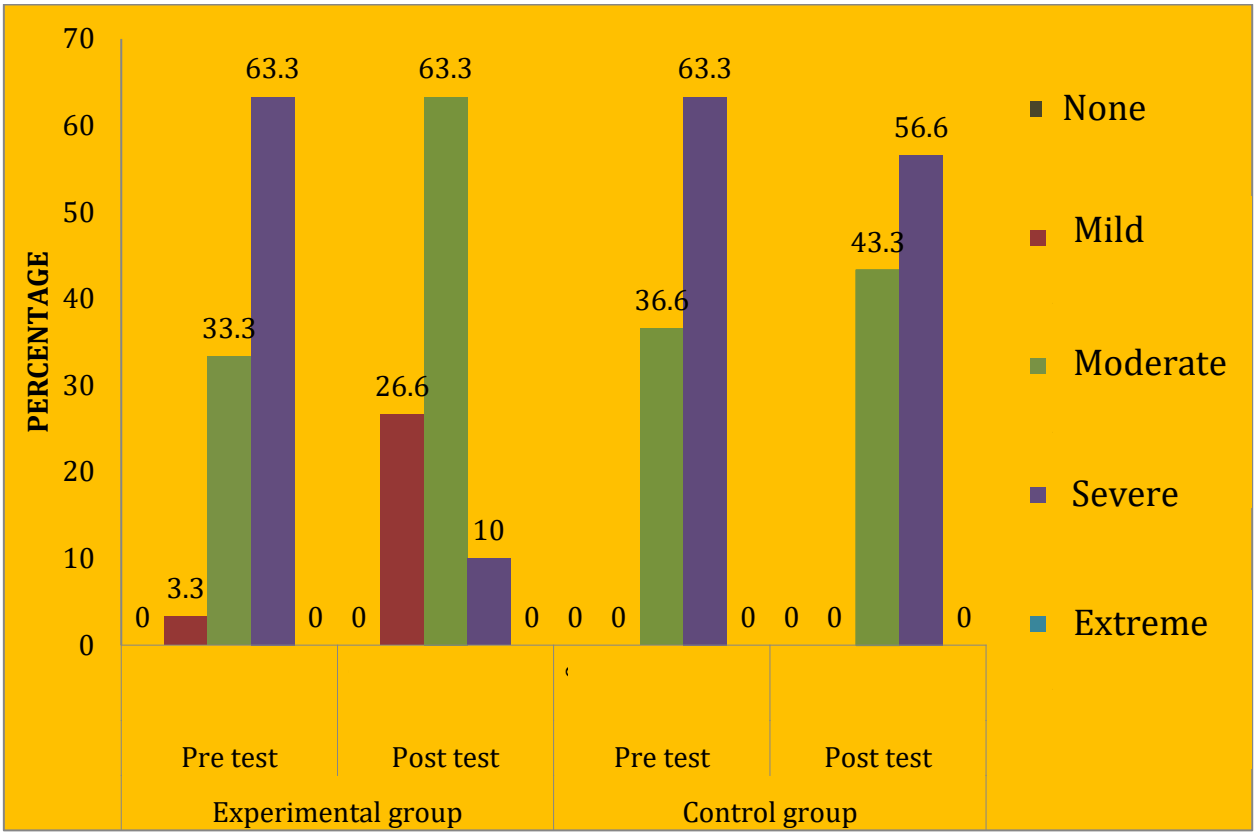


Figure 4: Percentage distribution of pre and post- test level of stiffness in experimental and control group.

Figure 3: shows the **pre-test score** of stiffness in experimental group, majority 19(63.3%) subjects had severe stiffness, 10(33.3%) had moderate stiffness, 1(3.3%) had mild stiffness; whereas in control group majority 26(63.3%) subjects had severe stiffness and 4(36.6%) had moderate stiffness.

The analysis on the **post-test score** of stiffness in experimental group, majority 19(63.3%) subjects had moderate stiffness, 8(26.6%) had mild stiffness and 3(10%) had severe stiffness; whereas in control group majority 17(56.6%) had severe stiffness, 13(43.3%) had moderate stiffness.

n=30+30

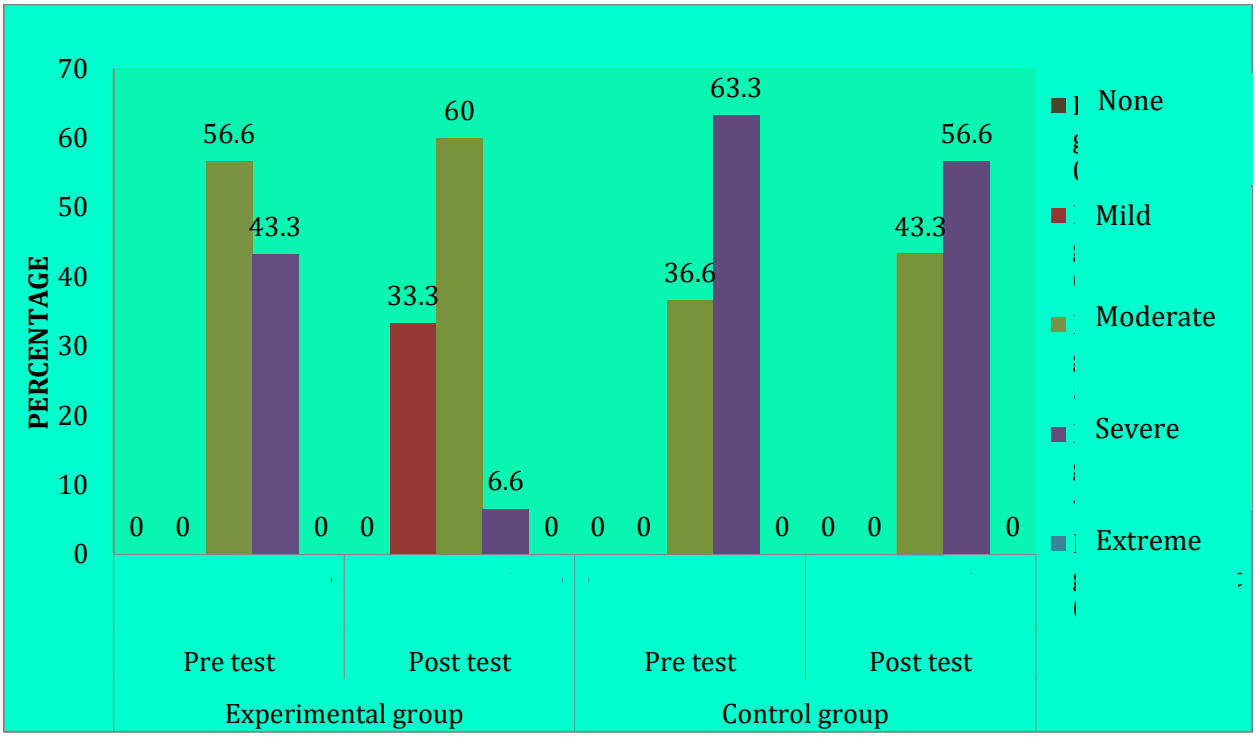


Figure 5: Percentage distribution of ore and post-test level of physical function in experimental and control group.

Figure 5: shows the **pre-test score** of physical function in experimental group, majority 17(56.6%) subjects had moderate physical function and 13(43.3%) had severe physical function, whereas in control group majority 19(63.3%) had severe physical function and 11(36.6%) had moderate physical function. The analysis on the **post-test score** of physical function in experimental group, majority 18(60%) subjects had moderate physical function and 10(33.3%) had mild physical function and 2(6.6%) had severe physical function whereas in control group majority 17(56.6%) had severe physical function and 13(43.3%) had moderate physical function.

