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# Effect of Hamstring Exercise on the Level of Low Back Pain Among Post Menopausal Women

**Karthika Mohan P**

Lecturer, Saraswathy College Of Nursing

**ABSTRACT**

Menopause is the process through which a woman ceases to be fertile or menstruate. It is a part of life and is not considered or condition symptoms may occur years before a women's final period. Low back pain is a massive problem in modern populations, both in social and economic terms. It affects a larger number of women, especially those aged 45- 60. This study has been conducted to assess the effect of hamstring exercise on the level of low back pain among post menopausal women at selected Kudumbasree units in Thiruvananthapuram district. The objectives of the study were to assess the level of low back pain among post menopausal women and assess the effect of hamstring exercise on the level of low back pain among post menopausal women. The research design used was quasi experimental pretest post test control group design was used for the study, 60 samples were selected by purposive sampling technique. The samples low back pain was assessed using an oswestery disability index scale. The investigator explained and demonstrated about each and every step of the exercise to the subjects of the experimental group. Hamstring exercise such as Standing hamstring stretch, chair hamstring stretch, towel hamstring stretch, wall hamstring stretch was practiced by experimental group 30 minutes a day in a week for one month. No interventions were provided to control group. Post test was conducted for both experimental and control groups on the 31 St day. Finding of the study showed that that there is a significant improvement on the level of low back pain among postmenopausal women in the experimental group than in the control group after providing hamstring exercise. The t value is 21 which were greater than p value 2.05 at the level of 0.05 that is there is a significant improvement in the level of low back pain in the experimental group than in control group Hence it is revealed that administration of hamstring exercise was an effective intervention for relieving low back pain among post menopausal women. Hypothesis, there is a significant difference on the level of low back pain among post menopausal women in experimental and control group is accepted.

**Keywords**: Effect, Hamstring exercise, Low back pain, Post menopausal women. ix

## CHAPTER 1 INTRODUCTION

### INTRODUCTION

"Women are like tricks by sleight of hand, which to admire, we should not understand"

**(William Congreve)**

Low back pain is a massive problem in modern populations, both in social and economic terms. It affects a larger number of women, especially those aged 45- 60[1].Low back pain is defined as

pain and discomfort localized below the costal margin and above the inferior gluteal folds, with or without leg pain[2]. As their life expectancy increases, contemporary women live a third life in menopause. Chronic pain is more prevalent in women than in men and it increases with age. [1]

Type of low back pain can be classified as acute low back pain and chronic low back pain. Pain that lasts less than 3 to 6 months, or pain directly related to tissue damage, is called acute pain. Chronic pain is pain that lasts more than three to six months, or beyond the point of tissue healing. This type of pain might also be termed chronic benign pain or chronic non-cancer pain depending upon the situation.[3]

Menopause is defined as the time of cessation of ovarian function resulting in permanent amenorrhea. It takes 12 months of amenorrhea to confirm menopause. Climacteric is the phase of waning ovarian activity and may begin 2-3 years before menopause and continue for 2- 5 years after it. The climacteric is thus phase of adjustment between the active and ovarian function and occupies several years of women's life and it involves physical, sexual and psychological adjustment. 60 million women in India are above the age of 55 years. The health problem cropping up during this period and related to estrogen deficiency of menopause is now obvious and better understood. An average Indian woman now lives for 65 years of age, whereas in developing countries a lifespan up to 80 years is possible.

Menopause normally occurs between the ages of 45- 50 years. There is a 50 % reduction in estrogen level at menopause. The three classical ways, in which the menstrual period ceases such as sudden cessation, gradual demotion in the amount of blood loss with regular period until menstruation stops. Gradual increases in the spacing of the period until they cease for at least a period of 1year.[4]

Throughout menopause, many hormonal changes occur in the body. This has many effects on the body, including weight changes, hot flushes, fatigue, lower bone density, urinary incontinence or joint and muscle pains. Studies indicate the prevalence of Low Back Pain is reported at higher rates in women especially with respect to postmenopausal women. These changes may be a contributing factor or increase the risk of developing LBP. Low back pain has major lifestyle implications as it restricts participation in many enjoyable activities or events and can cause financial hardship with respect to loss of productivity at work[4]. One of the main roles estrogen plays in the female body is regulation of calcium deposits and bone density. Without the control from estrogens a steep decline in bone mineral density is seen in females which have ramifications for the development of osteoporosis. Studies indicate resistance exercise is a vital component of the preservation of bone density. The resistance loading provides the required stimulus and signal to increase calcium production and slows the bone resorption process. Numerous symptoms associated with the perimenopausal period have been identified. Physical ones can include spine and joint pain, hot flushes, night sweats, chronic tiredness; psychological symptoms can include irritation and anxiety, mood swing, depression and sleep disorders.[5]

Low back pain affects post menopausal women daily living activities adversely. It also restricts mobility, interferes with normal functioning and results in lifelong pain and permanent disability. In India, most of the low-income group people are engaged in physically demanding jobs which may increase the risk of low back pain and disability. Low back pain also affects the quality of life (QOL) of not only the women themselves, but their families as well.[5]

International surveys was conducted on prevalence of low back pain and its relation to quality of

life and disability among women in rural areas of punducherry, India reported that the prevalence was 19-43% and point prevalence was 15-30%. The estimated worldwide lifetime prevalence of low back pain varies from 50% to 84%. Studies in developed countries have shown that the low back pain prevalence was 6.8% in North America, 13.7% in Denmark, 12% in Sweden, 14% in the United Kingdom, 33% in Belgium, and 28.4% in Canada. Similarly, some studies in developing countries have revealed a much higher incidence of 72.4% in Nigeria, 64% in China, and 56.2% in Thailand. The occurrence of low back pain in India is also alarming with nearly 60% of the people in India have suffered from low back pain at some time during their lifespan.[6]

The overall prevalence of LBP is higher in women than in men. Women are also affected by many chronic pain conditions , attributes sex difference in pain to interaction between biological, psychological and social cultural factors. The heightened pain sensitive among women can also partially explain greater reports of pain by women compared to men. Menstrual cycle fluctuations in pain sensitivity may help to explain sex difference in pain reports in younger adults. Biologic response to pregnancy and childbearing, the physical stress of child bearing, the perimenopausal abdominal weight gain is additional causes for LBP. Population based studies shown that the prevalence of widespread pain increases with age, peaking in the seventh and eighth decades. Recently it has been shown that genetics also played a role in the development of LBP.[7]

The common clinical manifestations of low back pain among post menopausal women were hormonal changes, cramps and breast tenderness, migraine, headache, joint pain, bruising, fibromyalgia, pain during intercourse. It can be diagnosed as inspection of back and posture, palpation/percussion of the spine, Neurologic exam, Straight leg rising**,** in some patients with suspected infection or malignancy, erythrocyte sedimentation rate (ESR) or C-reactive protein (CRP) in addition to plain radiographs to determine the need for advanced imaging. There are several treatment for LBP but their efficacy is not fully proven, physical activity has been suggested as an effective treatment for patients with sub-acute or chronic nonspecific LBP, therefore in the acute phase educational and physical activity promoting measures, spinal exercise and massage therapy should be the primary treatment options.[8]

The Hamstring consist of three muscles the biceps femoris muscle, the semitendinosus muscle and the semimembranosus muscle. These muscles combined are primarily responsible for the flexion of the knee joint as well as assisting the extension of the thigh. In addition to these function the hamstring muscle work in tandem to rotate the knee, assist in maintaining a standing position with knees slightly bent as well as limiting how far bend forward as try to touch our toes without bending our knees. The hamstring muscle also plays a role in our posture by assisting to straighten out the lower curvature of the spine which curves the pelvis forward when sitting.[9]

Standing hamstring stretch, chair hamstring stretch, towel hamstring stretch and wall hamstring stretch are the types of hamstring exercise. Hamstring stretch have been shown to be most effective when done for a duration of 30- 60 most effective when done twice daily and on a regular basis. It can be easier to remember to do the stretches if they are incorporated in to a daily routine, such as when getting up every morning and going to bed each night.[10]

Hamstring exercise help to prevent and relieve low back pain because of the way the muscles connect to bones. Hamstring muscles run from the back of thigh to pelvis. If they will pull pelvis down, which pushes spine in to an unnatural position that will eventually cause lower back pain.[11]

Many people with chronic back pain can experience dramatic improvement after stretching their hamstring on a daily basis for 1-3 month. If women do not have lower back problem, Stretching hamstring every day is an excellent preventive measures that will keep lower back and pelvis balanced for the years ahead.[12]

**NEED FOR THE STUDY**

Low back pain is a common disorder involving the muscles, nerves and bones of the back pain can vary from a dull constant ache to sudden sharp feeling.[13]

Menopause is a natural life occurrence. For most women, there is no cause for alarm or medical interventions. A study of menopausal women revealed that 80% experienced no changes in quality of life. 62% felt positively about menopause. 10%of women said they were irritable, fatigued and had feeling of despair during the menopausal phase of their lives.[14]

Women have more complex and stressful aging process as compared to men, due to hormonal changes that occur during menopausal transition. Menopause marks the end of female reproductive function and also makes them vulnerable to a new set of health problems such as cardiovascular diseases, and osteoporosis. Aging is also associated with gait and balance problems. There is an increased risk for falls and subsequent injuries. Body weight, physical activity, and muscle strength are mechanical factors that determine the loads placed on the skeleton. [15]

The incidence of back pain in premenopausal women varied between 12.2% and 72.3%[16]Several studies found that the prevalence of back pain was significantly higher in premenopausal women compared to pre and postmenopausal women. Other studies suggested that while back pain may be higher in premenopausal women than premenopausal women, the incidence increases further in postmenopausal women. Hormonal and biological factors were associated with an increased prevalence of back pain, including longer menopausal transition, premature pre and post-menopause, higher number of parities, and higher frequency of typical menopausal symptoms. Several lifestyle factors correlated with high prevalence of back pain including higher BMI, depression, inactivity levels, and alcohol consumption. Studies hypothesized that decreasing estrogens during menopause lead to osteoporosis, attributing to endplate and disc degeneration. One study suggested that low estradiol can cause an increase in general pain sensitivity.[17]