N = 60

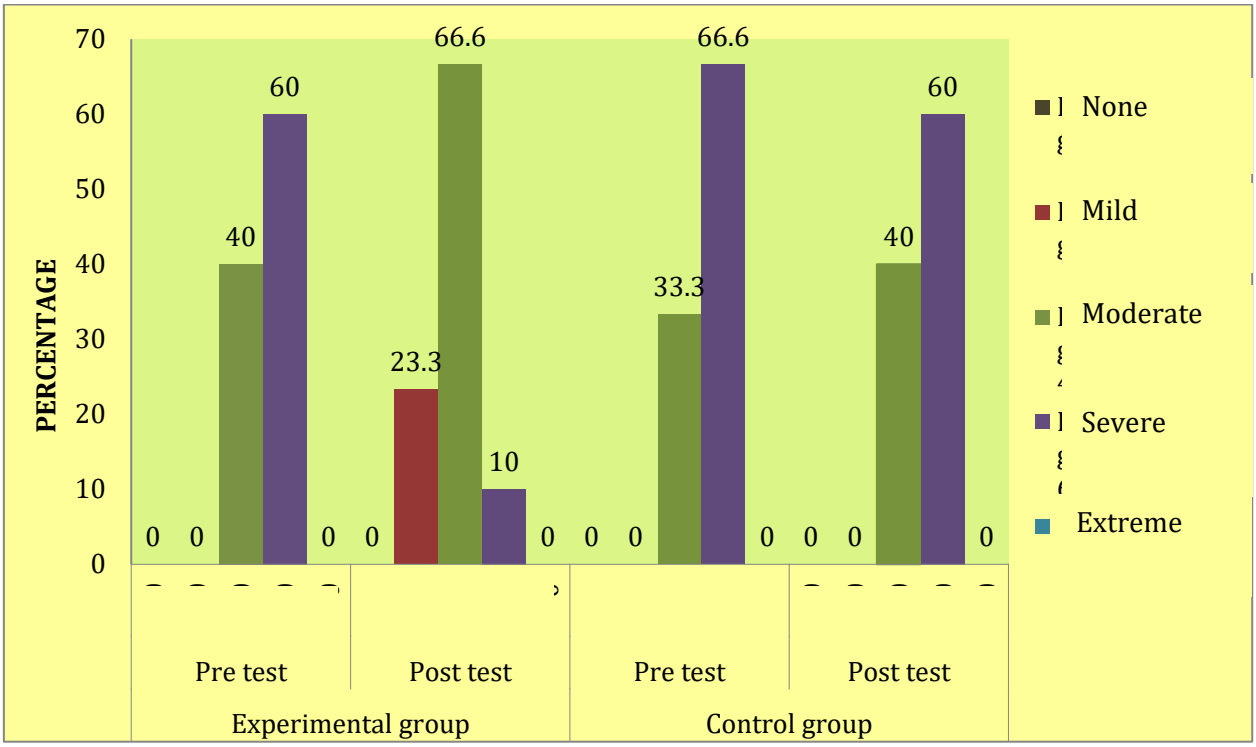


Figure 5: Percentage distribution of pre and post-test level of osteoarthritic index in experimental and control group.

Figure 5: shows the **pre-test score** of osteoarthritic index in experimental group, majority 18(60%) subjects had severe osteoarthritic index, 12(40%) had moderate osteoarthritic index, whereas in control group majority 20(66.6%) had severe osteoarthritic index and 10(33.3%) had moderate osteoarthritic index.

The analysis in the **post-test score** of osteoarthritic index in experimental group, majority 20(66.6%) subjects had moderate osteoarthritic index, 7(23.3%) had mild osteoarthritic index and 3(10%) had severe physical function whereas in control group majority 18(60%) had severe osteoarthritic index and 12(40%) had moderate osteoarthritic index

SECTION 4.3: COMPARISON OF PRE AND POST TEST LEVEL OF OSTEOARTHRITC INDEX AMONG PATIENTS DIAGNOSED WITH OSTEOARTHRITIS WITHIN EXPERIMENTAL AND CONTROL GROUP.

Table 4: Comparison of pre-test level of osteoarthritic index among patients diagnosed with osteoarthritis between experimental and control group.

N = 60

ASSESSMENT	OSTEOARTHRITC INDEX	Pre test		Post test		Paired 't' test
		Mean	SD	Mean	SD	
Experimental group	Pain	11.4	2.32	6.6	1.27	t =-10.6 S*** (P<0.001)
	Stiffness	4.7	0.87	2.96	0.72	t = -6.97 S*** (P<0.001)
	Physical function	33.83	6.73	18.83	3.43	t = -12.76 S*** (P<0.001)
	Total	51.4	10.17	28.5	3.91	t = -13.62 S*** (P<0.001)

S*-Significant at p<0.001 level**.

The table 4: shows that in Experimental group, the pre -test mean score of pain was 11.4 with S.D+2.32 and the post- test mean score was 6.6 with S.D+1.27. The calculated paired-'t' test is t= –10.6 was found to be highly significant at p<0.001 level.

The pre-test means score of stiffness was 4.7 with S.D+0.87 and the post-test mean score was 2.96 with S.D 0.72. The calculated paired-'t' test is t=-6.97 was found to be highly significant at p<0.001 level.

The pre- test mean score of physical function was 33.83 with S.D+6.73 and the post- test mean score was 18.83 with S.D+3.43. The calculated paired-'t' test is t=-12.76 was found to be highly significant at p<0.001 level.

The pre- test mean score of Osteoarthritic index was 51.4 with S.D+10.17 and the post- test mean score was 28.5 with S.D+3.91. The calculated paired-'t'test is t= 13.62 was found to be highly significant at p<0.001 level.

Table 5: Comparison of pre and post-test level of osteoarthritic index among patients diagnosed with osteoarthritis.

N = 60

Group	Osteoarthritic Index	Pre-test		Post-test		Paired 't' Test
		Mean	SD	Mean	SD	
Control group	Pain	11.6	2.35	11.4	3.56	t = - 0.26 NS (P<0.05)
	Stiffness	5.43	0.81	4.63	1.21	t =0.9 NS (P<0.05)
	Physical Function	35.9	6.85	35.06	6.86	t = -1.7 NS (P<0.05)
	Total	52.4	8.68	51.4	8.35	t = -1.39 NS (P<0.05)

NS- Non significant at p<0.05 level.

The table 5: shows that, in control group, the pre- test mean score of pain was 11.6 with S.D+2.35 and the post -test mean score was 11.4 with S.D+3.56. The calculated paired-'t' test is t = -0.26 was found to be statistically no significant at p<0.05 level.

The pre-test mean score of stiffness was 5.43 with S.D+0.81 and the post-test means score was 4.63 with S.D±1.21. The calculated paired-'t test is t = -0.9 was found to be statistically no significant at p<0.05 level.

The pre-test mean score of physical function was 35.9 with S.D+ 6.85 and the post-test mean score was 35.06 with S.D+6.86. The calculated paired-'t' test is t = -1.7 was found to be statistically no significant at p<0.05 level.

The pre- test mean score of Osteoarthritic index was 5.4 with SD-8.68 and the post -test mean score was 51.4 with S.D 8.35. The calculated paired-'t' test is t = -1.39) was found to be statistically no significant at p<0.05 level.

SECTION 4.4: COMPARISON OF PRE AND POST TEST LEVEL OF OSTEOARTHRITIC INDEX AMONG PATIENTS DIAGNOSED WITH OSTEOARTHRITIS BETWEEN EXPERIMENTAL AND CONTROL GROUP.

Table 6: Comparison of pre-test level of osteoarthritic index among patients diagnosed with osteoarthritis between experimental and control group.

N = 60

Assessment	Osteoarthritic index	Experimental Group		Control Group		Unpaired-'t' Test
		Mean	SD	Mean	SD	
Pre-test	Pain	11.4	2.32	11.6	2.35	t=-0.22 NS P<0.05
	Stiffness	4.7	0.87	5.43	0.88	t=-2.9 NS P<0.05
	Physical Function	33.83	6.73	35.9	6.85	t=-1.24 NS P<0.05
	Total	51.4	0.17	52.4	8.68	t=-0.42 NS P<0.05

NS- Non significant at p<0.05 level.

The table 5: shows that, the pre-test mean score of pain in experimental group was 11.4 with SD 2.32 and in control group was 11.6 with SD 2.35. The calculated unpaired-'t' value is t = -0.22 was found to be statistically non- significant at p<0.05 which indicates that there was no significant difference in the pre -test level of pain between the experimental and control group.

The pre-test mean score of stiffness in experimental group was 4.7with SD 0.87 and in control group were 5.43 with SD 0.88. The calculated unpaired-'t 'value is t = -2.9 was found to be statistically non -significant at p<0.05 which indicates that there was no significant difference in the pre- test level of stiffness between the experimental and control group.

The pre-test mean score of physical function in experimental group was 33.83 with SD 6.73 and in control group was 35.9 with SD 6.85. The calculated unpaired-'t' value is t = - 1.24 was found to be statistically non- significant at p<0.05 which indicates that there was no significant difference in the pre -test level of pain between the experimental and control group.

The pre-test mean score of osteoarthritic index in experimental group was 51.4with SD 0.17 and in control group were 52.4 with SD 8.68. The calculated unpaired-'t 'value is t = - 0.42 was found to be statistically non -significant at p<0.05 which indicates that there was no significant difference in the pre-test level of stiffness between the experimental and control group.

TABLE 7: COMPARISON OF POST-TEST LEVEL OF OSTEOARTHRITIS INDEX AMONG PATIENTS DIAGNOSED WITH OSTEOARTHRITIS BETWEEN EXPERIMENTAL AND CONTROL GROUP.

N =60

Assessment	Osteoarthritic Index	Experimental Group		Control Group		Unpaired-'t' Test
		Mean	SD	Mean	SD	
Post-test	Pain	6.6	1.27	11.4	3.56	t= -7.05 S*** P<0.001
	Stiffness	2.96	0.72	4.63	1.21	t= -5.67 S*** P<0.001
	Physical Function	18.83	3.43	35.06	6.86	t= -11.5 S*** P<0.001
	Total	28.5	3.91	51.4	8.35	t= -13.58 S*** P<0.001

S Significant at p<0.001 level.**

The table 7: shows that, the post- test mean score of pain in experimental group was 6.6 with SD 1.27 and in Control group was 11.4 with SD3.56. The calculated unpaired-'t' value is -7.05 was found to be statistically highly significant at p<0.001 which indicates that there was difference in the post test level of pain between the experimental and control group.

The post- test mean score of stiffness in experimental group was 2.96 with SD 0.72 and in Control group were 4.63 with SD 1.21. The calculated unpaired-'t value is t-5.67) was found to be statistically highly significant at p<0.001 which indicates that there was difference in the pre- test level of stiffness between the experimental and control group.

The post -test mean score of physical function in experimental group was 18.83 with SD3.43 and in Control group were 35.06with SD 6.86. The calculated paired-'t' value is t-11.5 was found to be statistically highly significant at p<0.001 which indicates that there was difference in the pre- test level of physical function between the experimental and control group.

The post- test means score of Osteoarthritic index in the experimental group was 28.5 with SD 3.91 and in control group were 51.4 with SD 8.35. The calculated unpaired-'t' value is t-13.58 was found to be statistically highly significant at p<0.001 which indicates that there was difference in the post test level of Osteoarthritic index between the experimental and control group. This clearly shows that the practice of bone strengthening exercise had significant reduction of Osteoarthritic index score in the experimental group than the control group.

SECTION 4.5: CORRELATION OF MEAN DIFFERENCE, PAIN AND STIFFNESS AMONG PATIENTS DIAGNOSED WITH OSTEOARTHRITIS IN EXPERIMENTAL AND CONTROL GROUP.

Table 7: Correlation of mean difference of pre- test score osteoarthritic index among patients diagnosed with osteoarthritis in experimental and control group.

N = 60

PRE TEST	VARIABLES	MEAN	SD	CORRELATION 'r'
EXPERIMENTAL GROUP	Pain	11.4	2.32	r = 0.4891 Positive correlation
	Stiffness	4.7	0.87	
	Pain	11.4	2.32	r = 0.5158 Positive correlation
	Physical function	33.83	6.73	
	Stiffness	4.7	0.87	r = 0.3158 Positive correlation
	Physical function	33.83	6.73	

****P<0.05, S – Significant, NS – Non significant.**

PRE TEST	VARIABLES	MEAN	SD	CORRELATION 'r'
CONTROL GROUP	Pain	11.6	2.35	r = 0.1212 Positive correlation
	Stiffness	5.43	0.81	
	Pain	11.6	2.35	r = 0.5922 Positive correlation
	Physical function	35.9	6.85	
	Stiffness	5.43	0.81	r =- 0.005 Negative correlation
	Physical function	35.9	6.85	

****P<0.05, S – Significant, NS – Non significant.**

The table 7 shows that, in Experimental Group, the pre -test mean score of pain was 11.4 with S.D 2.32, stiffness mean score of 4.7 with S.D 0.87 and the calculated Karl Pearson's Correlation value is r = 04891 shows a positive correlation. In Experimental Group, the pre- test mean score of pain was 11.4 with S.D 2.32, physical function mean score of 33.83 with S.D 6.73 and the calculated Karl Pearson's Correlation

value is r = 0.5158 shows a positive correlation. In Experimental Group, the pre- test mean score of stiffness was 4.7 with S.D 0.87 physical function mean score of 33.83 with S.D 6.73 and the calculated Karl Pearson's Correlation value is r = 0.3158 shows a positive correlation.

The table 7 shows that, in Control Group, the pre- test mean score of pain was 11.6 with S.D 2.35, stiffness mean score of 5.43 with S.D 0.81 and the calculated Karl Pearson's Correlation value is r = 0.1212 shows a positive correlation. In Control Group, the pre- test mean score of pain was 11.6 with S.D 2.35 physical function mean score of 35.9 with S.D 6.85 and the calculated Karl Pearson's Correlation value is r = 0.5922 shows a positive correlation. In Control Group, the pre-test mean score of stiffness was 5.43 with S.D 0.81 physical function mean score of 35.9 with S.D 6.85 and the calculated Karl Pearson's Correlation value is r = -0.005 shows a negative correlation.

Table 8: Correlation of mean difference of post test score of osteoarthritic index among patients diagnosed with osteoarthritis in experimental and control group.

N = 60

POST TEST	VARIABLES	MEAN	SD	CORRELATION 'r'
EXPERIMENTAL GROUP	Pain	6.6	1.27	r = 0.0509 Positive correlation
	Stiffness	2.96	0.72	
	Pain	6.6	1.7	r = -3478 Negative Correlation
	Physical function	18.83	3.43	
	Stiffness	2.96	0.72	r = -0.0689 Negative correlation
	Physical function	18.83	3.43	

****P<0.05, S – Significant, NS – Non significant.**

POST TEST	VARIABLES	MEAN	SD	CORRELATION 'r'
CONTROL GROUP	Pain	11.4	3.56	r = 0.2239 Positive correlation
	Stiffness	4.63	1.21	
	Pain	11.4	3.56	r = -0.0848

	Physical function	35.06	6.86	Negative correlation
	Stiffness	4.63	1.21	r = 0.2471 Positive correlation
	Physical function	35.06	6.86	

****P<0.05, S – Significant, NS – Non significant.**

The table 8 shows that, in Experimental Group, the post- test mean score of pain was 6.6 with S.D 1.27, stiffness mean score of 2.96 with S.D 0.72 and the calculated Karl Pearson's Correlation value is r = 0.0509 shows a positive correlation. In Experimental Group, the post- test mean score of pain was 6.6 with S.D 1.27, physical function mean score of 18.83 with S.D 3.43and the calculated Karl Pearson's Correlation value is r =-3478 shows negative correlation. In Experimental Group, the post- test mean score of stiffness was 2.96 with S.D 0.72 physical function mean score of 18.83 with S.D 3.43 and the calculated Karl Pearson's Correlation value is r = -0.0689 shows a Negative correlation.

The table 8 shows that, in Control Group, the post- test mean score of pain was 11.4 with S.D 3.56, stiffness mean score of 4.63 with 1.21 and the calculated Karl Pearson's Correlation value is r = 0.2239 shows a positive correlation. In Control Group, the post- test mean score of pain was 11.4 with S.D 3.56, physical function mean score 35.06 of with S.D 6.86 and the calculated Karl Pearson's Correlation value is r = -0.0848 shows a negative correlation. In Control Group, the post- test mean score of stiffness was 4.63 with S.D 1.21 physical function mean score of 30.06 with S.D 6.86 and the calculated Karl Pearson's Correlation value is r = 0.2471 shows a positive correlation.

SECTION 4.6: ASSOCIATION OF MEAN DIFFERENCE SCORE OF OSTEOARTHRITIC INDEX IN EXPERIMENTAL AND CONTROL GROUP WITH THEIR SELECTED DEMOGRAPHIC VARIABLES.

Table 8: Association of mean difference score of osteoarthritic index in experimental group with their selected demographic variables such as age, sex and education status.

N = 60

S.NO	Demographic variables	Pre test		Post test		Difference		ANOVA 'F'
		Mean	SD	Mean	SD	Mean	SD	
1.	**Age**							F=25.55 **S**** (P<0.05)
	a) 40-45 years	50.75	11.7	27.1	4.7	23.65	7	
	b) 46-50 years	49.6	9.9	29	2.6	20.6	7.3	
	c) 51-55 years	53.63	9.9	29.9	3.5	23.73	6.4	
2.	**Sex**							F=43.96 **S**** (P<0.05)
	a) Male	49.5	7.2	28.5	4.5	21	2.7	
	b) Female	52.35	11.4	29.09	3.1	23.26	8.3	
3.	**Education status**							F=24.6 **S****
	a) Illiterate	51.8	13.3	28.8	2.1	23	11.2	

	b) Primary education	54.18	9.6	29.45	3	24.73	6.6	(P<0.05)
	c) Higher secondary education	49.4	9.9	27.8	8.6	21.6	1.3	
	d) Graduate and above	44	0	23	0	21	0	

Ns-Non Significant, S-Significant At P<0.05 Level.**

The table 8: shows in experimental group, there is statistical significant. Association of mean difference score of osteoarthritic index with their selected demographic variables such as age (F-25.55), sex(F-43.9) and Educational status (F- 24.6).