Based on consistent evidence, the global prevalence of LBP is higher among females (1355 56). The prevalence of LBP was 24.3% for men and 28.3% for women The 2002 NHIS (National health interview survey) report also showed that the age-adjusted prevalence estimates of LBP were 19.5% for Hispanic or Latino, white, and black or African American males respectively and 27.3% for Hispanic or Latino, white, and black or African American females respectively.[18]

A cross-sectional study was conducted in the population living in eight villages of a Sathrik block of Barabanki district in Uttar Pradesh from July to December 2015. The study population comprised full-time homemakers in the age group 26–
65 years. The sample size was calculated to be 222 considering an expected prevalence rate of 31.1% .The study concluded that more than 40% of homemakers from rural areas in this study suffer from MSP (Moderate spine pain) at an average of 2.1 locations in the body, and more than 60% of these had pain for which a simple clinical examination is not sufficient to diagnose the underlying pathology.[19]

A case control study was conducted on increased active hamstring stiffness after exercise in women

with a history of low back pain done in a laboratory setting with 12 women with a history of recurrent episodes of LBP and 12 matched healthy women. LBP subjects reported an average 6.5 +/- 4.7 on the Oswestery disability index. The result showed that individuals with a history of recurrent LBP episodes presented significantly increased stiffness 48-72 hours post exercise compared with controls.[20]

A study was conducted to assess the effect of hamstring stretch with pelvic control of pain and work ability in standing worker in the Netherlands. A total

100 adults were selected and in that 34 adults assigned for general hamstring stretching and 32 as a control group. The control group performed self-home exercise. All interventions were conducted 3 days per week for 6 weeks and included on the hamstring stretching and lumbopelvic strengthening. The pelvic control hamstrings stretch exercise would be more helpful back pain reduction and improvement of work ability in an industrial setting as the population ages.[21]

About 40 % of the women studied reported that this type of pain had occurred within the previous month and those women had lower measures a physical health than women reporting either no LBP or pain confined to the lower back. They were also more likely to experience activity limitations, use medications and visit a physician or chiropractor. Almost two third of the women with LBP during the previous month reported multiple episodes of pain throughout their lives, but those with pain radiating into their legs were two to four times more likely to have been hospitalized or to have had spinal injections for back problems.[22]

The Hamstring insert on the Ischia tuberosity, which in the sit bone, its part of the pelvis and extend all the way down to the knee. When they are tight, however,they shorten and hence pull down on the pelvis giving way to a posterior pelvic tilt and then flattening out the lumbar spine is lost. And this puts the person at risk for a herniated disk and also just overuse and strains of the lumbar area. Since the pelvis is the foundation lower back and spine, having tight hamstring contributes to as unstable lower back and a greater chance of intermittent sprains and strains.[23]

Hamstring exercise help to prevent and relieve low back pain because of the way the muscles connect to the bones. Hamstring muscles run from the back of the thigh to the pelvis. If they will pull the pelvis down, which pushes the spine in to an unnatural position that will eventually cause lower back pain[23]

I have selected the study since low back pain is one of the major health problems prevailing in our society. During my health survey in community area I have found many post menopausal women suffering with low back pain. Since the treatment for low back pain was not affordable to middle income women I decided to conduct this study, which is completely free of cost.

**Statement of the problem**

A Study to assess the effect of Hamstring exercise on the level of low back pain among post-menopausal women in selected community area in Thiruvananthapuram district.

**Objectives**

- To assess the level of low back pain among post-menopausal women in experimental and control group.
- To assess the effect of hamstring exercise on the level of low back pain among post-menopausal women.

**Operational definitions:**

- **Effect**

In this study effect refers to outcomes obtained as a result of hamstring excersie on the level of low back pain which is measured with Oswestery disability index.

- **Hamtring exercise**
  In this study Hamstring exercise include 5 minute of warm up exercise (breathing exercise) 20 minutes of hamstring exercise (standing hamstring stretch , chair hamstring stretch, towel hamstring stretch, wall hamstring stretch)followed by 5 minutes cooling exercise 5 days in a week for 30 minutes for a month.
- **Low back pain**
  In this study low back pain refers to pain perceived by the post-menopausal women around lumbar region who scored between 21- 40 in Oswestry disability index.
- **Post menopausal women**
  In this study post-menopausal woman refers to women who attained menopause between the age group of 50 – 60 years.
  9
- **Hypothesis**

$H_1$:There is a significant difference on the level of low back pain among post-menopausal women in experimental and control group.

**Conceptual framework**

A framework is the overall conceptual under planning of a study. Conceptual framework is logically constructed concepts of the research study without using a single existing theory.[24]

The present study aims to evaluate the effect of hamstring exercise on the level of low back pain among post menopausal women. The conceptual framework of the present study is based on J.W Kenny's open system model. The conceptual framework of this study is based on "modified J.W Kenny's open system theory. The open system enumerates various aspects of the system and interaction. According to this theory a system is a group of elements that interact with one another in order to achieve the goal. The input consists of information, material or energy that enters the system. This input when processed, provides an output.[25]

This system is cyclical in nature and consists of four components such as input, process and output, feedback keep interacting with each other. If there are changes in any of the components, there will be alterations in all components. Feedback from within the system or from the environment provides information which helps the system to determine whether it is meeting its goal.[25]

**Input**

It refers to the information, energy or raw materials transformed by the system. In this study patient is a system with input from itself and those acquired from environment. Input includes baseline demographic data and clinical variables of post menopausal women such as age, religion, marital status, type of family, number of children, age of menopause, duration of back pain, history of illness, habit of doing exercise and the Oswestery disability index was used to assess the intensity of low back pain.

**Throughput**

Throughput is the process used by the system to convert raw materials or energy(input) from the environment into products or services that are usable by either the system itself the environment. In this study, throughput is administered of Hamstring exercise to post menopausal

women 30 days continuously.

**Output**

Output is the product or service which results from the systems throughput or processing of technical, social, financial, and human input.

In the present study, this was assessed through comparison between the pre-test score and post test score on the level of low back pain among post menopausal women.

**Feedback**

Feedback is information about some aspect of data or energy processing that can be used evaluates, monitor the system and guide it more effective performance. In the present study , it refers to the changes on the level of low back pain among post menopausal women. The decrease in the level of low back pain has indicated that the administration of hamstring exercise is effective in post menopausal women having low back pain.

**Environment**

The individual environment is the fixed constraints that may influence the effectiveness of the given input. In this study the environment is considered as the selected community area.[25]

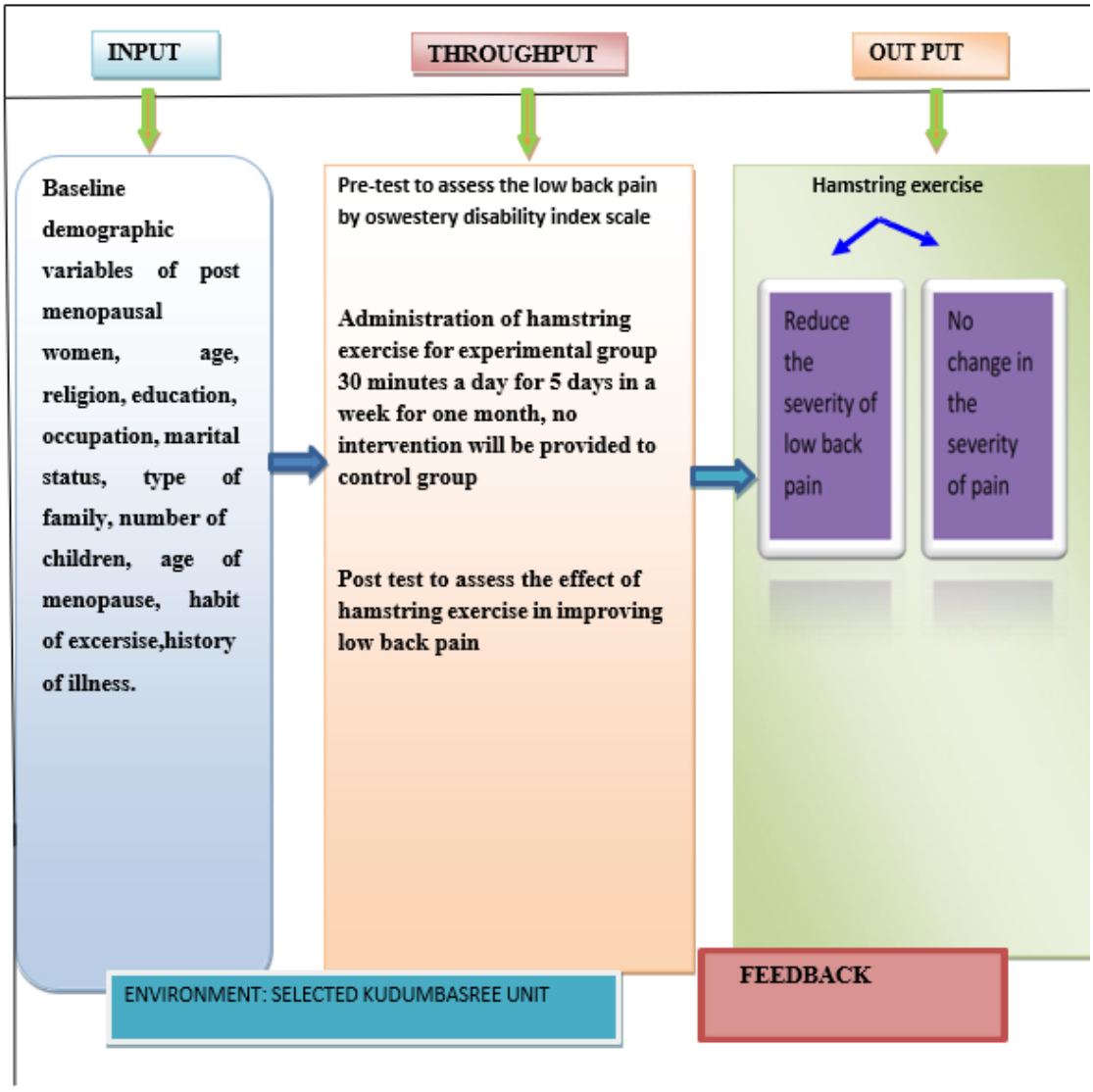


**Figure 1: Theoretical framework based on Kenni's open system model**

## CHAPTER 2 REVIEW OF LITERATURE

- Literature related to low back pain
- Literature related to low back pain on post-menopausal women
- Literature related to improvement of low back pain by various method
- Literature related to the effect of hamstring exercise on the level of low back pain among post-menopausal women.

**Review of literature**

A literature review is a text of a scholarly paper, which includes the current knowledge including substantive findings, as well as theoretical and methodological contributions to a particular topic.[26]

Review of literature related to the present study is organized under the following heading.

- Literature related to low back pain
- Literature related to low back pain on post-menopausal women
- Literature related to improvement of low back pain by various method
- Literature related to the effect of hamstring exercise on the level of low back pain among post-menopausal women.

**Studies related to prevalence of low back pain:**

A cross sectional study was conducted to estimate the prevalence of low back pain among the women living in slum areas of Dhaka city. The study was done with a structured questionnaire to collect information from randomly selected 60 slum women from three selected slums in Dhaka city The study revealed that about 82% slum women had low back pain. Among them, 76.7% were married and the majority of them were housewives (46.2%). The vulnerable age group for developing low back pain was 26 to 29 years Low back pain among slum women hampered the quality of their social and working lives.[27]

A community based cohort study was conducted to estimate the course of back pain in middle aged women over nine years in Australia. Middle-aged woman completed questionnaires every three years once between 2004 and 2013. 10,530 women were completed the survey in 2004 (mean age 55.5 years), 9,020 completed follow-up nine years later. Self-reported data on back pain in the last 12 months and other socio-demographic factors were collected at all four surveys. The result shows that back pain was common and persistent, with 48% having back pain in ≥ 3 out of the four surveys. The study concluded that Obesity, depressive symptoms, low education status and lack of vigorous physical activity are associated with higher risk of frequent back pain over the following nine years among women in their middle 50 years. Targeting these risk factors may lessen the burden of back pain.[28]

A systemic review of the global prevalence of low back pain between 1980 and 2009. A total of 165 studies from 54 countries was identified. Random sampling criteria were used in this study. The Result shows that low back pain was shown to be a major problem throughout the world, with the highest prevalence among female individuals and those aged 40–80 years. The study concluded that as the population increases, the global number of individuals with low back pain is likely to increase substantially over the coming decades. Investigators were encouraged to adopt recent recommendations for a standard definition of low back pain and to consult a recently developed tool for assessing the risk of bias of prevalence studies.[29]

A cross sectional study was conducted to estimate back complaints in the elders in Brazil and the Netherlands. 602 Brazilian and 675 Dutch participants aged ≥55 years with a new episode of

back pain from the Back Complaints in the Elders. The result shows that being female and having altered quality of sleep were associated with higher pain intensity. Altered quality of sleep, having two or more Co morbidities and physical inactivity was associated with higher disability. The study concluded that Irrespective of country, women with poor sleep quality, Co morbidities, low education and who are physically inactive was reported more severe low back pain.[30]

A study conducted on the prevalence and risk factor of low back pain among workers in a healthy facility in southern Nigeria. A total of 50 out of 53 workers participated in this study. Data was collected using a self-designed, interviewer assisted, semi structured questionnaire. The tool was administered during the different shifts of the health workers. The result of the study was the overall prevalence of LBP over the preceding 12 months was 28%, while the prevalence among males was 35% and females, 23.3%, respectively. The study concluded that prolonged standing/ sitting, being overweight or obese, and lifting of heavy objects were among risk factors reported by those with LBP. Use of ergonomically designed chairs and equipment's in the workplace, better lifting techniques and encouragement of mobility among the workers may help reduce the risk of LBP and thus improve workers' productivity and wellbeing.[31]

A descriptive study was conducted to estimate the prevalence of low back pain among non working women in Kanpur city, India. A sample of 300 non-working women of Kanpur city, aged 25 to 70 years, was selected. The Nordic Musculoskeletal Questionnaire, Oswestery Disability Index, and Zarit Burden Interview measuring musculoskeletal discomfort, low back disability and social burden respectively were given to all the women. Descriptive analysis data reveal the recent episode of LBP were present in 93% of the women, 82% had chronic LBP and 71% of women reported restriction on their normal activity of daily living due to their pain in last 12 months. The Oswestery Disability Index data revealed that more than 55% of women reported moderate disability due to pain. Correlation analysis showed that disability due to LBP has a significant correlation with social burden. The findings of the present study revealed alarming information regarding the prevalence of LBP in housewives of Kanpur city. Due to its significant correlation with disability and social burden, LBP plays a crucial role in the overall health status of housewives.[32]

**Studies related to low back pain on post menopausal women**

An epidemiological study was conducted on the prevalence of Low back pain in healthy postmenopausal women and the effect of physical activity among Italian healthy post menopausal women. A total of 210 women participated in the study

.A secondary analysis in the frame of the DAMA (diet, physical activity and mammography) trial, a factorial randomized intervention trial aimed to evaluate the ability of a 24-month intervention, based on moderate-intensity physical activity or dietary modification, in reducing mammographies breast density in healthy postmenopausal women.. A self-administered pain questionnaire was administered at baseline and at the end of the intervention. The study concluded that LBP was present in 32.9% of the participants. Among women randomized to the physical activity intervention, LBP prevalence at follow up (21.6%) was lower than at baseline (33.3%) ($p = 0.02$), while women who did not receive the physical activity intervention the LBP prevalence at baseline and follow up were 32.4% and 25.9%, respectively ($p = 0.30$). [33]

A study was conducted to estimate the impact of spinal pain on daily living activities in post menopausal women working in agriculture in Poland in 2016. The study included 1,119 post-menopausal women living in rural areas and working in agriculture. The women assessed the

severity of spinal pain in 3 sections, neck, thorax and lumbar. Neck Disability Index (NDI) and Oswestery Low Back Disability Index (ODI) questionnaires were used to assess the impact of spinal pain on daily life activities. The result shows that Postmenopausal women working in agriculture suffered most often from pain in the lumbar spine, less frequently in the neck, and the least in the thoracic. They concluded that spine pain disturbed the most women rest, standing, lifting objects, while sleep, concentration and walking the least. [34]

A Community-Based Study was conducted to determine the prevalence of lower back pain and associated leg pain and numbness in postmenopausal Caucasian women and the relationship of these symptoms to health status and function. A total of 573 white women enrolled in the Observational Study of the Women's Health Initiative (WHI) in Pittsburgh completed a questionnaire on low back pain (LBP) and leg pain (LP) and its impact on their daily activity. The result shows that almost half of the women, 49% reported that they had LBP during the previous month, 8% had only LBP, while 41% had both LBP and LP. In that 9% of the women leg and back symptoms were alleviated by sitting. The study concluded that low back pain that radiates into the hip, buttock, or leg is relatively common in postmenopausal Caucasian women living in the community and was associated with decreased physical health status and with physical limitations.[35]

A population based study was conducted to estimate the association between the premature menopause and low back pain at an American college of epidemiology .A total of 5325 women surveyed in the second National Health and Nutrition Examination survey. Among postmenopausal women, significant positive trends in low back pain were observed with decreasing age at menopause (P = 0.005) and increasing years since menopause (P = 0.004). The prevalence odds ratio for women who had their menopause before the age of 30 was 3.2 and for women who had their menopause for 15 or more years the odds ratio was 3.0. These findings suggest that premature menopause is associated with low back pain.[36]

A case-control study was conducted to identify major risk factors, such as natural menopausal transition, physical strain to the lower back, and psychosocial and lifestyle stress, for low back pain (LBP) prevalence among non institutional Chinese middle-aged women. A total of 182 cases and 235 control group participated. Data were collected at face-to-face interviews and body measurements were obtained. The data included exclusive criteria, descriptions of their LBP, social, demographic factors, menopausal status and reproductive factors, physical strain activities, psychosocial stress, lifestyle factors, and anthropometric parameters. The results indicated that LBP was prevalent among women who experienced stressful life events in the past 12 months, women who had high psychological stress related to housework or work, women who performed some physical strain activities, such as prolonged squatting or moderate physical activities in the previous year and women who had a low waist-to-hip ratio. The results reveal that showing women how to reduce physical strain during activity and how to maintain good postures may have great potential in reducing or eliminating LBP. The study concluded that the findings have important implications for the development of health education or health promotion such as how to take care of their backs and how to handle psychosocial stress in both the home and workplace.[37]

An explorative study was conducted to assess the relationship between bone mineral density (BMD) body mass index (BMI), postmenopausal period and outcomes of treatment for low back pain in postmenopausal Korean women. A total of 78 menopausal women participated in the

study. The result shows that on examining the medical records, investigators found that women with low BMD were older and had been postmenopausal for longer periods than women with normal BMD. The study concluded that age, postmenopausal length and BMI correlates with BMD in Korean women suffering from LBP. Larger studies investigating the associations between menopause, BMD, BMI and LBP seem desirable. Moreover, evidence-based therapeutic approaches should be explored for BMD and LBP management.[38]

A cross sectional study was conducted to identify the lateral back pain prevalent vertebral fractures in post-menopausal women at South West UK. A total of 504 post- menopausal women were recruited for the study. Back pain was assessed by self- completion of the Margolis pain diagram, and analysis was modified to assess whether the pain was mid-line or lateral. Vertebral fractures were diagnosed by the algorithm- based qualitative method on radiographs. The study result shows that

322 women, 64.1% reported back pain over the last 12 months. 37 (7.3%) had one or more vertebral fracture. The study concluded that in post-menopausal women with back pain, the presence of lateral waist pain was a higher risk of prevalent vertebral fracture.[39]

A study was conducted to compare LBP and physical function in post-menopausal pensioners .A total of 114 heavy physical workers (HPW), and 391 light physical workers (LPW) were participated in this study. LBP and physical function (domains of mobility, home routines) were scored by a questionnaire. Data on age, age at menopause, number of years in retirement, age at menarche, number of pregnancies, body mass index (BMI), femoral neck bone density, work related physical activity , years spent at work, and smoking were also collected. The result shows that heavy work related physical loads , aging and high BMI were LBP risk factors, whereas heavy work related physical loads had high BMI and early menopause were mobility risk factors The study concluded that Lifelong heavy work related physical load and high BMI seem to be risk factors for worse LBP and mobility in retired women. Mobility seems to be especially affected by these risk factors, and should be further investigated for prevention purposes.[40]