Table 8: Association of mean difference score of osteoarthritic index in experimental group with their selected demographic variables such as dietary pattern, marital status and religion.

S.NO	Demographic variables	Pre test		Post test		Difference		ANOVA 'F'
		Mean	SD	Mean	SD	Mean	SD	
4.	**Dietary pattern**							F=27.5 S** (P<0.05)
	a) Vegetarian	46	2.8	24	1.41	22	1.39	
	b) Non- Vegetarian	52.6	10.6	29.28	3.7	23.32	6.9	
	c) Lacto ova vegetarian	44.33	3.7	28.3	1.5	16.03	2.2	
5.	**Marital status**							F= 26.9 S** (P<0.05)
	a) Married	52.6	10.59	28.9	3.9	23.7	6.69	
	b) Single	44	4.2	27.5	0.7	16.5	3.5	
	c) Divorced	45.6	5.5	29	1.7	16.6	3.8	
	d) Widow	-	-	-	-	-	-	
6.	**Religion**							F=43.5 S** (P<0.05)
	a) Hindu	51.8	10.36	29.2	3.2	22.6	7.16	
	b) Muslim	45	5.6	28.5	2.1	16.5	3.5	
	c) Christian	-	-	-	-	-	-	
	d) Other	-	-	-	-	-	-	

S-Significant At P<0.05 Level.**

The table 8: shows in experimental group, there is statistical significant. Association of mean difference score of osteoarthritic index with their selected demographic variables such as dietary pattern (F-27.5) Marital status (F-26.9) and Religion (F-43.5).

Table 8: Association of mean difference score of osteoarthritic index in experimental group with their selected demographic variables such as occupation, working pattern and family income per month.

S.NO	Demographic variables	Pre test		Post test		Difference		ANOVA 'F'
		Mean	SD	Mean	SD	Mean	SD	
7.	**Occupation**							F=19.82 S** (P<0.05)
	a) Framer	49.8	11.6	27.6	4.47	22.2	7.13	
	b) Daily wages	50.5	6.9	29.4	2.6	21.1	4.3	
	c) House wife	59.28	9.8	30.2	3.45	29.08	6.35	
	d) Office workers	47.5	4.9	26.5	4.9	21	0	
	e) Retired	39	9.89	26	1.4	13	8.49	
8.	**Working pattern**							F=23.56 S** (P<0.05)
	a)Sedentary worker	50.5	17.67	27	1.4	23.5	16.27	
	b)Moderate worker	50.5	10.3	29	1.38	21.5	8.92	
	c)Heavy worker	50.5	11.1	28.8	4.5	21.7	6.6	
9.	**Family income per month**							F=24.34 S** (P<0.05)
	a)Below Rs.5,000	51.3	12.7	29	2.3	22.3	10.4	
	b)Rs.5,001-10,000	51.4	9.4	29.1	4.3	22.3	5.1	
	c)Rs.10,001-15,000	51.6	8	26.6	3.5	25	4.5	
	d)Above 15,000	-	-	-	-	-	-	

S-Significant At P<0.05 Level.**

The table 8: shows in experimental group, there is statistical significant. Association of mean difference score of osteoarthritic index with their selected demographic variables such as age (F-0.008), working pattern (F-0.21) and Family income per month (F-24.34).

Table 8: Association of mean difference score of osteoarthritic index in experimental group with their selected demographic variables such as body mass index and duration of joint pain.

S.NO	Demographic variables	Pre test		Post test		Difference		ANOVA 'F'
		Mean	SD	Mean	SD	Mean	SD	
10.	**Body Mass Index**							F=21.43 S** (P<0.05)
	a)<18.50 Underweight	39.6	7.5	27.6	2.51	12	4.99	
	b)18.50-24.99 Normal range	50.7	13.7	28.2	3.27	22.5	10.43	
	c)25.0-29.99 Pre Obese	54.1	7.5	29.5	4.14	24.6	3.36	
	d)30.0-34.99 Obese class I	49.5	2.12	27.5	3.5	22	-1.38	
11.	**Duration Of Joint Pain**							F=42.03
	a)<1 years	51.9	11.7	28.37	4.27	23.53	7.43	

	b)1-5 years	50.6	8.49	29.35	2.8	21.25	5.69	S*** (P<0.001)
	c)6-10 years	-	-	-	-	-	-	
	d)>11 year	-	-	-	-	-	-	

*****S- Significant at P<0.001 **S-Significant At P<0.05 Level.**

The table 8: shows in experimental group, there is statistical significant. Association of mean difference score of osteoarthritic index with their selected demographic variables such as Body Mass Index (F-21.43) and Duration Of Joint Pain (F-42.03).

Table 8: Association of mean difference score of osteoarthritic index in experimental group with their selected demographic variables such as site of joint pain, at which time feel pain.

S.NO	Demographic variables	Pre test		Post test		Difference		ANOVA 'F'
		Mean	SD	Mean	SD	Mean	SD	
12.	**Site of joint pain**							
	a)Elbow	44.6	6.5	28.8	3.03	15.8	3.47	F=31.5 S** (P<0.05)
	b)Knee	50.9	8.8	28.9	3.8	22	5	
	c)Ankle	58.5	14.8	28	4.24	30.5	10.56	
13.	**At which time feel pain**							
	a)Morning time	51	11.45	29	3.8	22	7.65	F=25.2 S** (P<0.05)
	b)Sleep at night time	58	15.5	29.5	2.12	28.5	13.38	
	c)Rest time	-	-	-	-	-	-	
	d)Working time	50.8	7.1	28.4	28.4	22.4	-21.3	

**** S-Significant At P<0.05 Level.**

The table 8: shows in experimental group, there is statistical significant. Association of mean difference score of osteoarthritic index with their selected demographic variables such as Site of joint pain (F-31.5) and At which time feel pain (F-25.2).

Section 4.5: Association of mean difference score of osteoarthritic index in experimental and control group with their selected demographic variables.

Table 8: Association of mean difference score of osteoarthritic index in experimental group with their selected demographic variables such as age, sex and education status.

S.No	Demographic Variables	Pre Test		Post Test		Difference		Anova 'F'
		Mean	SD	Mean	SD	Mean	SD	
1.	**Age**							
	A) 40-45 Years	50.7	7.41	50.1	7.5	0.6	-0.09	F=0.88 Ns (P<0.05)
	B) 46-50 Years	50.7	9.24	49.6	6.6	1.1	2.64	
	C) 51-55 Years	57.8	9.12	57.37	9.57	0.43	-0.45	
2.	**Sex**							F=0.4773

	A) Male	52.2	9.4	49.3	9.56	2.9	-0.16	**Ns** (P<0.05)
	B) Female	52.9	9.01	53.15	7.9	-0.25	1.11	
3.	**Education Status**							
	A) Illiterate	58	4	57.6	8.7	0.4	-4.7	Ft=0.95 **Ns** (P<0.05)
	B) Primary Education	55.16	5.7	56.5	5.12	-1.34	0.58	
	C) Higher Secondary Education	51.07	8.9	49.7	7.44	1.37	1.46	
	D) Graduate And Above	50.28	11.23	49.8	13.23	0.48	-2	

NS-Non Significant, at P<0.05 Level.

The Table 8: Shows in control group, there is no statistical significant. association of mean difference score of osteoarthritic index with their selected demographic variables such as age (f-0.88), sex (f-0.47) and education status (f-95).

Table 8: Association of mean difference score of osteoarthritic index in experimental group with their selected demographic variables such as dietary pattern, marital status and religion.

S.No	Demographic Variables	Pre Test		Post Test		Difference		Anova 'F'
		Mean	SD	Mean	SD	Mean	SD	
4.	**Dietary Pattern**							
	A) Vegetarian	53.07	8.58	53.7	6.49	-0.63	2.09	F=0.64 **Ns** (P<0.05)
	B) Non- Vegetarian	50.9	8.6	51.8	8.7	-0.9	-0.1	
	C) Ova Vegetarian	55	10.5	58.5	5.44	-3.5	5.06	
5.	**Marital Status**							
	A) Married	52.37	7.6	55.12	7.8	-2.75	-0.2	F=0.59 **Ns** (P<0.05)
	B) Single	32.5	4.5	33.5	4.7	-1	-0.2	
	C) Divorced	56.8	12.5	58	11.37	-1.2	1.13	
	D) Widow	-	-	-	-	-	-	
6.	**Religion**							
	A) Hindu	53.14	8.3	54.9	7.29	-1.76	1.01	F=0.56 **Ns** (P<0.05)
	B) Muslim	29	4.1	30	4.24	-1	-0.14	
	C) Christian	39.5	3.5	43	4.24	-3.5	-0.74	
	D) Other	-	-	-	-	-	-	

Ns-Non Significant, At P<0.05 Level.

The table 8: shows in control group, there is statistical significant. association of mean difference score of Osteoarthritic index with their selected demographic variables such as dietary pattern (F-0.64), marital status (F-0.59), and religion (F-0.56).

Table 8: Association of mean difference score of osteoarthritic index in experimental group with their selected demographic variables such as occupation, working pattern and family income per month.

S.No	Demographic Variables	Pre Test		Post Test		Difference		Anova 'F'
		Mean	SD	Mean	SD	Mean	SD	
7.	**Occupation**							F=0.88 **NS** (P<0.05)
	A) Framer	54.16	10.34	55.33	8.5	-1.17	1.84	
	B) Daily Wages	51	8.7	51	8.18	0	0.52	
	C) House Wife	52.21	8.8	55.7	7.8	-3.49	1	
	D) Office Workers	47.33	6.1	51.33	4.16	-4	1.94	
	E) Retired	59.5	6.36	63	7.07	-3.5	-0.71	
8.	**Working Pattern**							F=0.99 **Ns** (P<0.05)
	A)Sedentary Worker	56.6	7.19	56.2	7.5	0.4	-0.31	
	B)Moderate Worker	53.8	7.09	55.27	6.2	-1.47	0.89	
	C)Heavy Worker	50	10.09	50.16	9.8	-0.16	0.29	
9.	**Family Income Per Month**							F=0.86 **NS** (P<0.05)
	A)Below Rs.5,000	55.33	9.8	57.33	10.7	-2	-0.9	
	B)Rs.5,001-10,000	52.1	7.42	55.7	5.57	-3.6	1.85	
	C)Rs.10,001-15,000	48.8	13.25	53.6	13.2	-4.8	0.05	
	D)Above 15,000	60	5.6	59	0	1	5.6	

Non-Significant, At P<0.05 Level.

The Table 8: shows in control group, there is statistical significant. association of mean difference score of osteoarthritic index with their selected demographic variables such as occupation(F-0.88), working pattern(F-0.99) and family income per month(F-0.86).

Table 8: Association of mean difference score of osteoarthritic index in experimental group with their selected demographic variables such as body mass index and duration of joint pain

S.No	Demographic Variables	Pre Test		Post Test		Difference		Anova 'F'
		Mean	SD	Mean	SD	Mean	SD	
10.	**Body Mass Index**							F=0.66
	A)<18.50 Underweight	58.33	12.8	57.33	10.7	1	2.1	
	B)18.50-24.99 Normal Range	51.7	9.03	49	7.9	2.7	1.13	

	C)25.0-29.99 Pre Obese	55.37	8.08	59.8	5.02	-4.43	3.06	**Ns** (P<0.05)
	D)30.0-34.99 Obese Class I	51	5	56.6	5.8	-5.6	-0.8	
	E) 35.0-39.0 Obese Class Ii	56.5	9.19	62	2.8	-5.5	6.39	
	F) ≥40.0 Obese Class Iii	-	-	-	-	-	-	
11.	**Duration Of Joint Pain**							
	A)<1 Years	49.6	10.23	44.8	7.12	4.8	3.11	F=0.77 **Ns** (P<0.05)
	B)1-5 Years	53.6	7.7	54.8	7.9	-1.2	-0.2	
	C)6-10 Years	61.5	4.9	60	8.48	1.5	-3.58	
	D)>11 Year	-	-	-	-	-	-	

Ns-Non Significant, At P<0.05 Level.

The Table 8: Shows In Control Group, There Is Statistical Significant. Association Of Mean Difference Score Of Osteoarthritic Index With Their Selected Demographic Variables Such As Body Mass Index (F-0.66) And Duration Of Joint Pain (F-0.87).

Table 8: Association of mean difference score of osteoarthritic index in experimental group with their selected demographic variables such as site of joint pain and at which time feel pain.

S.No	Demographic Variables	Pre Test		Post Test		Difference		Anova 'F'
		Mean	SD	Mean	SD	Mean	SD	
12.	**Site Of Joint Pain**							
	A)Elbow	48.08	8.7	48.16	7.22	-0.08	1.48	F=0.75 **NS** (P<0.05)
	B)Knee	56	6.6	53.5	9.14	2.5	-2.54	
	C)Ankle	47.33	7.5	44.33	6.6	3	0.9	
13.	**At Which Time Feel Pain**							
	A)Morning Time	56.54	5.5	57.9	11	-1.36	-5.5	F=0.53 **Ns** (P<0.05)
	B)Sleep At Night Time	54	6.6	60.16	5.5	-6.16	1.1	
	C)Rest Time	52.2	8.01	53	8.15	-0.8	-0.14	
	D)Working Time	54.37	10.46	52.7	9.26	1.67	1.2	

Non Siginificant At P<0.05 Level.

the table 8: shows in control group, there is statistical no significant association of mean difference score of osteoarthritic index with their selected demographic variables such as site of joint pain (F-0.75).and at which time feel pain (F-0.73).

CHAPTER-V
DISCUSSION

The study was conducted to evaluate the effectiveness of Bone strengthening exercises demonstration on Osteoarthritic Index among Patients diagnosed with Osteoarthritis. The discussion is based on the objectives, the review of literature and null hypotheses specified in this study.

5.1 The first objective was to assess the pre and post-test level of osteoarthritic index in experimental and control group among patients diagnosed with Osteoarthritis

The overall analysis the **pre-test score of pain** in experimental group, majority 23(76.6%) subjects had severe pain, 6(20%) had a moderate pain and 1(3.3%) had a mild pain, where as in control group majority 23(76.3%) had severe, 6(20%) had moderate pain and 1(3.3%) had mild pain.

The overall analysis on the **post-test score of pain** in experimental group, majority 15(50%) subjects had moderate pain ,5(16.6%) had mild pain and 10(33.3%) had severe pain, whereas in control group majority 16(53.3%) had moderate pain and 14(46.66%) had a severe pain.

The overall analysis the **pre-test score of stiffness** in experimental group, majority 19(63.3%) subjects had severe stiffness, 10(33.3%) had moderate stiffness, 1(3.3%) had mild stiffness; whereas in control group majority 26(86.6%) subjects had severe stiffness and 4(13.3%) had moderate stiffness.

The overall analysis the **post-test score of stiffness** in experimental group, majority 19(63.3%) subjects had moderate stiffness, 8(26.6%) had mild stiffness and 3(10%) had severe stiffness; whereas in control group majority 17(56.6%) had severe stiffness, 13(43.3%) had moderate stiffness..

The overall analysis the **pre-test score of physical function** in experimental group, majority 17(56.6%) subjects had moderate physical function and 13(43.3%) had severe physical function, whereas in control group majority 19(63.3%) had severe physical function and 11(36.6%) had moderate physical function.

The overall analysis the **post-test score of physical function** in experimental group, majority 18(60%) subjects had moderate physical function and 10(40%) had mild physical function and 2(6.6%) had severe physical function whereas in control group majority 17(56.6%) had severe physical function and 13(43.3%) had moderate physical function.

The overall analysis the **pre-test score of osteoarthritic index** in experimental group, majority 18(56.6%) subjects had severe osteoarthritic index, 12(40%) had moderate osteoarthritic index , whereas in control group majority 20(66.6%) had severe osteoarthritic index and 10(33.3%) had moderate osteoarthritic index.

The analysis in the **post-test score of osteoarthritic index** in experimental group, majority 20(66.6%) subjects had moderate osteoarthritic index, 7(23.3%) had mild osteoarthritic index and 3(10%) had severe physical function whereas in control group majority 18(60%) had severe osteoarthritic index and 12(40%) had moderate osteoarthritic index

Ronald plotnikoff, (2015) the study was conducted osteoarthritis prevalence and modifiable factors: a population study Alberta, Canada. Overall prevalence of self -reported OA in the total sample was 14.8%, where 10.5% of individual reported having knee OA and 8.5% reported having hip OA. Differences in prevalence were found for males and females across age categories for OA. Modifiable factors, being obese (BMI >30kg/m2) was significantly associated with prevalence of knee(OR:4.37;95% CI:2.08,9.20) and hip (OR:2.52;95% CI:1.17,5.43).

5.2 The second objective was to compare pre and post- test level of Osteoarthritic index within experimental and control group among patients diagnosed with Osteoarthritis

In Experimental group, the pre -test mean score of pain was 11.4 with S.D+2.32 and the post- test mean score was 6.6 with S.D+1.27. The calculated paired-'t' test is t= –10.6 was found to be highly significant at p<0.001 level.

The pre-test means score of stiffness was 4.7 with S.D+0.87 and the post-test mean score was 2.96 with S.D 0.72. The calculated paired-'t' test is t= - 6.97 was found to be highly significant at p<0.001 level.

The pre- test mean score of physical function was 33.83 with S.D+6.73 and the post- test mean score was 18.83 with S.D+3.43. The calculated paired-'t' test is t=-12.76 was found to be highly significant at p<0.001 level.