A cross sectional study was conducted to determine the relation between low back pain prevalence, BMD reduction, and body mass index (BMI) respectively in post menopausal women. A total of 213 postmenopausal women was selected by simple random sampling technique. The data were collected using visual analog scale (VAS), by interviews and measurement of erector spine muscle endurance time using a modified Biering-Sorensen technique, while body mass density was assessed by bone densitometry. The prevalence of LBP and osteoporosis in the postmenopausal women were 58.2% and 21.6%, respectively. The study concluded that a significant positive linear correlation was found between BMI and VAS. It is recommended that low back pain in postmenopausal women be managed by strengthening exercises of the erector spine.[41]

A cross sectional study was conducted to Orthopaedic Morbidities among Postmenopausal Women in a Medical College Hospital in Rural Area of Western Maharashtra, India. A total of 500 postmenopausal women availing healthcare in a medical college hospital. Data was collected with the help of predesigned questionnaire by interview technique and with the help of case records available from orthopaedic department. The result shows that backache (62%) and osteoarthritis (51.6%) were common orthopaedic problems in post menopausal women Osteoarthritis were significantly associated with obesity.[42]

**Studies related to improvement of low back pain on various methods:**

A randomized, controlled trial, test-retest method of study was conducted to determine the efficacy

of a specific exercise intervention in the treatment of patients with chronic low back pain and a radiologic diagnosis of spondylolysis or spondylolisthesis. A total of 44 post menopausal women with this condition was assigned randomly into two treatment groups. The first group underwent a 10- week specific exercise treatment program involving the specific training of the deep abdominal muscles, with co-activation of the lumbar multifidus. The activation of these muscles was incorporated into previously aggravating static postures and functional tasks. The control group underwent treatment as directed by their treating practitioner. The result shows that after intervention, the specific exercise group showed a statistically significant reduction in pain intensity and functional disability levels, which was maintained at a 30-month follow-up. The control group showed no significant change in these parameters after intervention or at follow-up. The study concluded that A specific exercise treatment approach appears more effective than other commonly prescribed conservative treatment programs in post menopausal women with chronically symptomatic spondylolysis or spondylolisthesis.[43]

A quasi experimental research study was conducted to estimate the effect of Exercises for Low Back Pain among middle aged women at punducherry. The data were collected using demographic Performa and Mc Caffery pain scale. A total of 40 subjects with low back pain was identified and exercises that consisted of abdominal strengthening, back strengthening and hip stretching exercises were taught and practiced by them daily for half an hour for a period of one month. The results showed a significant difference in pretest and post test pain levels. The study concluded that is a common problem among middle aged women and doing exercises regularly would help to alleviate the pain.[44]

An experimental study was conducted to observe the effect of back extension exercise on quality of life and back extensor strength of women with osteoporosis. A sample of 30 subjects in the age group of 45 to 60 years were assessed and selected on the basis of inclusion and exclusion criteria. After obtaining their consent, the subjects were randomly allocated in the experimental group A and the control group B. Group A was given moist heat pack and back strengthening exercises and Group B was given hot pack and isometric exercise 1 set (10 repetitions) a day, 5 days a week for 4 weeks. The independent variables were back extension exercise and isometric exercise. The dependent variables were quality of life and back extensor strength. It is concluded that both the back extension exercise and back isometric exercise are effective in increasing back extensor strength and improving quality of life , however results suggest that back extension exercise is more effective than back isometric exercise in increasing back extensor strength and improving quality of life in post menopausal osteoporotic females.[45] A parallel-group, randomized, controlled trial study was conducted to compare the effect of 2 types of massage and usual care for chronic back pain at integrated health care delivery system in the Seattle area. A total of 401 persons 20 to 65 years of age with nonspecific chronic low back pain were selected for the study. Roland Disability Questionnaire (RDQ) and symptom bothersomeness scores at 10 weeks (primary outcome) and at 26 and 52 weeks were given to the samples. The result shows that the massage therapy had functional outcomes at 10 weeks. The study concluded that Massage therapy may be effective for treatment of chronic back pain, with benefits lasting at least 6 months.[46]

A study was conducted to estimate the effect of long-term exercise in postmenopausal women 16-year results of the Erlangen Fitness and Osteoporosis Prevention Study (EFOPS).137 early

postmenopausal women with osteopenia living in Erlangen-Nürnberg were included in the study. 86 women joined the experimental group (EG) and conducted two supervised groups and two home training sessions per week, whereas the control group maintained their physical activity level. Primary outcome parameters were clinical overall fractures incidence secondary study endpoint was Framingham study-based 10-year risk of coronary death/myocardial infarction and low back pain. In 2014, 59 women in the experimental group and 46 women in the control group were included in the 16- year follow-up analysis. Framingham study-based 10-year risk of myocardial infarction/coronary death increased significantly ($P < 0.001$) in both groups, however, changes were significantly more favourable in the EG. The ratio for clinical overall fractures was 0.47, and thus significantly lower in the EG. Although they focused on a high-intensity exercise strategy, low back pain was favourably affected in the EG. Multipurpose exercise programs demonstrated beneficial effects on various relevant risk factors and diseases of menopause or/and increased age, and should thus be preferentially applied for primary or secondary prevention in postmenopausal women.[47]

A quasi experimental study was conducted to assess the effect of spinal exercises and body mechanics on low back pain among post menopausal women. 40 post menopausal women who fulfilled the inclusion criteria were selected by non– probability purposive sampling technique. The intervention such as spinal exercises and body mechanics were performed to overcome the level of low back pain among post menopausal women. The pre and post assessment was done by using a combined numerical and categorical pain scale. This study revealed that there was high significant difference found in low back pain at $p<0.001$ The overall findings in the present study revealed that the spinal exercises and body mechanics was effective and had brought about significant change in the reduction of low back pain among post menopausal women compared to the pre test level of low back pain.[48]

**Studies related to effect of hamstring exercise**

A study conducted on the effects of Hamstring exercise with pelvic control of pain and work ability in standing worker by department of Physical Therapy in Korea. A total of 100 adult volunteers from a standing workers was randomly assigned to pelvic control hamstring stretching (PCHS) (n = 34), general hamstring stretching (GHS) (n = 34), control (n = 32) groups. The control group was performed self-home exercise. All interventions were conducted 3 days per week for 6 weeks, and included in the hamstring stretching and lumbopelvic muscle strengthening. Outcomes were evaluated through the visual analogue scale (VAS), straight leg raise test (SLR), sit and reach test (SRT), Oswestery disability index (ODI), and work ability index (WAI).The result shows that there is a significant difference in VAS, SLR, SRT, ODI, and WAI were found in the PCHS and GHS groups. The control group was a significant difference only in an ODI. The PCHS group showed a greater difference than the GHS group and control group in VAS, SLR, SRT, and ODI. The study concluded that the pelvic control Hamstring stretch exercise would be more helpful in back pain reduction and improvement of work ability in an industrial setting.[49]

A study conducted on the effect of dynamic stretching on hamstrings flexibility with respect to the spine-pelvic rhythm by faculty of Sports Science, Waseda University; ascertain the dynamic stretch effects of flexibility of the hamstrings on lumbar spine and pelvic kinematics. Tight hamstrings are positively correlated with low back pain. 12 healthy women participated in the study. The straight leg raising (SLR) angle, finger floor distance (FFD), and spino-pelvic rhythm was measured

before and after the 6-week stretching protocol. The result shows that after 6 weeks of stretching, significant improvements were seen in the FFD with maximum forward bending and in the SLR angle. Total pelvic rotation was also significantly increased in contrast to total lumbar flexion. A decreased spino-pelvic ratio was seen in the final phase. The study concluded that dynamic stretching could change the spine-pelvic rhythm to a pelvis-dominant motion, indicating that flexible hamstrings are important for preventing low back pain.[50]

## CHAPTER 3

## Methodology

- Research approach
- Research design
- Variable
- Schematic representation of the study
- Setting of the study
- Population
- Sampling and sampling **techniques**

**Inclusion criteria**

**Exclusion criteria**

- Tools/instruments

**Development /selection of tool**

**Description of the tool**

- Content validity
- Reliability of tool
- Pilot study
- Data collection process
- Plan for data analysis

**Methodology**

**Introduction**

Research is a careful and detailed study in to a specific problem, concern or issue using the scientific method.[51] Methodological research aims at improving research methodology and statistical methods in order to more precisely answer each question. In this study it refers to the various steps that are generally adopted by the researcher for studying the research problem along with logic behind them.

This chapter deals with methods for the present study includes research approach, research design, variables, population, sample and sampling technique, sampling error, development and description of the tool content validity of the tool, reliability of the tool, pilot study, data collection process and plan for data analysis.

**Research approach**

Research approach is plans and the procedure for research that span the steps from broad assumptions to detailed methods for data collection analysis and interpretation. Quantitative research is the systematic empirical investigating of observable phenomena via statistical, mathematical or computational techniques.[52]

In this study quantitative research approach was used to assess the effect of hamstring exercise on the level of low back pain among post-menopausal women.

**Research design**

A research design is the determination and statement of the general research approach or strategy adopted for the particular project. It is the heart of planning[53]. Quasi experimental pre-test and post-test control design will be adopted for this study.

E $O_1$ x $O_2$

C $O_1$ $O_2$

E - Experimental group C – Control group

$O_1$ – Pre-test to assess the level of low back pain X - Practice of hamstring exercise

$O_2$ – Post test to assess the level of low back pain after intervention

**Variables**

A variable is any quality of a person, group or situation that varies or takes on different values[54]. They are as follows.

**Independent variables**

It is a stimulus or activity that is manipulated or varied by the researcher to create the effect on the dependent variable. In this study, hamstring exercise is the independent variable.[55]

**Dependent variable**

The dependent variable is the outcome or response due to the effect of independent variable which researcher wants to predict or explain .In the present study, the dependent variable is level of low back pain among post-menopausal women.[56]


**Figure 2: schematic representation of the study**

**Setting of the study**

The researcher setting, the physical location and condition in which data collection takes place in a study[57]. The present study was conducted at selected Kudumbasree unit which is 20 km from Thiruvananthapuram. It is a community organization of neighborhood groups (NHGs ) of women in Kerala, has been recognized as an effective strategy for the empowerment of women in rural as well as urban areas , bringing women together from all spheres of life to fight for their rights or for empowerment. The overall empowerment of women is closely linked to economic empowerment. Women through these NHGs works on a range of issues such as health, nutrition, agriculture, etc, beside income generation activities and seeking micro credit. The mission launched by the state government with the active support of the government of India and NABARD has adopted a different methodology in addressing poverty by organizing the poor into a community based organization. The mission follows a process approach rather than a project approach. The mission was officially inaugurated by the Prime Minister Atal Bihari Vajpayee in 1998 as requested by the state government.