The pre- test mean score of Osteoarthritic index was 51.4 with S.D+10.17 and the post- test mean score was 28.5 with S.D+3.91. The calculated paired-'t test is t= 13.62 was found to be highly significant at p<0.001 level.

In control group, the pre- test mean score of pain was 11.6 with S.D+2.35 and the post -test mean score was 11.4 with S.D+3.56. The calculated paired-'t' test is t = -0.26 was found to be statistically no significant at p<0.05 level.

The pre-test mean score of stiffness was 5.43 with S.D+0.81 and the post-test means score was 4.63 with S.D±1.21. The calculated paired-'t test is t = -0.9 was found to be statistically no significant at p<0.05 level.

The pre-test mean score of physical function was 35.9 with S.D+ 6.85 and the post-test mean score was 35.06 with S.D+6.86. The calculated paired-'t' test is t = -1.7 was found to be statistically no significant at p<0.05 level.

The pre- test mean score of Osteoarthritic index was 5.4 with SD-8.68 and the post -test mean score was 51.4 with S.D 8.35. The calculated paired-'t' test is t = -1.39) was found to be statistically no significant at p<0.05 level.

This is clearly shows that the implementation of bone strengthening exercise had shown significant reduction in osteoarthritis index in the experimental and control group.

Hence the null hypothesis(NH1) stated earlier than " There is no siginificant difference in the pre and post – test level of osteoarthritis index in experimental and control group among patients diagnosed with osteoarthritis at p<0.05" was rejected in pre-test and retained post- test.

5.3 The third objective was to compare the pre and post- test level of the osteoarthritic index between experimental and control group among patients diagnosed with osteoarthritis

The overall analysis on the pre-test mean score of pain in experimental group was 11.4 with SD 2.32 and in control group was 11.6 with SD 2.35. The calculated unpaired-'t' value is t = -0.22 was found to be statistically non- significant at p<0.05 which indicates that there was no significant difference in the pre -test level of pain between the experimental and control group.

The overall analysis on the pre-test mean score of stiffness in experimental group was 4.7with SD 0.87 and in control group were 5.43 with SD 0.88. The calculated unpaired-'t 'value is t = -2.9 was found to be statistically non -significant at p<0.05 which indicates that there was no significant difference in the pre- test level of stiffness between the experimental and control group.

The overall analysis on the pre-test mean score of physical function in experimental group was 33.83 with SD 6.73 and in control group was 35.9 with SD 6.85. The calculated unpaired-'t' value is t = -

1.24 was found to be statistically non- significant at p<0.05 which indicates that there was no significant difference in the pre -test level of pain between the experimental and control group.

The overall analysis on the pre-test mean score of osteoarthritic index in experimental group was 51.4with SD 0.17 and in control group were 52.4 with SD 8.68. The calculated unpaired-'t 'value is t = -0.42 was found to be statistically non -significant at p<0.05 which indicates that there was no significant difference in the pre- test level of stiffness between the experimental and control group.

. The overall analysis on the post- test mean score of pain in experimental group was 6.6 with SD 1.27 and in Control group was 11.4 with SD3.56. The calculated unpaired-'t' value is -7.05 was found to be statistically highly significant at p<0.001 which indicates that there was difference in the post test level of pain between the experimental and control group.

The overall analysis on the post- test mean score of stiffness in experimental group was 2.96 with SD 0.72 and in Control group were 4.63 with SD 1.21. The calculated unpaired-'t value is t-5.67 was found to be statistically highly significant at p<0.001 which indicates that there was difference in the pre-test level of stiffness between the experimental and control group.

The overall analysis on the post -test mean score of physical function in experimental group was 18.83 with SD3.43 and in Control group were 35.06with SD 6.86. The calculated paired-'t' value is t-11.5 was found to be statistically highly significant at p<0.001 which indicates that there was difference in the pre-test level of physical function between the experimental and control group

The overall analysis on the post- test means score of Osteoarthritic index in the experimental group was 28.5 with SD 3.91 and in control group were 51.4 with SD 8.35. The calculated unpaired-'t' value is t-13.58 was found to be statistically highly significant at p<0.001 which indicates that there was difference in the post test level of Osteoarthritic index between the experimental and control group.

This clearly shows that the practice of bone strengthening exercise had significant reduction of Osteoarthritic index score in the experimental group than the control group.

Hence the null hypothesis (NH2) stated earlier that "there is no significant difference in the pre and post- test level of osteoarthritic index between experimental and control group among patients diagnosed with osteoarthritis at p<0.05" was rejected in pre-test and retained in control group.

MKloppenburg .,(2019) The study was conducted pub-Med search was performed for articles published between May 1st,2018 to April ,2019 Musculoskeletal disorder, including OA, are highly prevalent and are expected to increase. Based on data important, musculoskeletal disorders due to OA especially high at 40-55 years. Statistically significant. increase in comparison of 31.4% (95% confidence interval) (CI) 30.7 to 32.1). All these studies underline the impact OA and other musculoskeletal disorders have on individual and society .These results are crucial for health professionals and policy makers in order to plan the healthcare system of the future.

5.4 The objective was correlation of mean difference of pre- test and post-test score osteoarthritic index in experimental and control group among patients diagnosed with osteoarthritis.

The overall analysis of experimental Group, the pre -test mean score of pain was 11.4 with S.D 2.32, stiffness mean score of 4.7 with S.D 0.87 and the calculated Karl Pearson's Correlation value is r = 04891 shows a positive correlation. In Experimental Group, the pre- test mean score of pain was 11.4 with S.D 2.32, physical function mean score of 33.83 with S.D 6.73 and the calculated Karl Pearson's Correlation value is r = 0.5158 shows a positive correlation. In Experimental Group, the pre- test mean

score of stiffness was 4.7 with S.D 0.87 physical function mean score of 33.83 with S.D 6.73 and the calculated Karl Pearson's Correlation value is r = 0.3158 shows a positive correlation.

The overall analysis of control Group, the pre- test mean score of pain was 11.6 with S.D 2.35, stiffness mean score of 5.43 with S.D 0.81 and the calculated Karl Pearson's Correlation value is r = 0.1212 shows a positive correlation. In Control Group, the pre- test mean score of pain was 11.6 with S.D 2.35 physical function mean score of 35.9 with S.D 6.85 and the calculated Karl Pearson's Correlation value is r = 0.5922 shows a positive correlation. In Control Group, the pre-test mean score of stiffness was 5.43 with S.D 0.81 physical function mean score of 35.9 with S.D 6.85 and the calculated Karl Pearson's Correlation value is r = -0.005 shows a negative correlation.

The overall analysis of experimental Group, the post- test mean score of pain was 6.6 with S.D 1.27, stiffness mean score of 2.96 with S.D 0.72 and the calculated Karl Pearson's Correlation value is r = 0.0509 shows a positive correlation. In Experimental Group, the post- test mean score of pain was 6.6 with S.D 1.27, physical function mean score of 18.83 with S.D 3.43and the calculated Karl Pearson's Correlation value is r = -3478 shows negative correlation. In Experimental Group, the post- test mean score of stiffness was 2.96 with S.D 0.72 physical function mean score of 18.83 with S.D 3.43 and the calculated Karl Pearson's Correlation value is r = -0.0689 shows a negative correlation.

The overall of analysis of control Group, the post- test mean score of pain was 11.4 with S.D 3.56, stiffness mean score of 4.63 with 1.21 and the calculated Karl Pearson's Correlation value is r = 0.2239 shows a positive correlation. In Control Group, the post- test mean score of pain was 11.4 with S.D 3.56, physical function mean score 35.06 of with S.D 6.86 and the calculated Karl Pearson's Correlation value is r = -0.0848 shows a negative correlation. In Control Group, the post- test mean score of stiffness was 4.63 with S.D 1.21 physical function mean score of 30.06 with S.D 6.86 and the calculated Karl Pearson's Correlation value is r = 0.2471 shows a positive correlation

5.5 The fourth objective was to associate the mean difference score of osteoarthritic index in experimental and control group among patients diagnosed with Osteoarthritis with their selected demographic variables.

The result shows the association score of osteoarthritic index among patients diagnosed with Osteoarthitis with their selected demographic variables. In experimental group, there is statistical significant. Association of mean difference score of osteoarthritic index with their selected demographic variables such as age (F-25.55), sex (F-43.9) and Educational status (F- 24.6), dietary pattern (F-27.5), Marital status (F-26.9), Religion (F-43.5), occupation(19.82), working pattern(23.56) and duration of joint pain (42.03) at $p<0.05$.

The result shows the association score of osteoarthritic index among patients diagnosed with Osteoarthitis with their selected demographic variables. In control group, there is statistical no significant association of mean difference score of osteoarthritic index with their selected demographic variables.