**Population**

Population is defined as the entire set of individuals or objects having some common characteristics.[58] In this study population consisted of all post-menopausal women between 40 60 years with low back pain in selected community area at Thiruvananthapuram district during data collection period.

**Sample and Sampling technique Sampling technique**

The process of collecting a group of individuals or things in order to find out the estimated output through the study[59]. In this study the subjects were selected by purposive sampling technique following inclusion and exclusion criteria.

**Sample**

Sample is a subject of the population that is selected for a study. In present study 60 menopausal women were assigned from selected community area.[60]

**Sampling criteria**

Sampling criteria is the list of characteristics essential for inclusion or exclusion in the target population[61]

**Inclusion criteria**

Inclusion criteria are the criteria that specify population characteristics. In this study the inclusion criteria are: [62]

Post menopausal women

- Who are in the age group of 50- 60 years
- Who have pain over lumbar region and scored 21- 40 in Oswestry disability index
- Who are willing to participate in the study
- Who are available during the period of study

**Exclusion criteria**

Exclusion criteria are those characteristics that disqualify prospective subjects from inclusion in the study[63]. In this study exclusion criteria are:

Post-menopausal women

- Who are taking any other therapies for low back pain from any other system of medicines
- History of spinal cord injury

- Who are participating in other exercise
- Who cannot follow the instructions of the researcher
- Who had problem with visual, auditory and neural or vestibular spatial disorientation vertigo and dizziness
- Who cannot tolerate the exercise

**Tools /data collection Tools**

In this study, the research tool consist of three sections Section A : Demographic variable

Section B:Clinical parameters

Section C: Oswestery disability low back ache index

**Development of the tool**

Anything that becomes a means of collecting information for the study is called a research tool or research instrument[64] The following steps were used by the investigator for the development of the tool that is review of literature, discussion with experts and preparation of the criteria checklist, content validity and reliability and then tool, preparation of final draft.

**Description of the tool**

Section A: Demographic profile

This part contained the baseline information of the post-menopausal women age religion, marital status, educational status, occupation, type of family, number of children

Section B: Clinical data

This part consisted of family history of other illness, age of menopause, BMI, practice of exercise.

Section C: Oswestery low back ache index

The standardized Oswestry low back pain questionnaire is designed for the assessment of low back pain among post-menopausal women. It consist of 10 sections, each sections are scored 0-5. It consists of pain intensity, personal care, lifting, walking, sitting, standing, sleeping, sex life, social life, travelling and previous treatment.

**Content validity**

Content validity is defined as the degree to which the item in an instrument represent the concept being measured[65]. To ensure the content validity of the tool it was submitted to 5 experts, Mrs Priya (associate professor, govt medical college Trivandrum, Mrs Meera (associate professor, govt medical college, Thiruvanthapuram, Mrs.Asha (associate professor, govt, medical college Trivandrum,), Dr, Omman, Statistician, Govt medical college Trivandrum, Dr. Ashok (Consultant Orthopedician Saraswathy hospital Parassala, Dr. Kenny physiotherapist, Sarasawathy hospital Parassala.

**Reliability of tool**

Reliability is the accuracy and consistency of information obtained in the study[66]

.In this study a standardised oswestery disability index scale was used to assess the low back pain among post menopausal women.

**Pilot study**

A pilot study is a small scale version or trial run, done in preparation for a major study[67]. Formal permission was obtained from the authority in the selected area. Purposive sampling technique was used to select 6 samples out of which 3 were assigned for the experimental group and 3 for the control group. The investigator introduced herself to the participants and objectives of the study was explained to them and written consent was obtained. The pre-test was done to

both experimental and control groups. Hamstring exercise was practised by experimental group 30 minutes a day, 5 days in a week for one month. No interventions were provided to control group post test was conducted for both experimental and control group on 31 st day. Analysis of the data was done using descriptive and inferential statistics. The subjects were comfortable and cooperated well during the study and there were no modification done .The investigator proceeded with main study after the pilot study. The study found feasible and practible.

**Data collection process**

Prior written permission was obtained from the authority concerned in the selected area. Purposive sampling technique was used to select the samples. 60 samples were selected according to the inclusion criteria in which 30 for the experimental group and 30 for the control group. The investigator introduced herself to the participants and objectives of the study were explained to them Written consent from the samples was taken by the investigator. The investigator assessed the level of low back pain of post menopausal women using the oswestery disability index and demographic datas are also collected by the investigator. The level of pain was classified into mild, moderate and severe.

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The pre-test was done to both experimental and control groups. The investigator explained and demonstrated about each and every step of exercise to the subjects of experimental group. Hamstring exercise such as Standing hamstring stretch,

chair hamstring stretch, towel hamstring stretch, wall hamstring stretchwas practiced by experimental group 30 minutes a day in a week for one month. No interventions were provided to control group. Post test was conducted for both experimental and control group on the 31 st day.

**Plan for data analysis**

Data analysis is a process of inspecting, cleansing, transforming and modeling data with the goal of discovering useful information's, suggesting conclusion and supporting decision making[68]. Data analysis has multiple facets and approaches, encompassing diverse techniques under a variety of names in different business, sciences and social domains The data was planned to be analyzed on the basis of objectives and hypothesis by descriptive and inferential statistics.

**Descriptive statistics**

Descriptive statistics are summary statistics that quantitatively describe or summarize features of a collection of information, while descriptive statistics in the mass noun sense is the process of using and analysing those statistics[69]. Frequency and percentage distribution was used to study the demographic variable such as age , religion , marital status, educational status, occupation, type of family, number of children , age of menopause, duration of back pain, history of taking any medication , habit of doing exercise, history of other illness.

**Inferential statistics**

Inferential statistics are techniques that allow using these samples to make generalization about the population from which samples are drawn[70] .In this study Paired t test was used to analyse the difference in low back pain before and after administration of hamstring exercise among post menopausal women.

**Summary**

Research methodology consists of research approach (research design, variable, schematic representation of the study, setting, population, sampling and sampling technique), tools and instruments, (development/selection of tool, description of tool, content validity and reliability of

tool , pilot study (data collection process and plan for data analysis)

**CHAPTER 4**
**Analysis and Interpretation**
**Section 1: Description of the sample characteristics**
**Section 2: Effect of hamstring exercise the level of low back among post menopausal women**
**Analysis and Interpretation**
**Introduction**

Data analysis and interpretation is the process of assigning meaning to the collected information and determining the conclusion, significance and implication of the findings. This chapter deals with the analysis and interpretation of data obtained from the study population.

The present study was intended to assess the effect of hamstring exercise on the level of low back pain among post menopausal women. The data collected from 60 subjects from selected community area at Thiruvananthapuram district were tabulated, analyzed and interpreted using descriptive and inferential statistics.

Organization of finding:

Section 1: Description of sample characteristic

Section2: Effect of hamstring exercise on the level of low back pain among post menopausal women

**Section 1:**
**Description of sample characteristics:**

This section includes demographic variables of post menopausal women in both experimental and control group. It includes age, religion, marital status, educational status, occupation, number of children, duration of back pain, type of family, age of menopause, and habit of doing exercise history of other illness.

**Figure 3: Percentage distribution of samples based on their age**

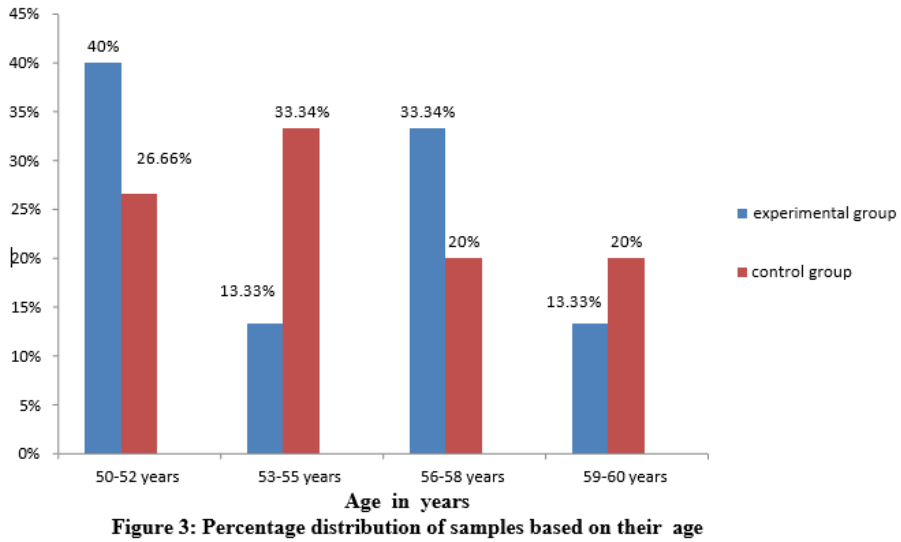


Figure 3: Percentage distribution of samples based on their age

Figure 3 shows that in the experimental group majority of sample 12 (40%) were between the age group of 50-52 and 4(13.34%) were between the age group of 59- 60 years. In control group, majority of

sample 10(33.34%) were between the age group of 56-58 years and 6(20%) were between the age group of 59-60 years.

**Figure 4: percentage distribution of samples based on their religion**

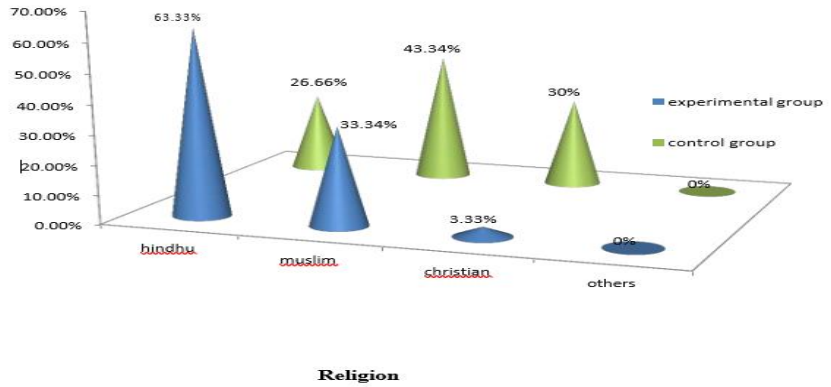


Figure 4 shows that in experimental group majority 19(63.33%) were Hindus. In control group 13(43.34%) were Muslims .None of them belongs to other religion in both experimental and control group.