The result shows the association score of osteoarthritic index among patients diagnosed with Osteoarthitis with their selected demographic variables. In experimental group, there is statistical significant. Association of mean difference score of osteoarthritic index with their selected demographic variables such as Site of joint pain (F-31.5) and at which time feel pain (F-25.2).

Hence the null hypothesis (NH3) stated earlier that "there is no significant association in the post test score of osteoarthritic index among patients diagnosed with Osteoarthitis in

experimental and control group at p<0.05" was retained for age, working pattern and body mass index in experimental group and age, sex, education status, dietary pattern, marital status, religion, occupation, working pattern, family income per month, body mass index, duration of joint pain, site of joint pain and at what you feel pain in control group".

CHAPTER VI

SUMMARY, CONCLUSION, IMPLICATION, RECOMMEDATIONS AND LIMITATIONS

This chapter deals with the summary of the study, conclusion drawn, implication, recommendations and limitations.

Summary

This study was undertaken to determine the effectiveness of bone strengthening exercise demonstration on osteoarthritic index among patients diagnosed with Osteoarthritis.

Aging is normal process of becoming 40 to 55 yrs. Aging has been defined as the collection of changes that render human beings progressively more likely to die. It is inevitable, irreversible but it is not necessarily negative. **(Joao pedro de megalhaes, 2014).**

Osteoarthritis is a common and often chronic condition among people. A major consequence is the limitation of the ability to conduct activities of daily living leading to loss of independence **(Pavithrasampath, 2013).**

Osteoarthritis is highly prevalent among 40 to 55years.Osteoarthritis is a non-inflammatory progressive disorder of movable joint, particularly weight bearing joints.. However it is strongly believed that it occur due to aging or `wear and tear or degenerative changes in the joint.

Risk factors for OA include age, gender, obesity, occupation, sports, previous trauma, irregularity in joint surface. The major symptoms present in osteoarthritis are pain and functional disability. The knee is most common site for osteoarthritis with characteristic sign like pain, stiffness, tenderness, swelling, crepitus and loss of movement, valgus deformity, locking of the knee, on auscultation of joint – scratching, crepitus and later on loud crackling sound. In addition, they have a lot of functional limitation when sitting and standing or going up and down stairs**.(Sumathi.g,ramamoorthy).2019.**

The bone strengthening exercise is applied to the body to stimulate healing and strengthening.it can be used to improve the muscle strengthening,physical activity, reduce pain and stiffness,it was once part convention therapy to practise in our home routinely daily in 20th century.it is very effective therapy for osteoarthritis patient.

The objectives of the study were:

1. To assess the pre and post-test level of osteoarthritic index among patients diagnosed with osteoarthritis in experimental and control group.
2. To compare the osteoarthritic index within experimental and control group of patients diagnosed with osteoarthritis.
3. To compare the osteoarthritic index between experimental and control group of patients diagnosed with osteoarthritis.
4. To correlate the osteoarthritic index among patients diagnosed with osteoarthritis between experimental and control group.
4. To associate the mean difference level of osteoarthritic index among patients diagnosed with osteoarthritis in experimental and control group with their selected demographic variables.

The null hypotheses stated were:

- **NH_1**-There is no significant difference in level of osteoarthritic index within the experimental and control group of patients diagnosed with osteoarthritis at $p<0.05$ level.
- **NH_2**-There is no significant difference in level of osteoarthritic index between the experimental and control of patients diagnosed with osteoarthritis group at $p<0.05$ level.

 NH_3-There is no significant correlation between osteoarthritic index among patients diagnosed with osteoarthritis in experimental and control group at $p<0.05$ level.

 NH_4-There is no significant association of mean difference score of osteoarthritic index among patients diagnosed with osteoarthritis in experimental and control group with their selected demographic variables at $p <0.05$ level.

The assumptions were:

 Osteoarthritis patients may have joint pain, stiffness, altered physical function.

 Bone strengthening exercise may be effective in reducing osteoarthritic index with Osteoarthritis patient.

 Osteoarthritis patients may share their knowledge and benefit of bone strengthening exercise to their neighbours and relatives.

 Bone strengthening exercise application may not have any side effects other than the drugs.

The conceptual framework for this study was developed based on the modified general system theory. It focus on interaction and on relationship parts in order to understand an entity's organization, functions outcome.

The research design selected for this study was the pre- test to be conducted to be level of osteoarthritic index respectively in the experimental and control group was assessed by modified WOMAC index scale on day. On the 3rd day, researcher implements the bone strengthening exercise through video in experiment group for 15-20minutes the researcher teach regular at morning followed that exercise for 3 weeks. After 21 days and post- test level of osteoarthritic index was assessed by same scale.

The pilot study was conducted in DR.Muth orthopaedic clinic in tiruvannamalai. The stools used for data collection were consisting of demographics variables. Modified WOMAC index scale for assessing osteoarthritis index among patients diagnosed with osteoarthritis.

The content validity of tool was established by eight experts consisting medicine experts, one orthopediciens and six nursing experts and the reliability of the tool was confirmed by test-retest method r= 0.9. So the tool was highly reliable.

The main study was conducted in Mother orthopaedic speciality hospital in tiruvan0.namalai. Based on the inclusion criteria, the researcher selected 60subject. The 30 patient were assigned to experimental group and 30 in control group through non-convenient sampling technique.

Data pertaining to the demographic variables was collected by the investigator through interview method. The pre –test score of osteoarthritis index in experimental and wait list control group was assessed using modified WOMAC index scale. Subjects of the experimental group were implemented bone strengthening exercise demonstration and wait list control group was routinely home activity. The post test score of osteoarthritic index was 22nd by using modified WOMAC index scale. Both inferential and descriptive statistics were used to analyse the data.

The major findings of the study were:

The majority of the subjects before practicing bone strengthening exercise application were on severe and extreme score of osteoarthritic index, whereas after implementation of bone strengthening exercise application majority 56.6% subjects had severe osteoarthritic index, 40% had moderate and 3.3% had extreme score of osteoarthritic index.

The comparison of the pre- test and post test score of osteoarthritic index among patients diagnosed with osteoarthritis between experimental group and control group revealed that the calculated unpaired t value 13.58 was found to be statistically significant at $p<0.001$ which indicates that there was difference in the post test pre -test score of osteoarthritic index between the groups, this clearly shows that the practice of bone strengthening exercise application had reduction in osteoarthritic index among patients diagnosed with osteoarthritis.

Conclusion

The present study assessed the effectiveness of application on bone strengthening exercise osteoarthritic index among patients diagnosed with osteoarthritis in selected Mother orthopaedic speciality hospital at Tiruvannamalai. The study findings concluded that there was a statistically significant difference in the score of osteoarthritic index after implementation of bone strengthening exercise application and this proved to be an effective alternative therapy and non -pharmacological therapy to reduction of osteoarthritic index.

Implications

The researcher has drawn the following implications from the study which is vital concern to the field of Nursing Practice, Nursing Education, Nursing Administration and Nursing Research.

Implications for Nursing Practice

- The nursing personnel should develop an in depth knowledge and skill on bone strengthening exercise application.
- Bone strengthening exercise application can be practiced as one of the nursing intervention as it has been proved to reduce the osteoarthritic index among patients diagnosed with osteoarthritis group.
- Nurses use holistic nursing interventions as a bone strengthening exercise application, such intervention are cost effective, economical, non- invasive and non - pharmacological compliments to medical care.
- Implementation of evidence based approach in treatment of osteoarthritis problem as an effective strategy.

Implications for Nursing Education

- The nurse educators need to be equipped with adequate knowledge regarding alternative therapy like bone strengthening exercise application
- The nurse educators should provide the knowledge of students with adequate exposure for practice of bone strengthening exercise application
- The nurse educators should strengthen the curriculum for nurses to excel them in knowledge and skill in areas of alternative therapies.
- The nurse educators Conduct workshops or conferences for students regarding the use of complementary and alternative therapy like bone strengthening exercise application in day today life.
- The educational institutions must provide opportunities for nursing students create opportunity for learning bone strengthening exercise application and its benefits

Implications for Nursing Administration

- Nursing administration should organize in-service education program on bone strengthening exercise application for the nurses to reduction and improvement of osteoarthritis index.
- Nursing administrators should plan for bone strengthening exercise application in patients diagnosed with osteoarthritis patients to reduction of osteoarthritic index
- Nursing administration can strengthen role of the nurses in initiating and provide motivation to the patients diagnosed with osteoarthritis to implementing bone strengthening exercise application as a non- pharmacological intervention for reduction of osteoarthritic index Implications for Nursing Research.
- Nursing researcher should disseminate the findings of research through conferences, seminars, and publication in nursing journals.
- Nursing researcher should motivate to conduct more studies to know the effectiveness of bone strengthening exercise application encourage the utilization of bone strengthening exercise application in the clinical and community settings.

Recommendations

- The study can be conducted with larger population in different setting for better generalization.
- Evaluative study can be done to assess the self- bone strengthening exercise application on osteoarthritic index among patients diagnosed with osteoarthritis.
- A comparative study can be under taken for effectiveness along with other therapies.
- The same study can be conducted on osteoarthritis patients with the group of 40-55 yrs.
- Evaluative study can be done to assess the bone strengthening exercise application on all joints.
- The study can be under taken bone strengthening exercise for chest congestions paediatrics and adults.

Limitations:

. As there were limited studies on bone strengthening exercise application, the researcher had difficulty in obtaining related review of literature.

Generalization is not possible.

DEMOGRAPHIC VARIABLES

1. AGE

a) 40 - 45 years
b) 46 - 50 years
c) 51 - 55 years

2. SEX

a) Male
b) Female

3. EDUCATIONAL STATUS

a) Illiterate
b) Primary school
c) High school
d) Graduate and above

4. DIETARY PATTERN

a) Vegetarian

b) Non vegetarian
c) Lacto ova vegetarian

5. MARITAL STATUS

a) Married
b) Single
c) Divorced
d) Widow

6. RELIGION

a) Hindu
b) Muslims
c) Christian
d) Other caste

7. OCCUPATION

a) Farmer
b) Daily wages
c) House wife
d) Office workers
e) Retired

8. WORKING PATTERN

a) Sedentary worker
b) Moderate worker
c) Heavy worker

9. FAMILY INCOME PER MONTH

a) Below Rs.5,000
b) Rs.5,001-10,000
c) Rs.10,001-15,000
d) Above 15,000

10. BODY MASS INDEX

a) <18.50 Underweight
b) 18.50-24.99 Normal range
c) 25.0-29.99 Pre Obese
d) 30.0-34.99 Obese class I
e) 35.0-39.0 Obese class II
f) >40.0 Obese class III

11. DURATION OF JOINT PAIN

a) <1 years
b) 1-5 years
c) 6-10 years
d) >11 year

12. DO YOU HAVE PAIN IN ANY OF THESE JOINT

a) Elbow JOINTS

b) Hip JOINTS
c) Knee and ankle Joints
d) Others

13. DO YOU HAVE ANY OF THESE CO-MORBID

a) Hypertension
b) Diabetes
c) Coagulopathy
d) Others

14. HAVE YOU TAKEN ANY OF NON-PHARMACOLOGICAL MEASURES

a) Heat or ice application
b) Physiotherapy
c) Compression socks
d) Any others

15. DO YOU HAVETAKEN ANY OF THESE OT DRUGS FOR JOINT PAIN

a) Acetaminophen
b) Ibuprofen
c) Aspirin
d) Other medication

TOOL ASSESSMENT OF MODIFIED **WOMAC** INDEX SCALE

Sample no……Section……..Date…….

PAIN SUBSCALE	**NONE (0)**	**MILD (1)**	**MODERTE (2)**	**SEVERE (3)**	**EXTREME (4)**
How much pain do you have ? 1. Walking 2. Climbingstairs 3.During sleep at nit time 4.Sitting or lying down 5.Weight bearing					

S.NO	STIFFNESS SUBSCALE	NONE (0)	MILD (1)	MODERATE (2)	SEVERE (3)	EXTREME (4)
B	HOW SEVERE STIFNESS DO YOU HAVE? 1.After first wakening in the morning? 2.After sitting or resting later in the day?					

S.NO	PHYSICAL FUNCTION-SUBSCALE	NONE (0)	MILD (1)	MODERATE (2)	SEVERE (3)	EXTREME (4)
C	How severe stiffness do you have? Descending stairs Ascending stairs Standing SittingFloorchair Bending to floor Raising from bed Lying in bed Wearing clothes Pulling/ pushing the door . Getting on toilet/ off toilet Western Indian 11.Object lifting (lights) eg: Water bottle, chairs. 12.Object lifting (heavy) eg: bag 13.While wearing the shoes or chapels. 14.While hair combing and fleeting. 15.Walking on flat surface. 16. Rising from sitting. 17.Taking off socks/stockings					

THE OSTEOARTHRITIC INDEX IS RATED AND INTERPRETED UNDER FOLLOWING CLASSIFICATION

S.NO	SCORE	LEVEL OF INDEX
1	0	None
2	01-24	Mild
3	25-48	Moderate
4	49-72	Severe
5	73-96	Extreme

SCORING FOR OSTEOARTHRITIC INDEX

ITEMS	NONE	MILD	MODERATE	SEVERE	EXTREME
OSTEOARTHRITIC INDEX	0	1	2	3	4

BONE STRENGTHENING EXERCISE

INTRODUCTION

Bone growth is stimulated by physical stress brought about by physical activity. As skeletal muscles contract, they pull their attachment on bones causing physical stress, making it stronger and thicker. Such bone strengthening exercise can increase density throughout our skeletal system.

MEANING

Bone strengthening exercise produce an impact or tension forces on the bones that promotes bone growth and strength.

OBJECTIVES

1. To increase your muscles mass in order to improve your balance
2. In which helps decrease risk factors of falls and bone fractures.
3. The regular exercise that load the bone can also help maintain bone strength and minimize bone loss in adulthood.
4. Reduced pain and inflammation.
5. Improved flexibility and range of motion.
6. Enhanced muscular strength.
7. Loss of excess weight.
8. Enhanced muscular and cardiovascular endurance.
9. Improved balance and coordination.

BONE STRENGTHENING EXERCISE

There are 5 components to an bone strengthening exercise the demonstration through video for 15 – 20 minutes.

- ❖ Warm-up
- ❖ Grief ball exercise.
- ❖ Elastic band exercise.
- ❖ Hamstring stretching exercise.
- ❖ Calf stretching exercise.

❑ This Exercise perform 15-20 min, to complete and should be performed daily at morning time for 3 weeks. After that 3 weeks by using modified WOMAC index scale to measure the pain and stiffness and physical activity.

STEP-1: WARM UP

- ➢ Stand with your legs and straight.
- ➢ Keep your hands loosely at your sides.
- ➢ Rotate your head clockwise and counter clockwise
- ➢ Position as above, hands raise to height, rotate the forearm inward and outwards and both arm rotate simultaneously clockwise, counter clockwise, opposite direction.
- ➢ Finger should be clasped, perform wrists rotation in both direction.
- ➢ Place your hands on your hips and your head straight, perform extensive hip rotation.
- ➢ Place your feet slightly apart, and hands on hips, raise your knee bent leg and perform knee rotation to the right and to the left and perform to another knee.

- Place your feet slightly apart, shifting your body weight on one foot, stand on the toes of your other leg and perform rotation of the raised foot clockwise and counter clockwise, perform same exercise to another foot.

STEP-2: GRIEF BALL EXERCISE

The grief ball exercise will demonstrated by researcher through video, the patient will follow as:

- Sitting or standing position to the patient
- The researcher divided in 2 group 15 members.
- The researcher give 15 grief balls to the patient.
- The researcher put video instruct patient:
  * The right hand hold the grief ball, slowly press and relax will practice 2 minutes.
  * Same exercise will practice left hand for 2 min totally 4 minutes.

STEP-3: ELASTIC BAND EXERCISE

- Sit or stand the patient.
- Provide elastic band to the patient.
- Take the elastic band in left hand.
- Extend arms overhead, hand in line with shoulder.
- Keeping the left arm still, pull your right arm down and right elbow bending to 90 degrees angle hold it for 30 sec.
- Coming in line with your shoulder slowly reverse move, right arm come back overhead.
- Repeat on the right arm still for 30 sec.
- Repetition 3 times totally 4 min.

STEP-4: HAMSTRING EXERCISE

- Lie on the floor or bed. Both leg should be lie-down.
- Took that elastic band put around bottom of your foot.
- Using elastic band for support to elevate your leg until you feel a gentle stretch at the back of your knee and thigh hold for 30 seconds.
- Repeat on the exercise another led perform 30 seconds.
- Repetitions of exercise 3 times totally 4 min.

STEP-5: CALF STRETCHING EXERCISE

- Stand away from wall in 2 feet distance.
- One foot , in front slightly bend, other leg keep your back knee straight , your heel on the ground and lean toward the wall and both hand of palm push towards the wall.
- Feel the stretch all along the calf of your bag leg, hold this stretch for 30 seconds.
- Perform the stretch exercise to another leg for 30 seconds.
- Repetitions calf stretch exercise for 3 times totally 4 min.

SUMMARY

- With all above bone strengthening exercise,start slowly and gradually increase duration and activity intensity. Begin with light exercise and do not over do in first week. Integrating your exercise into your daily routine will help you progress and improve your activities.