**MARIATAL STATUS:**

**Table1: Frequency and percentage distribution of samples based on their marital status: (n=60)**

| Marital status | Experimental group | | Control group | |
|---|---|---|---|---|
| | Frequency (f) | Percentage ( %) | Frequency (f) | Percentage (%) |
| **Married** | 18 | 60 | 12 | 40 |
| **Unmarried** | 0 | 0 | 0 | 0 |
| **Divorced** | 5 | 16.67 | 7 | 23.34 |
| **Widow** | 7 | 23.33 | 11 | 36.66 |
| **Separated** | 0 | 0 | 0 | 0 |
| **Total** | 30 | 100 | 30 | 100 |

Table 1 shows that in experimental group majority of sample 18(60%) were married and in control group majority of sample 12(40 %) were married. None of them were unmarried in both experimental and control group.

**Table 2: Frequency and percentage distribution of samples based on their educational status (n=60)**

| Educational status | Experimental group Frequency (f) | percentage (%) | Control group Frequency (f) | percentage (%) |
|---|---|---|---|---|
| Primary | 9 | 30 | 15 | 50 |
| High school | 17 | 56.66 | 8 | 26.66 |
| Higher secondary | 4 | 13.34 | 7 | 23.34 |
| Degree and above | 0 | 0 | 0 | 0 |
| Total | 30 | 100 | 30 | 100 |

Table 2 shows that in experimental group majority of samples 17(56.66%) were completed their high school education and in control group majority of sample 15(50%) were completed their primary school education . None of them completed degree and above in both experimental and control group.

**Figure 5: Percentage distribution of samples based on their occupation**

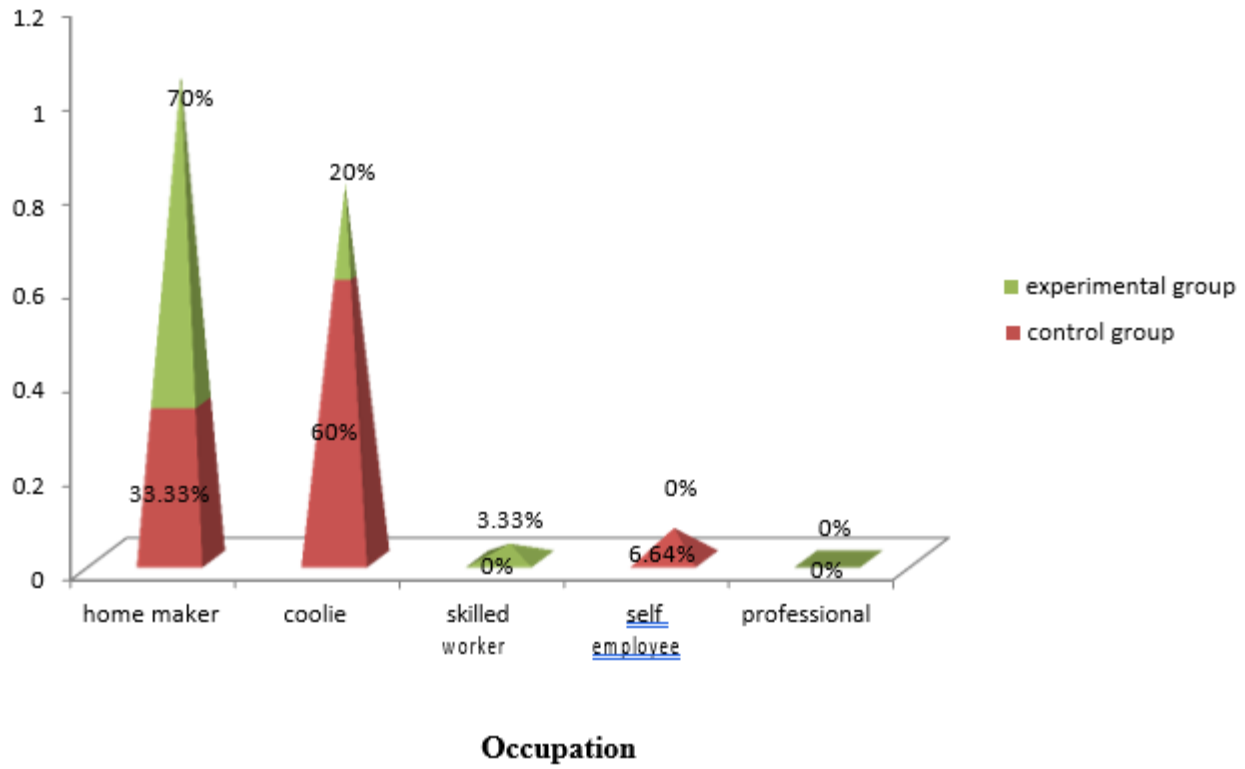


Figure 5 shows that in experimental group majority of sample 21(70%) were home maker and in control group majority of sample 18(60%) were homemaker. None of them were professionals in both experimental and control group.

**Figure 6: Percentage distribution of samples based on type of family**

**The figure 6 shows that both experiment and control group belong to nuclear family.**

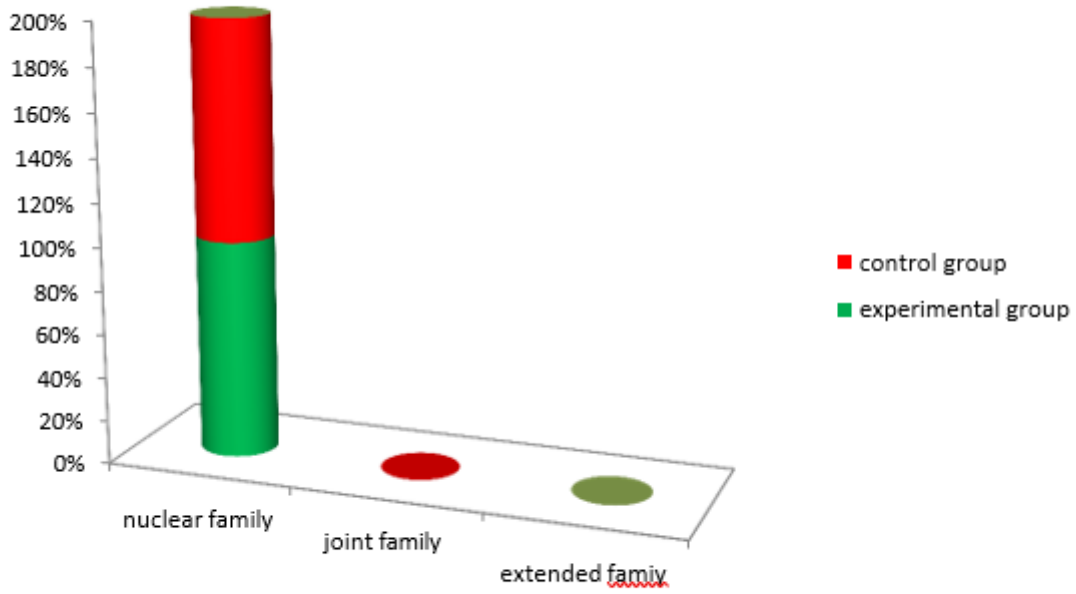


**Table 3: Frequency and percentage distribution of sample based on age of menopause (n=60)**

| Age of menopause | Experimental group Frequency (f) | Percentage (%) | Control group Frequency (f) | percentage (%) |
|---|---|---|---|---|
| **<48 years** | 15 | 50 | 10 | 33.33 |
| **49-50 years** | 8 | 26.64 | 13 | 43.34 |
| **51-56 years** | 7 | 23.34 | 6 | 20 |
| **>56 years** | 0 | 0 | 1 | 3.33 |
| **Total** | 30 | 100 | 30 | 100 |

Table 3 shows that in the experimental group majority of sample 15(50%) were attained menopause below 48 years and none of them attained menopause above 56 years. In control group majority of sample 10(33.33%) were attained menopause below 48 years 1(3.33%) attained menopause above 56 year.

**Table 5: Frequency and percentage distribution of samples based on number of children (n=60)**

| Number of children | Experimental group Frequency | Percentage | Control group Frequency | Percentage |
|---|---|---|---|---|

| | (f) | (%) | (f) | (%) |
|---|---|---|---|---|
| **1** | 4 | 13.34 | 3 | 10 |
| **2** | 11 | 36.66 | 16 | 53.34 |
| **>3** | 15 | 50 | 11 | 36.66 |
| **none** | 0 | 0 | 0 | 0 |
| **Total** | 30 | 100 | 30 | 100 |

Table 5 shows that in experimental group majority of samples 15(50%) has >3 children and in control group majority of sample that is 16(53.34%) has 2 children. None of them has no children in both experimental and control group.

**Figure 7: percentage distribution of samples based on duration of back pain**

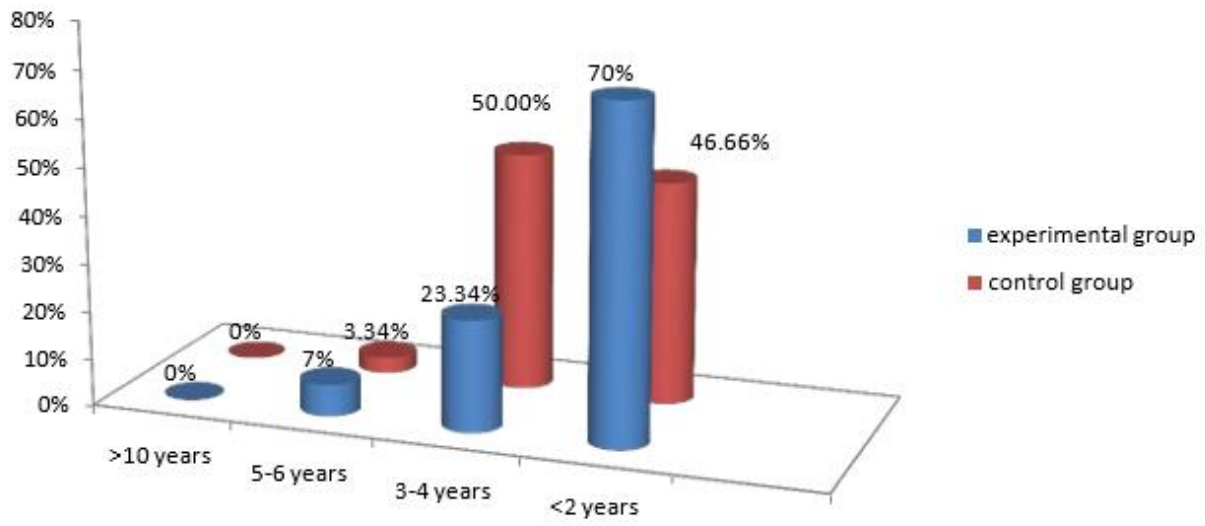


Figure 7 shows that in the experimental group majority of sample 21(70%) has back pain for less than 2 years, and in the control group majority of sample 15(50%) has back pain for 3-4 years. None of them has duration of back pain
>10 years in both experimental and control group.

**Figure 8: Percentage distribution of samples based on habit of exercise**

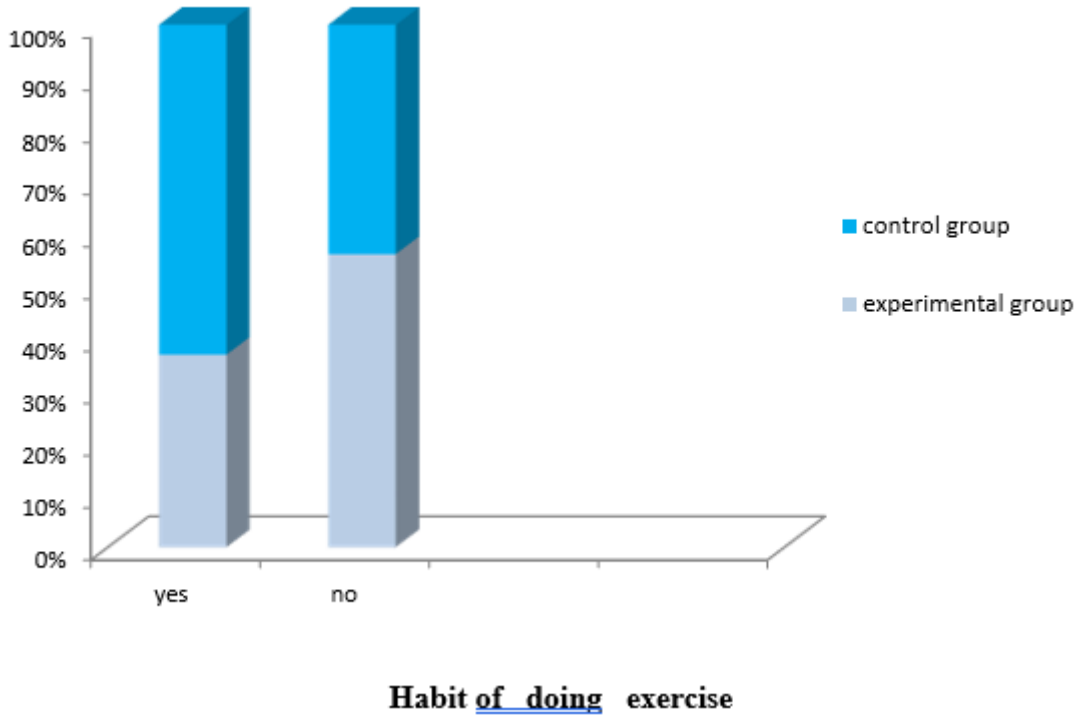


Figure 8 shows that in the experimental group majority of sample 23(76.64%) were not having habit of doing exercise and in the control group the majority of the sample 18(60%) were not having any habit of doing exercise.

**Table 6: Frequency and percentage distribution of samples based on history of other illness: (n=60)**

| History of other illness | Experimental group Frequency (f) | Percentage (%) | Control group Frequency (f) | Percentage (%) |
|---|---|---|---|---|
| **Yes** | 7 | 23.36 | 11 | 36.66 |
| **No** | 23 | 26.64 | 19 | 63.34 |
| **Total** | 30 | 100 | 30 | 100 |

Table 6 shows that in the experimental group majority of sample 23(76.64%) hadn't any history of other illness and 7(23.36%) has the history of other illness like hypothyroidism, diabetes mellitus hypertension. In the control group majority of the sample 19 (63.34%) hadn't any history of other illness and 11(36.66%) has the history of other illness like hypothyroidism, diabetes mellitus and hypertension.

**SECTION 2:**

**Effect of hamstring exercise on the level of low back pain among post menopausal women.**

This section intends to determine the effect of hamstring exercise on the level of low back pain

among post menopausal women. Effect of hamstring exercise on the level of low back pain was assessed by using paired t test.

**Table 7: Frequency and percentage distribution of pretest level and post test level of low back pain among post menopausal women in experimental group: (n=30)**

| Level of pain | Pretest | | Post test | |
|---|---|---|---|---|
| | Frequency | percentage | frequency | percentage |
| Minimal disability | 0 | 0% | 2 | 6.67% |
| Moderate disability | 1 | 3.34% | 27 | 90% |
| Severe disability | 26 | 86.66% | 1 | 3.33% |
| crippled | 3 | 10% | 0 | 0% |
| Exaggerated | 0 | 0% | 0 | 0% |
| Total | 30 | 100% | 30 | 100% |

Table 7 shows that in pretest majority 26(86.66%) samples were had severe disability, 3(10%) samples were had crippled, 1 (3.33%) sample had moderate disability. In post test 27(90%) had moderate disability, 2(6.66%) samples were had minimal disability, 1(3.33%) sample had severe disability.

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**Table 8: Frequency and percentage distribution of pretest and post test level of low back pain among post menopausal women in control group. (n=30)**

| Level of pain | Pretest | | Post test | |
|---|---|---|---|---|
| | Frequency | percentage | frequency | Percentage |
| Minimal disability | 0 | 0% | 0 | 0% |
| Moderate disability | 0 | 0% | 0 | 0% |
| Severe disability | 26 | 86.66% | 21 | 70% |
| crippled | 4 | 13.34% | 9 | 30% |
| exaggerated | 0 | 0% | 0 | 0% |
| Total | 30 | 100% | 30 | 100% |

Table 8 shows that in pretest majority 26(86.66%) samples were had severe disability,4(13.34%) samples were had crippled level of low back pain. In post test 21(70%) samples were had severe disability, 9(30%) were had crippled level of low back pain.

**Table 9: Mean standard deviation and t value of pretest and post test value of experimental group:**
**(n= 60)**

| Group | Mean | SD | Mean difference | Paired t test | P |
|---|---|---|---|---|---|
| Pretest | 54.53 | 4.4 | 21.2 | 26** | 2.05 |
| Post test | 33.33 | | | | |

****Significant at 0.05 level

Table 9 shows that the pretest mean score of low back pain was 54.53 with the standard deviation 4.4 and the post test score was 33.33 with the standard deviation 4.4.The mean difference was 21.2. t value is 26 which is greater than p value 2.05 . That is there is a significant improvement in low back pain among post menopausal women in experimental group.

**Table 10:**
**Mean standard deviation and t value of pretest and post test value of control group:**

| Group | Mean | SD | Mean difference | Paired test | P |
|---|---|---|---|---|---|
| Pretest | 55.66 | 6.98 | 1.27 | 1** | 2.05 |
| Post test | 56.93 | | | | |

** Not significant at 0.05 level

Table 10 shows that the pretest mean score of low back pain was 55.66 with the standard deviation 6.98 and the post test score was 56.93 with the standard deviation 6.98.The mean difference was 1.27. t value is 1 which is less than the p value 2.05. That is there is no significant improvement in level of low back pain among post menopausal women of control group. Hypothesis there is a significant difference on the level of low back pain among post menopausal women in experimental and control group is accepted

**Table 11: Comparing the effect of hamstring exercise in experimental and control group based on post test value:**

| Group | Post test mean | Mean difference | SD | t test | P |
|---|---|---|---|---|---|
| Experimental group | 33.33 | | 4.4 | | |
| | | 23.6 | | 21** | 2.05 |
| Control group | 56.93 | | 4.3 | | |

****Significant at the level of 0.05

Table 11 shows that post test mean score of low back pain in experimental group was 33.33 with the

standard deviation 4.4 and the post test mean score of low back pain in control group was 56.93 with the standard deviation 4.3.The mean difference was 23.6. The t value is 21 which is greater than p value 2.05 at the level of 0.05 that is there is a significant improvement in level of low back pain in experimental group than in control group. Hypothesis, There is a significant difference on the level of low back pain among post menopausal women in experimental and control group is accepted

## CHAPTER 5 RESULT

### Results

Results are the answers to research questions, obtained through the analysis of the collected data. The study intends to assess the effect of hamstring exercise on the level of low back pain among post menopausal women. This chapter deals with statistical analysis and findings of the study based on objectives and hypothesis of the study.

### Objectives:

The objectives of the study were:

- To assess the level of low back pain among post menopausal women
- To assess the effect of hamstring exercise on the level of low back pain among post menopausal women

### Hypothesis:

$H_1$: There is a significant difference on the level of low back pain among post menopausal women in experimental and control group.

### Results:

The result of the study is discussed under the following headings:

- Description of sample characteristics
- Level of low back pain among post menopausal women
- Effect of hamstring exercise on the level of low back pain among post menopausal women in both experimental and control group.

### Description of sample characteristics:

In the experimental group majority of sample 12 (40%) were between the age group of 50-52 and 4(13.34%) were between the age group of 59-60 years. In control group, majority of sample 10(33.34%) were between the age group of 56-
58 years and 6(20%) were between the age group of 59-60 years.

In experimental group majority 19(63.33%) were Hindus. In control group 13(43.34%) were Muslims .None of them belongs to other religion in both experimental and control group.

In experimental group majority of sample 18(60%) were married and in control group majority of sample 12(40 %) were married. None of them were unmarried in both experimental and control group.

In experimental group majority of samples 17(56.66%) were completed their high school education and in control group majority of sample 15(50%) were completed their primary school education. None of them completed degree and above in both experimental and control group.

In experimental group majority of sample 21(70%) were home maker and in control group majority of sample 18(60%) were homemaker. None of them were professionals in both experimental and control group.

Both experiment and control group belong to nuclear family.

In the experimental group majority of sample 15(50%) were attained menopause below 48 years and none of them attained menopause above 56 years. In control group majority of sample 10(33.33%) were attained menopause below 48 years 1(3.33%) attained menopause above 56 year.

In experimental group majority of samples 15(50%) has >3 children and in control group majority of sample that is 16(53.34%) has 2 children. None of them has no children in both experimental and control group.

In the experimental group majority of sample 21(70%) has back pain for less than 2 years, and in the control group majority of sample 15(50%) has back pain for 3-
4 years. None of them has duration of back pain >10 years in both experimental and control group.

In the experimental group majority of sample 23(76.64%) were not having habit of doing exercise and in the control group the majority of the sample 18(60%) were not having any habit of doing exercise.

In the experimental group majority of sample 23(76.64%) hadn't any history of other illness and 7(23.36%) has the history of other illness like hypothyroidism, diabetes mellitus hypertension. In the control group majority of the sample 19 (63.34%) hadn't any history of other illness and 11(36.66%) has the history of other illness like hypothyroidism, diabetes mellitus and hypertension.

**Effect of Hamstring exercise in improving low back pain among postmenopausal women:**

Paired t test was used to find out the effect of hamstring exercise in improving low back pain among post menopausal women. It was found that there was a significant difference between pretest and post test level of low back pain. The obtained t value was statistically significant at 0.05 levels. Hence the hamstring exercise was effective in improving the low back pain among post menopausal women and thus the hypothesis there is a significant difference on the level of low back pain among post menopausal women in experimental and control group is accepted

## CHAPTER 6

### Discussion, summary and conclusion

This chapter deals with the discussion, summary, conclusion, nursing implications, limitations and future recommendations.

**Discussion:**

The finding of the study should be discussed with study objectives, hypothesis, review of literature and conceptual framework. This study was intended to assess the effect of Hamstring exercise in improving low back pain among post menopausal women. Data collection and analysis were carried out based on the objectives of the study. The findings of the study were discussed in terms of objectives and hypothesis that are formulated during the beginning of the study.

**Objectives:**

The objectives of study were:

- To assess the level of low back pain among post menopausal women
- To assess the effect of Hamstring exercise on the level of low back pain among post menopausal women

**Hypothesis:**

$H_1$: There is a significant difference in the level of low back among postmenopausal women in both experimental and control group.

**Sample characteristics:**

In the experimental group majority of sample 12 (40%) were between the age group of 50-52 and 4(13.34%) were between the age group of 59-60 years. In the control group, majority of sample 10(33.34%) were between the age group of 56-58 years and 6(20%) were between the age group of 59-60 years.

In the experimental group majority 19(63.33%) were Hindus. In the control group 13(43.34%) were Muslims .None of them belongs to other religion in both experimental and control group.

In the experimental group majority of sample 18(60%) were married and in the control group majority of sample 12(40 %) were married. None of them were unmarried in both experimental and control group.

In the experimental group majority of samples 17(56.66%) were completed their high school education and in the control group majority of sample 15(50%) were completed their primary school education. None of them completed degree and above in both experimental and control group.

In the experimental group majority of sample 21(70%) were home maker and in the control group majority of sample 18(60%) were homemaker. None of them were professionals in both experimental and control group.

Both the experiment and the control group belong to nuclear family.

In the experimental group majority of sample 15(50%) were attained menopause below 48 years and none of them attained menopause above 56 years. In the control group majority of sample 10(33.33%) were attained menopause below 48 years 1(3.33%) attained menopause above 56 year.

In the experimental group majority of samples 15(50%) has >3 children and in the control group majority of sample that is 16(53.34%) has 2 children. None of them has no children in both experimental and control group.

In the experimental group majority of sample 21(70%) has back pain for less than 2 years, and in the control group majority of sample 15(50%) has back pain for 3-4 years. None of them has duration of back pain >10 years in both experimental and control group.

In the experimental group majority of sample 23(76.64%) were not having habit of doing exercise and in the control group the majority of the sample 18(60%) were not having any habit of doing exercise.

In the experimental group majority of sample 23(76.64%) hadn't any history of other illness and 7(23.36%) has the history of other illness like hypothyroidism, diabetes mellitus hypertension. In the control group majority of the sample 19 (63.34%) hadn't any history of other illness and 11(36.66%) has the history of other illness like hypothyroidism, diabetes mellitus and hypertension.

**The first objective of the study was to assess the level of low back pain among post menopausal women in both experimental and control group.**

From the present study shows that in experimental group majority 26(86.66%) samples were had severe disability, 3(10%) had crippled, 1(had moderate disability) in pretest and 27(90%) had moderate disability, 2(6.66%) had minimal disability, 1(3.33%) had severe disability in post test . In control group 26(86.66%) samples had severe disability, 4(13.34%) had crippled level of low back pain in pretest and 21(70%) sample had severe disability, 9(30%) had crippled level of low back pain in post test.

**The second objective of the study was to assess the effect of hamstring exercise on the level of low back pain among post menopausal women in both experimental and control group.**

From the present study, pretest mean score of low back pain was 54.53 with the standard deviation 4.4 and the post test score was 33.33 with the standard deviation 4.4.The mean difference was 21.2. The t value was 26 which are greater than p value 2.05. That was there was a significant improvement in low back pain among post menopausal women in experimental group. Pretest mean score of low back pain was 55.66 with the standard deviation 6.98 and the post test score was 56.93 with the standard deviation 6.98.The mean difference was 1.27. t value is 1 which was less than the p value 2.05. That was there was no significant improvement in level of low back pain among post menopausal women of control group. After comparing the post tests value of experimental and control group, post test mean score of low back pain in experimental group was 33.33 with the standard deviation 4.4 and the post test mean score of low back pain in control group was 56.93 with the standard deviation 4.3.The mean difference was 23.6. The t value was 21 which were greater than p value 2.05 at the level of 0.05 that was there was a significant improvement in level of low back pain in experimental group than in control group. Hence the intervention of providing hamstring exercise among post menopausal women in experimental and control group had a positive impact on the level of low back pain. Thus $H_1$ (There is a significant difference in the level of low back pain among postmenopausal women in both experimental and control group) is accepted.

Intensity of low back pain post menopausal women was assessed using oswestery low back disability index scale. The finding of the study revealed that there was a significant improvement in oswestery disability index score on the level of low back pain among post menopausal women in experimental group, but there was no significant improvement in control group. The conclusion is that after providing hamstring exercise, there was significant improvement on the level of low back pain among post menopausal women of experimental group, but no significant improvement in control group.

**Summary:**

The primary aim of the study was to assess the effect of Hamstring exercise on the level of low back pain among post menopausal women. The study was conducted at selected Kudumbasree unit, Vizhinjam.

The objective of the study was to assess the effect of hamstring exercise on the level of low back pain among post menopausal women. The study attempted to assess the following hypothesis: there is a significant difference on the level of low back pain among postmenopausal women in both experimental and control group. The conceptual framework of the present study is based on J.W. Kenny's open system model with input, throughput, output and it is provided a complete framework in order to achieve the objective of the study. An extensive review of literature for this study was done by the investigator, which helped to develop the conceptual framework and selection of the tool. The literature review also helped in determining the effectiveness of intervention and plan analysis. The research design consisted of quantitative research approach with quasi experimental pretest post test control group research design. 60 samples were selected by non probability purposive sampling technique. The samples low back pain was assessed using standardized oswestery low back disability index scale.

In order to establish content validity, the tool was given to 7 experts. After pretest Hamstring exercise was done 30 minutes in a day, 5 days in a week for one month. Post test was done at 31 st day.

The data gathered were analyzed and interpreted based on the objectives. Descriptive statistics used were frequency, percentage, mean and standard deviation. Inferential statistics used to test hypothesis were paired t test.

The major finding of the study showed that there is a significant improvement on the level of low back pain among postmenopausal women in experimental group than in control group after providing hamstring exercise.

**Conclusion:**

Finding of the study showed that that there is a significant improvement on the level of low back pain among postmenopausal women in experimental group than in control group after providing hamstring exercise. Hence it is revealed that administration of Hamstring exercise was an effective intervention for relieving low back pain among post menopausal women.

**Nursing implication:**

The result of the study have implication on nursing service, nursing education, nursing practice, nursing administration and nursing research.

**Nursing service:**

- Nursing professionals working in hospital setting will be able to find out opportunities to impart their knowledge regarding the effect of Hamstring exercise in reducing low back pain among post menopausal women.
- Health information can be imparted through various methods to the public as well as to the health professionals.

**Nursing education:**

- The nursing students should be made regarding the various ,measures of reducing low back pain among post menopausal women
- The nursing students can be impart this knowledge in their clinical posting
- In-service education can be conducted to the nursing personnel regarding the effect of Hamstring exercise on the level of low back pain post menopausal women.
- The nursing students can impart this knowledge in their community posting.

**Nursing administration:**

- Nursing administrator can organize health education programs regarding the effect of Hamstring exercise in reducing low back pain among post menopausal women.
- Nurse administrator can organize in service education programs regarding Hamstring exercise in reducing low back pain among post menopausal women.
- Ensure and conduct workshop, conference, seminars on non pharmacological method to reduce low back pain among post menopausal women.
- Nursing administrator must awaken to the fact that patients' education is a necessity and should provide resource in terms of money and material.

**Nursing research:**

The research implication of the study lies in the scope for expanding the quality of nursing service.

- Nursing research can be done to find out the various innovative methods to reduce low back pain among post menopausal women

- The findings of research findings must be encouraged.

**Limitations:**

- Since the sample size is small and limited to a particular community area, generalization of the findings is limited.
- The study was limited to post menopausal women
- Only limited literatures and studies were obtained from the Indian context.

**Recommendations:**

Based on the findings of the study the following recommendations are put forwarded for further research.

- The same study could be undertaken with large samples to show strong statistical association.
- A comparative study can be conducted to compare the level of low back pain among post menopausal women and menstruating women.
- An experimental study can be conducted in different settings such as industries, IT field etc.

**Summary:**

This chapter deals with discussion, summary, conclusion, nursing implication, limitations, and recommendations, of the study. It was found that providing Hamstring exercise among post menopausal women had a positive impact on the level of low back pain.

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